Anvil Range Mine Complex
2007 Annual Environmental Report
Water Licence QZ03-059



Prepared for

Deloitte & Touche Inc.

(acting as Court Appointed Interim Receiver for Anvil Range Mining Corporation)

Submitted by

Gartner Lee Limited

February, 2008

Gartner Lee

Anvil Range Mine Complex
2007 Annual Environmental Report
Water Licence QZ03-059

Prepared for

Deloitte & Touche Inc.

(acting as Court Appointed interim Receiver for Anvil Range Mining Corp.)

In association with

Gomm Environmental Engineering Consulting

February, 2008

Reference: **GLL 70505**

Distribution:

11	**Deloitte & Touche Inc.**
6+1e	**Yukon Territory Water Board**
2	**Gartner Lee Limited**

Gartner Lee

Gartner Lee Limited

February 29, 2008

Yukon Territory Water Board
Suite 106 - 419 Range Road
Whitehorse, Yukon, Y1A 3V1

Dear Board:

Re: Water Licence QZ03-059, Annual Environmental Report for 2007

We are pleased to submit five bound copies and one unbound original of the report Anvil Range Mine Complex, 2007 Annual Environmental Report, Water Licence QZ03-059. Gartner Lee Limited has prepared this report on behalf of Deloitte & Touche Inc., acting as court appointed Interim Receiver for Anvil Range Mining Corporation. The report is also enclosed in electronic format.

In addition to the above report are five bound plus one unbound copies of two accompanying reports that fulfill the reporting requirements for 2007:

1. 2007 Annual Geotechnical Evaluation and Instrument Review, Various Facilities at Faro Mine, Yukon as prepared by BGC Engineering Inc.; and
2. 2007 Annual Inspection, Waste and Water Management Facilities, Vangorda Mine, Yukon Territory as prepared by SRK Consulting (Canada) Inc.

We draw your attention also to the report, Anvil Range Mine Adaptive Management Plan - Annual Review for 2007, which is appended.

If you have any questions please do not hesitate to contact us.

Yours very truly,
GARTNER LEE LIMITED

H. Badry

Heather Badry, B.Sc.
Senior Environmental Scientist

HB;sg

2251 2nd Avenue, Whitehorse, Yukon, Y1A 5W1 tel 867.633.6474 fax 867.633.6321
www.gartnerlee.com

Executive Summary

The Anvil Range Mine was “shut down” in February 1998 due to poor economic circumstances and projections. The mine owner at that time was Anvil Range Mining Corporation. The owner entered into receivership in April 1998 and, since that time, management of the mine property has been under the direction of Deloitte and Touche Inc. acting as the court appointed Interim Receiver. Mining and ore processing activities have never been restarted and the mine is considered to be permanently closed.

Care and maintenance activities at the Faro and Vangorda Plateau mine sites are regulated under Water Licence QZ03-059. The licence, in general, allows for the continuation of care and maintenance activities and the development of a Final Closure and Reclamation Plan.

The Water Licence required that a Final Closure and Reclamation Plan (FCRP) for the mine facilities be prepared and submitted to the Board by December 31, 2006. The plan is being prepared under the general management of Indian and Northern Affairs Canada and the Government of Yukon through the Faro Project Management Team (FPMT). The plan is to be submitted by these two governments.

In October 2006, the Interim Receiver submitted an application to amend Clause 58 of the Licence, to extend the date for filing of the final closure and reclamation plan from December 31, 2006 to February 28, 2009. The YWB granted this request and issued amendment #1 to the Water Licence on December 20, 2006. The amendment also requires quarterly updates to the YWB regarding the FCRP beginning in June 2007. Quarterly update reports were submitted to the Board as required throughout 2007, outlining on the status of the closure planning process.

The environmental monitoring programs required under the Water Licence are largely a continuation or a refinement of programs that have been carried out for years under this and previous water licences. These programs include surface water monitoring, groundwater monitoring, biological monitoring and physical stability monitoring. There is also an adaptive management plan that is reviewed on an annual basis as well as a number of specific projects that may require separate reports.

All of the requirements for environmental monitoring and for special projects for 2007 were completed and the results are presented in this report.

The water licence does not allow for any mining or ore processing activities to recommence. Therefore, no tailings or process water were deposited into the mined-out Faro Main Pit or into the Down Valley tailings impoundments in 2007. The backfilled Faro Zone II Pit was dewatered into the Faro Main Pit as required to maintain an acceptable water level in the Zone II pit. Water from the Faro Main pit and the Intermediate Pond was successfully treated with lime through the on-site water treatment systems and released to the environment according to the terms of the water licence. No pumping or treatment was required at the Vangorda Pit in 2007 because a sufficiently large volume of water had been successfully treated in 2005.

The summary highlights of the 2007 environmental monitoring programs are as follows:

- All of the required monitoring, projects and reporting were completed;
- The required annual volumes of water were treated and released from the Faro Main pit and the Intermediate Pond; the Vangorda Pit did not require pumping in 2007 because of the large volume pumped in 2005;
- A change to the Faro site water management strategy was designed and constructed in 2006/2007 that eliminated the need for operation of the less efficient Down Valley treatment system. Under the new system, water was pumped from the Intermediate Pond and emergency tailings area (via the Intermediate Pond) directly to the Mill water treatment system; complementary to this pumping system was an upgrade of the Mill water treatment system to a high-density sludge process. Although the Down Valley Treatment system remained in place throughout 2007 in a decommissioned state, this system was not required under the new water management strategy;
- Compliance of effluent with the maximum allowable discharge criteria was excellent; no licence discharge limits were exceeded in 2007;
- No substantive or high-risk issues were identified for any of the water retention dams or dykes on the property that were not already being actively managed;
- The benthic invertebrate community remains healthy in Rose Creek;
- Fish populations remain healthy in both Vangorda and Rose Creeks with no negative trends indicated;
- Maintenance programs were successfully completed for the water treatment facilities, pumping systems, dams, diversions, roads and other facilities that are required for the care and maintenance programs; and
- The Adaptive Management Plan continued to be successfully implemented and appropriate investigations and responses were developed as required.

Table of Contents

Letter of Transmittal
Executive Summary

Page

1. Introduction 10

1.1 Background 10
1.2 Summary of Water Licence Requirements 11
1.3 Organization of the Report 12

2. Water Use 17

2.1 Rose Creek Drainage 17
2.1.1 Summary 17
2.1.2 Zone II Pit 19
2.1.3 Main Pit 20
2.1.4 Emergency Tailings Area 26
2.1.5 Intermediate Pond 27
2.1.6 Cross Valley Pond 30
2.1.7 Seepage at Cross Valley Dam 32
2.1.8 Freshwater 32
2.1.9 Continuous Flow Monitoring 33
2.2 Vangorda Creek Drainage 36
2.2.1 Summary 36
2.2.2 Little Creek Dam Pond 37
2.2.3 Vangorda Pit 38
2.2.4 Grum/Vangorda Freshwater Supply Pond 43
2.2.5 Grum Pit 43
2.2.6 Effluent Discharge 44
2.2.7 Continuous Flow Monitoring 44

3. Water Quality Monitoring – Rose Creek Drainage 47

3.1 Overview of Water Quality Monitoring Program 47
3.2 Open Pits, Rock Dumps and Tailings 48
3.2.1 Main Pit 48
3.2.1.1 Main Pit 48
3.2.1.2 Miscellaneous Surface Seepages 50
3.2.2 Zone II Pit 51
3.2.3 Rock Dumps 53
3.2.3.1 Old Faro Creek Channel 53
3.2.3.2 Groundwater: Main Rock Dumps 55
3.2.3.3 Groundwater: Intermediate Rock Dumps 55
3.2.3.4 Groundwater : Zone II Rock Dumps 57
3.2.3.5 Groundwater: Northeast Rock Dumps 57
3.2.3.6 Miscellaneous Surface Seepages 57
3.2.4 Rose Creek Tailings Facility 59
3.2.4.1 Intermediate Pond 59

3.2.4.2 Groundwater 63
3.2.4.3 Miscellaneous Surface Seepages 63
3.3 Water Quality Entering Rose Creek 64
3.3.1 Effluent Discharge 64
3.3.2 Cross Valley Dam Seepage 65
3.3.3 Faro Creek Diversion 66
3.3.4 Groundwater 67
3.4 Receiving and Background Water Quality 68
3.4.1 North Fork of Rose Creek 68
3.4.2 South Fork of Rose Creek 70
3.4.3 Rose Creek Diversion Channel 71
3.4.4 Rose Creek Immediately Downstream of the Mine Area 73
3.4.5 Rose Creek to Anvil Creek/Anvil Creek 74
4. Water Quality Monitoring – Vangorda Creek Drainage 76
4.1 Overview Of Water Quality Monitoring Program 76
4.2 Open Pits and Rock Dumps 77
4.2.1 Grum Open Pit 77
4.2.2 Grum Rock Dump 78
4.2.2.1 Surface Seepage 78
4.2.2.2 Groundwater Seepage 79
4.2.3 Vangorda Open Pit 80
4.2.4 Vangorda Rock Dump 81
4.2.4.1 Surface Seepage 81
4.2.4.2 Groundwater Seepage 83
4.3 Water Quality Entering Vangorda Creek 84
4.3.1 Sheep Pad Pond 84
4.3.2 Vangorda Pit Northwest Interceptor Ditch 85
4.3.3 Grum Creek 85
4.3.3.1 Location V2 86
4.3.3.2 Location V2A 88
4.3.4 AEX Creek 90
4.4 Receiving and Background Water Quality 91
4.4.1 Shrimp Creek 91
4.4.2 Upper Vangorda Creek 91
4.4.3 Lower Vangorda Creek 93
4.4.3.1 West Fork 93
4.4.3.2 Main Fork 94
4.4.3.3 Lower Vangorda Creek 94
4.4.4 Long Term Trends In Lower Vangorda Creek 98
4.4.4.1 1988 to 1990 98
4.4.4.2 1991 to 1992 98
4.4.4.3 1993 to 1994 98
4.4.4.4 1995 to 1997 99
4.4.4.5 1998 to 2007 99

5. Water Treatment Plant Performance 103

5.1 Introduction ... 103
5.1.1 Overview of Water Treatment Strategy ... 103
5.1.2 Coordinated Operating Procedures ... 104
5.1.2.1 Personnel and Safety ... 105
5.1.2.2 Water Quality Sampling ... 105
5.1.2.3 Treatment Chemicals ... 106
5.1.2.4 Clean Water Diversions ... 106
5.1.2.5 Contaminated Water Collection ... 106
5.2 Mill Water Treatment System ... 107
5.2.1 Overview ... 107
5.2.2 Clean Water Diversions ... 109
5.2.2.1 Faro Creek Diversion ... 109
5.2.2.2 Faro Valley Interceptor Ditch ... 110
5.2.3 Contaminated Water Collection ... 110
5.2.4 2007 Operations ... 111
5.2.4.1 Water Quantities ... 111
5.2.4.2 Lime Usage ... 111
5.2.4.3 Water Quality ... 111
5.2.4.4 Treatment Sediments ... 112
5.2.4.5 2007 Operating Issues ... 113
5.2.4.6 Comments for 2008 Operations ... 114
5.3 Down Valley Water Treatment System ... 114
5.3.1 Overview ... 114
5.3.2 Clean Water Diversions ... 116
5.3.2.1 North Wall Interceptor Ditch ... 116
5.3.2.2 Rose Creek Diversion Canal ... 116
5.3.3 Contaminated Water Collection ... 117
5.3.4 2007 Operations ... 117
5.4 Grum/Vangorda Water Treatment System ... 117
5.4.1 Overview ... 117
5.4.2 Changes from Previous Operations ... 119
5.4.3 Clean Water Diversions ... 120
5.4.3.1 Vangorda Creek Diversion Flume ... 120
5.4.3.2 Northeast Interceptor Ditch ... 120
5.4.3.3 Northwest Interceptor Ditch ... 120
5.4.3.4 Old Vangorda Creek Channel ... 121
5.4.4 Contaminated Water Collection ... 121
5.4.4.1 Vangorda Rock Dump Seepage Collector Ditch ... 121
5.4.4.2 Little Creek Dam ... 121
5.4.5 2007 Operations ... 122
5.4.5.1 2007 Maintenance Work ... 122
5.4.5.2 Comments for 2008 Operations ... 122

6. Biological Monitoring 123

6.1 Benthic Invertebrates 123
6.2 Stream Sediments 123
6.3 Fish 124

7. Physical Stability Monitoring 125

7.1 Faro Mine Site 125
7.2 Vangorda Plateau Mine Site 126

8. Maintenance Activities 127

8.1 General 127
8.2 Site Operating Manuals 127
8.3 Rip Rap Rock 128
8.4 Waste Oil 128
8.5 Emergency Tailings Area 128
8.6 Faro Creek Diversion Channel 129
8.7 Faro Site Miscellaneous Tasks 130
8.8 Vangorda Creek Diversion Flume 130
8.9 Vangorda Site Miscellaneous Tasks 131
8.10 Other Activities 131

9. Studies and Plans 132

9.1 Overview 132
9.2 Contingency Plans 132
9.3 Terrestrial Effects Study 133
9.4 Town of Faro Water Supply Study 133
9.5 Water Treatment Sludge Management Study 134
9.6 Grum Pit Water Management Plan 134
9.7 Aquatic Life Sampling and Testing Program 134
9.8 Adaptive Management Plan 135
9.9 Comprehensive Risk Assessment 136
9.10 Rose Creek Tailings Facility Water Management Plan 141
9.11 Plan for the Management of Oxide Fines 141
9.12 Final Closure and Reclamation Plan 141
9.13 Community Liaison Committee 142

List of Figures

Figure 1-1. Anvil Range Mine Property General Layout 14
Figure 1-2. Faro Mine Site General Layout 15
Figure 1-3. Vangorda Plateau Mine Site General Layout 16
Figure 2-1. Faro Zone II Pit Water Elevation, 1997 to 2007 20
Figure 2-2. Faro Main Pit Filling Curve, 1992 to 2007 22
Figure 2-3. Faro Main Pit Water Level, 2001 to 2007 22
Figure 2-4. Main Pit Precipitation versus Natural Inflows (2000 to 2006) 26
Figure 2-5. Intermediate Pond Water Level, 2005-2007 28
Figure 2-6. Cross Valley Pond Water Level, 2005-2007 31
Figure 2-7. Preliminary 2007 Flow Record for Location R7, North Fork Rose Creek 34
Figure 2-8. Preliminary 2007 Flow Record for Location X14, Rose Creek 35
Figure 2-9. Little Creek Dam Pond Water Levels, 2005 to 2007 37
Figure 2-10. Filling Curve for Vangorda Pit, 1998 to 2007 39
Figure 2-11. Natural Inflows to Vangorda Pit 42
Figure 2-12. Grum Pit Filling Curve 44
Figure 2-13. Preliminary 2007 Flow Record for Location V8, Lower Vangorda Creek 46
Figure 3-1. Sulphate at X22B 49
Figure 3-2. Zinc at X22B 49
Figure 3-3. Cadmium at X22B 50
Figure 3-4. Sulphate at X26 52
Figure 3-5. Zinc at X26 52
Figure 3-6. Sulphate at X23 54
Figure 3-7. Zinc at X23 54
Figure 3-8. Sulphate at P96-7, P96-8A and P96-8B 55
Figure 3-9. Sulphate Concentrations in Groundwater Wells S1A, S2A, and S3 56
Figure 3-10. Zn in Groundwater Wells S1A, S2A and S3 57
Figure 3-11. Zn at W10 and W8 58
Figure 3-12. Sulphate at X4 61
Figure 3-13. Zinc at X4 61
Figure 3-14. Iron at X4 62
Figure 3-15. pH at X4 62
Figure 3-16. Zinc at X5/X5P 65
Figure 3-17. Zn at X13 66
Figure 3-18. Sulphate at X16A, X17A, and X18A 68
Figure 3-19. Sulphate at R7, R10, and X2 69
Figure 3-20. Zinc at R7, R10 and X2 70
Figure 3-21. Sulphate at X2, X3, X10 72
Figure 3-22. Zinc at X2, X3, and X10 72

Figure 3-23. Sulphate at X14 73
Figure 3-24. Zinc at X14 74
Figure 4-1. Zinc at V23 77
Figure 4-2. Sulphate at V15 79
Figure 4-3. Zinc at V22 81
Figure 4-4. Zinc at LCD 83
Figure 4-5. Sulphate at V25BSP 85
Figure 4-6. Grum Creek (V2) Total and Dissolved Zinc (mg/L) 87
Figure 4-7. Grum Creek (V2) Sulphate 88
Figure 4-8. V2A Total and Dissolved Zinc (mg/L) 89
Figure 4-9. V2A Sulphate (mg/L) 90
Figure 4-10. Sulphate at V1 92
Figure 4-11. Lower Vangorda Creek (V5, VGMAIN, V8) Total Suspended Solids 95
Figure 4-12. Lower Vangorda Creek (V5, VGMAIN, V8) Total Zinc 96
Figure 4-13. Lower Vangorda Creek (V5, VGMAIN, V8) Sulphate 97
Figure 4-14. V5 and V8 Long Term Sulphate 100
Figure 4-15. V5 and V8 Long Term Suspended Solids Trends 101
Figure 4-16. V5 and V8 Long Term Zinc Trends 102
Figure 9-1. Summary Risk Assessment Classification Matrix July 2006 Update (reflecting the 2005-2006 care and Maintenance activities and investigations) 140

List of Tables

Table 1-1. Summary of Water Licence Requirements for 2007 12
Table 2-1. Summary of 2007 Direct Water Use from Rose Creek 17
Table 2-2. Monthly Precipitation at Faro Airport to 2007 18
Table 2-3. Faro Main Pit Water Balance, 2007 24
Table 2-4. Summary Main Pit Water Volumes 25
Table 2-5. ETA Collection System Flow Rates, 2007 27
Table 2-6. Intermediate Pond Water Balance, 2007 30
Table 2-7. Summary of 2007 Water Use from Vangorda Creek 36
Table 2-8. Vangorda Pit Water Balance, 2007 40
Table 2-9. Summary Vangorda Pit Water Volumes 42
Table 3-1. Summary of Sulphate and Zinc Concentrations in Groundwater Downgradient of the Cross Valley Dam (2007) 68
Table 3-2. Total Zinc and Sulphate Concentrations in Rose Creek 2007 75
Table 5-1. Summary of Faro Lime Usage 111
Table 9-1. Summary of Studies and Plans 132
Table 9-2. Summary of Changes in Risk Classification 139

Appendices

1. Schedule A of Water Licence QZ03-059.
2. UTM Coordinates for Surface Water Sampling Locations.
3. 2007 Surface Water Quality Data – Rose Creek Drainage.
4. 2007 Groundwater Quality Data – Rose Creek Drainage.
5. 2007 Bioassay Results – Rose Creek Drainage.
6. 2007 Water Quality Data – Vangorda Creek Drainage.
7. 2007 Bioassay Results – Vangorda Creek Drainage.
8. Biological and Sediment Monitoring Program at Rose Creek, Faro, YT, 2007 Laberge Environmental Services, December 2007
9. 2007 Aquatic Life Sampling And Testing Program For The Anvil Range Mine Site, Rose And Vangorda Creek Watersheds, Faro, Yukon, To Meet The Requirements Of Water Licence QZ03-059, Conducted: During August 2007, White Mountain Environmental Consulting, January 2008
10. BGC Project Memorandums
    -Summary of Seepage Event and Remediation Efforts
    -Supplementary Memo on Channel Rehabilitation Needs, Faro Creek Diversion Channel
    -Remediation Construction Summary, Faro Creek Diversion Channel
11. Town of Faro Water Wells Report – 2007
12. Anvil Range Mine Adaptive Management Plan – Annual Review for 2007, Gartner Lee Limited, February 2008

1. Introduction

1.1 Background

The Anvil Range Mine was “shut down” in February 1998 due to poor economic circumstances and projections. The mine owner at that time was Anvil Range Mining Corporation. The owner entered into receivership in April 1998 and, since that time, management of the mine property has been under the direction of Deloitte and Touche Inc. acting as the court appointed Interim Receiver (the “Interim Receiver”). Mining and ore processing activities have never been restarted and the mine is considered to be permanently closed.

Since their appointment in April 1998, the Interim Receiver has successfully maintained compliance with the terms of the water licence by implementing a broad scope of tasks related to environmental protection and environmental monitoring, which have included:

- Pumping and treatment of water from the Faro Main pit and the Faro Zone II pit;
- Treatment of water in the Intermediate Pond (the Tailings Impoundment Facility);
- Compliance with the effluent discharge criteria in the water licences;
- Conversion of mill equipment for use as a water treatment plant;
- Water quality, biological and physical stability monitoring in accordance with and in excess of terms of the water licences;
- Preparation and submission to the Yukon Water Board of monthly water quality reports and annual environmental reports;
- Assistance with large-scale DIAND scrap steel reclamation projects;
- Removal of laboratory and process chemicals, PCB containing equipment, used oil, used tires and residual concentrate from the mine sites;
- Physical maintenance of water retention and diversion structures;
- Undertaking of a Comprehensive Risk Assessment with Annual Updates;
- Completion of comprehensive hydrogeological and geochemical studies of the Rose Creek Tailings Facility;
- Assistance with development of the Final Closure and Reclamation Plan including managing major site investigations such as drilling programs;
- Renewal of the Water Licence;
- Obtaining new permitting to incinerate waste oil for heat and to operate the operational landfill;
- Substantive improvement in the interception of clean water to reduce the volumes of water requiring treatment;
- Emergency responses to major weather events to minimize environmental effects and damage to mine facilities;
- Refurbishments to primary water diversions including the Rose Creek Diversion Canal, the Vangorda Creek Diversion Flume and the Faro Creek Diversion Channel; and

- Design and construction of a positive change to the water management strategy at the Faro site including the collection of contaminated seeps from the Emergency Tailings Area (ETA) and pumping of this water to the Intermediate Pond. Water from the Intermediate Pond is then pump to the Mill water treatment system.

1.2 Summary of Water Licence Requirements

Prior to 2004, activities at the Faro and Vangorda Plateau mine sites were regulated under two separate Water Licences, QZ95-003 (Faro) and IN89-002 (Vangorda Plateau). Both of those water licences expired on December 31, 2003. The regulatory process for renewal of those water licences was initiated in May 2002 and subsequently proceeded through environmental assessment and regulatory review. The result of those activities was the issuance of new Water Licence QZ03-059 (The "Water Licence"). The "new" Water Licence combines activities at both mine sites into one licence that, in general, allows for the continuation of care and maintenance activities and the development of a Final Closure and Reclamation Plan ("FCRP").

Part F, Item 58 of the Water Licence required that a Final Closure and Reclamation Plan (FCRP) for the mine facilities be prepared and submitted to the Board by December 31, 2006. The plan is currently being prepared under the general management of Indian and Northern Affairs Canada and the Government of Yukon through the Faro Project Management Team (FPMT). The plan is to be submitted by those two governments.

In October 2006, the Interim Receiver wrote to the Yukon Water Board (YWB) to request, on behalf of the two responsible governments, an extension to the timing for submission of the FCRP. The two governments had jointly informed the Interim Receiver that a submission by December 31, 2006 was not possible and requested that the Interim Receiver apply to the YWB for an extension. The extension requested was to February 2009, the expiry of the Water Licence. The YWB granted this request and issued amendment #1 to the Water Licence on December 20, 2006. The amendment also requires quarterly updates to the YWB regarding the FCRP beginning in June 2007. The development of the FCRP will continue to be the responsibility of the FPMT with no involvement by the Interim Receiver in the development of the closure plan.

The environmental monitoring programs required under the Water Licence are largely a continuation or a refinement of the programs that were being carried out under the two previous water licences. These programs include surface water monitoring, groundwater monitoring, biological monitoring and physical stability monitoring. There are also several new environmental programs that were introduced in 2004 under the Water Licence. These include an Adaptive Management Plan ("AMP"), regular fisheries monitoring and a number of special projects, each with a unique due date and each requiring a stand-alone report.

The Water Licence requirements for 2007 are summarized in Table 1-1. The requirements for 2007 include several reports and special projects.

Table 1-1. Summary of Water Licence Requirements for 2007

Item	Licence Clause	Dates
Monitoring Activities		
Surface Water	54, 59, 60, 61, Sch.A	Varies, weekly to annual
Groundwater	54, 59, Sch.A	Twice per year
Benthic invertebrates & Sediment	64, Sch.B	Vangorda Creek in odd years; Rose Creek in even years
Fish	53	Annual
Physical stability	66, 67	Inspection annual; instrumentation varies
Glaciation in Rose Creek Diversion Canal	69	Monthly during winter
Routine Reporting (from the terms of the Water Licence)		
Monthly data report	11, 12, 15	Monthly – 30 days following
Annual Env. Report	11, 12, 13, 14	Annual – February 28
Comprehensive Risk Assessment	55	Part of Annual Env. Report
Water Treatment Plant Performance Evaluation	65	Part of Annual Env. Report
Physical Stability	66	Part of Annual Env. Report
Maintenance Related to Dam Safety	71	Part of Annual Env. Report
Benthic Invertebrates & Sediment	B.8	Part of Annual Env. Report
Special Reports & Projects		
HazMat Inventory	19	Maintain but do not submit
Terrestrial Effects Study	49	December 31, 2005
Annual Reporting (from submitted plans and studies)		
Fish Monitoring	53	Annual
Adaptive Management Plan	54	Annual
Town of Faro Water Wells Study	50	2006/2007 Annual Env. Report

1.3 Organization of the Report

This annual environmental report for the year 2007 has been prepared according to the provisions of Part A, Section 13 of the Water Licence. This report, including all data presentations and interpretations, was prepared by Gartner Lee Limited ("Gartner Lee") based on information provided by the Interim Receiver, BGC Engineering Inc., SRK Consulting, Laberge Environmental Services and White Mountain Environmental Consulting.

This report is broadly organized into the following sections. Where applicable, the Rose Creek Drainage/Faro mine site and the Vangorda Creek Drainage/Vangorda Plateau mine site are reported separately within these sections:

Summary;

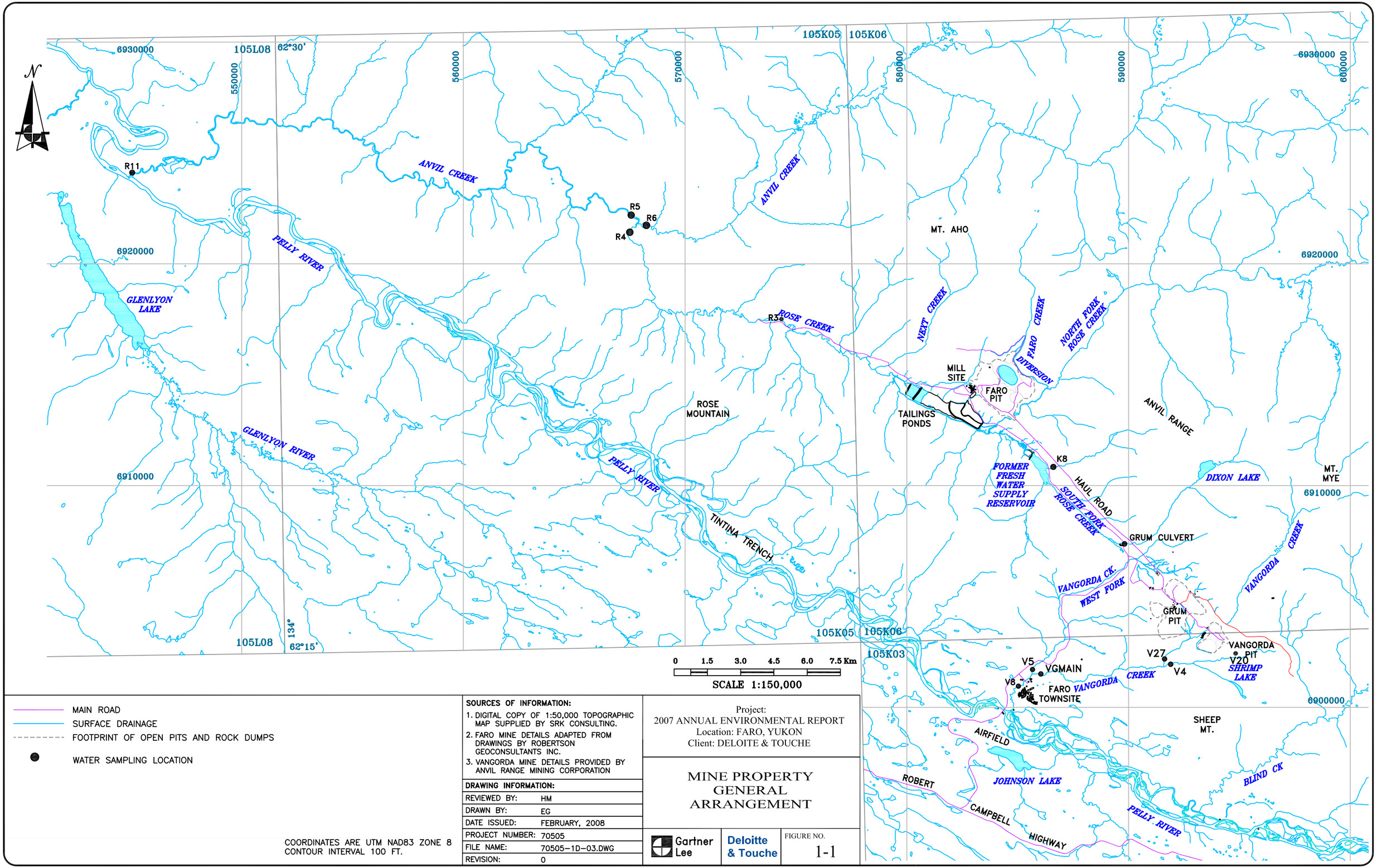
1. Introduction;
2. Water Use;
3. Water Quality Monitoring – Rose Creek Drainage;
4. Surface water, groundwater and effluent quality.
5. Water Quality Monitoring – Vangorda Creek Drainage;
6. Surface water, groundwater and effluent quality.
7. Water Treatment Plant Performance;
8. Three water treatment systems.
9. Biological Monitoring;
10. Benthic invertebrates, sediment, fish and wildlife.
11. Physical Stability Monitoring;
12. Engineering inspections and instrumentation data review for both mine sites.
13. Maintenance Activities; and
14. Special Projects.

Detailed reports on the following individual monitoring programs and projects as prepared by specialist consultants are summarized within this report. Where these have not previously been submitted to the Water Board, they accompany or are appended to this report:

- Benthic Invertebrates and Sediment, Laberge Environmental Services;
- Fish, White Mountain Environmental Consulting;
- Physical Stability, Faro Mine Site, BGC Engineering Inc.;
- Physical Stability, Vangorda Plateau Mine Site, SRK Consulting;
- Adaptive Management Plan, 2007 Annual Review, Gartner Lee Limited;
- Comprehensive Risk Assessment, Interim Receiver; and
- Town of Faro Water Wells 2007 Monitoring Report, Gartner Lee Limited.

“The Anvil Range Property 2007 Dam Safety Review” report prepared by Klohn Crippen Berger will be submitted at a later date under separate cover.

Figures 1-1, 1-2 and 1-3 illustrate the general layout of the mine property and facilities.



MAIN ROAD
SURFACE DRAINAGE
FOOTPRINT OF OPEN PITS AND ROCK DUMPS
WATER SAMPLING LOCATION

COORDINATES ARE UTM NAD83 ZONE 8
CONTOUR INTERVAL 100 FT.

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.
3. VANGORDA MINE DETAILS PROVIDED BY ANVIL RANGE MINING CORPORATION

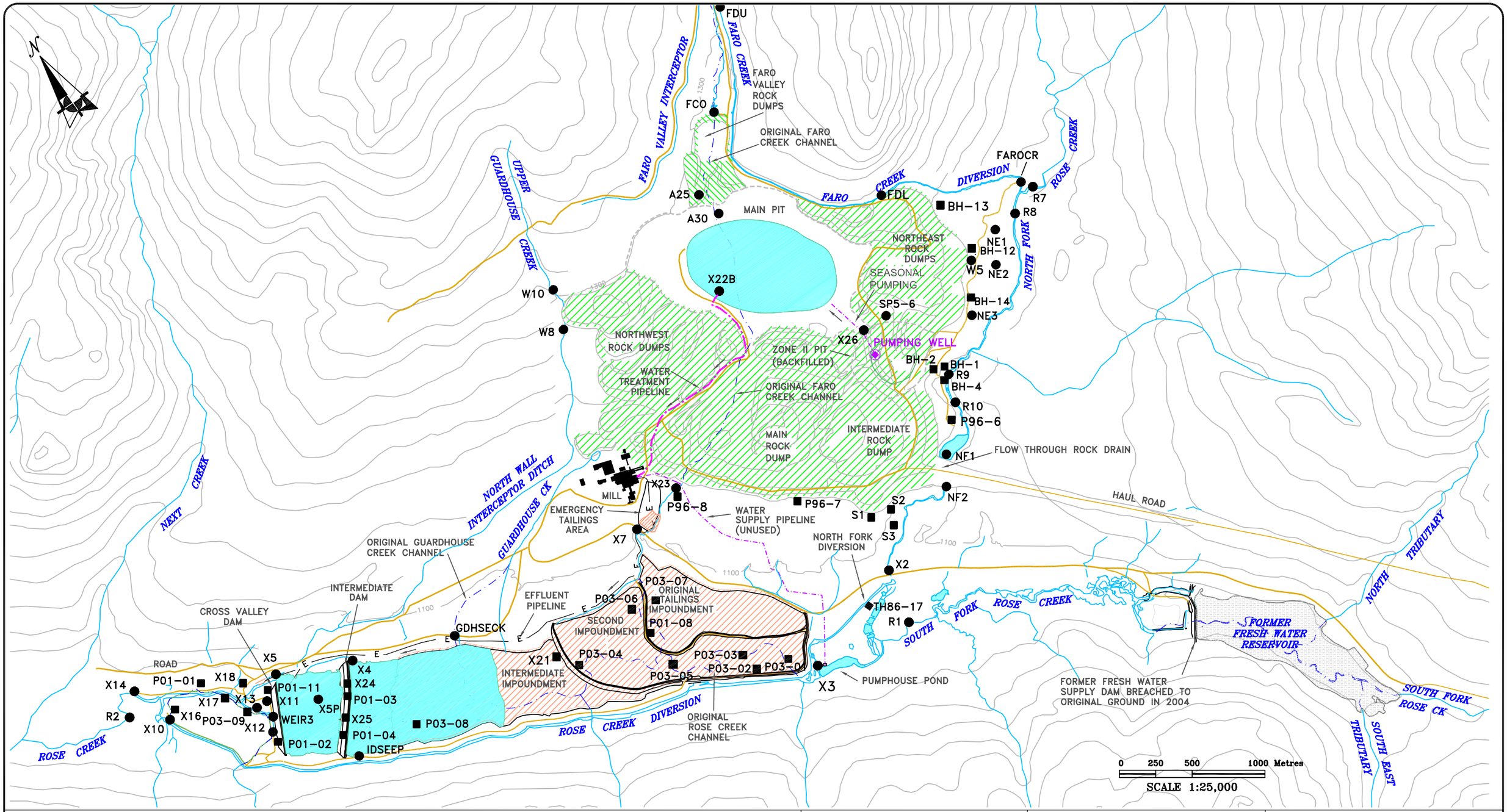
DRAWING INFORMATION:	
REVIEWED BY:	HM
DRAWN BY:	EG
DATE ISSUED:	FEBRUARY, 2008
PROJECT NUMBER:	70505
FILE NAME:	70505-1D-03.DWG
REVISION:	0

Project:
2007 ANNUAL ENVIRONMENTAL REPORT
Location: FARO, YUKON
Client: DELOITE & TOUCHE

MINE PROPERTY GENERAL ARRANGEMENT

Gartner Lee | Deloitte & Touche

FIGURE NO. 1-1



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER
- WASTE DUMPS
- TAILINGS IMPOUNDMENT
- GROUNDWATER SAMPLING LOCATION
- SURFACE WATER SAMPLING LOCATION

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. MAP COORDINATES ARE UTM NAD83 ZONE 8; CONTOUR INTERVAL 100 FT.
3. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

DRAWING INFORMATION:

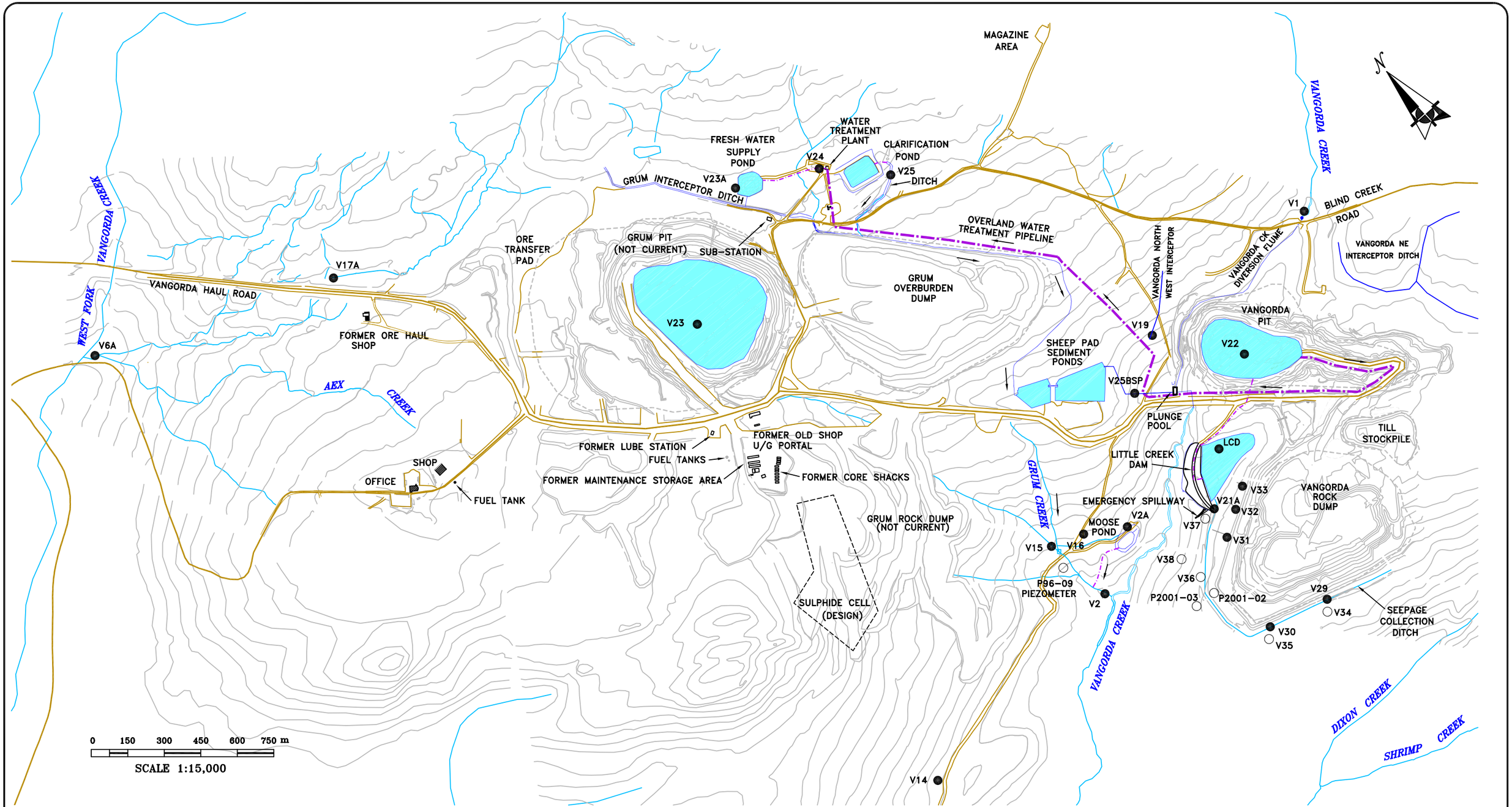
REVIEWED BY:	HM
DRAWN BY:	EG
DATE ISSUED:	FEBRUARY, 2008
PROJECT NUMBER:	70505
FILE NAME:	70505-1D-01.DWG
REVISION:	0

2007 ANNUAL ENVIRONMENTAL REPORT

FARO MINE SITE GENERAL ARRANGEMENT

Gartner Lee | Deloitte & Touche

FIGURE NO. 1-2



LEGEND:

- ROADS
- EXISTING SURFACE DRAINAGE
- PRE-MINE DRAINAGE
- E — EFFLUENT PIPELINE
- PIPELINE
- WATER TREATMENT PIPELINE
- SURFACE WATER
- GROUND WATER SAMPLING LOCATION
- SURFACE WATER SAMPLING LOCATION

DRAIN #2 = V29
DRAIN #3 = V30
DRAIN #4 = V31
DRAIN #5 = V32
DRAIN #6 = V33

GROUNDWATER WELLS = V34 TO V38

SOURCES OF INFORMATION:

1. DIGITAL COPY OF 1:50,000 TOPOGRAPHIC MAP SUPPLIED BY SRK CONSULTING.
2. FARO MINE DETAILS ADAPTED FROM DRAWINGS BY ROBERTSON GEOCONSULTANTS INC.

DRAWING INFORMATION:

REVIEWED BY:	HM
DRAWN BY:	EG
DATE ISSUED:	FEBRUARY, 2007
PROJECT NUMBER:	70505
FILE NAME:	70505-1D-02.DWG
REVISION:	0

2007 ANNUAL ENVIRONMENTAL REPORT

VANGORDA PLATEAU MINE SITE GENERAL ARRANGEMENT

Gartner Lee | Deloitte & Touche

FIGURE NO. 1-3

2. Water Use

2.1 Rose Creek Drainage

2.1.1 Summary

The Water Licence authorizes the direct use of water from Rose Creek up to a maximum rate of 65,465 m^3/day (Part B, Items 21a and 21b). Information that was provided in the Water Licence Application Report suggested an average annual direct use of water of 4.1 million m^3 per year. The Water Licence specifically recognizes the following water uses:

- Pumping from the Zone II pit;
- Pumping from the Faro Main pit; and
- Diversion through the Intermediate Pond.

Table 2-1 summarizes the total water obtained from Rose Creek in 2007 for the authorized purposes. There was no use of water for unauthorized purposes and actual use was significantly below the allowable limit.

Table 2-1. Summary of 2007 Direct Water Use from Rose Creek

Water Use	Maximum Rate (m^3/day)	Total (million m^3)
Zone II Pit Pumping	2,074	0.1
Main Pit Pumping	9,599	1.2
Intermediate Pond	2,514	0.3
Total Estimated Water Use	**14,187**	**1.6**
Total Allowable	**65,465**	**4.1**[1]

1. As suggested in the Water Licence Application Report.

For general interest as related to water use, Table 2-2 presents measured monthly precipitation at the Faro airport over the available period of record, 1978 to 2007. Due to instrumentation issues there were no data for precipitation due to snow measurements in 2007. Additional information is being developed regarding site-specific climate data through the studies that are underway for development of the FCRP including two climate stations: one at the Faro side and one at the Vangorda/Grum side. However, at this time the 2007 data is not available. Once this information is available an estimate of the precipitation at the site will be made for 2007.

Table 2-2. Monthly Precipitation at Faro Airport to 2007

Year	Jan	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (mm)
1978	0.4	**miss**	trace	4.1	11.6	27.0	38.1	41.6	7.8	32.4	20.2	19.0	
1979	8.9	18.3	20.2	6.7	10.5	68.2	55.4	13.8	13.4	11.6	12.4	34.4	273.8
1980	19.7	2.4	11.7	12.5	10.5	11.1	95.4	33.2	46.7	**miss.**	21.3	13.3	
1981	6.5	23.1	4.0	4.5	7.8	42.8	41.3	22.5	41.9	21.5	17.0	5.4	238.3
1982	10.2	18.0	9.5	4.1	18.2	14.3	58.3	47.3	47.2	42.3	11.8	13.6	294.8
1983	35.7	6.6	9.8	2.2	20.6	55.6	49.1	65.8	21.2	16.3	11.4	3.9	298.2
1984	27.6	24.1	5.9	2.4	38.8	49.0	16.6	64.9	5.5	10.8	10.7	22.5	278.8
1985	22.5	24.8	2.2	13.8	17.2	28.1	62.6	80.8	46.3	20.0	22.2	26.1	366.6
1986	8.4	4.7	34.6	12.9	35.1	12.8	81.8	77.4	44.4	22.7	15.9	5.6	356.3
1987	3.1	14.0	2.8	10	40.1	50.8	92.4	63.5	30.2	26.6	17.8	6.2	357.5
1988	7.0	10.4	17.2	8.2	38.0	37.3	97.2	25.5	43.8	29.0	17.9	16.5	348.0
1989	19.8	3.6	19.8	2.0	17.9	41.0	51.7	16.9	30.8	46.3	39.8	13.8	303.4
1990	14.4	25.8	5.0	7.0	23.4	45.4	30.0	64.4	66.2	22.7	25.4	24.8	354.5
1991	17.2	22.6	16.6	2.8	22.4	30.2	115.4	33.0	48.2	49.6	43.4	40.0	441.4
1992	22.8	24.6	7.6	15.8	14.4	11.4	66.1	34.4	47.8	13.8	18.8	13.0	290.5
1993	22.2	15.0	1.6	6.0	76.7	48.6	50.2	56.0	50.8	35.7	**miss.**	**miss.**	
1994	20.2	8.4	11.4	5.0	39.8	24.2	19.6	25.2	45.6	41.6	24.4	8.0	273.4
1995	8.4	7.8	18.4	5.2	10.9	33.9	73.4	63.4	28.8	12.2	22.3	15.4	300.1
1996	10.2	9.1	27.1	7.2	13.4	20.0	64.4	70.8	52.7	34.8	3.5	5.9	319.1
1997	6.6	8.7	1.4	14	16.5	39.3	86.4	33.2	trace	25.2	6.4	12.4	250.1
1998	7.0	2.8	4.8	4.2	14.4	29.6	19.2	24.2	23.4	24.0	4.6	8.2	166.4
1999	24.4	10.0	15.4	1.8	44.4	64.8	42.0	33.8	27.0	22.4	12.8	21.6	320.4
2000	12.2	2.0	trace	6.0	9.6	39.6	48.1	116.2	102.2	8.6	19.4	5.8	369.7
2001	7.4	3.0	4.0	14.6	30.8	35	58.4	14.2	44.6	28.6	12.2	15.4	268.2
2002	9.2	5.8	9.0	7.0	19.6	19.4	34.9	64.1	38.4	18.2	9.6	9.4	244.6
2003	22.4	8.0	16.0	0.4	7.6	45.2	63.2	30.4	30.8	12.8	32.8	19.9	289.5
2004	31.1	11.4	45.0	4.0	15.6	34.0	13.5	38.0	48.5	33.6	9.8	45.0	329.5
2005	26.7	12.4	2.6	19.5	58.6	41.0	83.8	38.6	36.6	13.0	30.0	10.8	373.6
2006	11.0	7.0	18.5	21.6	16.2	38.0	33.4	33.3	35.6	21.0	33.1	8.3	277.0
2007	**miss.**	**miss**	**miss.**	**miss.**	**miss.**	47.2	35.4	22.2	46.4	**miss.**	**miss.**	**miss.**	
Max	35.7	25.8	45	21.6	76.7	68.2	115.4	116.2	102.2	49.6	43.4	45	
Year	1983	1990	2004	2005	1993	1979	1991	2000	2000	1991	1991	2004	
Mean	**15.3**	**11.9**	**12.7**	**7.8**	**24.2**	**36.2**	**55.9**	**45.0**	**39.8**	**24.9**	**18.8**	**15.9**	**307.1**
Min	0.4	2	1.4	0.4	7.6	11.1	13.5	13.8	5.5	8.6	3.5	3.9	
Year	1978	2000	1978	2003	2003	1980	2004	1979	1997	2000	1996	1983	
St.Dev	9.0	7.8	10.6	5.6	16.4	14.8	26.3	23.9	18.4	11.3	10.1	10.5	

All values expressed in mm as compiled by BGC Engineering Inc.

Due to instrumentation problem there were no snow measurements taken in 2007

2.1.2 Zone II Pit

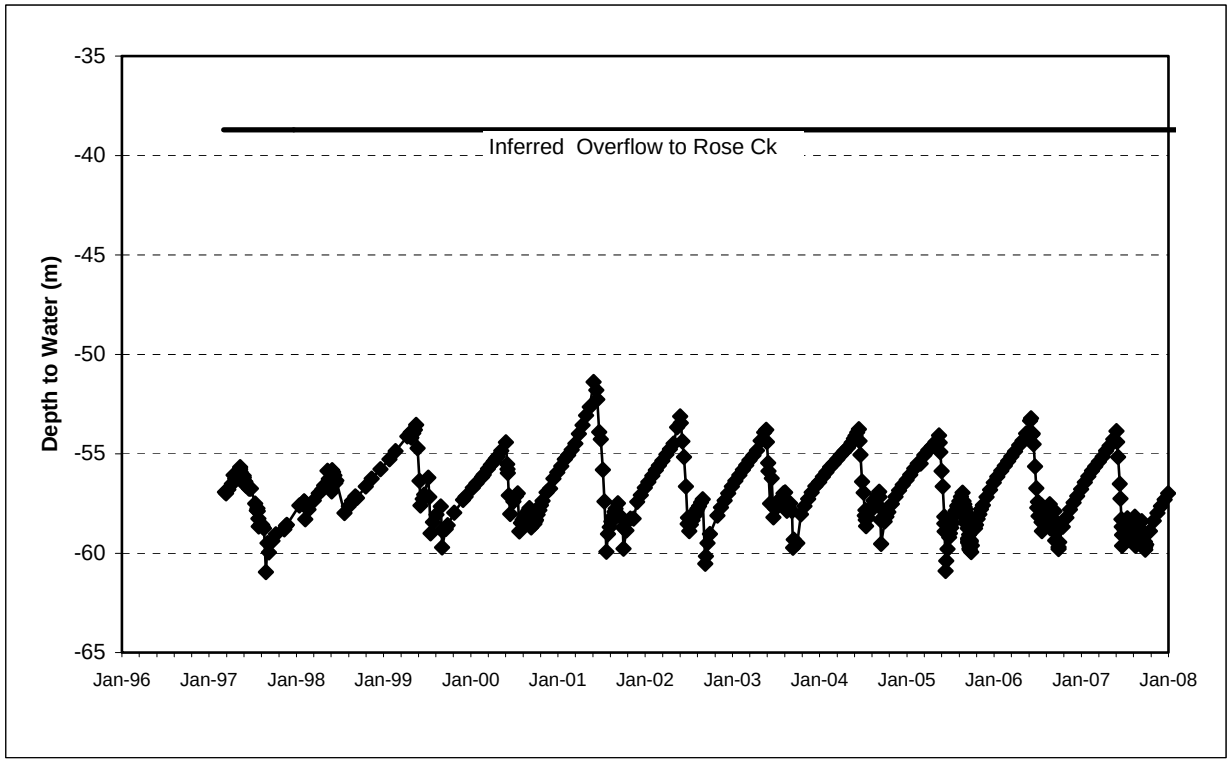
The Zone II Pit is backfilled with waste rock but still serves as a collection point for runoff water. A downhole pump is used to pump water from the backfilled pit on an as-required basis to maintain the water level within the desired range. The pump is operated only in the summer season.

An open riser pipe was installed in the pumping well in March 1997 that allowed direct water level measurements. The measured water levels are illustrated on Figure 2-1. The total volume pumped during 2007 is estimated at 69,230 m^3 based on the measured water levels and an estimated pumping rate of 0.024 m^3/s (380 USgpm). This volume compares to estimates for previous years as follows:

- 1995: Zone II volume pumped = 139,000 m^3
- 1996: Zone II volume pumped = 75,000 m^3
- 1997: Zone II volume pumped = 51,000 m^3
- 1998: Zone II volume pumped = 43,000 m^3
- 1999: Zone II volume pumped = 73,500 m^3
- 2000: Zone II volume pumped = 64,500 m^3
- 2001: Zone II volume pumped = 157,500 m^3
- 2002: Zone II volume pumped = 99,500 m^3
- 2003: Zone II volume pumped = 135,000 m^3
- 2004: Zone II volume pumped = 66,500 m^3
- 2005: Zone II volume pumped = 101,500 m^3
- 2006: Zone II volume pumped = 75,250 m^3

The Water Licence requires that the water level in the Zone II pit be maintained at least 50 m below ground level (Part B, Item 24). This was achieved through 2007, as illustrated on Figure 2-1.

Figure 2-1. Faro Zone II Pit Water Elevation, 1997 to 2007



2.1.3 Main Pit

The recycle water system which provides water from the Faro Main pit to the mill was installed during the summer of 1997 and was utilized to provide an estimated minimum 95% of the water required for processing while the mill was operating prior to February 1998. The system has been used since mine operations ceased to pump water from the Faro Main pit to the mill for treatment in order to maintain the in-pit water level within the desired range.

The water pumping system is made up of the following primary components:

1. Three electric pumps mounted on a floating barge in the pit rated at providing 5,000 USgpm each to the mill (only one or occasionally two pumps are operated at one time);
2. Overhead powerline from the substation adjacent to the mill to the pumps; and
3. 30" sclair pipeline from the barge to the mill with flexible sections near the barge that minimize the risk of damage to the pipeline which might otherwise result from vertical movement of the barge.

The measured Faro Main pit water levels are illustrated on Figures 2-2 and 2-3. The complete filling curve from 1992 to 2007 (Figure 2-2) shows the rate of filling prior to activation of the recycle water system in late July 1997 and the subsequent changes in the water level resulting from pumping for supply of water for processing and/or discharge. The water levels for recent years (Figure 2-3) illustrate seasonal pumping program that has been implemented. Figure 2-3 also illustrates the effect of modifications to the barge mount that were completed in 2002 to allow pumping water to a lower level than was previously possible.

The recommended maximum elevation of 3750 feet above sea level ("asl") (3859 feet mine datum) as illustrated on Figures 2-2 and 2-3 is approximately 15.2 m (approximately 50 feet) below the low point in the pit perimeter where water would be expected to overflow from the Main pit into the Zone II pit. This safety margin was incorporated into the design of the recycle water system in 1997 as a means of providing containment for an unexpected breach of the Faro Creek diversion into the pit and to reduce the risk of an increase in seepage into the Zone II pit through the fractured and faulted wallrock that separates the two pits. This elevation also corresponds to the current elevation of the fixed base of the swivel at the shore. The higher recommended maximum elevation of 3864 feet mine datum presented on Figures 2-2 and 2-3 is the maximum level that the barge can be raised without compromising the electrics.

The Water Licence requires that the water level in the Main pit be maintained below 1178.35 m (3866 ft) mine datum (Part B, Item 23). This was achieved through 2007, as illustrated on Figures 2-2 and 2-3.

Figure 2-2. Faro Main Pit Filling Curve, 1992 to 2007

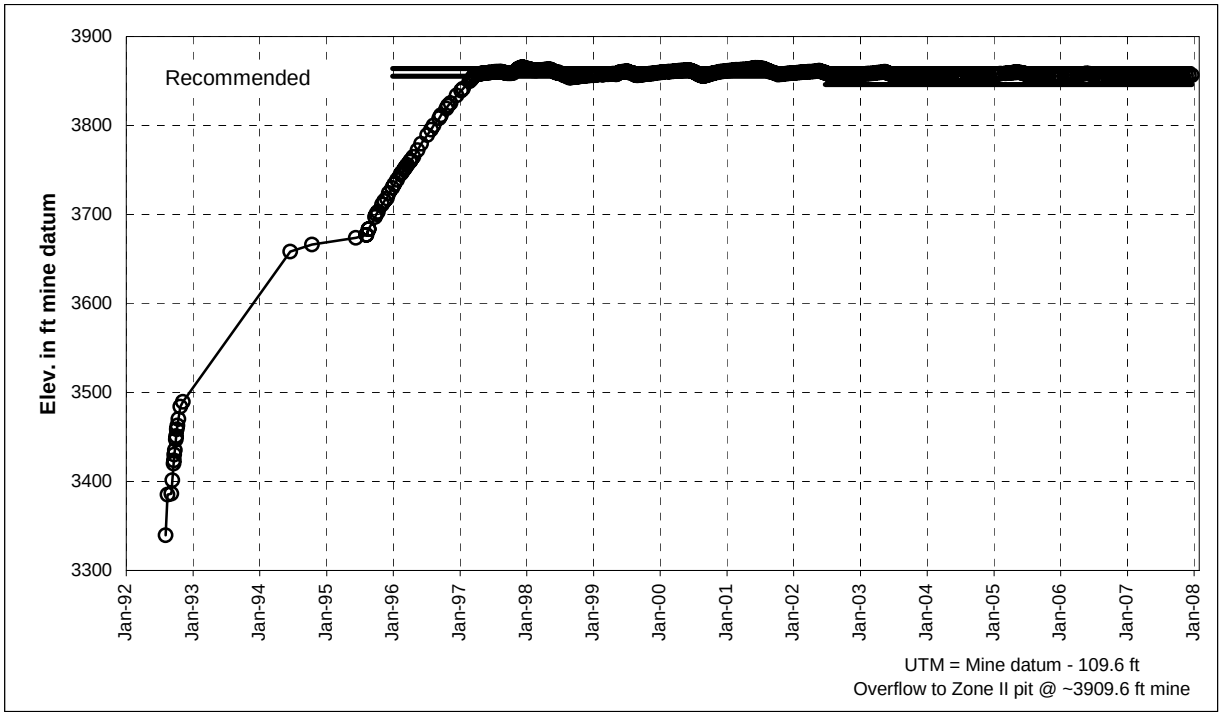
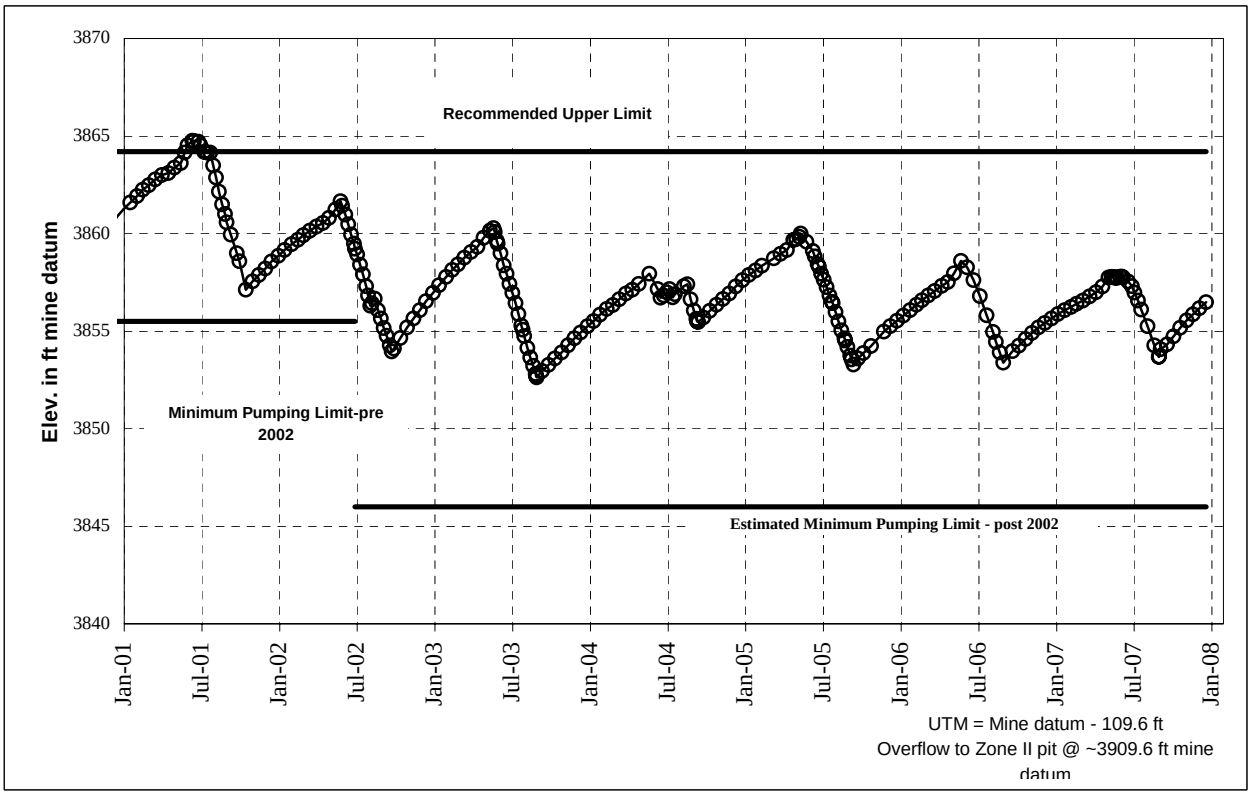


Figure 2-3. Faro Main Pit Water Level, 2001 to 2007



A simple water balance can be described for the Faro Main pit that is based on the known values of pit water level measurements, the height-volume relationship and the dates of pumping. In this case, the water balance parameters are:

- "Zone II water";
- "Net uncontrolled inflows" (groundwater seepage in/out, runoff, precipitation, etc.) calculated from observed changes in the pit pond water elevation during strategic periods;
- "Water pumped"; and
- Overall "net inflow" calculated from the overall change in the water elevation for the year.

The simple water balance could be expressed as follows with application of the subsequent notes:

Zone II Water[1] + Net Uncontrolled Inflows[2] - Water Pumped[3] = Net Inflow[4]

Therefore, the 2007 water balance for the Faro Main pit can be expressed as:

0.07 + 1.22 – 1.15 = +0.14 (in millions m^3)

Notes (also see Table 2-3):

1. The quantity of water pumped from the Zone II pit into the Main pit in 2007 is estimated to be 69,230 m^3 (Section 2.1.2).

13. The estimated volume of net uncontrolled inflows entering the Main pit from direct precipitation, evaporation, local run off, seepage inflow and seepage losses was 1.22 million m^3 for 2007 (avg. 3,345 m^3/day or 39 L/s). This estimate was developed from direct measurements of the pond water level during periods in 2007 where the only inflows/outflows were the uncontrolled water and inflow pumped from the Zone II pit. Net uncontrolled inflows during the period where there was active pumping from the pit was estimated from the average of the preceding and subsequent periods. This may provide for a slight underestimate since the pumping periods may coincide with periods of peak inflows. The estimate of net uncontrolled water inflows for 2007 is within the range of calculated values from 1995 to 2006 (1.0 to 2.0 million m^3). Further discussion of net inflows and how these may have been reduced in recent years by maintenance work on water diversions is provided in Section 5 of this report.

14. The quantity of water pumped out is calculated for the pumping period from the know volumes derived from the measured changes in pond level plus the (assumed) net uncontrolled inflow and water pumped from the Zone II pit. The estimated volume pumped in 2007 is 1.15 million m^3. This provides an estimated average flow rate of 9,599 m^3/day (1,761 USgpm average) over the operating period, which would be inclusive of operating variations. This method of estimating the pumping rate is not directly comparable with the rated pump capacity of 5,000 USgpm (per pump).

15. The net inflow of water entering the Main pit (for the year) is accurately tracked via the change in water elevation from January 1 to December 31. This volume is inclusive of all uncontrolled inflows, inflows from the Zone II pit and water pumped out. In 2007, there was a net increase in the pond level of 0.25 m (0.83 feet) representing a net volume increase of 0.14 million m^3.

Table 2-3. Faro Main Pit Water Balance, 2007

Period (days)	Elevation Change (ft mine datum)	Net Volume Change	Zone II Inflow	Net Uncontrolled Inflows	Water Pumped OUT
Jan01-May14 (134)	3855.65 – 3857.75 (+5 mm/day)	+350,120 m^3 (+2,613 m^3/day)	Nil	+350,120 m^3 (+2,613 m^3/day)	Nil
May15-Sep11 (120)	3857.75 – 3853.70 (-10 mm/day)	-675,232 m^3 (-5,627 m^3/day)	+69,230 m^3 (+2,098 m^3/day) (33 days)	+407,400 m^3 (+3,395 m^3/day) assumed	-1,151,862 m^3 (-9,599 m^3/day) calc.
Sep12-Dec31 (111)	3853.70 – 3856.48 (+8 mm/day)	+463,493 m^3 (+4,176 m^3/day)	Nil	+463,493 m^3 (+4,176 m^3/day)	Nil
Total 2007 (365)	3855.65 – 3856.48 (+0.7 mm/day)	+18,340 m^3 (+380 m^3/day)	+69,230 m^3 (+190 m^3/day)	+1,221,013 m^3 (+3,345 m^3/day)	-1,151,862 m^3 (-3,156 m^3/day)

The water level in the Main pit was lowered by approximately 1.5 m during the pumping period and ended the year at an estimated 3856.48 ft asl (mine datum), which was 0.25 m higher than at the start of the year. As a result, the storage volume created is adequate to contain the anticipated inflows until the scheduled restart of pumping in summer 2008.

The volume pumped from the pit in 2007 was the lowest since 2000 (Table 2-4), with the exception of 2004, which was lower. The volume pumped in 2004 was considerably less due to issues regarding cyanide analyses, which were resolved early in 2005. Table 2-4 also lists the annual change in pit level, estimated annual net inflows and annual precipitation. These values suggest that the 2007 pumping program maintained an overall constant water elevation with a relatively low volume of water pumped out.

The estimated volumes of annual net inflows are plotted against annual precipitation on Figure 2-4. The plot suggests that there is a consistent linear relationship between net inflows and precipitation for the five years up to 2003 (R^2=0.87). Figure 2-4 suggests that there may be a different relationship between net inflows and precipitation for 2004 and 2005 wherein the net inflows are less than preceding years. This can reasonably be linked to the maintenance work performed on the Faro Pit diversions, primarily from 2003 through 2005. If true, then this simply confirms the

observations of site management. In 2006, the natural inflows entering the pit versus total precipitation is close to the relationship for 1999-2003, which is not necessarily as supportive of the effects of the maintenance work. Another means of demonstrating this trend is the "Inflow Factor" listed in Table 2-4, which shows a lower factor for 2004 and 2005 than for other years. Continued annual assessments of inflows, and particularly the detailed analyses being conducted for the FCRP, may confirm or disprove this suggestion.

This assessment is not possible at this time for 2007 due to an incomplete precipitation record at the Faro Airport due to instrumentation issues. Additional site-specific climate data is available from two climate stations: one at the Faro side and one at the Vangorda/Grum side. However, at this time the 2007 data is not available. Once this information is available an estimate of the precipitation at the site will be made for 2007.

Table 2-4. Summary Main Pit Water Volumes

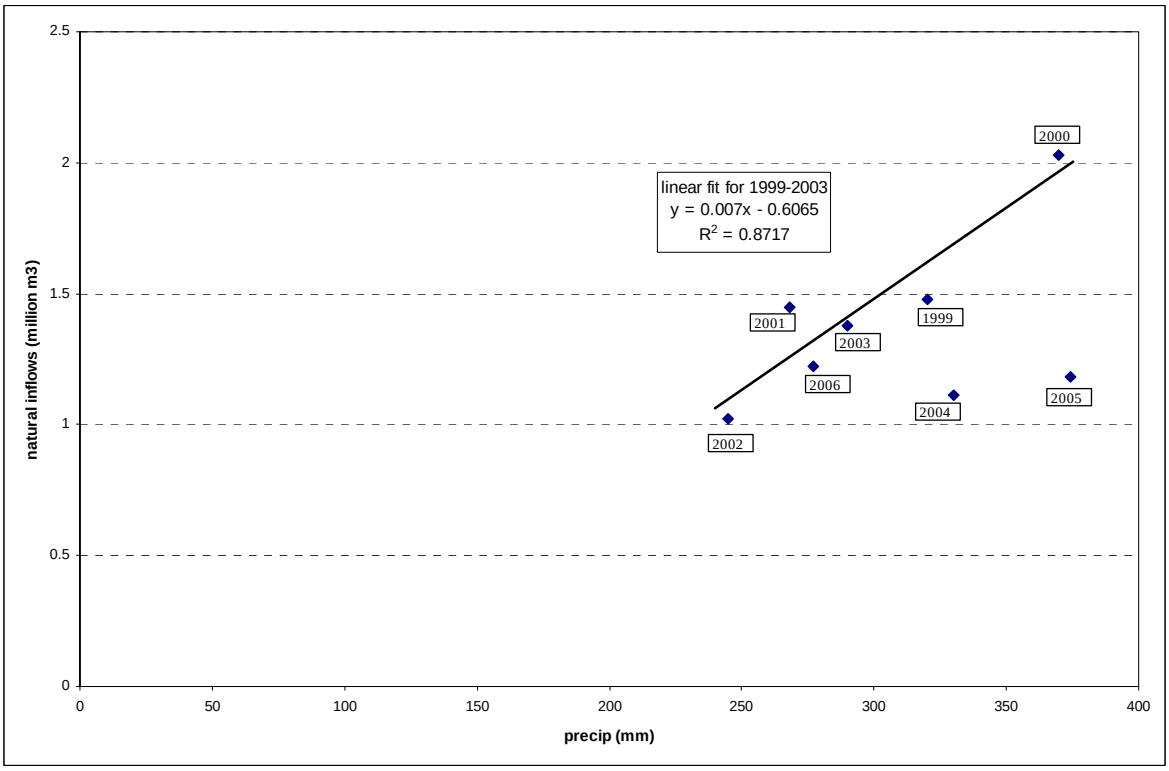
Year	Water Treated[1] (million m^3)	Annual Change in Pit Level[1]	Natural Inflows[1] (million m^3)	Annual Precipitation[2] (mm)	Inflow Factor[3] (million L/mm)
1999	1.06	+0.9 m	1.48	320	4.6
2000	1.80	+0.6 m	2.03	370	5.5
2001	1.93	-0.7 m	1.45	268	5.4
2002	1.94	-1.5 m	1.02	245	4.2
2003	1.76	-0.5 m	1.38	290	4.8
2004	0.78	+0.7 m	1.11	330	3.4
2005	1.62	-2.1 m	1.18	374	3.2
2006	1.28	+0.0 m	1.22	277	4.4
2007	1.15	+0.8	1.22	n/a	n/a

Notes: 1. As reported in the Annual Environmental Reports.

2. At the Faro airport as compiled by BGC Engineering Inc. as summarized from Table 2-2.

3. Calculated as natural inflows divided by annual precipitation.

Figure 2-4. Main Pit Precipitation versus Natural Inflows (2000 to 2006)



2.1.4 Emergency Tailings Area

Various studies carried out of the past few years concluded that surface and groundwater flows through the Emergency Tailings Area (ETA) contribute a significant contaminant load to the downstream area and that portion of this contaminate loading was escaping collection leading to possible contaminate loading to the aquifer below the Rose Creek Tailings. In response to this issue, a collection and treatment system for the ETA water was installed during the fall and winter of 2006/2007. Key components of this system include the following:

- Dual sump water collection system with cutoff trench below the ETA;
- Pipeline from ETA to the Intermediate Pond;
- Barge mounted vertical turbine pump at the intermediate Pond;
- Pipeline from Intermediate Pond to Mill Water Treatment System; and
- Pump and pipeline from the ETA to the Mill Water Treatment System.

Water from the ETA is collected in the collection sump and transported by pipeline to the Intermediate Pond. The water from the Intermediate Pond is then pumped using the floating barge system to the Mill Water Treatment System to be treated. The treated water then is conveyed to the Polishing Pond using the existing piping system and discharged to Rose Creek via siphon. The

management of water from the ETA is an internal operating practice and the Water Licence does not regulate this water use.

The ETA collection system was started up on May 22 and shutdown on October 15 due to freezing conditions. Flow rates were collected and recorded mid-month and month-end for each month of operations at the ETA collection sump and the channel weir just below the collection area (Table 2-5). Based on the flow rates from mid-June to the end of September, excluding the measurements from August 1, an average of 77% of the ETA drainage is being collected and pumped to the Intermediate Pond while 23% bypasses the collection system.

Table 2-5. ETA Collection System Flow Rates, 2007

Date	ETA Collection Sump (US Gal/day)	Channel Weir (US Gal/day)
June 18, 2007	60342	23314
June 27, 2007	133257	29257
July 16, 2007	107685	30171
August 1, 2007[a]	*66286*	*62400*
August 29, 2007	102857	32000
September 13, 2007	108571	34286
September 26, 2007	112228	36990
Average	104157	31003
% Collected	77	23

1. ETA sump feed pipes were cleaned out prior to collecting flow rates on August 29th as water was ponding in collection areas. This may have been a contributing factor for the similar flow rates on August 1st.

An estimated 57,564 m^3 was collected and piped to the intermediate Pond at the estimated average flow rate of 104,157 US Gallon/day (or 4.5 L/s) over the 145 day operating period.

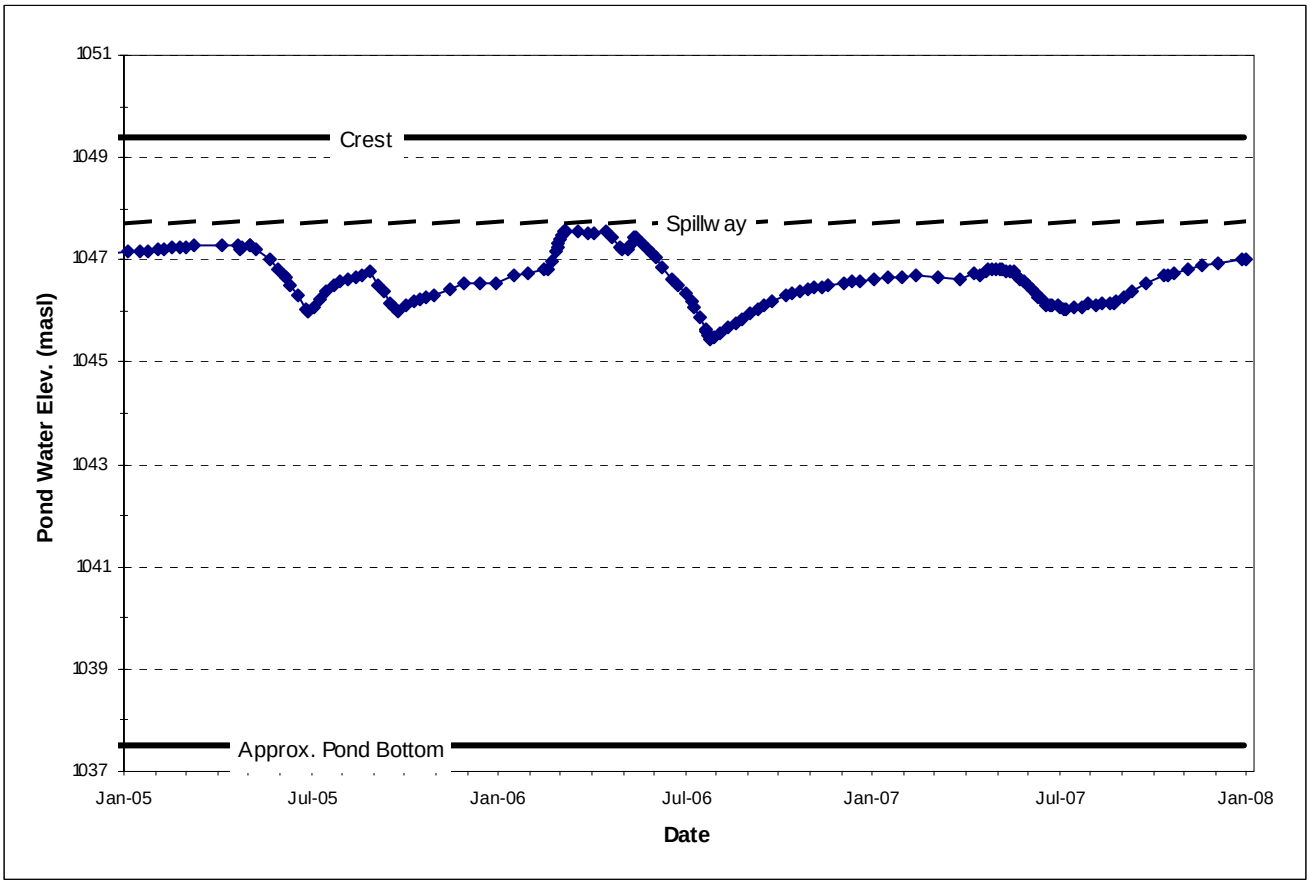
2.1.5 Intermediate Pond

In previous years, the Intermediate Pond was managed by maintaining the water level below the spillway elevation by periodically syphoning water out into the Cross Valley Pond (with treatment). As outlined in the previous section, in 2007 a barge was installed in the Intermediate Pond and water was pumped up to the Mill Water Treatment System. This practice of lowering the pond water level reduces the environmental and physical stability risks associated with operating a retained water pond at full supply level as demonstrated to the Yukon Water Board in a technical report previously submitted under Part F, Item 56 of the Water Licence. This is an internal operating practice and the Water Licence does not regulate pond level or discharge from the Intermediate Pond.

From April 18 to August 27, non-compliant water was pump continuously from the barge in the Intermediate Pond to the Mill Water Treatment System, except for a three day shutdown in June. Due to a water leak in the gearbox oil cooling system, the ETA Barge was shutdown from June 23 to June 26. An estimated 331,831 m^3 was pumped (and treated) from the Intermediate Pond in 2007 from April 18 to August 27 at an estimated average flow rate of 2,514 m^3/day (461 USgpm) average over the 132 day operating period inclusive of the three day operational shutdown. As per the established operating practice, the system was operated to provide storage for the (low) winter inflows.

Figure 2-5 illustrates the water level measurements in the Intermediate Pond from 2005 to 2007. The pond level was 0.4 m higher at year end than at the beginning of the year.

Figure 2-5. Intermediate Pond Water Level, 2005-2007



A simple water balance can be described for the Intermediate Pond that is based on the measured pond water levels, the height-volume relationship and the dates of active pumping to the Mill Water Treatment System. In this case, the water balance parameters are the quantities of:

- "Net uncontrolled inflows" (groundwater seepage in/out, runoff, precipitation, net inflows ETA system, etc.) calculated from observed changes in the pit pond water elevation during strategic periods;
- "Water Pumped from Cross Valley Pond" if any (in 2007 no water was pumped from the Cross Valley Pond);
- "Water Pumped to Mill Water Treatment System"; and
- Overall "net inflow" calculated from the overall change in the water elevation for the year.

The simple water balance could be expressed as follows with application of the subsequent notes:

Net Uncontrolled Inflows[1] + Water Pumped from Cross Valley Pond[2] – Water Pumped to Mill Water Treatment System[3] = Net Inflow[4]

Therefore, the 2007 water balance for the Intermediate Pond pit can be expressed as:

+0.42[1] + 0.0[2] – 0.33[3] = +0.09[4] (in millions m^3)

Notes (also see Table 2-5):

1. The estimated volume of net uncontrolled inflows entering the Intermediate Pond from direct precipitation, evaporation, local run off, seepage inflow and seepage losses was 0.42 million m^3 for 2007 (avg. 13 L/s). This estimate was developed from direct measurements of the pond water level during periods in 2007 where the only inflows/outflows were the uncontrolled water. For the period during which there was pumping from the Intermediate Pond to the Mill Water Treatment System the net uncontrolled inflow was estimated from the subsequent period (August 28 to December 31). This may provide for a slight underestimate since the periods of siphoned outflow may coincide with periods of peak inflows.

16. In 2007 there was no water pumped from the Cross Valley Pond to the Intermediate Pond.

17. The water pump out is calculated for the pumping period from the know volumes derived from the measured changes in pond level plus the net uncontrolled inflow. The estimated volume pumped to the Mill Water Treatment System in 2007 is 0.33 million m^3. The estimated average flow rate of 2,514 m^3/day (461 USgpm) is the average for the entire operating period, inclusive of three day operational shutdown.

18. The net inflow of water entering the Intermediate Pond (for the year) is accurately tracked via the change in water elevation from January 1 to December 31. This volume is inclusive of all uncontrolled inflows and water pumped out. In 2007, there was a net increase in the pond level of 0.4 m representing a net volume of 0.09 million m^3.

Table 2-6. Intermediate Pond Water Balance, 2007

Period (days)	Elevation Change (m asl)	Net Volume Change	Net Uncontrolled Inflows	Pumped from Cross Valley Pond	Water Pumped Out
Jan01-Apr17 (107)	1046.62 - 1046.715 (+0.9 mm/day)	+21,269 m^3 (+199 m^3/day)	+21,269 m^3 (+199 m^3/day)	Nil	Nil
Apr18-Aug27 (132)	1047.715 – 1046.15 (-4.3 mm/day)	-125,647 m^3 (-952 m^3/day)	+206,184 m^3 (+1,562 m^3/day) assumed	Nil	-331,831 m^3 (-2,514 m^3/day) (-461 USgpm) calc.
Aug28-Dec31 (126)	1045.15 – 1047.02 (+6.9 mm/day)	+196,874 m^3 (+1,562 m^3/day)	+196,874 m^3 (+1,562 m^3/day)	Nil	Nil
Total 2007 (365)	1046.62 – 1047.02 (+1.1 mm/day)	+92,495 m^3 (+253 m^3/day)	+424,327 m^3 (+1,163 m^3/day)	Nil	-331,831 m^3 (-909 m^3/day)

The water level in the Intermediate Pond was about the same (+0.01 m) at year-end as at the beginning of the year. The storage volume created is adequate to contain the anticipated inflows until the scheduled restart of dewatering in 2008.

2.1.6 Cross Valley Pond

The Cross Valley Pond is managed by maintaining the water level below the spillway elevation by periodically syphoning water out to Rose Creek. This practice reduces the environmental and physical stability risks associated with operating a retained water pond at full supply level. This water is the final effluent and it is not released unless it meets the maximum allowable discharge limits specified in the Water Licence (Part C, Items 27 through 31).

The potential sources of water entering the Cross Valley pond are:

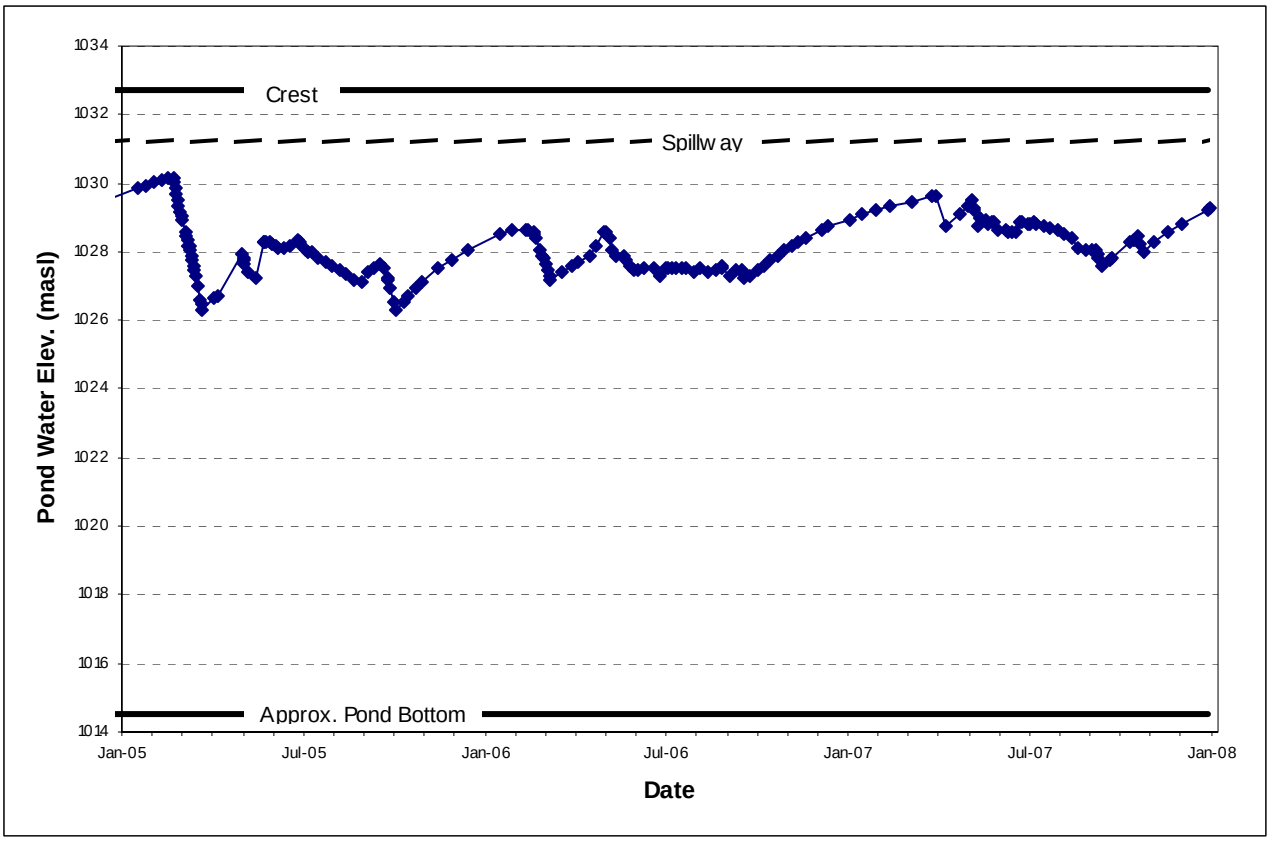
- surface inflow syphoned (and treated) from the Intermediate pond (Section 2.1.5);
- water that is pumped from the Faro Main Pit and Intermediate Pond (includes ETA water) and treated in mill treatment system (Section 2.1.3, 2.1.4 and 2.1.5);
- groundwater that may possibly discharge into the pond from the underlying aquifer; and
- precipitation and local runoff.

There were 147 days of syphon operation from April 3 to October 29 at an estimated average flow rate of 361 L/s (5,730 USgpm), as measured via staff gauge, with two shutdown periods: April 12 to May 6 and September 18 to October 22. As per the established operating practice, the system was operated through the summer to pass (treated) water inflows from the mill treatment system.

Site environmental staff recorded staff gauge readings on a daily basis and collected periodic flow measurements at location X5 when the discharge syphon was operating. The measured flow would be inclusive of the North Wall Interceptor (NWI) Ditch, which directs clean water to this location. The NWI flow would be a minor portion (in the order of 1% maximum) of the total measured flow at times when the effluent discharge syphon was operating.

Figure 2-6 illustrates the water level measurements in the Cross Valley Pond from 2005 to 2007. The pond level was 0.30 m higher at year end (2007) than at the beginning of the year.

Figure 2-6. Cross Valley Pond Water Level, 2005-2007



An estimated 4.6 million m^3 of (compliant) water was released via location X5 in 2007. This is inclusive of:

- Via the Mill Water Treatment System:
  - inflow from the Main Pit (1.15 million m^3); and
  - inflow from the Intermediate Pond (0.33 million m^3);
- Net increase in the pond level by 0.30 m over the course of the year; and
- Any other inflows and outflows, including the North Wall Interceptor Ditch.

2.1.7 Seepage at Cross Valley Dam

A continuous flow of seepage emerges to surface at the toe of the Cross Valley Dam. This is generally thought to consist primarily of seepage through the dam and the dam foundation from the Cross Valley Pond with some portion of deeper groundwater flow also. Additional information on this topic is being developed through studies that are currently underway for development of the FCRP. However, the information is not available for reporting at this time.

The total volume of effluent that entered Rose Creek via location X13 in 2007 was estimated to be 0.84 million m^3 at a rate of flow that varied from 22 to 35 Lps, as compiled by BGC Engineering Inc.

2.1.8 Freshwater

No freshwater was drawn from Rose Creek for industrial purposes in 2007. Freshwater from Rose Creek was not used for reagent mixing in the water treatment systems, drinking water or wash water.

Some components of the fresh water supply system that was previously used (during mine operations) to supply water to the mill from Rose Creek remain in place. The system is inoperable and no longer allowed under the terms of the Water Licence.

The previous fresh water dam and reservoir in the South Fork of Rose Creek represented a large component of the fresh water supply system. The dam was breached to original ground level in 2004 and there is no longer any ponding or storage of water in a reservoir. The work, which includes follow up monitoring and reporting, is conducted under a separate water licence that was issued specifically for that project.

The fresh water supply system also includes the following (unused) components which remain largely in place:

1. Pumphouse Pond located at the confluence of the North and South Forks of Rose Creek;
   The pond continues to pass all of the flow from the South Fork and most of the flow from the North Fork (high flows in the North Fork partially spill into the North Fork Diversion). The North Fork channel into the Pumphouse Pond includes several settling/groundwater recharge ponds. The pond itself represents overwintering habitat for fish.
2. Pumphouse Building;
   The building is largely empty. Pumps and motors have been previously removed for alternate use.
3. Freshwater Pipeline; and
   The steel pipeline is buried where it passes under the (former) copper sulphate and bulk explosives manufacturing yard and access road and is then overland to the mill.

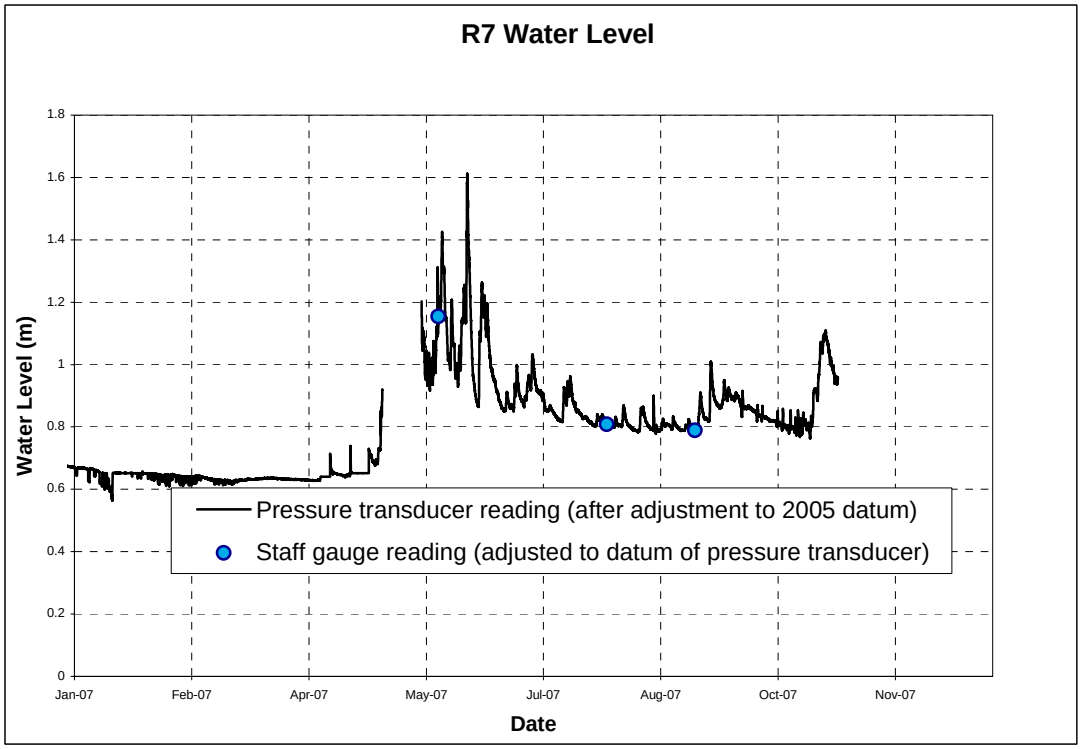
Prior to 2005, there were also two ground water wells, PW3 and PW6, located in the Rose Creek valley near the Pumphouse Pond. In 2005, the wells were capped and surface structures removed.

2.1.9 Continuous Flow Monitoring

Continuous flow monitoring at location R7 in the North Fork of Rose Creek and location X14 in Rose Creek immediately downstream of the tailings facility is a requirement of the Water Licence (Schedule A, Part III). The water levels have been monitored on a continuous basis using a pressure transducer and datalogger since 1996 (R7) and 1994 (X14) except during periods of malfunction or damage. These flow records for 2007 were subject to an annual technical review by a hydrologist.

Figures 2-7 (R7) and 2-8 (X14) are graphs of the 2007 water levels and flow rates.

Figure 2-7. Preliminary 2007 Flow Record for Location R7, North Fork Rose Creek



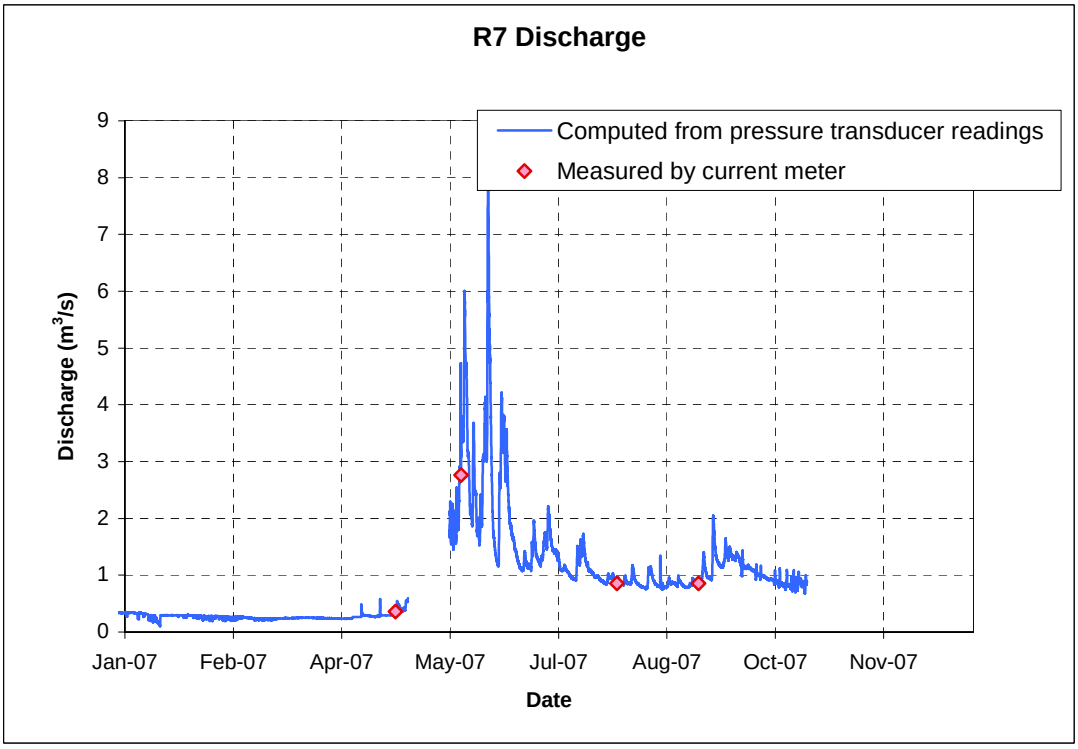
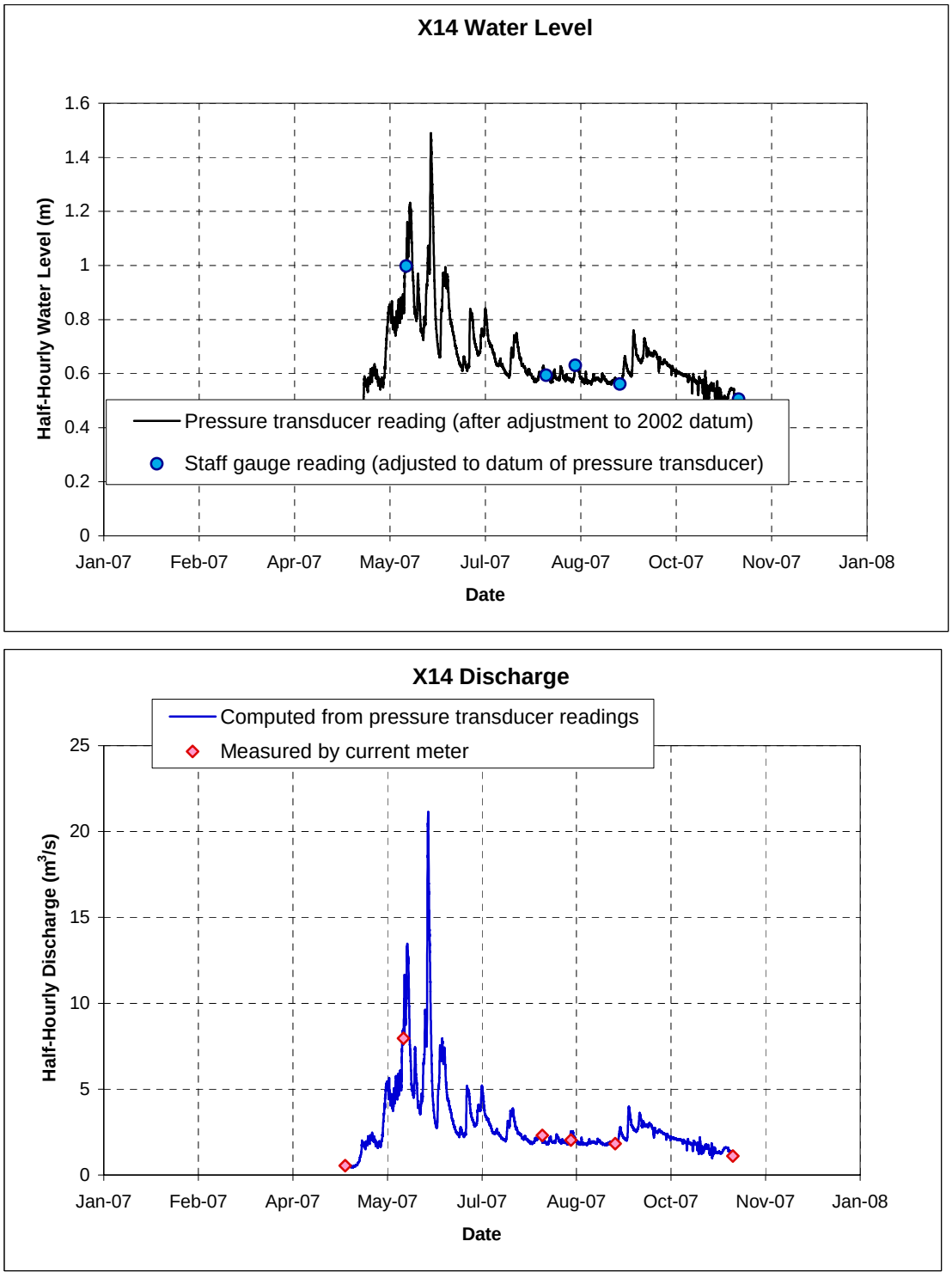


Figure 2-8. Preliminary 2007 Flow Record for Location X14, Rose Creek



2.2 Vangorda Creek Drainage

2.2.1 Summary

The Water Licence authorizes the use of water from Vangorda Creek up to a maximum rate of 19,930 m^3/day (Part B, Items 21a and 21c). Information that was provided in the Water Licence Application suggested an average annual direct use of water of 951,000 m^3 per year. The Water Licence specifically recognizes the following water uses:

- Pumping from the Little Creek Dam Pond;
- Pumping from the Vangorda pit;
- Pumping from the Freshwater Supply Pond; and
- Possible Future Pumping from the Grum pit.

Table 2-7 summarizes the total water obtained from Vangorda Creek in 2007 for the authorized purposes. One of the authorized water uses is possible future pumping from the Grum Pit (300,000 m^3 per year at a rate of 6,000 m^3/day) which was not required in 2007. Therefore, these amounts are not included in the amounts listed in Table 2-7. There was no use of water for unauthorized purposes.

Table 2-7. Summary of 2007 Water Use from Vangorda Creek

Water Use	Maximum Rate (m^3/day)	Total (m^3)
Pumping from Little Creek Dam Pond	2,734	27,340
Pumping from the Vangorda Pit	Nil	Nil
Pumping from Freshwater Supply Pond	Nil	Nil
Possible Future Pumping from the Grum Pit	Not required	Not required
Total Estimated Water Use	**2,734**	**27,340**
Total Allowable Water Use	**13,930**[1]	**651,000**[1,2]

1. Excluding Possible Future Pumping from the Grum Pit.

2. As suggested in the Water Licence Application Report.

Table 2-7 shows that no water was pumped from the Vangorda Pit in 2007. This was following the management strategy that was implemented in 2005, which pumped a sufficiently large volume of water in 2005 to eliminate the need for any pumping in 2006 and 2007. This strategy provides operational and cost benefits, reduces environmental risks and provides for moving the average annual volumes of water on a multi-year basis. In this way, the overall annual volumes pumped will be as anticipated.

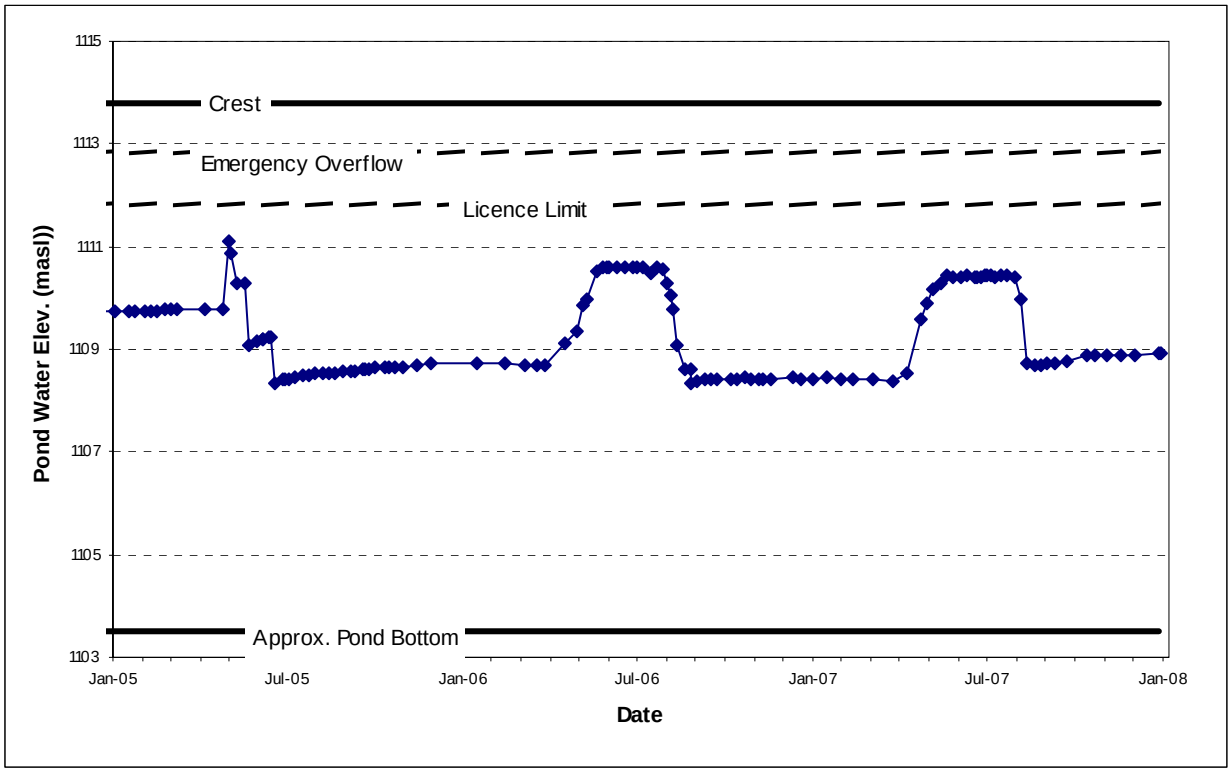
2.2.2 Little Creek Dam Pond

The water that collects in Little Creek Dam Pond is (contaminated) runoff and seepage from the Vangorda waste rock dump. This water is pumped to the Vangorda pit on an as-required basis, typically on only one or two occasions each summer, to maintain the water level below the prescribed "safe" elevations.

An estimated 27,340 m^3 was pumped from Little Creek Dam Pond in 2007. This is estimated from the measured pond elevations and the height-capacity relationship. There were 10 days of pumping between August 6 and August 16 at an estimated average flow rate of 2,734 m^3/day (500 USgpm) average over the pumping period.

Figure 2-9 illustrates the water level measurements in Little Creek Dam Pond from 2005 to 2007. The pond level was approximately 0.5 m higher at year end than at the beginning of the year. The Water Licence requires that the water level in Little Creek Dam Pond be maintained no less than 1 m below the overflow structure (Part B, Item 26). This was achieved through 2007.

Figure 2-9. Little Creek Dam Pond Water Levels, 2005 to 2007



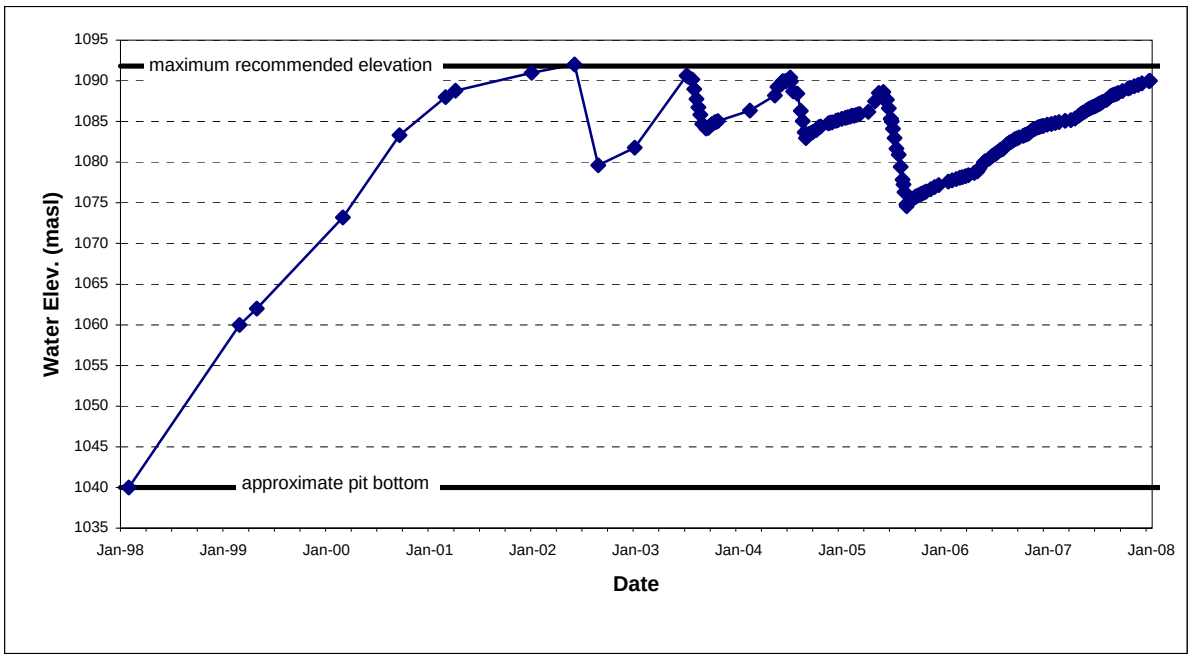
2.2.3 Vangorda Pit

From mine shut down in 1998 to 2001, the water level in the Vangorda pit rose to its recommended "maximum" allowable elevation. This elevation provides approximately 30 m of safety freeboard below the estimated overflow elevation. The pit water is contaminated from rock piles and pit walls. The inflows into the pit include local area runoff, leakage and underflow from the Vangorda Creek Diversion, direct precipitation and water pumped from Little Creek Dam Pond.

In 2002, the Grum/Vangorda water treatment plant was reactivated and a new overland pumping system was installed from the Vangorda pit. From 2002 to 2005, an annual seasonal pumping program was conducted to maintain the pit water level below the maximum recommended elevation. In 2005, a sufficiently large volume of water was pumped to eliminate the need for any pumping in 2006 and 2007. This multi-year cycle will be continued, if practical, as the preferred management strategy for the Vangorda pit.

The filling curve for the Vangorda pit through 2007 is illustrated on Figure 2-10. The Water Licence requires that the water level in the Vangorda pit be maintained below 1092.0 m asl (Part B, Item 25). This was achieved through 2007.

Figure 2-10. Filling Curve for Vangorda Pit, 1998 to 2007



A simple water balance can be described for the Vangorda pit that is based on the known values of pit water level measurements, the height-volume relationship and the dates of pumping. In this case, the water balance parameters are:

- "LCD water inflow";
- "Net uncontrolled inflows" (groundwater seepage in/out, runoff, precipitation, etc.) calculated from observed changes in the pit pond water elevation during strategic periods;
- "Water pumped"; and
- Overall "net inflow" calculated from the overall change in the water elevation for the year.

The simple water balance could be expressed as follows with application of the subsequent notes:

LCD Water[1] + Net Uncontrolled Inflows[2] - Water Pumped[3] = Net Inflow[4]

Therefore, the 2007 water balance for the Vangorda pit can be expressed as:

0.03 + 0.32 – 0 = 0.35 (in millions m^3)

Notes (also see Table 2-7):

1. The quantity of water pumped from Little Creek Dam into the Vangorda pit in 2007 is estimated to be 27,430 m^3 (Section 2.2.2).

19. The estimated volume of net uncontrolled inflows entering the Vangorda pit from direct precipitation, evaporation, local run off, seepage inflow and seepage losses is 0.32 million m^3 for 2007 (avg. 10 L/s). This estimate was developed from direct measurements of the pond water level during 2007 where the only inflows/outflows were the uncontrolled water and inflow pumped from Little Creek Dam. The estimate of net uncontrolled water inflows for 2007 is within the range of calculated values from 1998 to 2006 (0.2 to 1.0 million m^3).

20. There was no water pumped from the Vangorda Pit in 2007.

21. The net inflow of water entering the Vangorda pit (for the year) is accurately tracked via the change in water elevation from January 1 to December 31. This volume is inclusive of all uncontrolled inflows, inflows from Little Creek Dam and water pumped out. In 2007, there was a net increase in the pond level of 5.4 m representing a net volume increase of 0.35 million m^3.

Table 2-8. Vangorda Pit Water Balance, 2007

Period (Days)	Elevation Change (m)	Net Volume Change	Water Pumped from Little Creek Dam	Net Uncontrolled Inflows	Water Pumped Out
Jan01-Apr30 (120)	1084.57 – 1085.83 (+11 mm/day)	+79,619 m^3 (+664 m^3/day)	Nil	+79,619 m^3 (+664 m^3/day)	Nil
May01-Jun30 (61)	1085.83 – 1087.04 (+20 mm/day)	+79,925m^3 (+1,310 m^3/day)	Nil	+79,925m^3 (+1,310 m^3/day)	Nil
Jul01-Sep30 (92)	1087.04 – 1088.78 (+19 mm/day)	+114,932 m^3 (+1,249 m^3/day)	+27,430 m^3 (+298 m^3/day)	+87,502 m^3 (+951 m^3/day) (assumed)	Nil
Oct01-Dec31 (92)	1088.78– 1089.96 (+13 mm/day)	+77,943 m^3 (+847 m^3/day)	Nil	+77,943 m^3 (+847 m^3/day)	Nil
2007 (365)	1084.57 – 1089.96 (+15 mm/day)	+352,419 m^3 (+966 m^3/day)	+27,430 m^3 (+75 m^3/day)	+324,989 m^3 (+890 m^3/day)	Nil

An estimated 352,419 m^3 accumulated in the Vangorda Pit in 2007 from runoff, precipitation and water pumped from Little Creek Dam. The water level in the Vangorda pit ended the year at an elevation of 1089.96 m asl, which 5.4 m higher than at the start of the year. This water level remained well below the maximum recommended elevation of 1092 m asl. The pit water levels are illustrated on Figure 2-10.

Substantive maintenance work was completed on the Vangorda clean water diversion ditches in 2003 and 2004. This work provided a visibly improved catchment of clean water, especially in the northeast diversion ditch. It is of interest to investigate whether this work results in a noticeable difference in the amount of water entering the Vangorda Pit, as calculated through the Vangorda pit water balance.

The estimated volumes of annual net inflows are plotted against annual precipitation on Figure 2-11. The plot suggests that there is a consistent exponential relationship between net inflows and precipitation for the five years up to 2002 (R^2=0.92). This is representative of the period before the substantive maintenance work was completed on the northeast, and other, diversion ditches.

Figure 2-11 suggests that 2003 is different than all of the other years plotted and the reason for this is unknown. We note, however, that the frequency and procedure for monitoring the pit water level were upgraded in mid-2003 such that the data for the first-half of 2003 contain a greater degree of extrapolation that may skew some of the indications.

Figure 2-11 does not clearly suggest that 2004, 2005 and 2006 show a different relationship between precipitation and estimated natural inflows. We note, however, that the natural inflows for 2004 include an unknown volume representative of a 12-hour diversion of Vangorda Creek into the pit during a flood event. This would have the effect of artificially increasing the estimated natural inflows. The data for 2005 and 2006 place this year with lower natural inflows, which could be related to a general reduction of inflows. If true, then this would confirm the observations of site management, who have suggested a noticeable effect. Continued annual assessments of inflows will confirm or disprove this suggestion.

Because the water balance presented herein is coarse and based, in part, on generalized inputs compiled over a number of years, the true effect of the improvements to the Vangorda Pit diversions are thought to be understated.

Similar to the Faro Main Pit, this assessment is not possible at this time for 2007 due to an incomplete precipitation record at the Faro Airport due to instrumentation issues. Additional site-specific climate data is available from two climate stations: one at the Faro side and one at the Vangorda/Grum side. However, at this time the 2007 data is not available. Once this information is available an estimate of the precipitation at the site will be made for 2007.

Table 2-9. Summary Vangorda Pit Water Volumes

Year	Water Treated1 (m^3)	Annual Change in Pit Level	Natural Inflows2 (m^3)	Annual Precipitation3 (mm)
1998	Nil	+20.0 m	231,100	166
1999	Nil	+13.2 m	441,500	320
2000	Nil	+14.8 m	817,000	370
2001	Nil	+3.0 m	417,000	268
2002	894,000	-7.0 m	389,000	245
2003	750,000	+4.4 m	1,006,500	290
2004	556,000	-1.1 m	456,500[4]	330
2005	924,500	-7.8 m	446,000	374
2006	Nil	+2.2 m	368,000	277
2007	Nil	+5.4 m	352,419	n/a

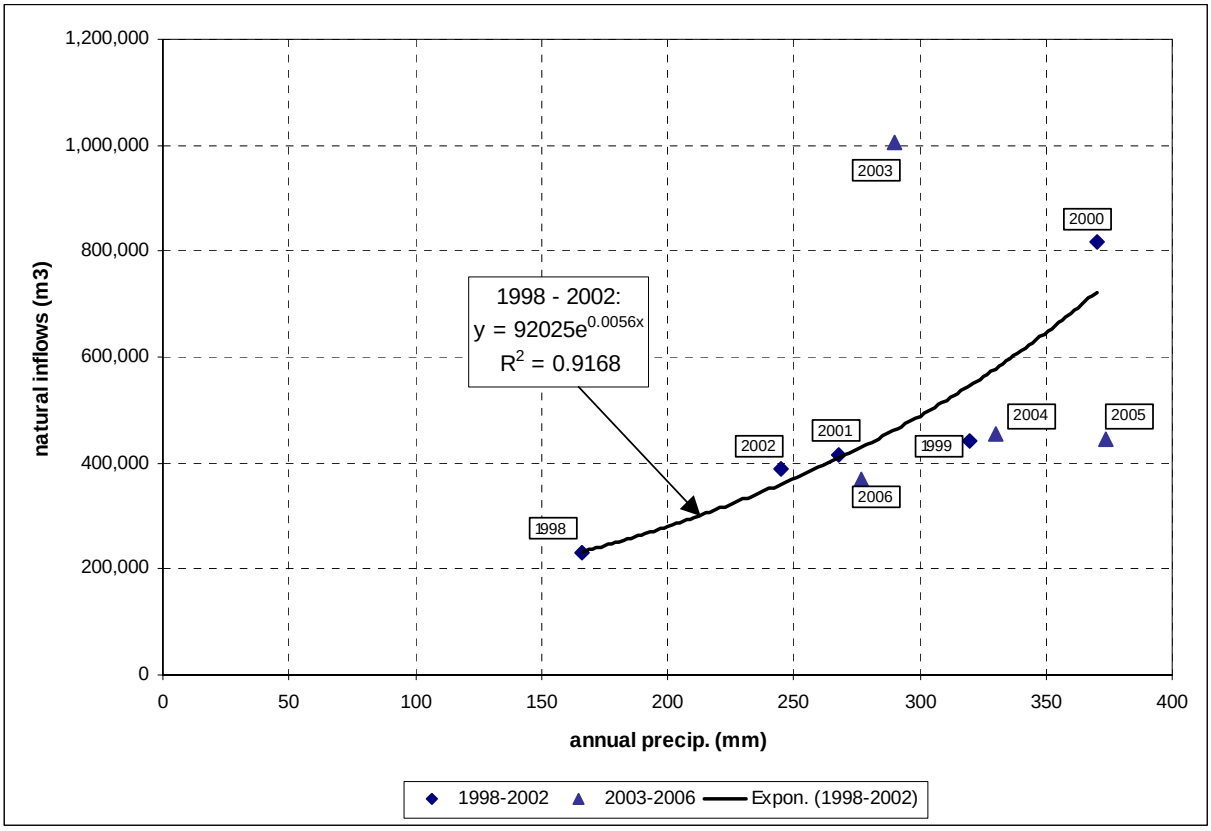
Notes: 1. As reported in the Annual Environmental Reports.

2. As estimated from the Vangorda Pit water balance.

3. At the Faro airport as compiled by BGC Engineering Inc. as summarized from Table 2-2.

4. Includes the inflow of a portion of Vangorda Creek for ~12 hrs related to extreme flooding.

Figure 2-11. Natural Inflows to Vangorda Pit



2.2.4 Grum/Vangorda Freshwater Supply Pond

During years when the Grum/Vangorda water treatment plant is operated, a relatively small amount of freshwater is drawn from Vangorda Creek for mixing lime in the plant. This water is drawn from the Grum/Vangorda Freshwater Supply Pond which stores some surface runoff that flows into the Grum Interceptor Ditch just upgradient of the water treatment plant. Water is pumped from the pond to the plant on an on-demand basis to maintain an adequate supply of mix water in a storage tank located in the plant.

The Grum/Vangorda water treatment plant was not operated in 2007 and no freshwater was used.

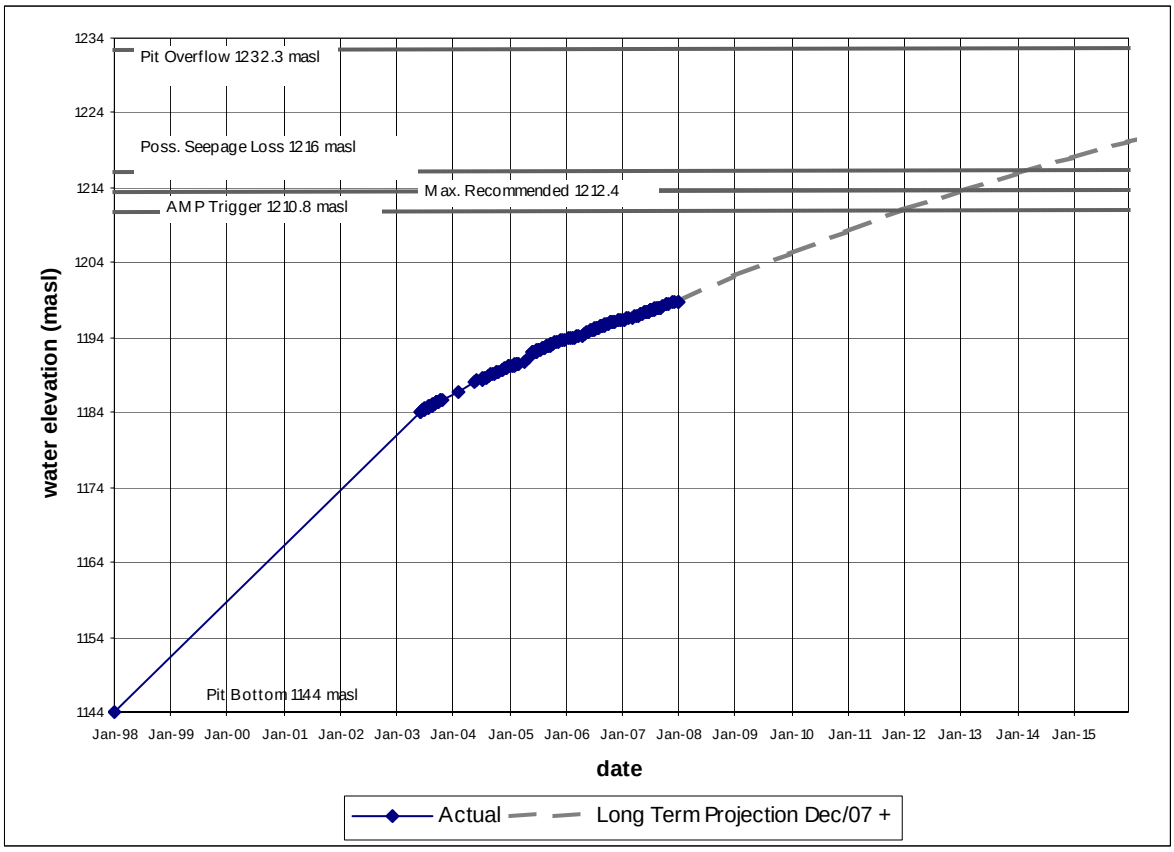
2.2.5 Grum Pit

Since the cessation of mining activities in 1998, the Grum pit has been allowed to accumulate natural runoff water. The rate of filling has been slower than the Vangorda pit because of the relatively smaller inflows and relatively larger size. In 2003, a study was undertaken by Gartner Lee that developed a height-capacity relationship and that recommended a maximum recommended water elevation where treatment or some other intervention should be considered if the water were non-compliant.

The pit filling curve illustrated on Figure 2-10 shows that no “action” levels were reached in 2007. Further, rough conservative projections of the rate of filling indicate that the earliest that the action level prescribed in the Adaptive Management Plan (AMP) might be reached is during 2011. This is projected to be a minimum 2 years prior to the water level reaching the elevation at which subsurface seepage might occur. The projected rate of filling is one of the elements of the Adaptive Management Plan and is also discussed in Section 9.8.

The estimated net quantity of water that accumulated in the Grum Pit in 2007, based on the measured elevations and the height-capacity curve, is 309,881 m^3 (10 L/s average).

Figure 2-12. Grum Pit Filling Curve



2.2.6 Effluent Discharge

There was no effluent discharged from the Grum/Vangorda water treatment plant in 2007.

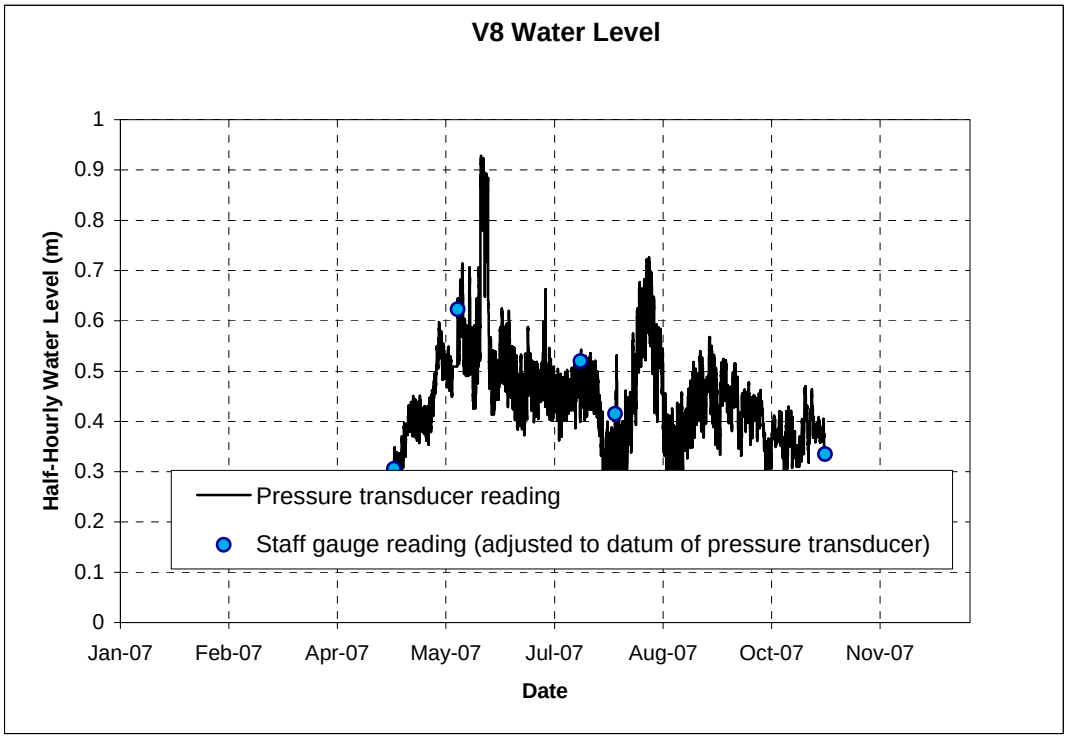
2.2.7 Continuous Flow Monitoring

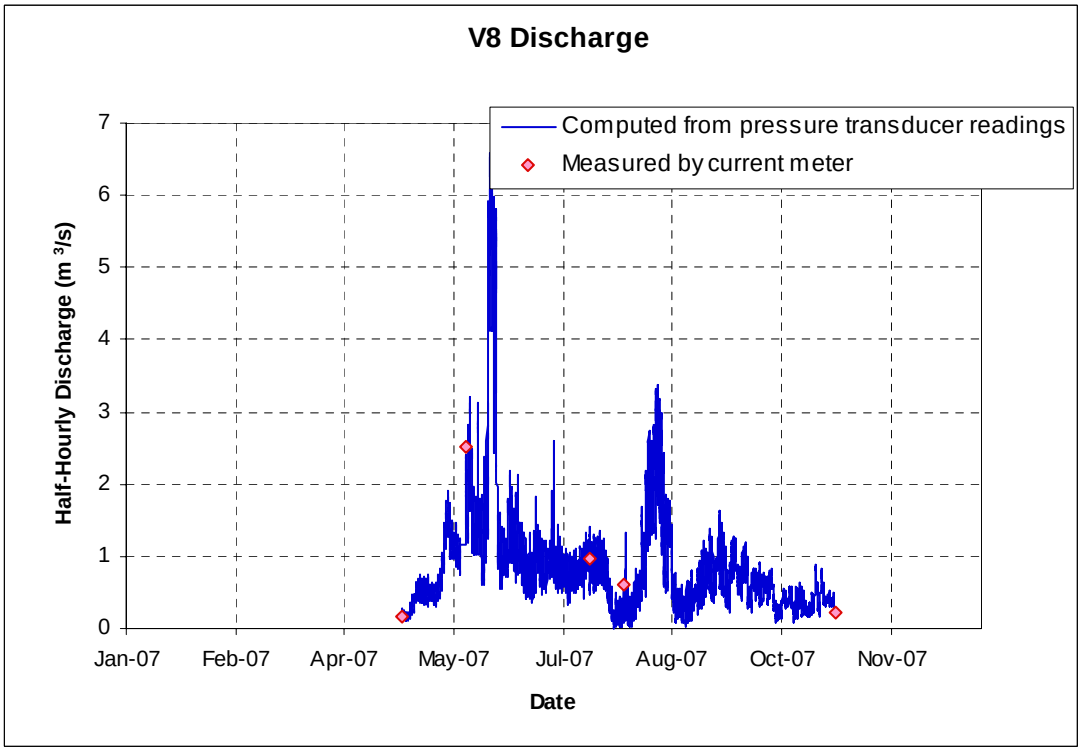
Continuous flow monitoring location V8 in lower Vangorda Creek is a requirement of the Water Licence (Schedule A, Part III). The monitoring location is adjacent to the Town of Faro access road and the bridge to the town pumphouses. This is below the confluence of the West Fork and the "Main Fork". The water level has been monitored on a continuous basis using a pressure transducer and datalogger since 1996 except during periods of malfunction or damage. This flow record for 2007 was subject to an annual technical review by a hydrologist.

Review of the record indicates that the pressure transducer may need to be calibrated. Also, during installation of the station in April, there were limited options due to extensive ice cover. As a result, that during times of flow measurement, the water level in stilling well was often much lower than the surface water. The flow measurement site will be relocated to a better location in the spring of 2008 and the pressured transducer will be recalibrated.

Figures 2-13 illustrates the graphs of the 2007 water levels and flow rates at V8.

Figure 2-13. Preliminary 2007 Flow Record for Location V8, Lower Vangorda Creek





3. Water Quality Monitoring – Rose Creek Drainage

3.1 Overview of Water Quality Monitoring Program

Water quality is monitored regularly throughout the mine property as described in Part G and Schedule A of the Water Licence. The water quality monitoring program outlined in the Water Licence prescribes the sampling locations, sampling frequency and the minimum parameters to be analysed annually.

The monitoring program is carried out by staff employed at the mine site by the Interim Receiver. Various professional laboratories have been used to provide the sample analyses over the life of the project. Laboratories are selected on the basis of certification with the Canadian Association of Environmental Analytical Laboratories, service and other factors. In 2007, most of the water analyses were conducted by CanTest with the exception of cyanide, which was analysed by ALS Laboratory Group. The analytical data is managed and maintained through an electronic database that is managed by Gartner Lee Limited.

The monitoring program also makes extensive use of the unique capability for high-quality, on-site zinc analyses to provide immediate feedback to site managers regarding effluent quality. On-site analyses of effluent zinc concentrations are conducted on a daily, or more frequent, basis when treated effluent is being released.

Water sampling frequencies vary from weekly (for treated effluents) to twice per year (for groundwater). The majority of water samples are collected on a monthly or quarterly basis. Continuous flow monitoring via dataloggers is required at two locations in the Rose Creek drainage (R7 and X14). Other locations have various requirements for flow measurement.

Schedule A of the Water Licence, including the descriptions of the monitoring locations, sampling frequencies and minimum parameters, is provided in Appendix 1. UTM coordinates for the sampling locations have been previously provided to the Board and are provided in Appendix 2 for ease of reference. The monitoring locations are also illustrated on Figures 1-1, 1-2 and 1-3. Analytical data for 2007 is provided in Appendix 3 (surface water) and Appendix 4 (groundwater). Bioassay results are provided in Appendix 5. A brief review of the data is provided in the following sections.

3.2 Open Pits, Rock Dumps and Tailings

3.2.1 Main Pit

3.2.1.1 Main Pit

Water quality in the Faro Main Pit is monitored in the near surface zone at location X22B. In 2007, monthly samples were collected for the purpose of monitoring and assessment of pit water quality conditions, and to support management of the annual Faro pit-pumping program. Water quality at this location is generally demonstrative of buffered acid rock drainage with high levels of metals and sulphate at a neutral pH. This is as expected given the presence of mineralized rock dumps and pit walls in the drainage area and the inflow up until February 1998 of lime treated tailings slurry. A generally progressive increase in zinc (Zn) concentrations from 1998 to 2003 is consistent with anticipated trends related to the discontinuation of high pH water inflow from the tailings slurry. Zinc concentrations appear to be relatively consistent since 2004.

During 2007, the average sulphate concentration at Station X22B was 620 mg/L, with concentrations ranging from 559 mg/L to 662 mg/L at station X22B. The concentrations of total and dissolved zinc at location X22B ranged from 12.2 mg/L to 17.3 mg/L and from 11.3 mg/L and 17.3 mg/L, respectively, with average concentrations of 13.9 mg/L and 13.2 mg/L, respectively. Concentrations of sulphate and zinc observed in 2007 are within ranges typically observed at this site in recent years (Figures 3-1 and 3-2).

In 2007, total cadmium concentrations at X22B ranged from 0.0049 mg/L to 0.0090 mg/L, with an average concentration of 0.0066 mg/L. Dissolved cadmium concentrations ranged from 0.0.044 mg/L to 0.0093 mg/L, with an average concentration of 0.0063 mg/L. A progressively decreasing trend in maximum annual concentrations has been observed at this location since 2003 (Figure 3-3).

Lead (Pb) concentrations remained at relatively low concentrations throughout 2007, ranging from <0.001 mg/L to 0.004 mg/L, with an average concentration of 0.0014 mg/L. Dissolved lead concentrations remained below the detection limit of <0.001 mg/L for all samples.

Figure 3-1. Sulphate at X22B

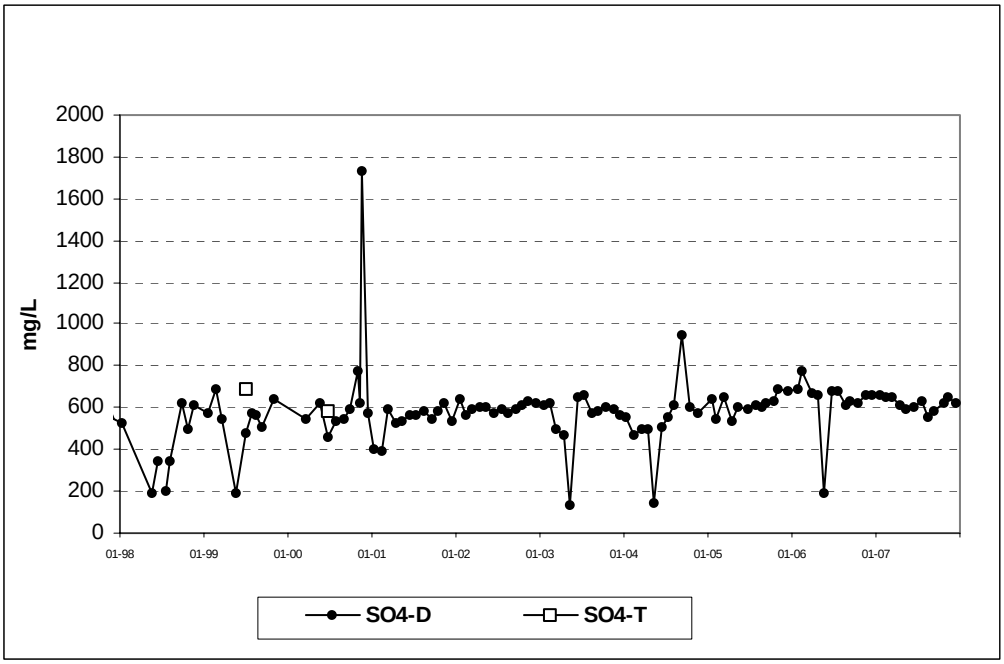


Figure 3-2. Zinc at X22B

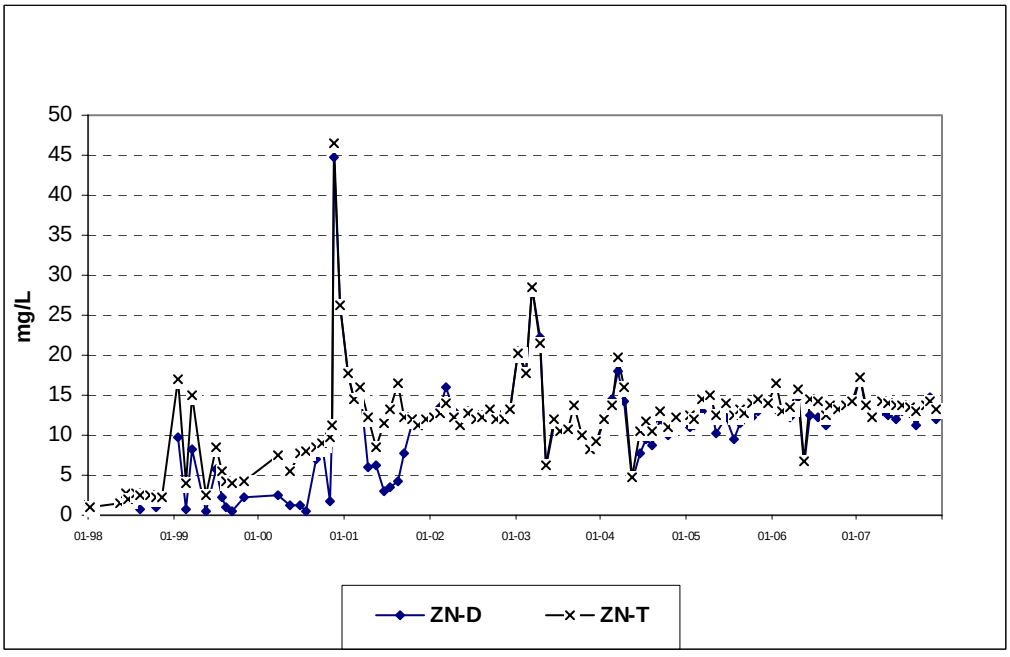
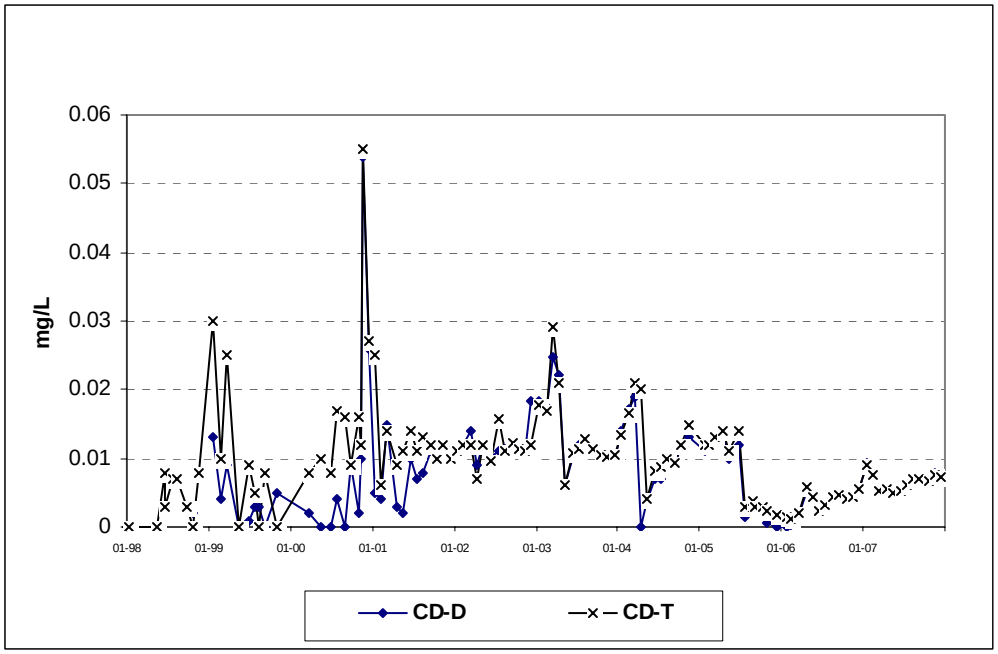


Figure 3-3. Cadmium at X22B



3.2.1.2 Miscellaneous Surface Seepages

Flow that collects in the Faro Creek channel above the Faro Valley rock dump (location FCO) was sampled in the June and October of 2007. This water flows along the base of the Faro Valley rock dump and into the Main Pit. Sulphate concentrations were 18 mg/L and 72.9 mg/L. Zinc, copper, and cadmium concentrations were comparable to those observed in recent years.

Locations A25 and A30 are seeps into the Main Pit from the Faro Pit walls. Location A25 is located on the northwest wall and station A30 is located immediately below the toe of the Faro Valley rock dump on the north pit wall. In 2007, both stations were sampled in June and October. Water quality at station A30 is most likely impacted by acid rock drainage and metals leaching, as indicated by the elevated metal and sulphate concentrations and low pH observed at this site. Historical trends observed at station A30 typically demonstrate higher metals and sulphate concentrations during the spring (June) sampling event; however, cadmium, copper, lead, sulphate and zinc concentrations in 2007 were higher during the October sampling event, possibly due to higher than average precipitation rates during the preceding month. Elevated total suspended solids concentrations (17 mg/L) observed in October at this site support this assumption. During the June and October sampling events, sulphate concentrations were 271 mg/L and 387 mg/L, respectively, and total zinc concentrations were 24 mg/L and 35.1 mg/L, respectively.

Station A25 was also sampled in June and October of 2007. Metal and sulphate concentrations at this station are lower than those observed at station A30, with sulphate concentrations of 32.2 mg/L

and 18.6 mg/L, and total zinc concentrations below the method detection limit (MDL). Seepage at this location was circum neutral during both sampling events. Concentrations of arsenic, cadmium, and copper have remained below MDL's since water quality monitoring began at this site in 2004.

In 2007, location SP5/6, a surface ditch into the Main Pit from the North East Dumps, was sampled in spring and fall. Metal concentrations were comparable to those observed over the last several years, with total and dissolved zinc concentrations ranging from 2.69 mg/L to 4.81 mg/L, and 2.19 mg/L to 4.23 mg/L, respectively.

3.2.2 Zone II Pit

Water pumped from the Zone II Pit into the Main Pit is monitored at location X26 for water chemistry. Information at this location can identify changes in water chemistry that may be related to acceleration in the acid rock drainage process within the Zone II pit and also provides information on contaminant loading into the Main Pit.

Four monthly samples were collected in 2007 at location X26 during periods of active pumping (June to September). During this period, sulphate concentrations ranged from 2350 mg/L to 2740 mg/L. Although sulphate concentrations have increased progressively at this location between 2002 and 2005, concentrations observed in 2006 and 2007 were typically less than those observed in 2005. The highest sulphate concentration of any of the monitored inflows into the Main Pit continues to be location X26.

Total and dissolved zinc concentrations ranged from 64.5 mg/L to 100 mg/L and 53.9 mg/L to 93.8 mg/L, respectively, at location X26 in 2007. Zinc concentrations have typically stabilized since 2003. (Figure 3-5)

In 2007, cadmium and lead concentrations at X26 were comparable to those observed in recent years. Total and dissolved cadmium concentrations ranged from 0.019 mg/L to 0.021 mg/L and 0.018 mg/L and 0.09 mg/L, respectively. Total lead concentrations ranged from 0.038 mg/L to 0.061 mg/L, with an average concentration of 0.053 mg/L. Dissolved lead concentrations were all below the MDL (<0.001 mg/L).

Figure 3-4. Sulphate at X26

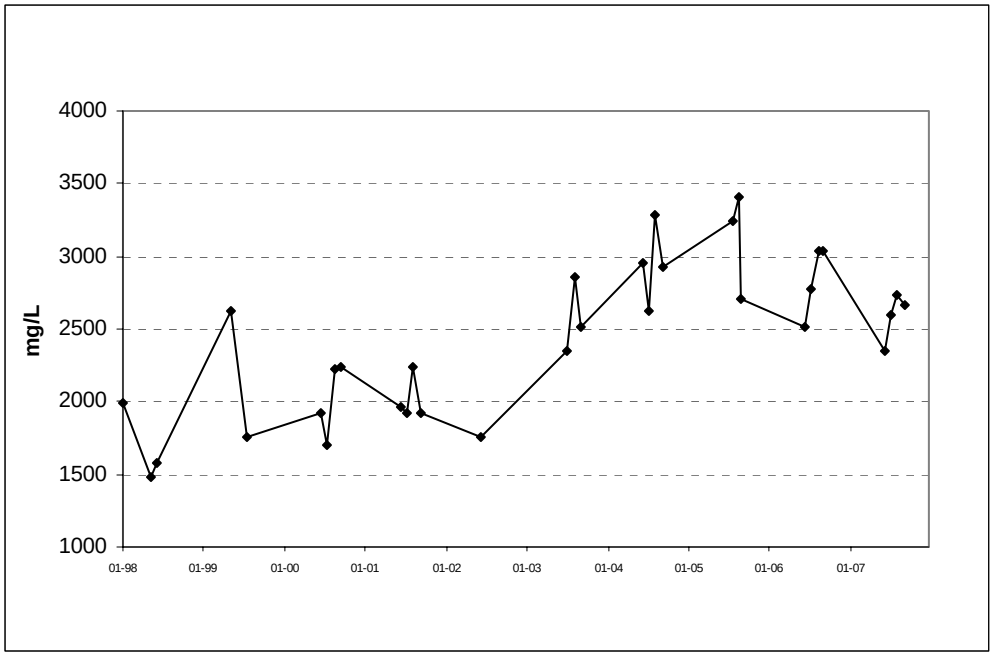
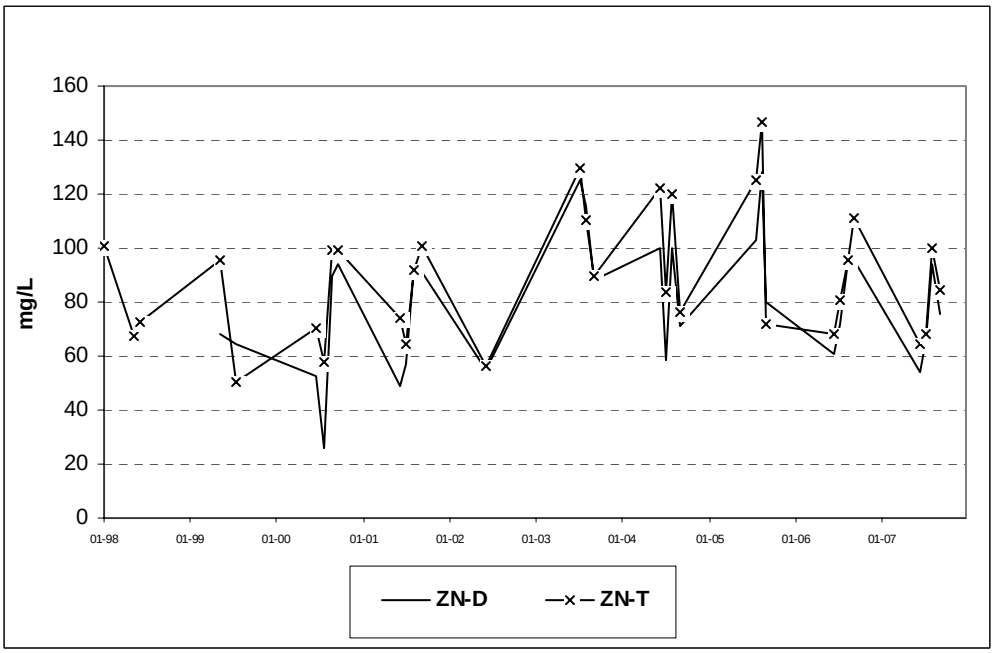


Figure 3-5. Zinc at X26



3.2.3 Rock Dumps

3.2.3.1 Old Faro Creek Channel

Surface seepage from the toe of the Main and Intermediate rock dump area is sampled at X23 located in the old Faro Creek channel. Water quality at this location is characterized by buffered acid rock drainage with elevated metals and sulphate at neutral pH. This water then flows through the Emergency Tailings Area (ETA). Various studies carried out of the past few years concluded that surface and groundwater flows through the Emergency Tailings Area (ETA) contribute a significant contaminant load to the downstream area and that portion of this contaminate loading was escaping collection leading to possible contaminate loading to the aquifer below the Rose Creek Tailings. In response to this issue, a collection and treatment system for the ETA water was installed during the fall and winter of 2006/2007.

Water from the ETA is collected in the collection sump and transported by pipeline to the Intermediate Pond. The water from the Intermediate Pond is then pumped using the floating barge system to the Mill Water Treatment System to be treated. The treated water then is conveyed to the Polishing Pond using the existing piping system and discharged to Rose Cree via siphon.

Twelve monthly samples were collected at location X23 in 2007. Sulphate concentrations have generally increased since sampling commenced in 1986; however, sulphate concentrations at station X23 were generally lower than the previous year, averaging 5,233 mg/L. (Figure 3-6).

The concentrations of total and dissolved zinc at location X23 in 2007 ranged from 214 mg/L to 323 mg/L and 191 mg/L to 303 mg/L, respectively, with average concentrations of 259 mg/L and 235 mg/L, respectively. Zinc concentrations have shown a decreasing trend since 2006 (Figure 3-7).

Figure 3-6. Sulphate at X23

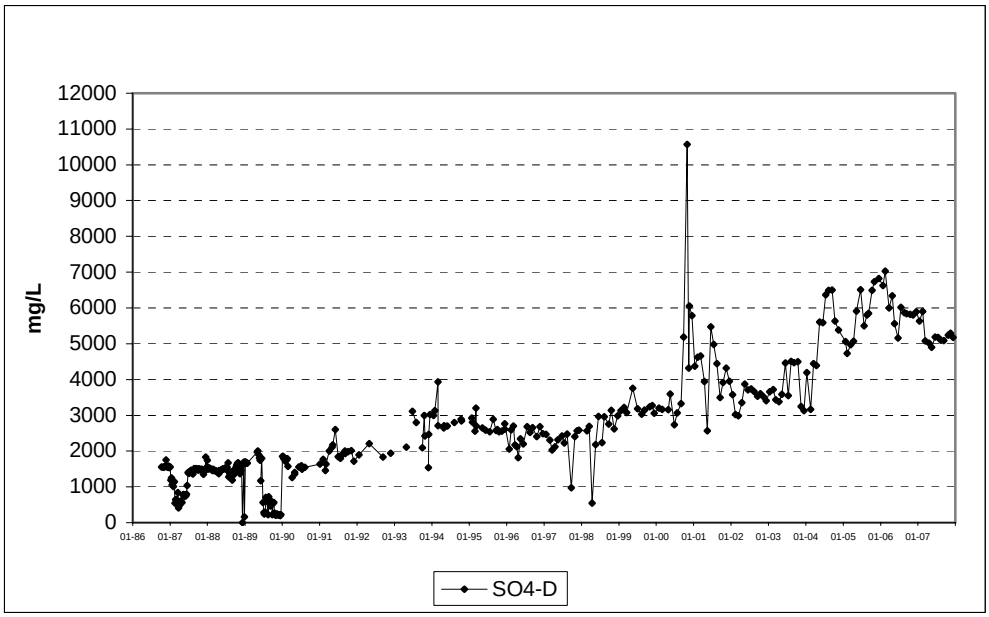
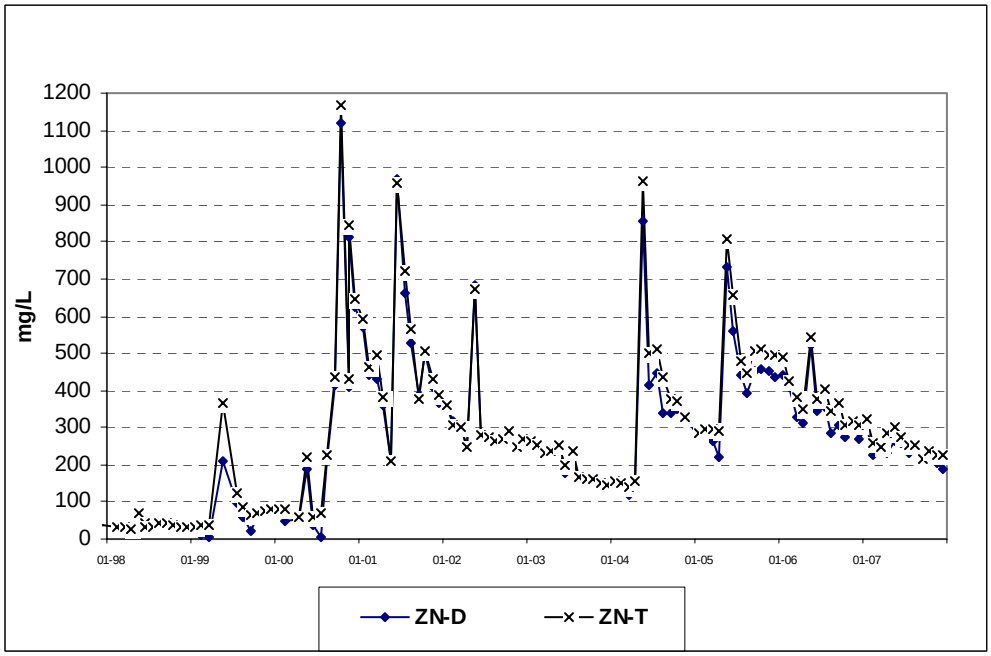


Figure 3-7. Zinc at X23

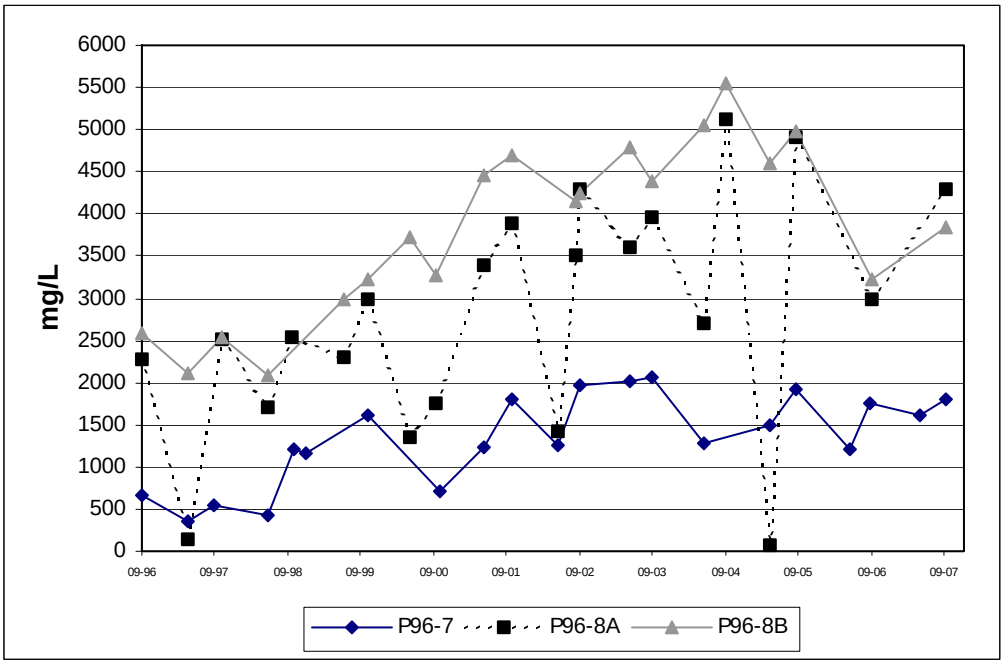


3.2.3.2 Groundwater: Main Rock Dumps

Adjacent to surface monitoring location X23, well P96-7 is located at the central toe of the Main Waste Dump and wells P96-8A/B are located in the Old Faro Creek Channel. Well P96-7 was sampled in May and October of 2007 and wells P96-8A/B were sampled during the October sampling event. Sulphate concentrations in all these wells were comparable to those observed at each location over the last six years (Figure 3-8). Well P96-7 exhibited the lowest sulphate concentrations of these three sampling points, at 1620 and 1810 mg/L, while P96-8A and P96-8B had concentrations of 4290 and 3840 mg/L, respectively during the fall sampling event. Groundwater samples within the Main Rock dump had observed pH values of 7.87 and 7.61.

In 2007, dissolved zinc concentrations at location P96-7 were comparable to previous years for both sampling events, at 0.0081 mg/L and 0.017 mg/L. In wells P96-8A and P96-8B, zinc concentrations reported during the October sampling event were 170 and 208 mg/L, respectively. Dissolved lead, cadmium and copper concentrations for all wells were below the minimum detection limits, with the exception of cadmium for wells P96-8A and P96-8B, which reported concentrations of 0.039 mg/L and 0.0608 mg/L, respectively.

Figure 3-8. Sulphate at P96-7, P96-8A and P96-8B



3.2.3.3 Groundwater: Intermediate Rock Dumps

Wells S1A/B, S2A/B and S3 are located at the toe of the Intermediate Rock Dumps just below the Vangorda haul road. P96-6 is located at the toe just above the Vangorda Haul road. In 2007, all six sampling points were sampled twice, in May and October.

Sulphate concentrations in the shallower wells S1A, S2A and S3 ranged from 526 mg/L to 5,200 mg/L whereas sulphate concentrations in deeper wells S1B and S2B ranged from 818 mg/L to 4,800 mg/L. In the shallower wells S1A, S2A, and S3, dissolved zinc concentrations ranged from 207 mg/L to 365 mg/L, whereas Zn concentrations in deeper wells S1B and S2B ranged from 0.124 mg/L to 89.9 mg/L. Zinc concentrations in shallower wells exhibit an overall increasing trend from about 2000 (Figures 3-9 and 3-10).

Sulphate and zinc concentrations at location P96-6 were 264 mg/L and 268 mg/L, and 0.239 mg/L and 0.808 mg/L, respectively. Dissolved metals in groundwater at well P96-6 were all observed at low concentrations.

Figure 3-9. Sulphate Concentrations in Groundwater Wells S1A, S2A, and S3

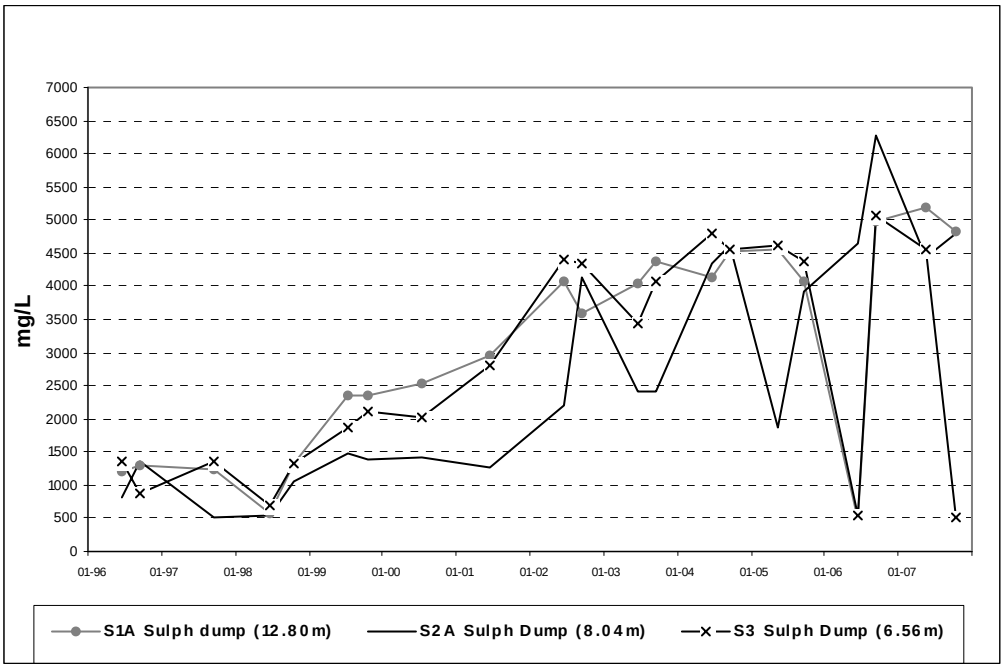
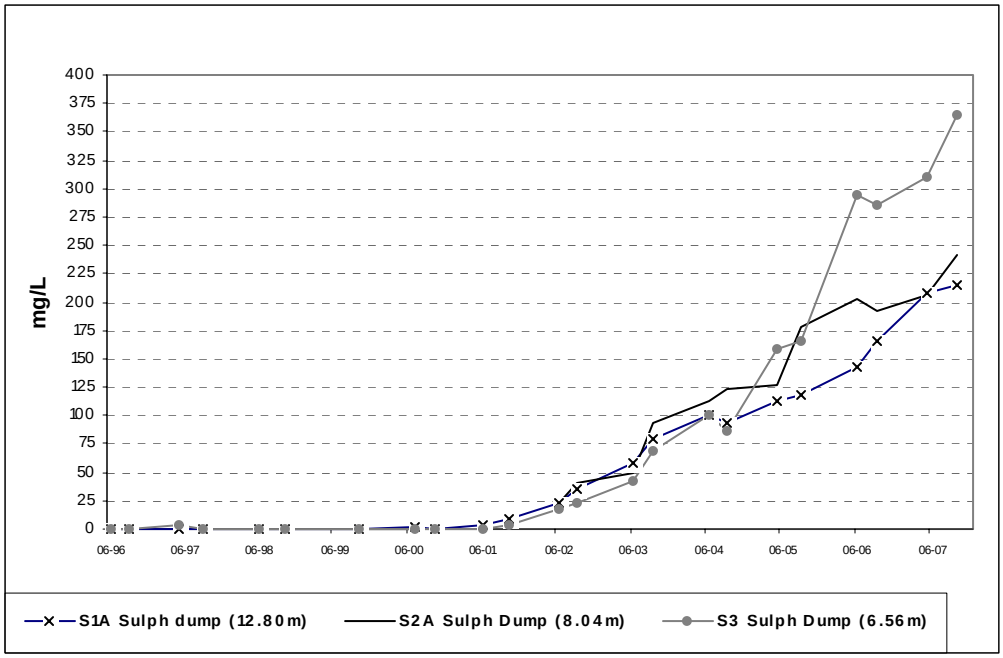


Figure 3-10. Zn in Groundwater Wells S1A, S2A and S3



3.2.3.4 Groundwater : Zone II Rock Dumps

Wells BH1, BH2 and BH4 are located at the base of the Zone II Rock Dumps. In 2007, locations BH1 and BH2 were sampled in May and October, while BH4 was sampled during the fall. Sulphate concentrations at these sampling points ranged from 41.4 mg/L to 129 mg/L and Zn concentrations ranged from 0.971 mg/L to 10.8 mg/L. In 2007, the highest sulphate concentrations were observed at BH4, and the highest zinc concentrations were observed at BH2.

3.2.3.5 Groundwater: Northeast Rock Dumps

Wells BH12A/B, BH13A/B and BH14A/B are located at the base of the Zone II Rock Dumps. In 2007, locations BH12A/B and BH13A/B were sampled in October, and location BH14A/B was sampled May and October. Sulphate and zinc concentrations at wells BH12A/B and BH13A/B were consistent with concentrations previously observed at this site, ranging from 142 mg/L to 623 mg/L, and from 0.0091 mg/L to 0.305 mg/L, respectively. Well BH14A/B had sulphate concentrations similar to those typically observed at this site ranging from 1660 to 2030 mg/L, however, zinc concentrations were higher in 2006 and 2007 compared to historical data during the fall sampling event, at 0.59 mg/L and 0.239 mg/L.

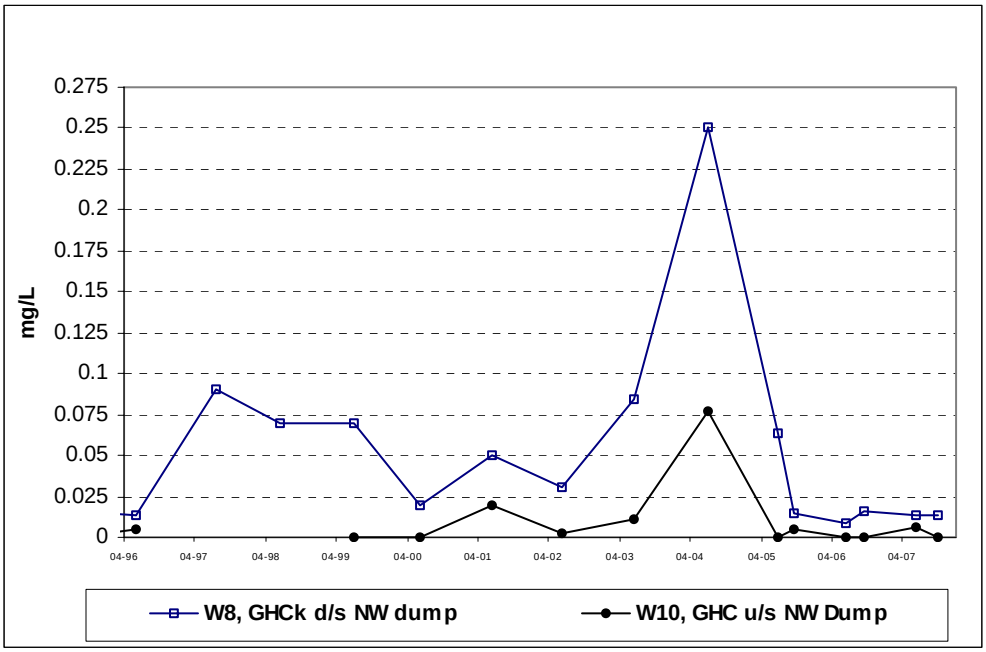
3.2.3.6 Miscellaneous Surface Seepages

Locations W10 and W8 are located in Upper Guardhouse Creek where it passes under the corner of the Northwest Rock Dump. Location W10 is immediately upstream of the rock dump and location

W8 is immediately downstream. In 2007, both seeps were sampled in the spring and fall. Sulphate concentrations at these locations remain relatively low at 2.5 mg/L to 6.87 mg/L, which is consistent with previous years. Total and dissolved zinc (Zn) concentrations ranged from 0.008 mg/L to 0.036 mg/L and <0.005 mg/L to 0.014 mg/L, respectively. On both sampling dates greater concentrations of total zinc were observed immediately downstream of the rock dump at location W8.

Location W5 is located at the toe of the Northeast Rock Dump. In 2007, this site was sampled in June and October. Total and dissolved zinc concentrations ranged from 0.74 to 5.55 mg/L and 0.61 to 4.91 mg/L, respectively. Sulphate concentrations were slightly higher than the previous year at 713 mg/L and 423 mg/L.

Figure 3-11. Zn at W10 and W8



Locations NE1 and NE2 are located at two small intermittent surface flows below the toe of the Northeast rock dumps. Both locations were sampled in the spring and fall of 2007. The June and October total and dissolved zinc concentrations ranged from <0.005 mg/L to 0.006 mg/L and 0.006 mg/L to 0.012 mg/L for NE1, respectively, and <0.005 mg/L to 0.071 mg/L and <0.005 to 0.064 mg/L for NE2, respectively. Concentrations of both zincZn and sulphate in 2007 are typical for these sites. Sulphate concentrations were 106 mg/L and 178 mg/L for NE1, and 652 mg/L and 464 mg/L for NE2.

3.2.4 Rose Creek Tailings Facility

3.2.4.1 Intermediate Pond

From approximately 1986 to 1992, the Intermediate Impoundment was used for tailings deposition. Then from 1992 to 1997, a cessation of tailings deposition into the Down Valley Tailings Facility occurred and there was a general increase in the concentration of zinc in water flowing through the Intermediate Pond. This trend is attributed to:

- Removal of a large inflow of alkalinity that previously entered the pond via the tailings slurry;
- Continued inflow of contaminated water from the rock dumps (location X23) and the plant site (location GHSCK); and
- Continued flushing of contaminants by run off over beached (exposed) tailings in the upstream portion of the Intermediate Impoundment.

In 1992, the Down Valley Water Treatment system was put into operation. This system included syphoning and treatment of water from the Intermediate Pond by addition of lime slurry in a mixing tank, followed by release of treated effluent into the Cross Valley Pond.

On a seasonal basis, the Intermediate Pond received inflow of treated water pumped from the Faro Main pit from 1998 to 2000. This periodic inflow of a relatively high volume of high pH water resulted in a general improvement in pond water quality. In 2001, the method for treatment of water pumped from the Faro Main pit was improved due to construction and activation of a new treatment system in the mill that utilizes certain fixed equipment for lime treatment and settlement of sediments. From 2001 through 2005, bypassing the Intermediate Pond allowed for compliant effluent from the mill to be delivered into the Intermediate Pond spillway. This observed an apparent negative impact on water quality within the Intermediate Pond due to the removal of the periodic inflow of high pH (treated) water.

In 2006/2007, a water collection system (a sump) was installed at the Emergency Tailings Area (ETA) to reduce contaminate loading from the area into the underlying aquifer. Water collected in the sump is pumped directly to the Intermediate Pond. In 2007, the Down Valley Water Treatment system was decommissioned and a pumping barge was installed at the Intermediate Pond for redirection of water requiring treatment to the Mill Water Treatment System. Treated effluent is then released into the Cross Valley Pond. Details of the Mill Water Treatment systems are discussed in Section 5.

The water quality of the Intermediate Pond is monitored at Station X4 which in 2007 was taken directly from the pond. In 2007, samples were collected every month, according to Licence monitoring requirements during periods of outflow, as well as water quality monitoring when no outflow was occurring for site management purposes.

Sulphate concentrations in 2007 were generally consistent with samples observed since 2005 and zinc levels were are comparable to the previous year.

Sulphate concentrations at location X4 ranged from 633 mg/L to 905 mg/L over the year, with an average concentration of 803 mg/L for 2007. Sulphate concentrations remained relatively consistent from 1998 to 2003, followed by an increasing trend through 2004 and 2005 (Figure 3-12). Since 1998, sulphate concentrations demonstrate seasonal variability with low concentrations observed during the spring months, although in 2007 the low spring concentrations were not as profound.

Within the Intermediate Pond, the concentrations of total and dissolved zinc ranged from 13.7 mg/L to 23.3 mg/L and from 13 mg/L to 21.8 mg/L, respectively, with average concentrations of 17.1 mg/L and 16.1 mg/L, respectively. In 2007, zinc concentrations were comparable to those observed in 2006 (Figure 3-13).

Prior to 2002, iron concentrations at X4 ranged from <0.01 mg/L to 5.48 mg/L. Since 2002, Iron concentrations in the Intermediate Pond have followed a seasonal trend with maximum concentrations typically observed during winter months and minimum concentrations observed during summer months. In 2007, total iron concentrations were typically higher than those observed within the Intermediate Pond in 2006, ranging from 3.01 mg/L to 17.7 mg/L, with an average concentration of 9.78 mg/L (Figure 3-15). Total aluminum concentrations were also elevated in 2007 in comparison to historical trends. Increases in iron and aluminum concentrations may be attributed to the direct discharge of water collected from the Emergency Tailings Area (via the sump) into the Intermediate Pond from May to October of 2007.

In 2007, the Intermediate Pond pH ranged from 3.3 to 7.1, with increased acidification observed during summer months. This seasonal fluctuation in pH follows historical trends, however, pH values reported in 2007 are typically lower (more acidic) than previous years. This decrease may be due to the continued acidification of the pond since introduction of treated alkaline water from the Faro pit was discontinued in 2001, or from the direct discharge of water collected from the ETA during the summer months of 2007.

Figure 3-12. Sulphate at X4

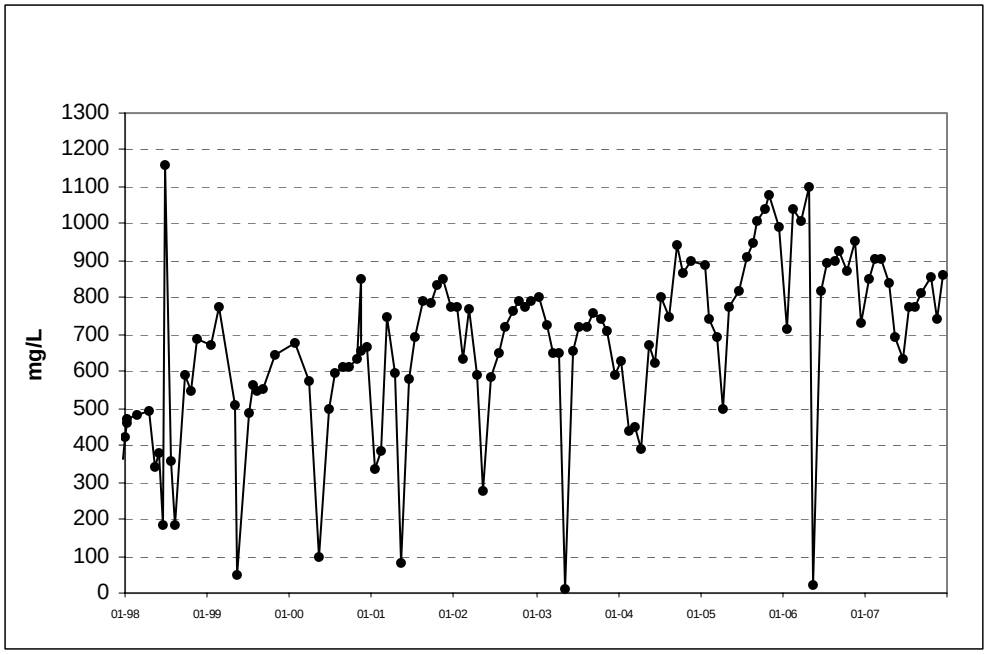


Figure 3-13. Zinc at X4

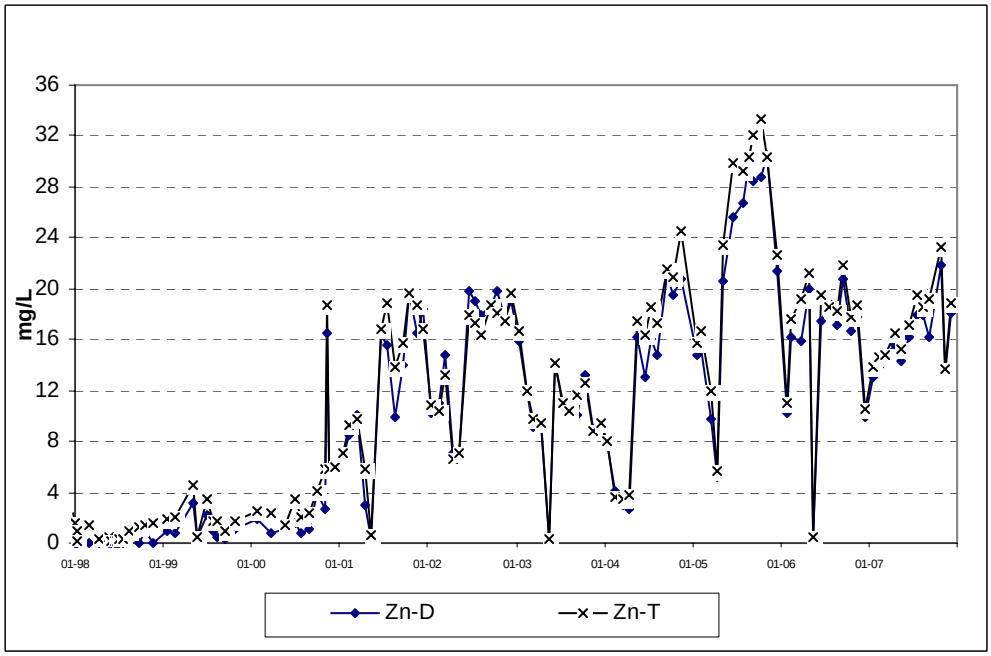


Figure 3-14. Iron at X4

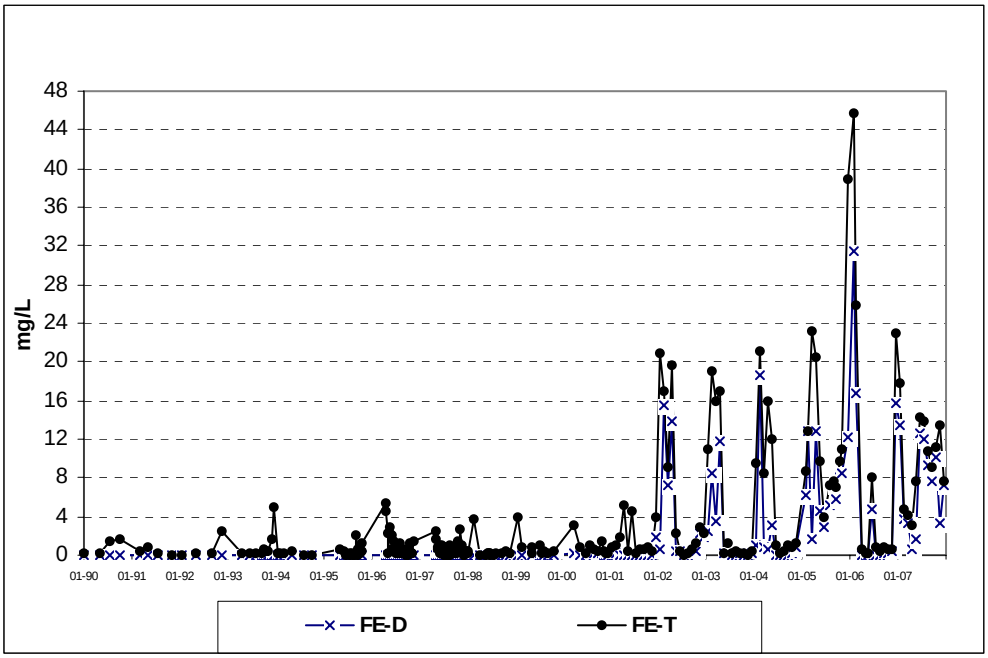
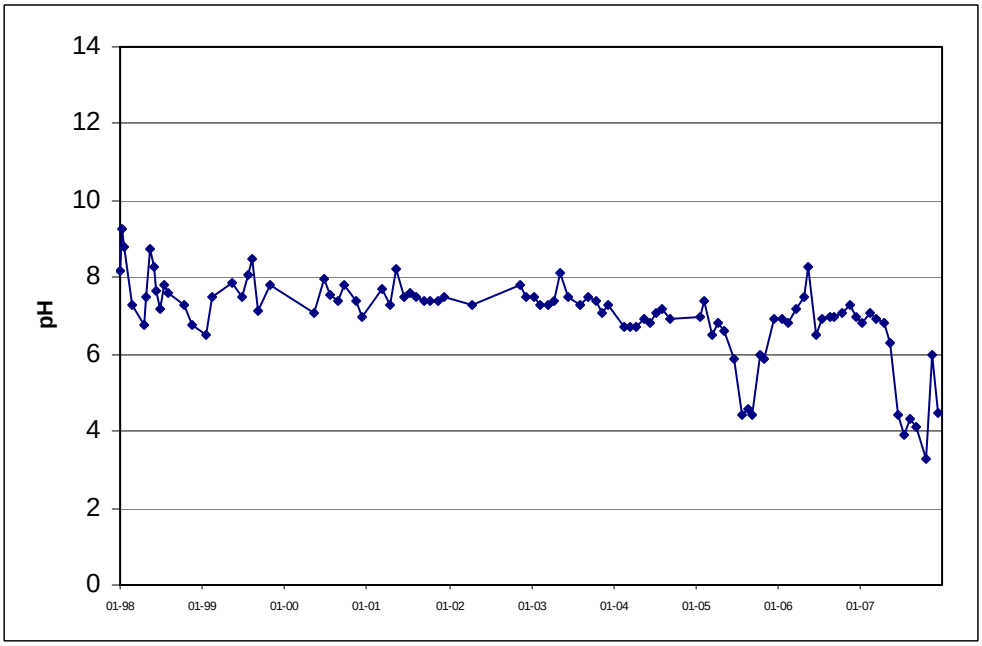


Figure 3-15. pH at X4



3.2.4.2 Groundwater

In 2007, groundwater wells in the Rose Creek Tailings Facility and the underlying native soils (i.e., the aquifer) were sampled three times, in August, October, and November. Additional sampling of certain wells was conducted in July and August as part of the Adaptive Management Plan (Section 9.8). The nested wells at location X24 (toe of the Intermediate Dam) have been identified as requiring special investigation during 2007 to determine their reliability. Groundwater sampling attempts made at X24A, X24B and X24C in 2007 suggest these wells are compromised due to potential subsurface movement at this well location.

Comprehensive studies of groundwater quality within the aquifer underlying the tailings impoundments are underway for development of the FCRP. However, this information is not available for reporting at this time. In addition, changes in zinc and sulphate concentrations in the aquifer at X24 triggered the Adaptive Management Plan. The investigations that have been undertaken are described in Section 9.8.

The groundwater monitoring wells located at the toe of the Intermediate Dam (Wells X24, X25, P01-03 and P01-04) report generally lower sulphate and zinc levels than those wells located upgradient in and under the tailings facility. In 2007, the sulphate concentrations at the toe of the Intermediate Dam ranged from 31.2 mg/L to 1930 mg/L and zinc concentrations ranged from <0.005 mg/L to 0.0824 mg/L. Similar to previous years, sulphate concentrations on the north side of the valley continue to be higher than in the south and central areas of the valley.

3.2.4.3 Miscellaneous Surface Seepages

In 2007, location X7, a subsurface seep that emerges to surface just below the mine access road in the old Faro Creek channel, was sampled in the spring and fall. The June and October samples reported sulphate concentrations of 5910 mg/L and 7280 mg/L. Total and dissolved zinc concentrations ranged from 335 mg/L to 398 mg/L and 301 mg/L to 387 mg/L, respectively. The pH was 5.4 and 5.6 for the two sampling dates. Sulphate, zinc, and pH concentrations were comparable to concentrations reported for these stations during the 2006 water quality monitoring program.

Lower Guardhouse Creek receives runoff from some areas of the plant site and flows into the Intermediate Impoundment. In 2007, Lower Guard House Creek (GHSCR1) was sampled in June and October along the lower reaches, immediately upstream of the Intermediate Impoundment. Since 2001, water chemistry results, including sulphate and zinc concentrations have remained relatively consistent at this station. The June and October samples observed sulphate concentrations of 614 mg/L and 503 mg/L. Total and dissolved zinc concentrations ranged from 1.91 mg/L to 2.28 mg/L and 1.45 mg/L to 1.6 mg/L, respectively. This site reported circumneutral pH for both sampling events (7.9 and 8.0).

3.3 Water Quality Entering Rose Creek

3.3.1 Effluent Discharge

Location X5 samples the effluent discharged from the Cross Valley Pond as surface outflow. The Water Licence requires X5 to be sampled weekly when discharging and also requires a surface grab of the Cross Valley Pond to be sampled monthly when there is no discharge (X5P).

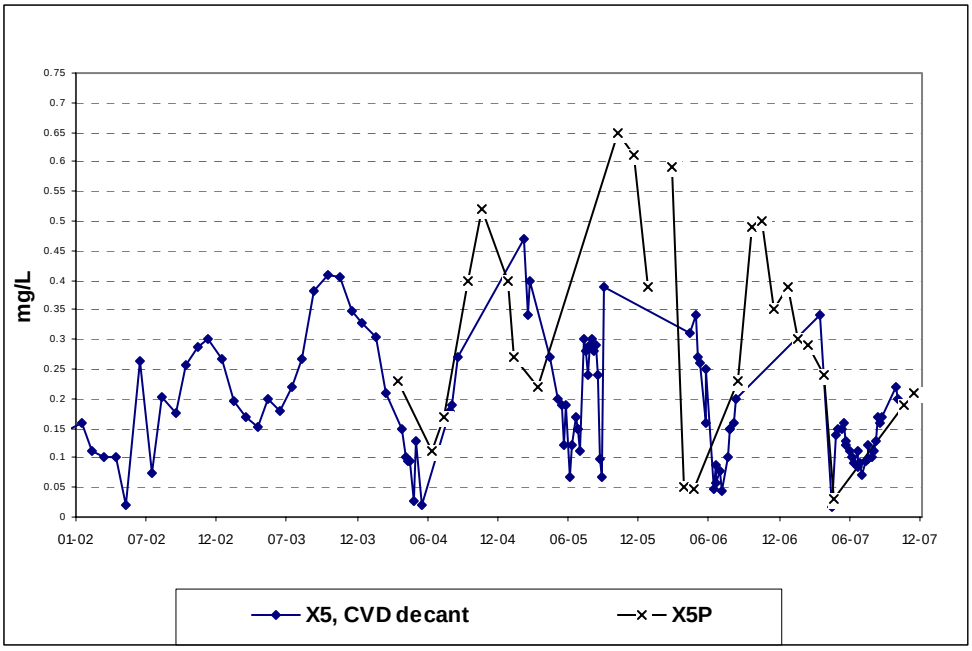
The Mill Water Treatment system was successfully operated in 2007 as described in Sections 5. The treatment system and the "polishing" action of the Cross Valley Pond were effective in maintaining compliance with the effluent discharge criteria for water released via location X5. The periods and volumes of effluent release are described in Section 2.

Total and dissolved zinc released to Rose Creek at location X5 during periods of discharge ranged from 0.018 mg/L to 0.132 mg/L and 0.014 mg/L to 0.33 mg/L, respectively (Figure 3-16). From 2001 to 2007, due to the implementation of the mill treatment system which significantly increased treatment efficiency compared treatment methods employed prior to 2001, zinc concentrations have remained below the allowable discharge limits. Licence discharge standards were also met for all other licenced parameters at location X5 in 2007.

In addition to the chemical analyses at the external laboratory, frequent in-house analyses for total zinc were performed on-site to provide site management with an immediate indication of effluent quality. This was appropriate because site-specific experience has shown that total zinc is the critical parameter for achieving compliance. The in-house analyses utilized professional level atomic absorption (AA) equipment operated by trained assayers. In-house analyses for zinc were conducted on a routine daily or more frequent basis during periods of discharge in 2007. The individual results are available at the mine site and were available for review by Water Resources personnel during site visits.

In 2007, four samples were collected in March, June, September, and December at X5/X5P for acute lethality testing using rainbow trout (96-hour LC_{50}). All tests passed by >100%, with no mortalities. The March, September, and December test was conducted on water collected from the Cross Valley Pond, location X5P, as no water was being discharged at that time at location X5.

Figure 3-16. Zinc at X5/X5P



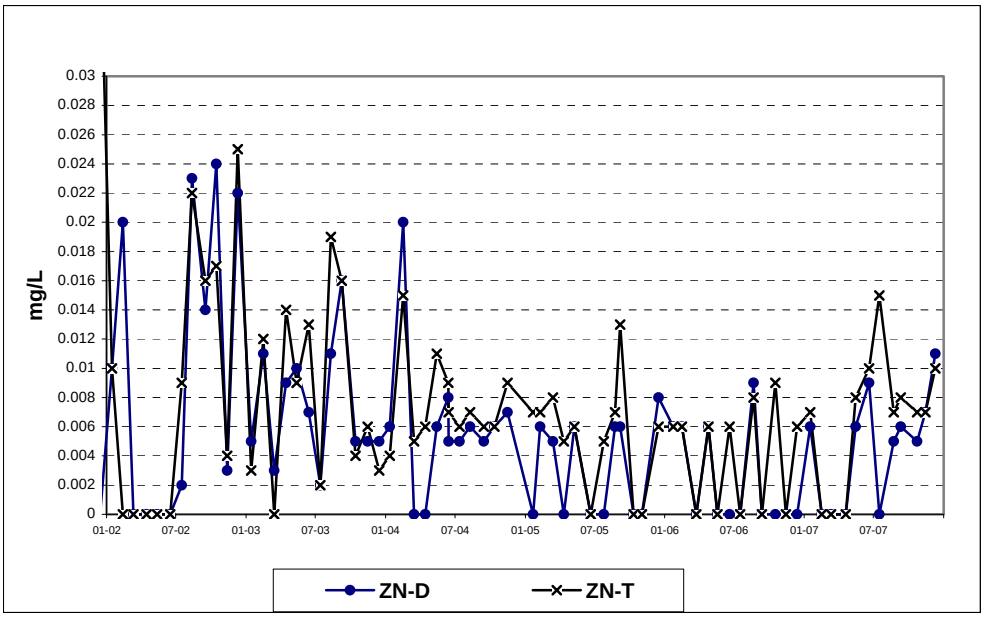
3.3.2 Cross Valley Dam Seepage

Seepage from the Cross Valley Dam is monitored just downgradient of the toe at location X13. There are three individual seepages that report to location X13, including X11, X12 and WEIR3. Location X11 is the primary seepage stream and collects seepage from the north abutment of the Cross Valley Dam and is suspected to also have collected some seepage from the Cross Valley Dam spillway during periods when there was overflow from the pond. Location X12 collects seepage from the south abutment of the Cross Valley dam. Location WEIR3 collects seepage from the central area between locations X11 and X12.

Flow information at these locations and the implications with regards to the geotechnical performance of the Cross Valley Dam are described in the accompanying geotechnical inspection report prepared by BGC Engineering Inc.

Twelve monthly samples of the Cross Valley Dam seepage discharge (X13) were collected and analysed in 2007. Water quality was within the maximum allowable discharge limits throughout the year. Total zinc concentrations ranged from <0.005 to 0.015 mg/L (Figure 3-17). During 2007, sulphate concentrations ranged from 750 mg/L to 939 mg/L, with an average concentration of 818 mg/L.

Figure 3-17. Zn at X13



Routine quarterly bioassay samples for acute lethality testing using rainbow trout (96-hour LC_{50}) were collected in March, June, September and December of 2007 at location X13. All tests passed with no mortalities.

Locations X11 and WEIR3 were sampled in February and August of 2007, while X12 was only sampled in August. In 2007, water quality at X11 was typical for this site, with sulphate concentrations of 1100 mg/L and 1060 mg/L and total zinc concentrations of 0.007 mg/L and 0.008 mg/L. At location X12, the single sample observed a sulphate concentration of 435 mg/L and total zinc concentration below detection limit (similar to previous years). At WEIR3 sulphate concentrations were 650 mg/L and 714 mg/L, which were slightly higher than those recorded in the past 10 years. The total zinc concentrations for the February and August sampling events were 0.008 mg/L and below MDL (<0.005 mg/L), respectively. Similar to previous years, most other contaminant concentrations were below detection limit in the three Cross Valley Dam seepage locations.

3.3.3 Faro Creek Diversion

The Faro Creek Diversion passes clean water from the Old Faro Creek channel around the northeast side of the Main Pit and into the North Fork of Rose Creek. Location FDU, the upper portion of the Faro Creek Diversion, was sampled in June and October of 2007. Sulphate concentrations at this station remained very low in 2007 (1.04 mg/L and 1.99 mg/L) and most contaminant concentrations were below MDL's. Total zinc was reported at 0.011 mg/L and below

MDL (<0.005 m/L) for the two sampling events. Location FDL represents the mid-section of the Faro Creek Diversion, which was sampled twice in 2007, in June and October. At this location in the diversion channel sulphate concentrations also remained very low with concentrations of 1.74 mg/L and 2.27 mg/L. June and October total zinc concentrations were 0.03 mg/L and below MDL (<0.005 mg/L), respectively.

In 2007, monthly samples were collected from June to December at location FAROCR that is located at the outfall of the Faro Creek Diversion into the North Fork of Rose Creek. In 2007, concentrations of sulphate were relatively low, ranging from 2.78 mg/L to 5.97 mg/L and averaging 3.87 mg/L. Total and dissolved zinc concentrations ranged from 0.007 mg/L to 0.028 mg/L and 0.006 mg/L and 0.024 mg/L, respectively, with average concentrations of 0.015 mg/L and 0.010 mg/L. In previous years maximum zinc concentrations at this site were typically associated with spring conditions, although in 2007 the maximum concentrations remained relatively low in comparison to historical trends.

3.3.4 Groundwater

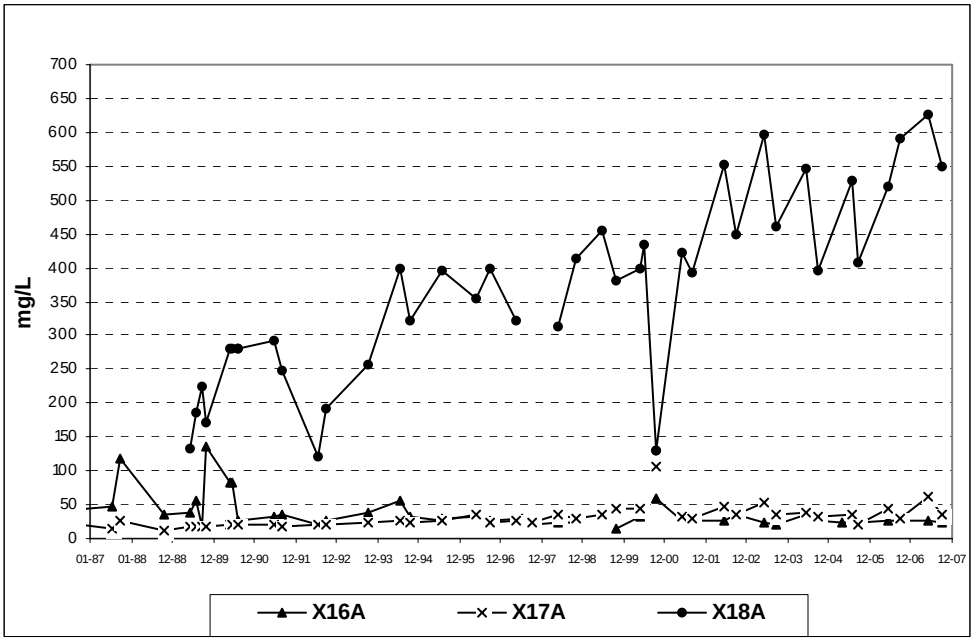
Groundwater quality is monitored below the Cross Valley Dam. A portion of the groundwater from the underlying aquifer is thought to discharge to the surface and enter Rose Creek in the general vicinity of Rose Creek sampling location X14, and some portion is thought to remain in the aquifer as groundwater flow. New information on this topic is being developed through the studies that are underway for development of the FCRP. However, the information is in a preliminary state and not available for reporting at this time.

The groundwater monitoring well locations X16A/B, X17A/B, X18A/B, P01-01A/B, and P01-11A/B downgradient of the Cross Valley Dam were monitored twice in 2007, in May and October. Location P01-02A was sampled in October and P01-02B was sampled in May. Both sulphate and zinc concentrations observed in these wells generally fall within ranges typically observed at these locations. The ranges of sulphate and zinc in 2007 are listed in Table 3-1. Sulphate concentrations continue to decrease with increasing distance downgradient of the tailings facility. Sulphate concentrations on the north side of the valley (X18, P01-01) continue to be higher than in the south and central areas of the valley. This is illustrated for shallower wells X16A, X17A and X18A on Figure 3-18.

Table 3-1. Summary of Sulphate and Zinc Concentrations in Groundwater Downgradient of the Cross Valley Dam (2007)

Well	Max Sulphate (mg/L)	Min Sulphate (mg/L)	Max Dissolved Zinc (mg/L)	Min Dissolved Zinc (mg/L)
P01-11	1110	1090	0.0092	<0.005
X18A/B	645	548	0.0102	0.0069
X17A/B	176	34.6	0.0092	<0.005
P01-01 A/B	692	364	0.0090	0.0055
X16 A/B	27.8	23.8	0.0312	0.006
P01-02 A/B	123	107	0.0058	0.0053

Figure 3-18. Sulphate at X16A, X17A, and X18A



3.4 Receiving and Background Water Quality

3.4.1 North Fork of Rose Creek

There are seven locations in the North Fork of Rose Creek that are monitored regularly: R7, R8, R9, R10, NF1, NF2, and X2. Location R7 is located upstream of the confluence with the Faro Creek diversion and is representative of background reference conditions in the North Fork area. Location R8 is located downstream of the confluence of the North Fork with the Faro Creek diversion and upstream of the Zone II pit area. Location R9 is located approximately adjacent to

the area of the Zone II pit. Location R10 is located just downstream of the Zone II pit area. Locations NF1 and NF2 are located immediately upstream and downstream, respectively, of the rock drain in the Vangorda haul road. Location X2 is located at the crossing of the mine access road downstream of the rock drain and the rock dumps. Stations R7, R8, R9, R10, and X2 were sampled eight to eleven times throughout 2007. In 2007, NF1 and NF2 were sampled in June and October.

Water quality at location R7 in 2007 was representative of historic data. Total zinc concentrations ranged from below MDL (<0.005 mg/L) to 0.017 mg/L and sulphate ranged from 5.62 mg/L to 11.1 mg/L. Throughout 2007, this sample location reported the majority of total metal concentrations below the MDL's.

Similar to previous years, comparing water quality at locations R7, R8, R9, R10 and X2 suggests that sulphate and zinc concentrations undergo a general increase along the North Fork from R7 to X2. Figures 3-19 and 3-20 illustrate this trend for sulphate and zinc, respectively. Along the North Rock Dump and the Zone II area, between R7 and R10, sulphate concentrations increase most notably during winter baseflow periods, similar to all years on record. Stations R10 and X2, show a more significant increase in sulphate along the Main/Intermediate Rock Dump area. New information on this topic is being developed through studies that are underway for development of the FCRP; however this information is not available for reporting at this time. In addition increasing concentrations of total zinc and sulphate at location X2 triggered the Adaptive Management Plan in 2006, The investigations that have been undertaken are described in Section 9.8.

Figure 3-19. Sulphate at R7, R10, and X2

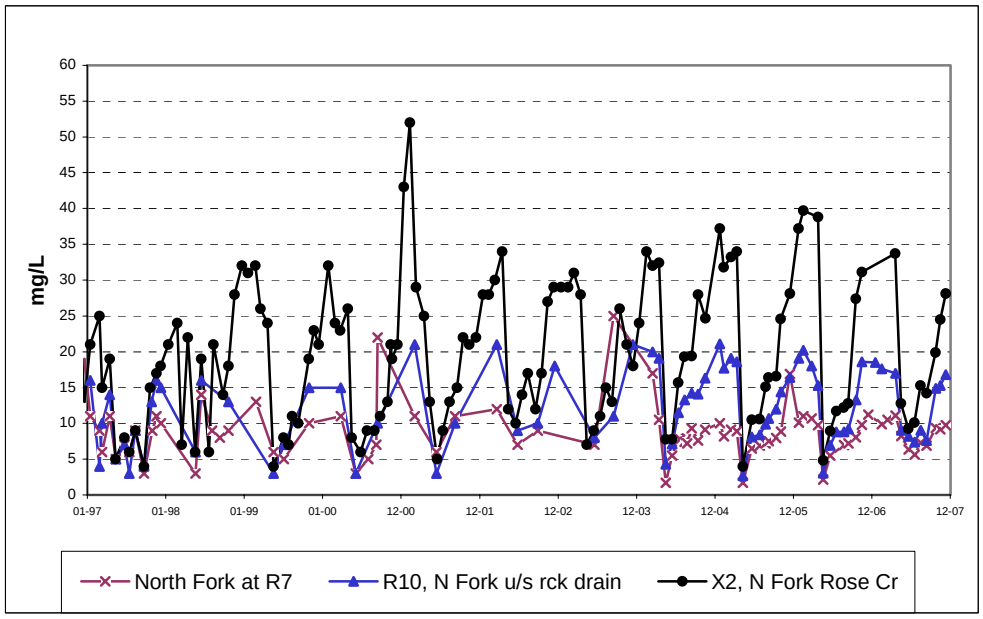
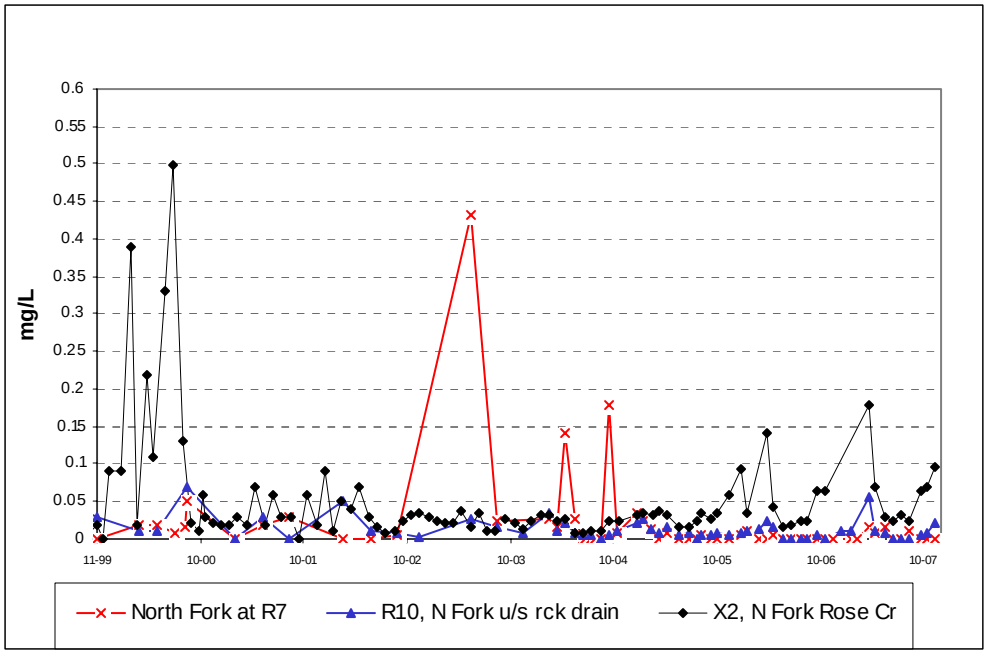


Figure 3-20. Zinc at R7, R10 and X2



3.4.2 South Fork of Rose Creek

Location Grum Corner (also know as “GCULV”) is the South Fork of Rose Creek at the mine access road crossing. Location K8 is a tributary to the South Fork in the area of the former freshwater reservoir. In 2007, these locations were sampled on a monthly basis, with the exception of location K8 that was not sampled in January due to frozen (no flow) conditions. In 2007, sulphate concentrations at these two sites remained very low, ranging from 3.76 mg/L to 20.4 mg/L. Total zinc concentrations ranged from below MDL (<0.005 mg/L) to 0.02 mg/L, and dissolved zinc concentrations remained below MDL’s for all sample dates. Water quality results were forwarded directly to the Ross River Dena Council and to their technical consultant by the Interim Receiver on a monthly basis, as agreed through the Water Licence renewal process.

Location R1 is located in the South Fork of Rose Creek below the previous freshwater reservoir area and upstream of the tailings impoundment area. In 2007, this location was sampled once in August. This sample observed a sulphate concentration of 15.4 mg/L, which is comparable to previous August samples. Total and dissolved zinc concentrations were both below minimum detection limits (<0.005 mg/L).

3.4.3 Rose Creek Diversion Channel

Rose Creek is monitored at the upstream (location X3) and downstream (location X10) extents of the constructed diversion channel that passes Rose Creek around the Rose Creek tailings facility. In 2007, twelve monthly samples were collected at both locations.

Station X3 is located at the outflow of the pumphouse pond. Monitoring this water includes evaluating all flow from the South Fork of Rose Creek and a majority of the flow from the North Fork of Rose Creek via location X2. A small portion of the flow from the North Fork of Rose Creek bypasses the pumphouse pond during high flow events via a secondary diversion channel that was constructed in previous years. This “bypass” flow enters the Rose Creek diversion channel immediately downstream of the pumphouse pond. Location X10 is located near the downstream extent of the Rose Creek diversion channel adjacent to piezometer X16.

In 2007, sulphate concentrations at location X3 ranged from 9.29 mg/L to 45.9 mg/L, with an average concentration of 24 mg/L. Zinc concentrations at this site followed previously established trends, with maximum concentrations observed during the spring, followed by a decrease to lower concentrations by the next sampling event. In 2007, the average total and dissolved zinc concentrations at location X3 were 0.048 mg/L and 0.038 mg/L, respectively.

Total and dissolved zinc at location X10 ranged from 0.016 mg/L to 0.083 mg/L and 0.012 mg/L to 0.065 mg/L, respectively. Sulphate concentrations remain within typical ranges of previous years, from 11.4 mg/L to 36.4 mg/L.

Locations X2, X3, and X10 generally follow the same trends in zinc and sulphate concentrations, with seasonal fluctuations of both zinc and sulphate and higher concentrations typically observed during winter months (Figures 3-23 and 3-24). All three locations reported maximum iron (Fe) concentrations during the month of May.

Figure 3-21. Sulphate at X2, X3, X10

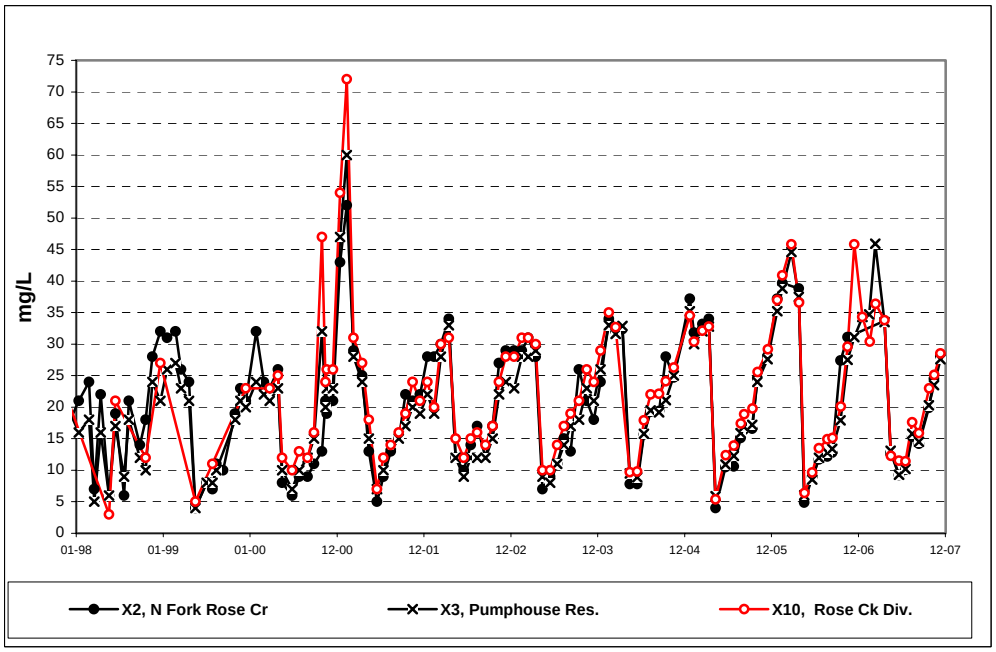
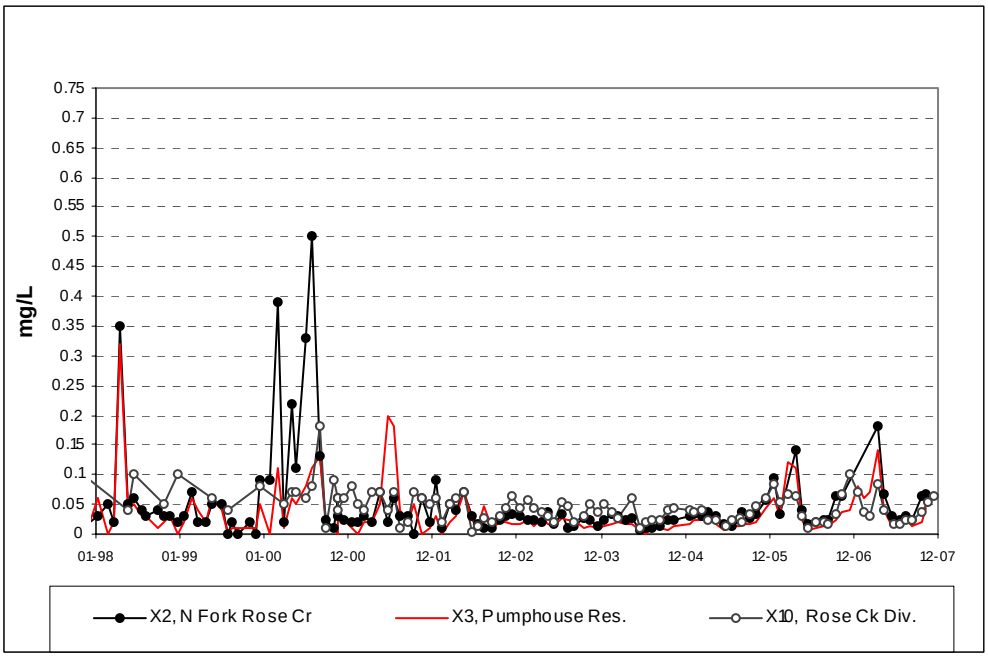


Figure 3-22. Zinc at X2, X3, and X10



3.4.4 Rose Creek Immediately Downstream of the Mine Area

Rose Creek immediately downstream of the confluence with effluent discharges (locations X5 and X13) is monitored at location X14. The Licence requires that X14 be sampled monthly, or weekly when effluent is being released via location X5. In 2007, 33 samples were collected from this location. This station typically reports higher zinc and sulphate during periods of effluent discharge in comparison to sampling periods with no active discharge from the Cross Valley Pond. In 2007, the highest concentrations of sulphate and zinc were observed in April during a period of active discharge in low flow conditions, with concentrations of 704 mg/L and 0.22 mg/L, respectively.

In 2007, water quality at location X14 was similar to previously established trends. Sulphate concentrations averaged 137 mg/L, although one of the April samples observed the highest sulphate concentration to date as 704 mg/L (Figure 3-25). Total and dissolved zinc concentrations ranged from 0.014 mg/L to 0.22 mg/L and 0.009 mg/L to 0.19 mg/L, respectively (Figure 3-26). Water chemistry at this location generally follows seasonal trends, with maximum concentrations typically observed during the spring. Maximum iron and lead concentrations of 1.59 mg/L and 0.008 mg/L, respectively, occurred at this site in April in concert with elevated total suspended solids (TSS) (46 mg/L). Subsequent sampling at this location indicates metal concentrations returned to within typical ranges observed for this site by the next sampling event.

Figure 3-23. Sulphate at X14

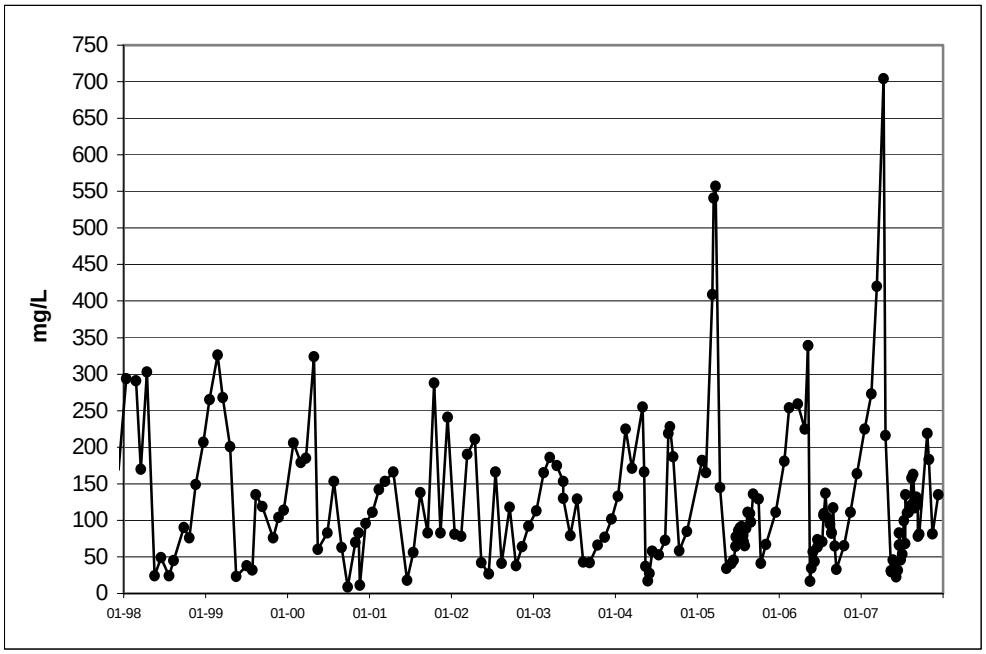
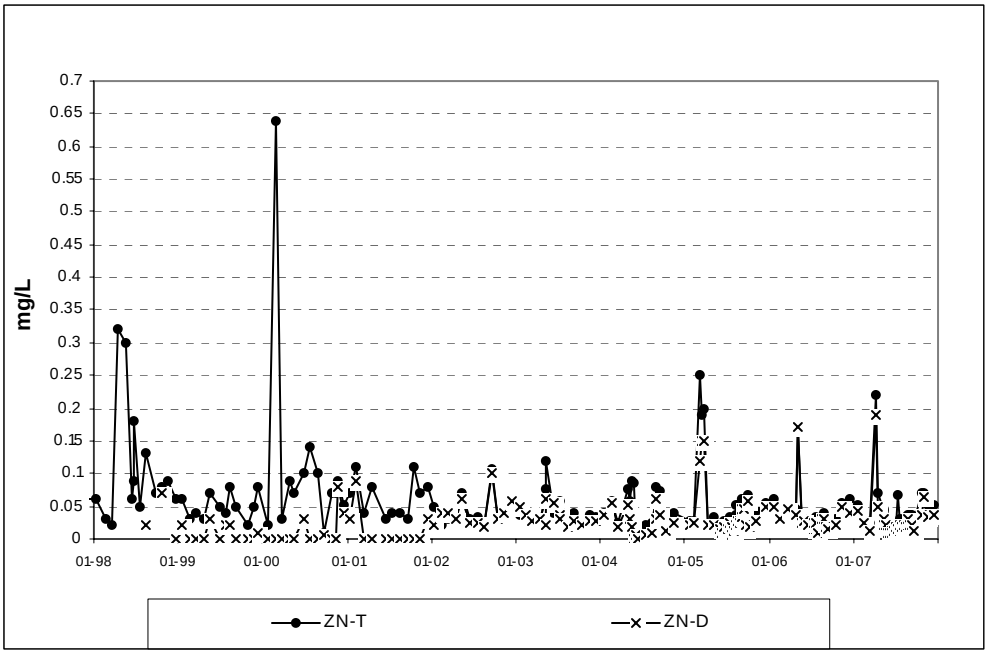


Figure 3-24. Zinc at X14



3.4.5 Rose Creek to Anvil Creek/Anvil Creek

Locations R2, R3, and R4 are sampled in Rose Creek, locations R5 and R6 are sampled in Anvil Creek at the confluence with Rose Creek, and location R11 is sampled at the mouth of Anvil Creek. In 2007, all the locations were sampled twice a year in February and August, except location R5 which was only sampled during the summer.

R2 is located approximately 100 m downstream of location X14 in Rose Creek below the effluent-mixing zone. Notably, there are no significant inflows between the two locations. R3 is located in Rose Creek approximately mid-point between station R2 and the confluence with Anvil Creek. R4 is located approximately 26 km downstream of the tailings impoundments. R5 is located downstream of the confluence with Rose Creek. Station R6 is located within Anvil Creek, upstream of the confluence with Rose Creek. This station is representative of regional background conditions in the Anvil Creek area.

From 1996 to 2007, total zinc and sulphate concentrations have observed the following generally anticipated trends:

- concentrations are typically greatest at location R2 and typically decrease to downstream locations R3 and R4 due, presumably, to dilution;
- concentrations at R4 are typically greater than at R6 reflecting the signature of mine area runoff and effluent in Rose Creek;
- concentrations at R5 are typically between those at R4 and R6 reflecting the mixing of Rose and Anvil Creeks; and
- concentrations of sulphate increase along Anvil Creek from R5 to R11 (2004 to 2007 data only), although zinc does not follow a similar trend.

The trends described above are illustrated by 2007 data as listed in Table 3-2.

Table 3-2. Total Zinc and Sulphate Concentrations in Rose Creek 2007

Location	February Total Zinc	August Total Zinc	February Sulphate	August Sulphate
R2 (near mine)	0.031	0.033	288	150
R3 (mid-Rose Ck)	0.017	0.019	187	131
R4 (mouth Rose Ck)	<0.005	0.012	126	113
R6 (Anvil Ck u/s Rose Ck)	<0.005	<0.005	19.5	20.2
R5 (Anvil Ck d/s Rose Ck)	-	<0.005	-	25.2
R11 (Mouth of Anvil Ck)	<0.005	<0.005	47.9	50.4

All values expressed as mg/L.

4. Water Quality Monitoring – Vangorda Creek Drainage

4.1 Overview Of Water Quality Monitoring Program

Part G and Schedule A of the Water Licence describe the water quality monitoring program for the Vangorda Plateau mine site. The Water Licence provides the sampling locations, sampling frequencies and the minimum parameters to be analysed.

The monitoring program is carried out by staff employed at the mine site by the Interim Receiver. Various professional laboratories have been used to provide the sample analyses over the life of the project. Laboratories are selected on the basis of certification with the Canadian Association of Environmental Analytical Laboratories, service and other factors. In 2007, most of the water analyses were conducted by CanTest with the exception of cyanide, which was analysed by ALS Laboratory Group. The analytical data is managed through an electronic database that is managed by Gartner Lee Limited.

The monitoring program also makes extensive use of the unique capability for high-quality, on-site zinc analyses to provide immediate feedback to site managers regarding effluent quality. On-site analyses of effluent zinc concentrations are conducted on a daily, or more frequent, basis when treated effluent is being released.

Water sampling frequencies vary from weekly (for treated effluents) to twice per year (for groundwater). The majority of water samples are collected on a monthly or quarterly basis. Continuous flow monitoring via dataloggers is required at one location, in lower Vangorda Creek (location V8). Other locations have various requirements for flow measurement.

Schedule A of the Water Licence, including the descriptions of the monitoring locations, sampling frequencies and minimum parameters, is provided in Appendix 1. UTM coordinates for the sampling locations have been previously provided to the Board and are provided in Appendix 2 for ease of reference. The monitoring locations are also illustrated on Figures 1-1, 1-2 and 1-3. Analytical data for 2007 is provided in Appendix 6. Bioassay results are provided in Appendix 7. A brief review of the data is provided in the following sections.

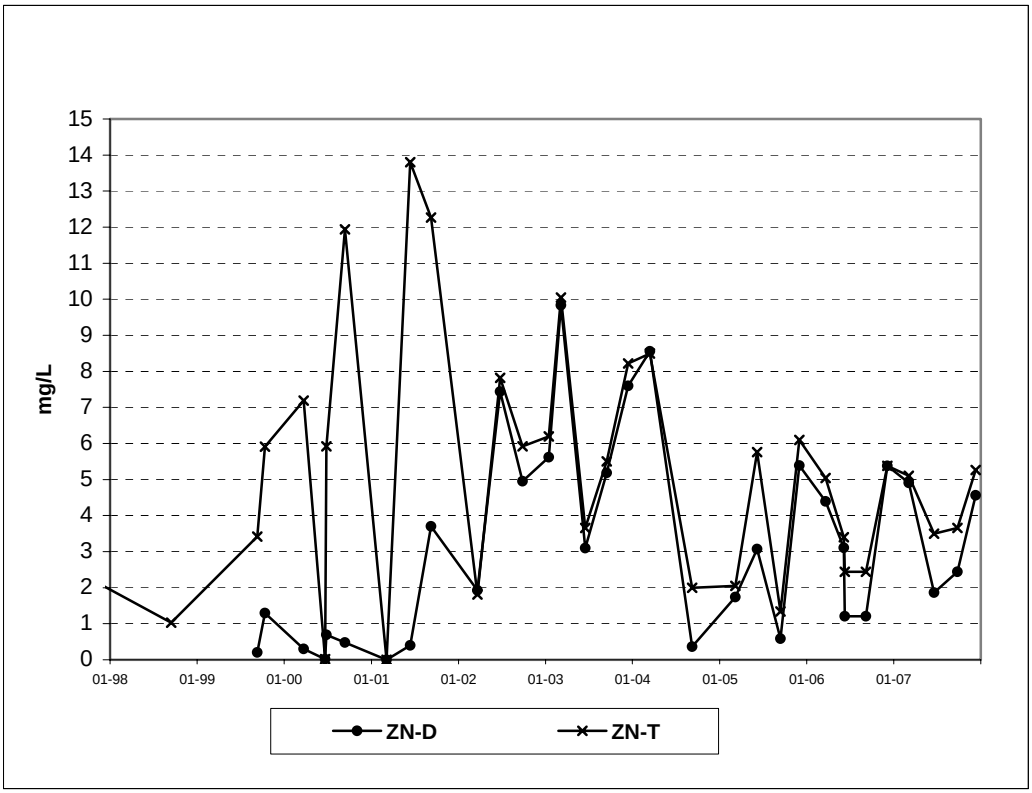
4.2 Open Pits and Rock Dumps

4.2.1 Grum Open Pit

Water quality in the Grum open pit is monitored at location V23 (pit pond). Location V23 has been routinely monitored since mine shut down (February 1998) and represents the accumulation of water in the pit in the absence of dewatering activities.

In 2007 samples were collected quarterly at location V23 in 2007, in March, June, September and December. The samples were collected as grab samples from the surface of the pit pond. The concentrations of total and dissolved zinc (Zn) ranged from 3.50 mg/L to 5.26 mg/L and from 1.86 mg/L to 4.91 mg/L, respectively, in 2007 (Figure 4-1).

Figure 4-1. Zinc at V23



In 2004, a pilot project of biological pit lake treatment using algae was implemented at the Grum Pit as part of ongoing studies for the development of the Closure and Reclamation Plan for the Faro Mine Complex (FCRP). Reductions in zinc concentrations observed during the first year of treatment prompted continuation of the treatment program. Zinc concentrations throughout 2007 are comparable to the first year of pit lake treatment implementation (2005), with seasonal trends defined by lower concentrations typically observed during the summer months.

The concentration of sulphate remained consistent with previous years, ranging from 377 mg/L to 462 mg/L. The pH remained neutral to slightly alkaline in 2007 ranging from 7.3 to 9.0.

4.2.2 Grum Rock Dump

4.2.2.1 Surface Seepage

Locations V14, V15 and V16 are surface seepages below the toe of the Grum rock dump along the north, central and south areas of the rock dump, respectively.

No samples were collected at location V14 in 2007. Location V14 was dry in June and September when sampling was conducted.

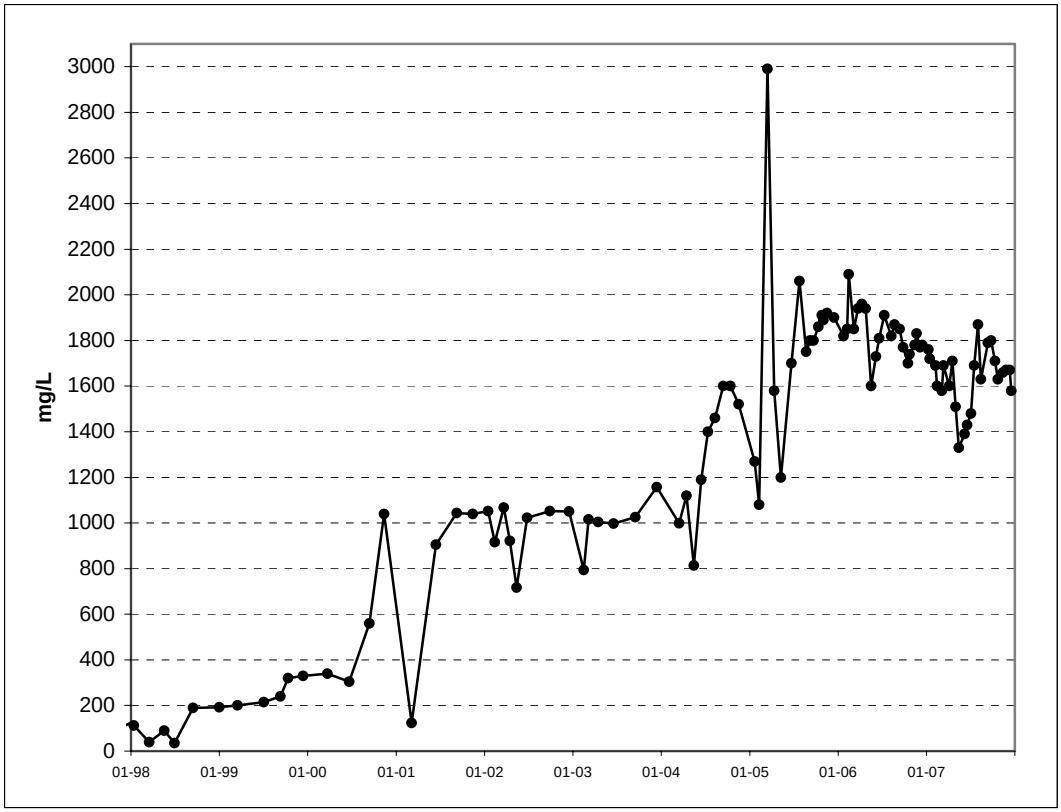
Two samples were collected at location V16 in June and October 2007. Location V16 exhibited neutral pH in 2007 at 7.0 and 7.6 in June and October, respectively. Sulphate concentrations were 1,880 mg/L and 2,100 mg/L. The sulphate record shows an increasing trend since 2001. There was neither a corresponding increase in the concentrations of total or dissolved zinc, nor a corresponding decrease in pH. The total Zn concentrations in 2007 were 0.019 mg/L and 0.010 mg/L.

Location V15 is located in a small draw, which naturally collects some surface flow below the rock dump including the area occupied by the sulphide cell. A sump collects flow and promotes settlement of suspended sediment. Flow from this location enters Grum Creek upstream of monitoring location V2.

Samples were collected twice per month at location V15 in 2007. Water pH was consistently circum neutral ranging from 6.3 to 7.5. The concentrations of total and dissolved zinc ranged from 0.36 mg/L to 1.4 mg/L and from 0.067 mg/L to 0.69 mg/L, respectively. Elevated zinc concentrations observed in 2007 prompted redirection of water from location V15 to V2A for preservation of downstream water quality at location V2. The Government of Yukon Water Resources Branch was notified of the action plan for water redirection prior to initiation. Between January and the second week of August, water from location V15 to V2. In August, a small lined a rip rap ditch was constructed and from that point on water flowed via gravity to V2A.

The concentration of sulphate ranged from 1,330 mg/L to 1,870 mg/L in 2007 at location V15. A general increasing trend is evident in sulphate concentrations from 1995 (beginning of sample record) to 2005, with a stabilizing trend observed between 2006 and 2007. The historical concentrations of sulphate at location V15 are illustrated on Figure 4-2.

Figure 4-2. Sulphate at V15



Water that is sampled at location V15 is a contributing flow to downstream location V2, which is a trigger location in the Adaptive Management Plan. This means that degraded water quality at location V15 would be detected prior to having a detrimental impact in Vangorda Creek. The Adaptive Management Plan is described in Section 9.8.

4.2.2.2 Groundwater Seepage

Groundwater wells P96-9A and P96-9B are nested in one drill hole in a bedrock valley that is at least 20 m deep near surface monitoring location V15. The groundwater wells allow monitoring of groundwater flow that is assumed to originate, in part, from the portion of the Grum rock dump that includes the sulphide cell. The deeper installation (P96-9B), which is screened over the interval from 16.5 to 18.0 m below surface, is inoperable due to presumed ground movement or collapse of the hole in 2002.

Piezometer P96-9A was sampled in May and October 2007. The concentrations of dissolved Zn were 0.0141 mg/L and <0.050 mg/L and the concentrations of sulphate were 1,500 mg/L and 1,760 mg/L. An increasing trend in sulphate has been apparent since 2000, showing a seasonal trend with spring having lower sulphate concentrations.

Additional groundwater monitoring wells were installed in the area of Grum Creek and its tributaries in September 2004. These wells were installed as part of the investigations undertaken for the Adaptive Management Plan as described in Section 9.8.

4.2.3 Vangorda Open Pit

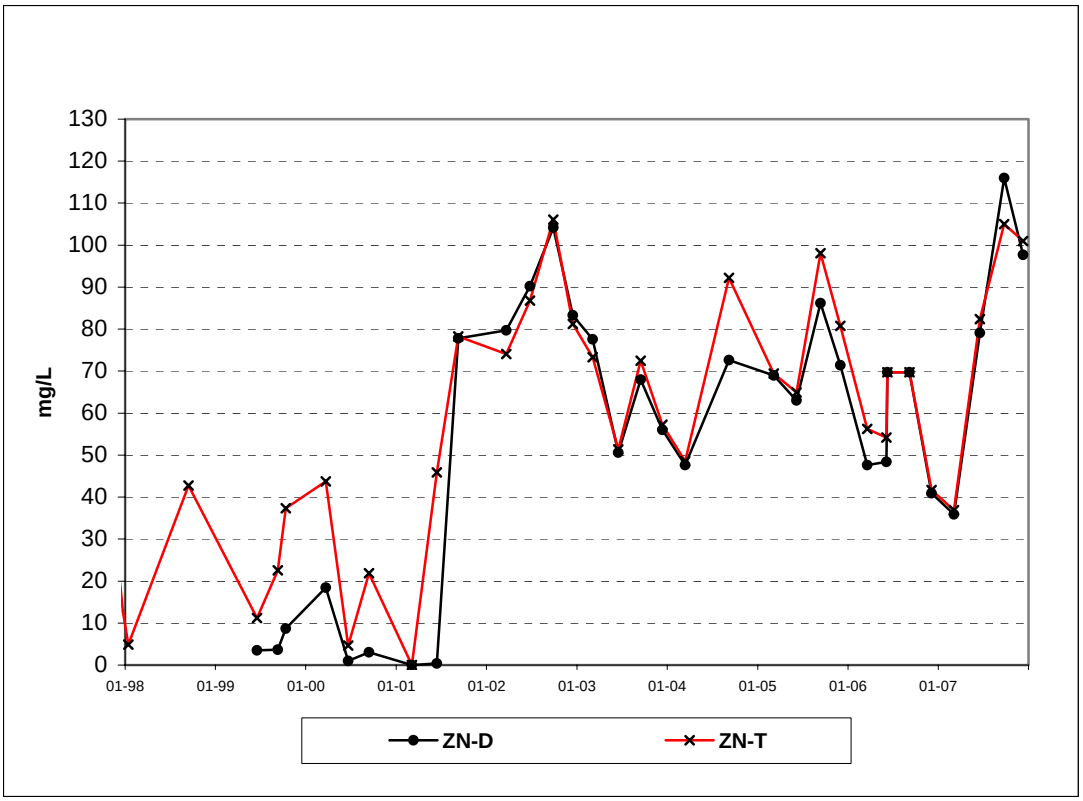
Vangorda Pit water is monitored at location V22. During the period of active mining (pre-1998) when pit dewatering was underway, location V22 was sampled at the outflow of the dewatering pipe. Following the suspension of mining activities (and dewatering) in February 1998, location V22 has been sampled in the pit pond. The water that has accumulated in Vangorda Pit since mine shut down has included natural inflows, water pumped periodically from Little Creek Dam and water pumped/siphoned periodically from the Sheep Pad Pond. From 2002 through 2005, a summer season water pumping and treatment program has been conducted to maintain the pit pond water level within the desired range. Pumping was not required in 2006 and 2007 due to the low level of drawdown achieved in 2005.

Four samples were collected at location V22 in 2007, in March, June, September and December. These samples were collected as grab samples from the surface of the pit pond. The concentrations for total zinc ranged from 36.9 mg/L to 105 mg/L. The sharp increase in zinc in 2002 (Figure 4-3) may be related to maintenance and repairs to one of the freshwater diversions, the Northeast Interceptor Ditch, in 2001. This repair work substantially improved the efficiency of the ditch to pass clean water around the Vangorda pit to Shrimp Creek. It is possible that this work removed a relatively large inflow of clean water and resulted in the increased concentrations observed in the pit. Also, zinc concentrations were observed to increase with depth in a 2000 pit survey and it is possible that the variability of zinc concentrations in surface grab samples is related to seasonal effects such as pond turnover.

The concentrations of sulphate in 2007 ranged from 522 mg/L to 1,030 mg/L. These are within the ranges observed since 2002. Winter values (September and December) are elevated in comparison to spring values. The pH was acidic to neutral in 2007 with a range of 2.7 to 7.3.

The water level in the Vangorda Pit is maintained below a defined maximum desired level to provide for emergency storage below the overflow elevation to accommodate unforeseen events. This is accomplished through a summer season water pumping and treatment program that was been undertaken from 2002 through 2005. Water is pumped from the Vangorda pit to the Grum/Vangorda water treatment plant and, after treatment and removal of metals, is released to Vangorda Creek via the Grum Interceptor Ditch to the Sheep Pad Pond and monitoring location V25BSP. The pumping and release of water is further described in the Water Treatment Plant Performance Review that is documented in Section 5 of this report.

Figure 4-3. Zinc at V22



4.2.4 Vangorda Rock Dump

4.2.4.1 Surface Seepage

Six transverse drains were constructed in 1994 that pass toe seepage from the Vangorda rock dump through the till containment berm that rings the dump. These six drains represent monitoring locations V28 through V33. Drain #1 (V28) is considered inoperable and is not part of the Water Licence monitoring schedule.

Drain #2 (V29) was dry in 2006 and 2007. Flow at this location has been intermittent in the past and 2004/05 was the first two consecutive years sampled. Drain #3 (V30) was also dry in 2007.

Drain #4 (V31) was sampled once in 2007, in June. The concentrations of dissolved zinc and sulphate were 743 mg/L and 5,410 mg/L respectively. The pH was acidic at 5.0 for the sampling event. Flow at this location has been intermittent in the past, but has been consecutively sampled from 2005 to 2007. Concentrations of dissolved zinc and sulphate were less than the peak values seen in September 2005.

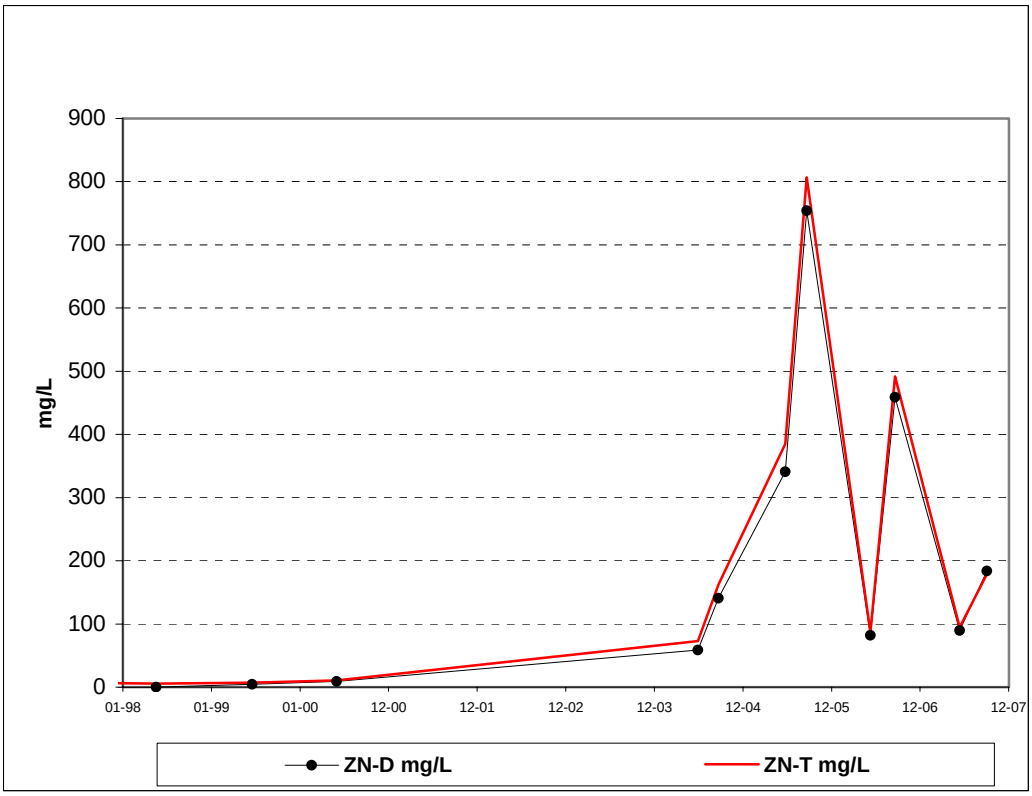
Drain #5 (V32) was sampled on two occasions in 2007, in June and October. Water quality at drain #5 continued to show high metal and sulphate concentrations at acidic pH. The concentrations of dissolved zinc were 10,300 mg/L and 11,300 mg/L and the concentrations of sulphate were 54,500 mg/L and 67,400 mg/L. The pH at drain #5 (V32) was acidic in June and October, at 2.9 and 3.1, respectively. Sulphate and zinc concentrations exhibit an increasing trend, while pH shows a decreasing trend. Concentrations of cadmium exhibit a similar pattern with a maximum concentration of 10.0 mg/L in 2007. The consistently poor water quality at V32 is attributed, in part, to the location of the drain in the (assumed) seepage path of the sulphide cell area of the Vangorda rock dump.

Drain #6 (V33) was sampled once in 2007, in October. Zinc and sulphate concentrations at drain #6 have decreased over the previous year. The concentrations of dissolved Zn and sulphate in October 2007 were 5,620 mg/L and 54,800 mg/L, respectively. The pH was slightly acidic at 5.9 for the October sampling event. The consistently poor water quality at V33 is attributed, in part, to the location of the drain in the (assumed) seepage path of the sulphide cell area of the Vangorda rock dump.

Little Creek Dam (LCD) is the collection point for surface run off from the Vangorda rock dump, toe seepage from the Vangorda rock dump, local area run off from its catchment area and direct precipitation. Prior to the shut down of mining activities in February 1998, the Vangorda Pit was dewatered directly into Little Creek Dam and all water was pumped from Little Creek Dam to the water treatment plant for treatment and discharge. Since the mine shut down, water from Little Creek Dam has been pumped into the Vangorda pit. This has been required on a seasonal basis and has occurred once or twice per summer. The water that has accumulated in Little Creek Dam has been non-compliant for zinc and, therefore, has not been discharged into Vangorda Creek.

The pumping procedure has maintained an appropriate water elevation in Little Creek Dam such that the risk of release of non-compliant water was minimized. Little Creek Dam was previously sampled in 2000 and 2004 to 2006. LCD was sampled on two occasions in 2007, in June and October. The concentrations of total zinc were 94.8 mg/L and 179 mg/L and the concentrations of dissolved zinc were 89.8 mg/L and 184 mg/L, respectively. The concentrations of sulphate were 608 mg/L and 1,590 mg/L, respectively, and pH was 6.6 and 6.3. The concentration of zinc (Figure 4-4) has decreased since the maximum concentration observed in September 2005, and shows a seasonal trend due to the effects of ice melt and snow melt during freshet.

Figure 4-4. Zinc at LCD



4.2.4.2 Groundwater Seepage

Monitoring wells GW94-01 through GW94-04 (monitoring locations V34 through V37) were installed in 1994 around the toe of the Vangorda rock dump to allow monitoring of groundwater seepage below the collector ditch. Each of these piezometers were sampled twice during 2007, in May and October. Piezometer GW94-05 (V38) is inoperable.

Ground water quality in piezometers GW94-01 through GW94-04 continued, in 2007, to show low metal concentrations. The concentrations of dissolved zinc ranged from 0.0044 mg/L to 0.038 mg/L in 2007. The concentrations of sulphate in piezometers GW94-01 to GW94-04 ranged from 63.5mg/L to 1,680 mg/L in 2007. The concentrations of sulphate in piezometers GW94-02 and GW94-03 continued, in 2007, to be greater than in GW94-01 and GW94-04.

A series of piezometers (P94-01 through P94-04, V39 to V47) are installed in the till berm which surrounds the base of the rock dump and through which the transverse drains pass seepage water. No water quality monitoring has been performed since 1998.

Two additional monitoring piezometers were installed in 2001 around the toe of the Vangorda rock dump to allow monitoring of groundwater seepage below the collector ditch, P2001-02 and P2001-03. Piezometer P2001-02 is a nested well in one drill hole, P2001-02A and P2001-02B. Each of these piezometers was sampled twice during 2007, in May and October. P2001-03 was sampled once in May 2007.

Ground water quality in piezometers P2001-02 and P2001-03 continued, in 2007, to show low metal concentrations and neutral pH. The concentrations of dissolved Zn was <0.002 mg/L for all samples in 2007. The concentrations of sulphate in piezometers wells P2001-02 and P2001-03 ranged from 124 mg/L to 332 mg/L in 2007.

4.3 Water Quality Entering Vangorda Creek

4.3.1 Sheep Pad Pond

Location V25BSP consists of all water that enters Vangorda Creek via the Sheep Pad Pond including water discharged from the water treatment plant/clarification pond and natural runoff. Location V25BSP is a licence discharge location and is a point of compliance for water entering Vangorda Creek from the Sheep Pad Pond. Sampling is undertaken weekly during periods of discharge from the water treatment plant and monthly at other times.

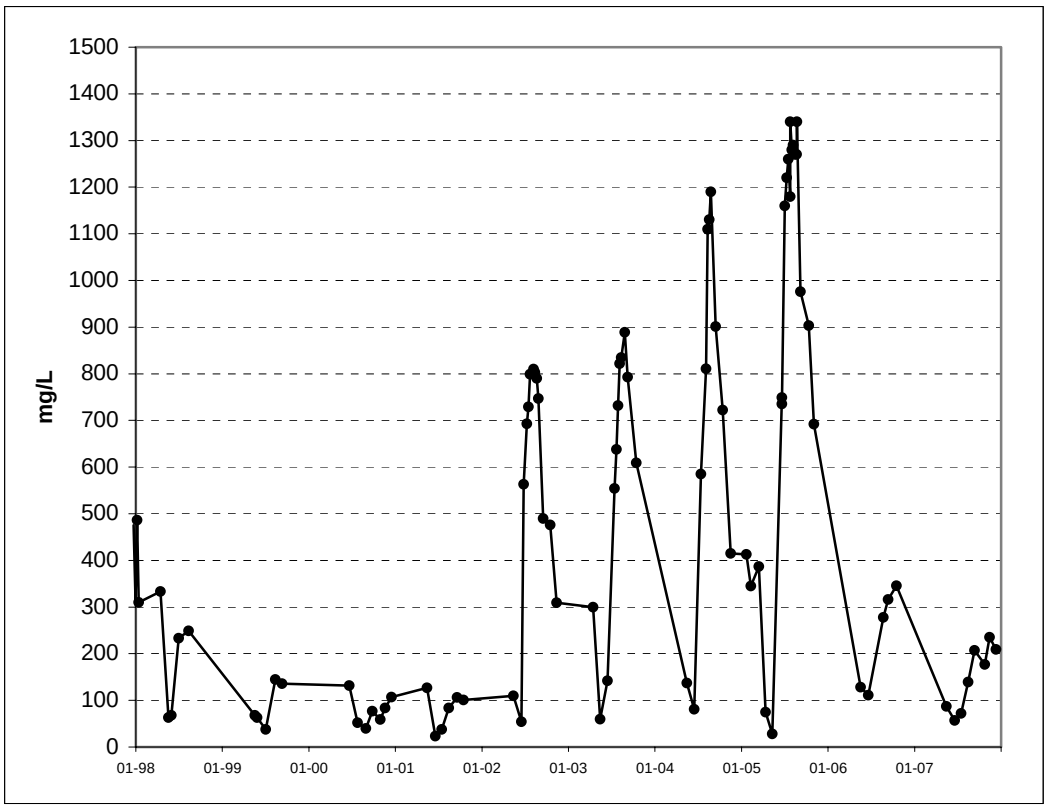
A total of eight samples were collected monthly at location V25BSP from May to December in 2007. The concentrations of total suspended solids at location V25BSP were below the maximum allowable discharge limit of 15 mg/L. Turbidity concentrations ranged from less than 0.1 to 2.5 NTU. The maximum allowable discharge limit for turbidity is 15 NTU and was not exceeded in 2007.

The concentrations of total and dissolved zinc ranged from 0.026 mg/L to 0.095 mg/L and from 0.017 mg/L to 0.079 mg/L, respectively, in 2007. All values were less than the discharge criteria of 0.5 mg/L. The highest zinc concentration occurred in May.

The concentrations of sulphate ranged from 56.7 mg/L to 235 mg/L with peak concentration occurring during November. The peak concentration observed in November is well below the maximum concentration seen in summer of 2005 (Figure 4-5).

Bioassay samples were collected at location V25BSP in June and September. Both samples passed with no mortalities.

Figure 4-5. Sulphate at V25BSP



4.3.2 Vangorda Pit Northwest Interceptor Ditch

Location V19 is the Vangorda Pit Northwest Interceptor Ditch, which drains into Vangorda Creek at the plunge pool. Two samples were collected at location V19 in 2007, in June and October. The pH was neutral for location V19, at 7.4 and 7.5. Sulphate concentrations of 1.96 mg/L and 2.56 mg/L were reported at this station for the two sampling events. Total zinc concentrations ranged from non-detectable levels (<0.005 mg/L) to 0.034 mg/L.

4.3.3 Grum Creek

Location V2 is in Grum Creek upstream of entry into Vangorda Creek. The changes to the water management system implemented during 1995 and 1996 diverted a large portion of the Grum Creek catchment area into the Sheep Pad Pond and this, in combination with the interception of shallow ground water by the Grum open pit, reduced the flow in Grum Creek substantially from its original (i.e. pre-mine) levels.

The changes to the water management system implemented during 1995 and 1996 also allowed the diversion of a portion of the remaining Grum Creek water into the Moose pond where the water is observed to seep into the ground. This diversion was put into place as part of the mitigation plan for reducing suspended sediment loadings entering Vangorda Creek via Grum Creek and remained in place through 2007. The diverted Grum Creek water is sampled at location V2A prior to entry into the Moose Pond.

4.3.3.1 Location V2

Location V2 was sampled once in January, and twice per month in May, June, July, August, September, October, November and December. The concentration of total suspended solids at location V2 continued to be greatly improved over previous years prior to about 1996. The concentrations of total suspended solids ranged from 1 mg/L to 5 mg/L in 2007 and were below the maximum allowable discharge limit of 15 mg/L. The pH ranged from 7.5 to 8.3.

The concentrations of total and dissolved zinc at location V2 in 2007 ranged from 0.005 mg/L to 0.053 mg/L and from < 0.005 mg/L to 0.11 mg/L, respectively (Figure 4-6).

The concentrations of sulphate at location V2 in 2007 ranged from 637 mg/L to 1,040 mg/L (Figure 4-7). An increasing trend in the concentration of sulphate at V2 is evident from 1989 (beginning of sample record) through 2005, with a sharp increase observed between 2000 and 2005. Sulphate concentrations appear to have stabilized over the last two years. There has not been a corresponding increase in the concentrations of total or dissolved Zn. This trend in sulphate is consistent with upstream location V15 (Section 4.2.2). The sulphate concentrations are higher at location V15, which is reasonable given that it is a smaller flow closer to the suspected source, the Grum rock dump.

The increasing trend in sulphate concentrations at location V2 triggered the Adaptive Management Plan, when it became effective in 2004. The investigations that have been undertaken are described in Section 9.8.

Quarterly bioassay samples were collected at location V2 in June, September and December. All samples passed with no mortalities at 100% concentration over 96 hours.

Figure 4-6. Grum Creek (V2) Total and Dissolved Zinc (mg/L)

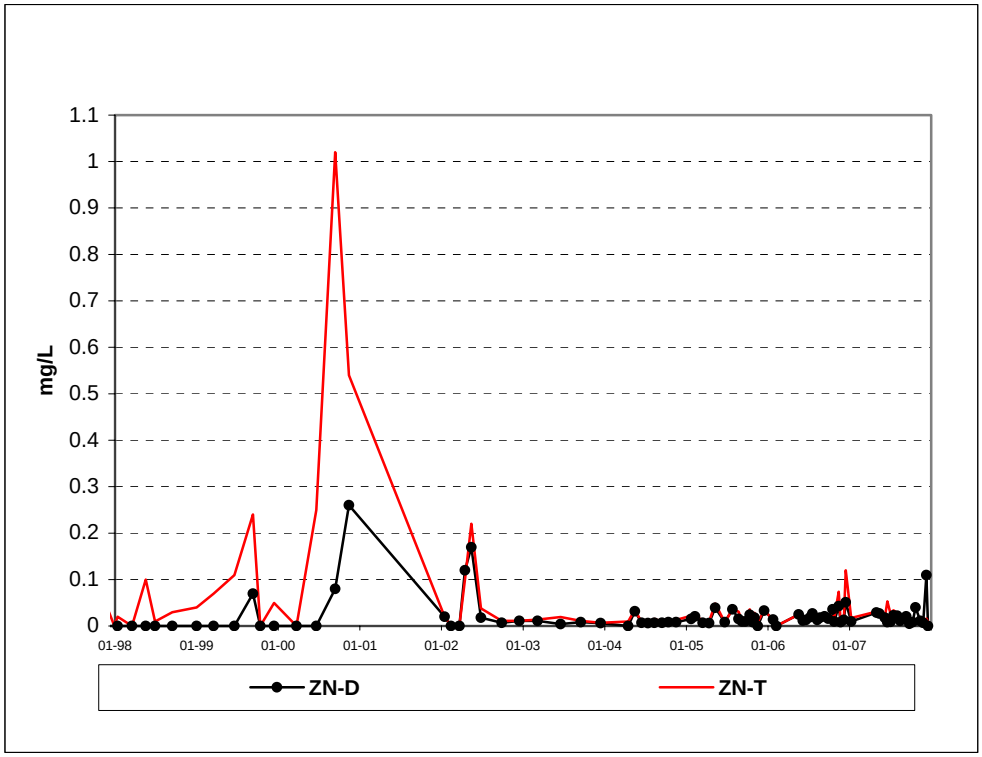
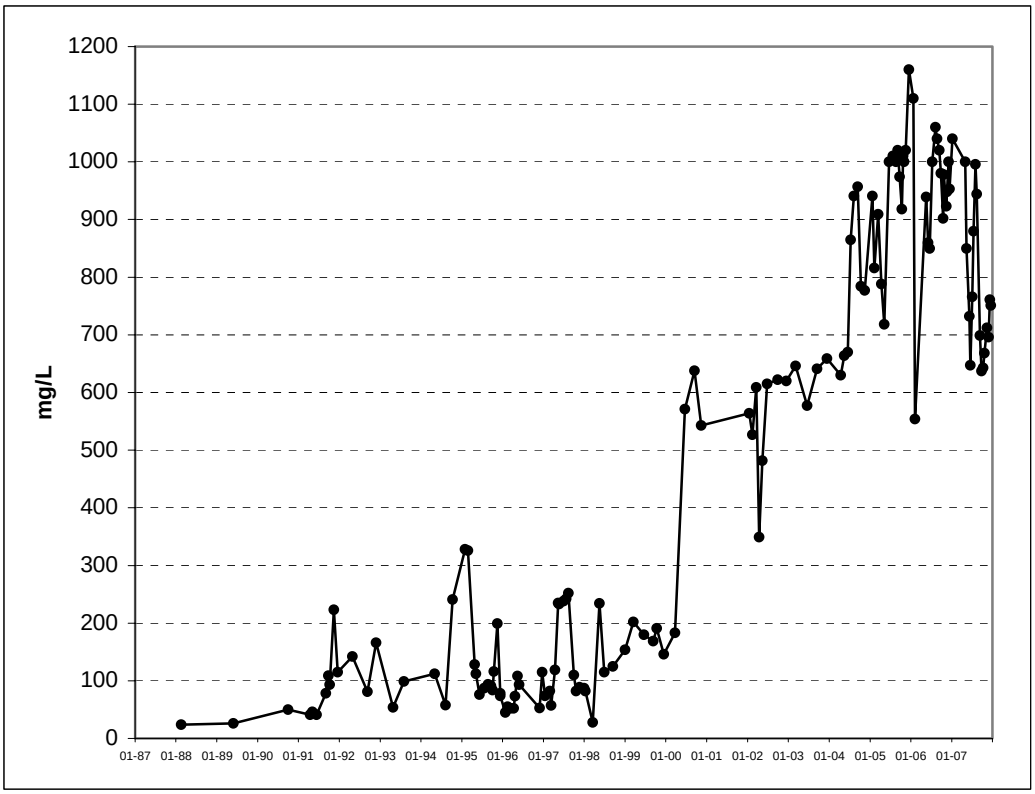


Figure 4-7. Grum Creek (V2) Sulphate



4.3.3.2 Location V2A

Location V2A was sampled twice per month in June, July, August, September and November 2007. Prior to around 2001, water quality entering the Moose Pond via location V2A was similar to that observed at location V2 in Grum Creek. Since about 2001, this trend has not been observed. Higher concentrations of Zn are observed entering the Moose Pond via location V2A than are present in Grum Creek at location V2. This has been attributed to the collection and diversion of a seep from the toe of the Grum rock dump into the Moose Pond. Presently, this water is managed by enabling it to go to ground in the Moose Pond while undertaking additional data collection and investigations.

Throughout 2007, water was collected from location V15, and conveyed to location V2A as described in Section 4.2.2.1. This redirection of water was prompted by elevated zinc concentration observed at location V15 in efforts to preserved downstream water quality.

The concentrations of total and dissolved zinc at location V2A ranged from 0.086 mg/L to 0.26 mg/L and from 0.032 mg/L to 0.23 mg/L, respectively (Figure 4-8). Seasonal zinc trends continued in 2007 with peak concentrations observed in spring (June) followed by decline and return to lower

winter concentrations. The concentrations of sulphate at location V2A ranged from 751mg/L to 1,000 mg/L in 2007, showing an increasing trend since 1998 (Figure 4-9).

Figure 4-8. V2A Total and Dissolved Zinc (mg/L)

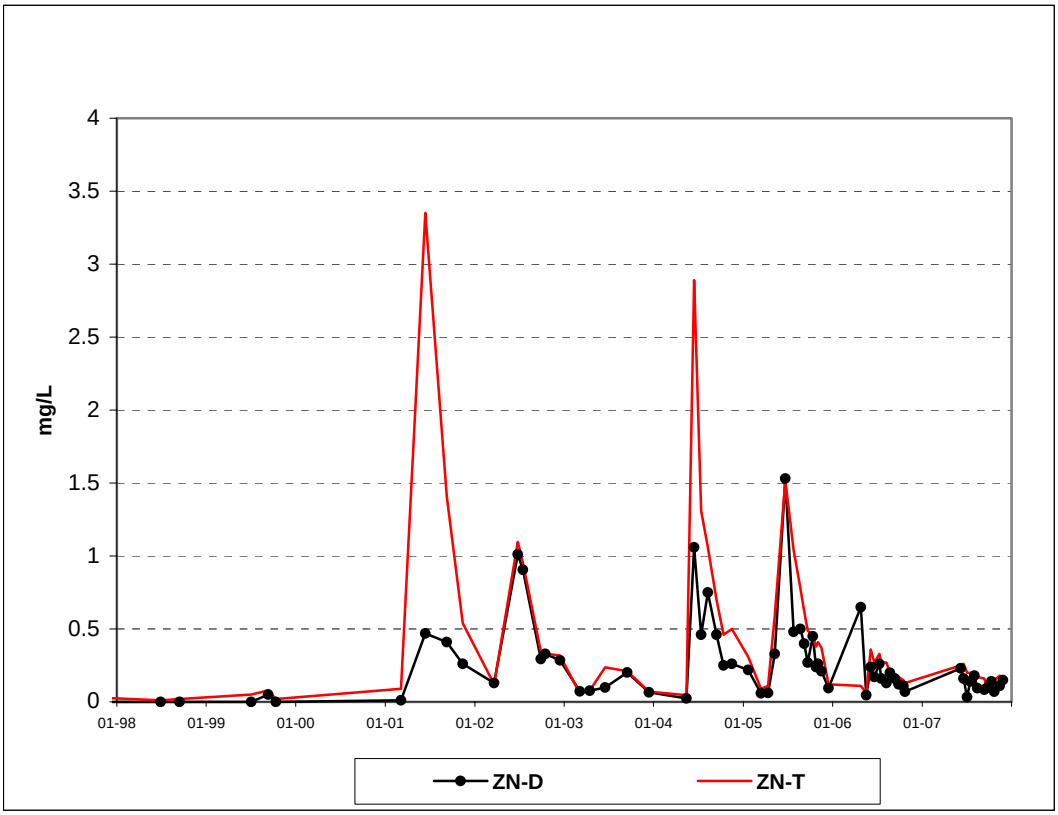
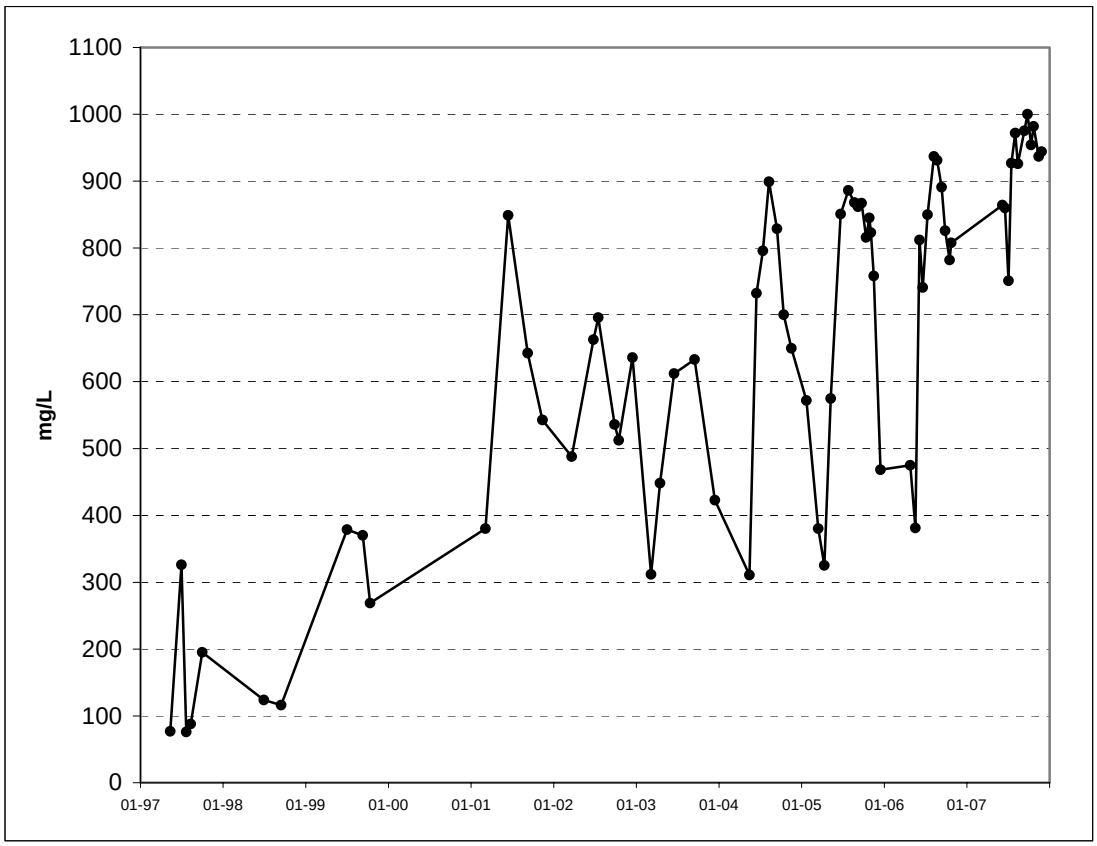


Figure 4-9. V2A Sulphate (mg/L)



4.3.4 AEX Creek

Location V17A is sampled at a small stream that crosses the Vangorda haul road containing natural run off from the slopes north of the Grum pit as well as surface run off from the north side of the Ore Transfer Pad. This stream then passes into AEX Creek.

Two samples were collected at location V17A in 2007, in June and October. The concentrations of sulphate were 8.59 and 21.8 mg/L, consistent with previous data. The concentrations of total zinc were 0.009 mg/L and 0.056 mg/L. The peak zinc concentration seen in September 2005 is an order of magnitude higher than any other value on record and is suspected of being an outlier. Total zinc concentrations have returned to lower historical concentrations since the peak zinc concentration seen in September 2005.

Location V6A is AEX Creek immediately upstream of its entry into the West Fork of Vangorda Creek. This water includes the tributary sampled at location V17A. Location V6A was sampled three times in 2007, in June, September and December. The concentrations of total zinc were

0.014 mg/L and 0.029 mg/L and dissolved zinc were 0.013 mg/L and 0.024 mg/L. The concentrations of sulphate were 13.6 mg/L and 49.1 mg/L. These concentrations are consistent with those observed since mine shut down in 1998.

4.4 Receiving and Background Water Quality

4.4.1 Shrimp Creek

Location V20 is near the downstream end of the Vangorda northeast interceptor ditch, which passes clean run off water that would originally have flowed directly into Vangorda Creek around the east and south sides of the Vangorda pit and rock dump area. This diverted water then enters Shrimp Creek. Flow at location V20 has, historically, been intermittent and an investigation conducted in 2002 identified the cause of this poor performance as ditch leakage into Vangorda pit. In response to this, physical maintenance work was performed to the ditch in the summer of 2002, which resulted in the effective diversion of water around the Vangorda pit, per the original intent for the ditch.

Two samples were collected at location V20 in June and October 2007. The concentrations of zinc and sulphate at location V20 remained at low levels in 2007, consistent with previous data. Total zinc concentrations in the month of June and October were 0.009 mg/L and 0.017 mg/L, respectively. The concentrations of sulphate were 5.79 mg/L and 9.31 mg/L.

Location V4 is Shrimp Creek upstream of the confluence with the Main Fork of Vangorda Creek. This location provides reference information regarding water quality in the Shrimp Creek area and includes inflows from the upstream tributary sampled at location V20.

Location V4 was sampled three times, in June, July and October of 2007. Total and dissolved zinc concentrations were <0.005 to 0.009 and less than detectable (<0.005 mg/L), respectively. Sulphate concentrations ranged from 41.2 mg/L to 50.8 mg/L. These sulphate concentrations are generally consistent with historical data.

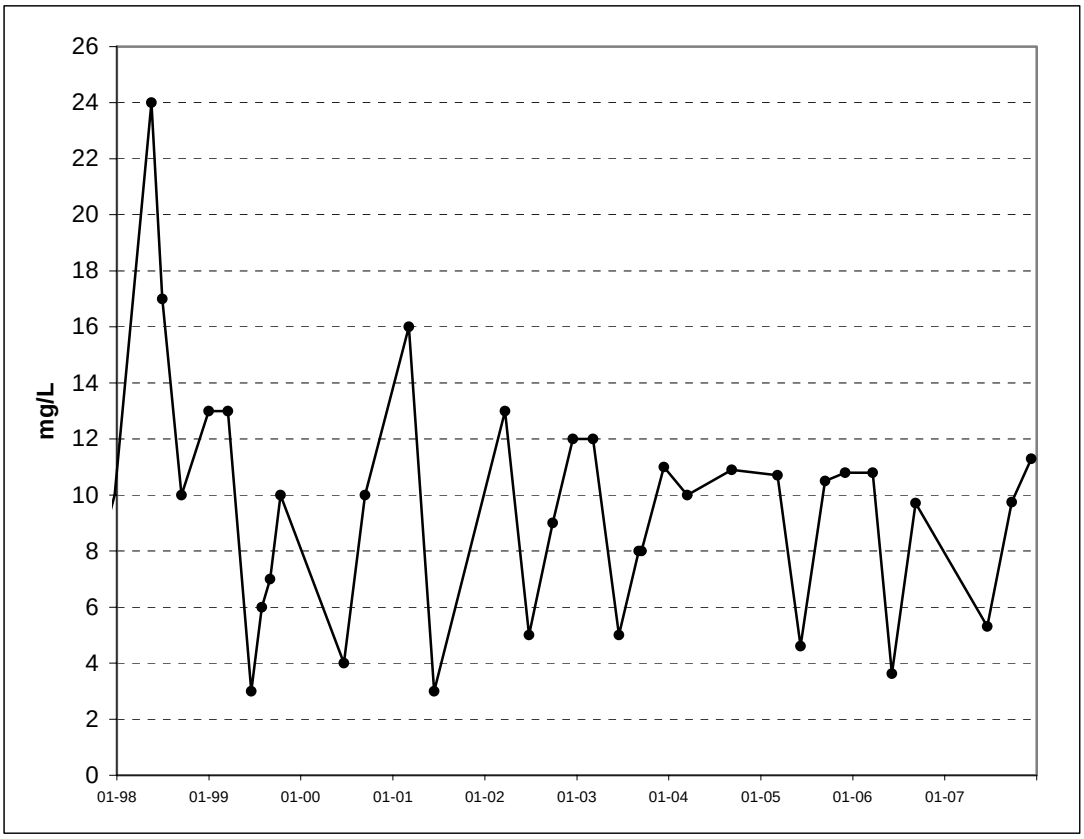
4.4.2 Upper Vangorda Creek

“Upper” Vangorda Creek is the primary receiving water for mine site discharges and is sampled upstream of mine activities at V1, and locally downstream of mine activities at V27, just above the confluence with Shrimp Creek. There is no known fish habitat in “upper” Vangorda Creek due to downstream impasses near the town of Faro.

Location V1 is the Main Fork of Vangorda Creek immediately upstream of mine activities. This location provides background reference information for Vangorda Creek upstream of the mine site. Location V1 was sampled three times in 2007, in June, September and December. During 2007, sulphate concentrations ranged from 5.31 mg/L to 11.3 mg/L, and total zinc concentrations ranged

from < 0.005 mg/L to 0.006 mg/L. Zinc concentrations in 2007 are similar those previously recorded at this site. Sulphate concentrations are also similar to historical concentrations, including a seasonal sulphate trend, with slightly higher concentrations observed during winter months (Figure 4-10).

Figure 4-10. Sulphate at V1



Location V27 is the Main Fork of Vangorda Creek upstream of the confluence with Shrimp Creek and provides information regarding effects of the mine facilities on Vangorda Creek. All surface water from the Grum rock dump, the Grum Interceptor Ditch/Sheep Pad Pond, and the Vangorda Northeast Interceptor Ditch reports to location V27 via Grum Creek or the Vangorda Creek plunge pool. Extremely steep terrain creates unsafe access to this sampling location at some times of the year (particularly winter and spring freshet) and water sampling is conducted accordingly, with maximum recognition of worker safety.

In 2007, location V27 was sampled in June, July and October. The concentrations of total zinc for the sampling events ranged from 0.016 mg/L to 0.031 mg/L. Sulphate concentrations ranged from 8.46 mg/L to 64.1 mg/L. These concentrations are consistent with previous data.

4.4.3 Lower Vangorda Creek

The West Fork of Vangorda Creek represents natural run off and some mine site drainage originating from location V6A in AEX Creek, the Vangorda haul road and a small portion of the Grum rock dump. Water quality in the West Fork of Vangorda Creek is monitored at location V5.

The Main Fork of Vangorda Creek represents natural run off including Shrimp Creek via location V4, drainage from the mine site via location V27 plus a relatively large area of natural runoff below the mine site. Water quality in the Main Fork of Vangorda Creek is monitored at location VGMAIN.

"Lower" Vangorda Creek is the juvenile fish rearing habitat in the first 1 to 2 km above the Pelly River and downstream of the confluence of the West and Main Forks. Water quality in lower Vangorda Creek is monitored at location V8.

Water quality information that was collected in 2007 for each of locations V5, VGMAIN and V8 is described in the following sections and recent data for total suspended solids, total zinc and sulphate is illustrated on Figures 4-11, 4-12 and 4-13, respectively. Additional information regarding water quality in Lower Vangorda Creek in a longer-term context is described in Section 4.4.4.

4.4.3.1 West Fork

Location V5 is the West Fork of Vangorda Creek just upstream of the confluence with the Main Fork. Location V5 receives drainage from AEX Creek (location V6A) and, thereby, potential influences from surface drainage from the north portion of the Ore Transfer Pad. Both AEX Creek and the West Fork of Vangorda Creek receive run off from the Vangorda ore haul road and the mine access road. Road maintenance activities such as re-surfacing or application of dust suppression products or spills could potentially affect water quality at V5. There is a small portion of the Grum rock dump that drains into the West Fork of Vangorda Creek between AEX Creek and location V5. This portion of the Grum rock dump does not include any part of the sulphide cell.

Nine samples were collected at location V5 throughout 2007. Total suspended solids (TSS) concentrations are similar to those recorded in recent years, ranging from 3 mg/L to 208 mg/L. In 2007, TSS concentrations continued to follow a previously established seasonal trend with maximum annual concentrations observed during spring peak flow conditions. The source of the sediment flushed into the creek during freshet originated from "non-mine" areas such as the landslide area and the old ski hill area.

Total and dissolved zinc concentrations at location V5 ranged from <0.005 mg/L to 0.035 mg/L and from <0.005 to 0.033 mg/L, consistent with recent years.

In 2007, concentrations of sulphate and hardness at location V5 continued to exhibit a general seasonal trend with greater concentrations associated with winter months, when surface run off is at a minimum. This trend is attributed to the presence in the West Fork catchment area of certain rock types that influence surface run off and ground water discharge to surface. Sulphate and

hardness concentrations were consistent with recent years, ranging from 39.1 mg/L to 167 mg/L and from 167 mg/L to 436 mg/L $CaCO_3$, respectively.

4.4.3.2 Main Fork

Location VGMAIN is located in the Main Fork of Vangorda Creek immediately upstream of the confluence with the West Fork. This location provides important information regarding the relative impacts of the Main and West Forks on the fish-rearing habitat in lower Vangorda Creek. Although Licence location V27 is also in the Main Fork, location V27 is over 6 km upstream of the fish rearing habitat and it is difficult to apply water chemistry data from location V27 in an analysis of lower Vangorda Creek because of the potential for numerous and unquantified impacts on the Main Fork downstream of location V27.

Monthly samples were collected from January to December at location VGMAIN in 2007. Total suspended solids concentrations typically remained <1 mg/L throughout 2007, with a peak concentration of 2 mg/L during freshet, less than observed TSS at location V5 in the West Fork.

In 2007, the concentrations of total and dissolved zinc at location VGMAIN ranged from 0.010 mg/L to 0.086 mg/L and from 0.006 mg/L to 0.039 mg/L, respectively, which were within the ranges observed in recent years.

In 2007, peak concentrations of sulphate and hardness were observed during winter months, during periods of low flow. These trends are similar to those observed in 2004. Sulphate and hardness concentrations at location VGMAIN ranged from 33.2 mg/L to 190 mg/L and from 86 mg/L to 350 mg/L $CaCO_3$, respectively, in 2007.

4.4.3.3 Lower Vangorda Creek

Location V8 is in lower Vangorda Creek downstream of the confluence of the West Fork (location V5) and the Main Fork (location VGMAIN). Twelve monthly samples were collected at this station in 2007.

Total suspended solid concentrations at this site ranged from less than 1 mg/L to 52 mg/L in 2007, with the highest concentrations recorded in January, corresponding to winter low flow conditions (Figure 4-11).

In 2007, total and dissolved zinc concentrations at location V8 ranged from 0.007 mg/L to 0.064 mg/L and < 0.05 mg/L to 0.029 mg/L, respectively. These concentrations are consistent within the ranges typically observed at this site in recent years (Figure 4-12).

Similar to upstream locations V5 and VGMAIN, sulphate and hardness concentrations at location V8 increased in the winter months of 2007, during periods of low flow and minimal surface runoff. Sulphate and hardness concentrations at location V8 ranged from 99.8 mg/L to 129 mg/L and from 260 mg/L to 293 mg/L $CaCO_3$, respectively, in 2007 (Figure 4-13).

Figure 4-11. Lower Vangorda Creek (V5, VGMAIN, V8) Total Suspended Solids

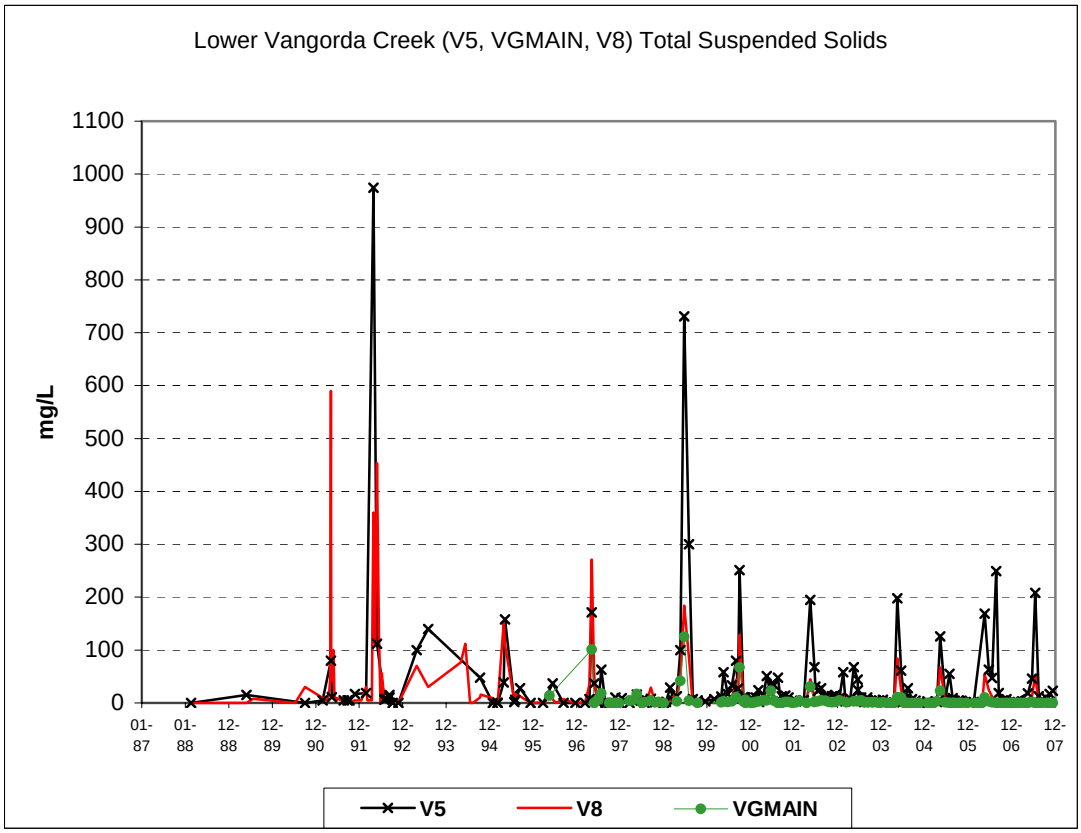


Figure 4-12. Lower Vangorda Creek (V5, VGMAIN, V8) Total Zinc

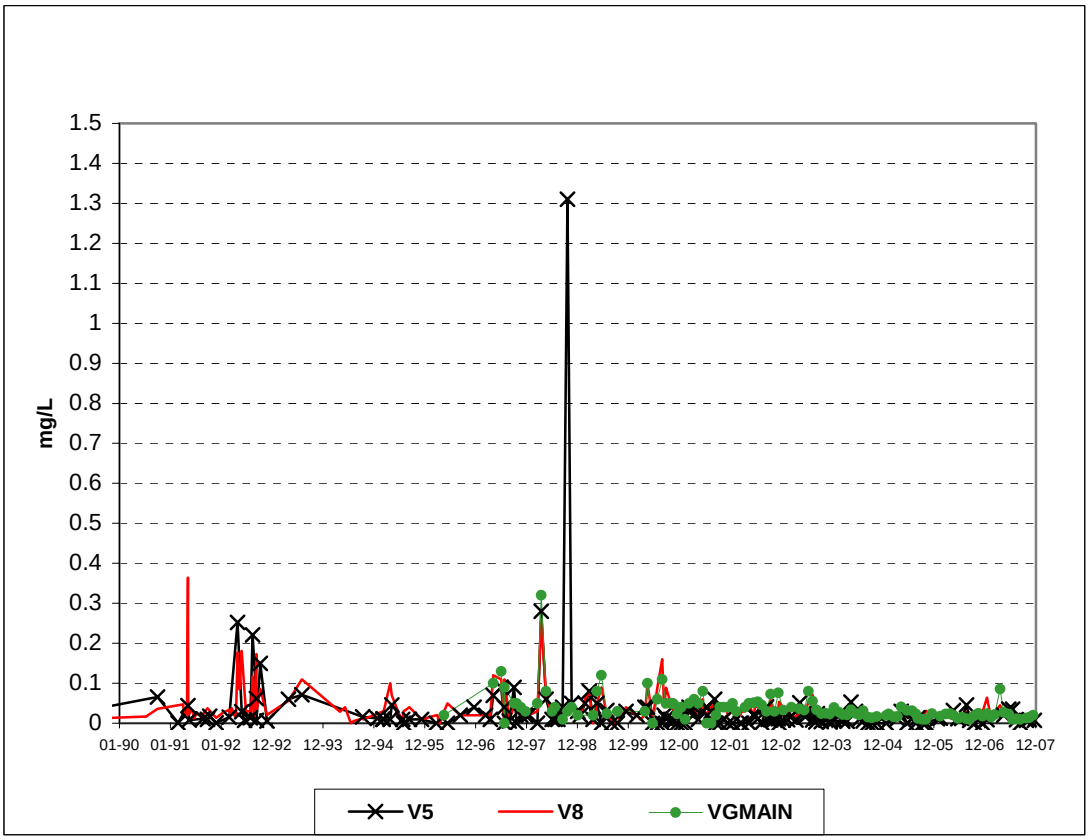
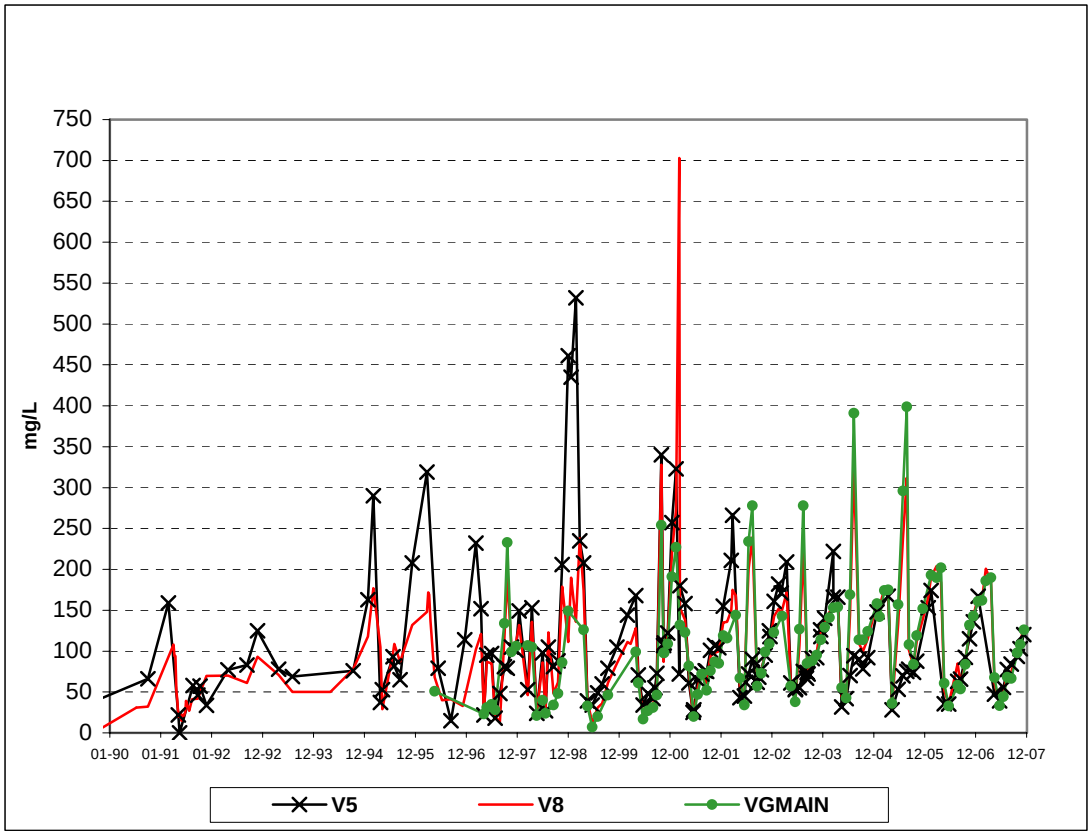


Figure 4-13. Lower Vangorda Creek (V5, VGMAIN, V8) Sulphate



4.4.4 Long Term Trends In Lower Vangorda Creek

The long-term trends in water quality in lower Vangorda Creek (location V8) from 1988 to 2007 indicate that mining activities on the Vangorda Plateau have had an observable influence on concentrations of total suspended solids, total zinc, total lead and ammonia in lower Vangorda Creek. It is also evident that water quality in the West Fork has a significant effect on water quality in the fish-rearing habitat, particularly in terms of total suspended solids and sulphate. The information also confirms that there are significant concentrations of suspended sediments that can enter Vangorda Creek downstream of the mine site that are not related to mine activities.

Concentrations of sulphate, total suspended solids and total zinc at locations V5 and V8 (for which the monitoring records extend back to 1988) are illustrated on Figures 4-14, 4-15 and 4-16, respectively, for the period from 1988 to 2007.

4.4.4.1 1988 to 1990

During the period from 1988 to 1990 (3 years), there was a relatively small amount of work done in overburden stripping for the Grum Open Pit. Although relatively few water samples were collected during this period, water quality at location V8 could be taken as representative of conditions largely unaffected by mine operations. This is evident through relatively low concentrations of total suspended solids, total zinc, ammonia, total lead and arsenic, although the concentration of total zinc was recorded at, or just greater than, the federal recommended guideline for the protection of freshwater aquatic life (CCME) on two occasions. The average concentration of total suspended solids during this period was 12 mg/L with a peak value of 30 mg/L. The average and peak concentrations of total zinc were 0.02 mg/L and 0.04 mg/L, respectively.

4.4.4.2 1991 to 1992

During 1991 and 1992, a substantial overburden stripping program was carried out on the Vangorda Plateau, mining was performed in the Vangorda Open Pit and the Vangorda ore haul road was constructed. The mining activity is reflected in the water quality in lower Vangorda Creek. The concentrations of total suspended solids, total zinc, total lead and ammonia all show an increase in average and peak values during this period. The average concentration of total suspended solids during this period was 62 mg/L with a peak value of 590 mg/L. The average and peak concentrations of total zinc were 0.06 mg/L and 0.36 mg/L, respectively.

4.4.4.3 1993 to 1994

During 1993 and 1994, no mining operations were performed on the Vangorda Plateau. Although fewer water samples were collected during this period than during the previous operating period, reduced levels of total suspended solids and total zinc were observed in lower Vangorda Creek. The apparently reduced levels were generally greater than those observed during the period preceding mine activities (1988 to 1990). The average concentration of total suspended solids

during 1993 and 1994 was 40 mg/L with a peak value of 112 mg/L. The average and peak concentrations of total zinc were 0.03 mg/L and 0.11 mg/L, respectively.

4.4.4.4 1995 to 1997

During 1995, 1996 and 1997, mining activities on the Vangorda Plateau were resumed including discharge of treated effluent from the water treatment plant. Even in light of the resumption of mine operations, water chemistry in lower Vangorda Creek during this period did not show a return to the chemistry observed during the previous period of mine operations on the Vangorda Plateau (1991 and 1992). The concentrations of total suspended solids, total zinc, total lead, ammonia and arsenic observed from 1995 through 1997 remained similar to those observed during the shut down period of 1993 and 1994 with the exception of a peak concentration of total suspended solids. During the period from 1995 to 1997, the average concentration of total suspended solids was 29 mg/L with a peak value of 271 mg/L. The average and peak concentrations of total zinc were 0.04 mg/L and 0.12 mg/L, respectively.

4.4.4.5 1998 to 2007

During the period from 1998 to 2007, mining activities were terminated. There was no discharge of effluent from the water treatment plant until the summer of 2002. Water quality in lower Vangorda Creek (V8) from 1998 to 2007 was generally consistent with the two preceding periods (mine shut down in 1993/1994 and mine operation from 1995 to 1997) although some isolated high peak concentrations of total suspended solids, total zinc and total arsenic were observed. During the period from 1998 to 2007, the average concentration of total suspended solids was 10.4 mg/L with a peak value of 184 mg/L. The average and peak concentrations of total zinc were 0.030 mg/L and 0.26 mg/L, respectively.

Sulphate concentrations show the influence of re-activation of the Grum/Vangorda Water Treatment Plant in 2002 through annual summer peaks that correspond to periods of effluent release. The general seasonal trend of higher concentrations in the low-flow, winter season also continues.

Figure 4-14. V5 and V8 Long Term Sulphate

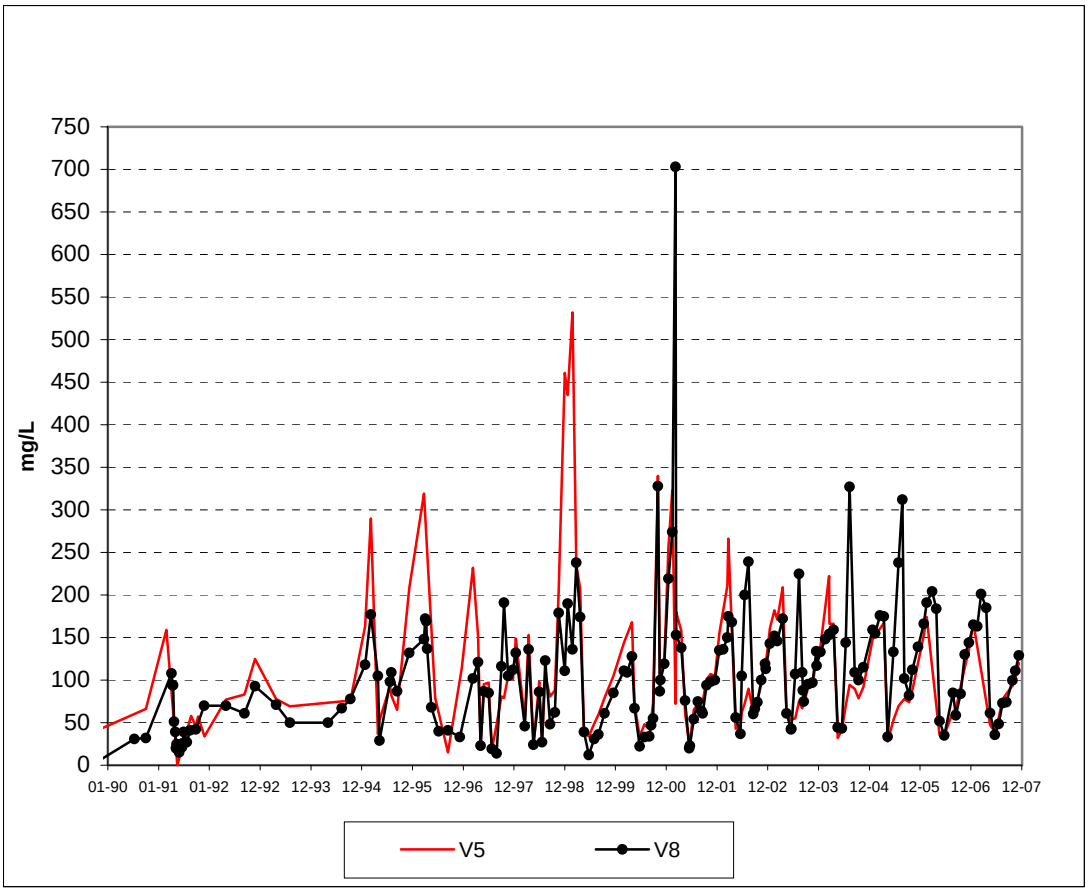


Figure 4-15. V5 and V8 Long Term Suspended Solids Trends

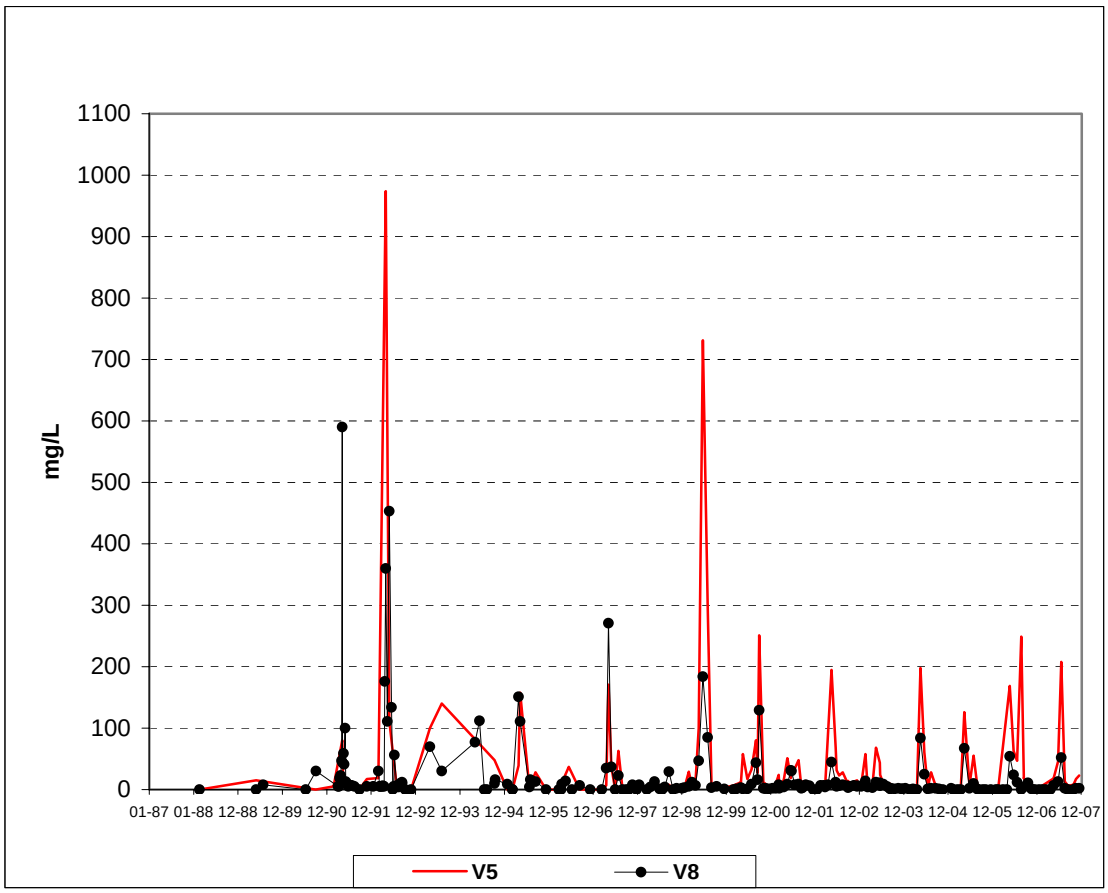
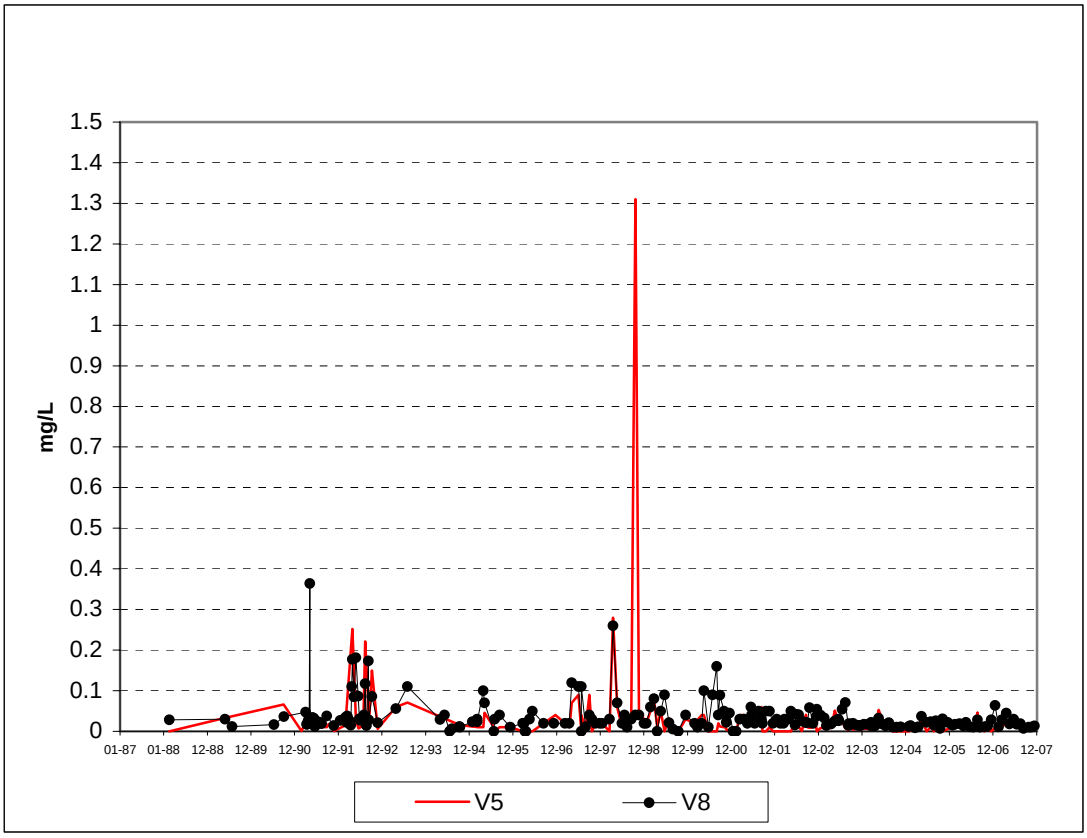


Figure 4-16. V5 and V8 Long Term Zinc Trends



5. Water Treatment Plant Performance

5.1 Introduction

5.1.1 Overview of Water Treatment Strategy

Providing adequate treatment for mine water that can not be released directly to the receiving environment is one of the fundamental purposes of the care and maintenance activities that are regulated under the Water Licence. The Water Licence provides the maximum allowable concentrations of contaminants in any water released to the receiving environment.

Heavy metals, most notably zinc, that are mobilized into water from tailings, rock piles and open pit walls are the primary contaminants of concern and the focus for water treatment. Water treatment for removal of heavy metals has been accomplished at three locations:

1. Grum/Vangorda Water Treatment Plant;
   Treats water from the Vangorda pit.
2. Mill Water Treatment System; and
   Treats water pumped from the Faro Main pit.
3. Down Valley Water Treatment System.
   Treats water siphoned from the Intermediate Pond of the Rose Creek Tailings Facility.

Water that is treated through the Mill and Down Valley water treatment systems is combined in the Cross Valley Pond prior to discharge into Rose Creek as a single effluent stream (location X5). Water that is treated through the Grum/Vangorda water treatment plant is released into Vangorda Creek via the Grum Interceptor Ditch (location V25BSP).

All three treatment systems reduce metal concentrations in water through pH-modification with lime followed by settlement of treatment sediments, either with or without the aid of flocculants. pH "normalization" after treatment is through natural atmospheric processes.

The water treatment systems are operated in a coordinated manner during the summer season. Each system is operated to reduce water levels in the source ponds to the point where treatment is not required until the subsequent summer season. This seasonal process has been undertaken since 1998 and will be required until such time in the future when the FCRP may reduce or eliminate some treatment requirements. Improvements to the general process and to the treatment systems have been implemented annually and will continue to be implemented as opportunities are identified. In the case of the Vangorda pit, the water level was lowered sufficiently in 2005 that pumping was not required in 2006 and 2007. As well, in 2007, water from the Intermediate Pond and emergency tailings area was pumped directly to the Mill water treatment system such that the Down Valley system was not required.

The benefits to this approach lie primarily in taking full advantage of the efficiencies that have been established in the Mill system. The Down Valley system is a portable system that does not provide the high level of controlled lime conditioning, flocculation and settlement that is provided in the Mill. As a result, the lime usage in the Down Valley system is very high and the confidence, although acceptable, is not as high as for the Mill system.

Also, the Down Valley system generates a large volume of treatment sediments that accumulate in the Cross Valley Pond. The sediments are effectively contained and subsequently removed from an inflow area that has been constructed in recent years. However, removal of the sediments is an on-going cost and resourcing issue and has, in the past, created water quality issues in the Cross Valley Pond. Discontinuation of the use of the Down Valley system eliminated the introduction of these sediments to the Cross Valley Pond and associated water quality issues.

The Down Valley system remained in place on a standby status in 2007 but was not required.

Various studies carried out of the past few years concluded that surface and groundwater flows through the Emergency Tailings Area (ETA) contribute a significant contaminant load to the downstream area and that portion of this contaminate loading was escaping collection leading to possible contaminate loading to the aquifer below the Rose Creek Tailings. In response to this issue, a collection and treatment system for the ETA water was installed during the fall and winter of 2006/2007. This resulted in the delivery of increased volumes of poor quality water to the intermediate Pond in 2007, without losses to groundwater. Key components of this system include the following:

- Dual sump water collection system with cutoff trench below the ETA;
- Pumping from ETA to the Intermediate Pond;
- Barge mounted vertical turbine pump at the intermediate Pond;
- Pipeline from Intermediate Pond to Mill Water Treatment System;
- Pump and pipeline from the ETA to the Mill Water Treatment System;
- Tie-in of High Density Conditioner and additional lime conditioning cells;
- Installation of new lime distribution pumps and pipes; and
- Other various piping and instrumentation in the mill.

Water from the ETA is collected in the collection sump and transported by pipeline to the Intermediate Pond. The water from the Intermediate Pond is then pumped using the floating barge system to the Mill Water Treatment System to be treated. The treated water then is conveyed to the Polishing Pond using the existing piping system and discharged to Rose Cree via siphon.

5.1.2 Coordinated Operating Procedures

The treatment systems are operated in a coordinated manner through one management system. There are a number of coordinated procedures that enhance the efficiency of the process as a whole as described below.

5.1.2.1 Personnel and Safety

Each treatment system is operated by one or two 24-hour dedicated operators to ensure that lime mixing and other activities proceed smoothly. A dedicated 2-man crew is present for 12-hour day and night shifts at the Grum/Vangorda Water Treatment Plant. One operator is present at each of the Mill and Down Valley systems linked to the security guardhouse via radio and routine safety checks. A site foreman and site manager is on call at all times.

On weekdays, an extended work crew is present that includes electrical and mechanical maintenance personnel, equipment operations and a site foreman. This extended crew completes routine maintenance and any required repairs related to the treatment systems and other related facilities. The maintenance personnel (electrical and mechanical) service all of the treatment systems and schedule time and parts ordering in a coordinated manner.

The operators maintain a logbook at each location of activities and pH readings related to operation of the treatment system and related facilities. The logbooks are reviewed as part of the annual performance review.

A centralized first aid/security attendant is present on-site at all times when one of the treatment systems is operating (i.e., 24-hours/day). The attendant is located in the Faro guardhouse and linked to each of the treatment locations via radio and scheduled safety checks.

The process is managed by the site manager who oversees all of the treatment systems and ensures that activities are carried out in a coordinated and efficient manner.

All of the activities related to water treatment are carried out according to comprehensive site-wide contingency, emergency response and safety plans. Safety plans are managed in a coordinated manner that is consistent for each treatment system.

5.1.2.2 Water Quality Sampling

WTP operators record manual pH readings at key locations within the treatment systems on a routine basis. This provides a frequent check on the installed pH probes that, in some cases, control the automated lime-addition circuitry.

Water samples for in-house use are also collected at key locations within the treatment systems on a routine basis, typically several times per day. These samples are analysed in-house each morning for total zinc. This verifies compliance and serves as a management control tool for operating the systems.

The analytical procedures for the on-site analyses have been established and in practice since 1998 and use professional grade AA (atomic absorption) equipment operated by trained and experienced assayers utilizing standard procedures to provide high quality analyses of total zinc. A

logbook of zinc analyses is maintained by the assayers at the mine site. The logbook is available for review by Water Resources personnel during their site visits.

Finally, water samples are collected for external analysis on a weekly schedule when treated water is being released, as required by the Water Licence. The external analyses provide final verification of compliance and can also serve as a calibration check on the in-house assay procedures. Quarterly acute lethality tests (LC_{50} bioassays) are required for effluents.

5.1.2.3 Treatment Chemicals

Lime and flocculant are ordered in bulk to provide for all three systems. This allows for better pricing for purchase and transportation of lime. The Grum/Vangorda treatment system requires pulverized lime since there is no grinding mill.

5.1.2.4 Clean Water Diversions

The diversion of clean water around the mine developments is an important component of the water treatment systems for two primary reasons.

1. Most importantly, a higher level of environmental protection is provided by minimizing the amount of clean water that may become contaminated. Even though this water would receive treatment to meet the effluent discharge criteria, the levels of zinc and, possibly, other contaminants released would likely be greater than the initial background levels.
2. Secondly, extra costs would be incurred to treat an increased volume of contaminated water. These extra costs would come from increased lime consumption, increased manpower, increased electrical power and increased operating costs.

Each of the water treatment systems has associated clean water diversions, which are described in subsequent sections for each treatment system.

5.1.2.5 Contaminated Water Collection

The collection of water that requires treatment is an important component of the water treatment systems. This prevents contamination of the receiving water. To a large degree, the water that requires treatment on the Anvil Mine property naturally collects in the various ponds from which the influent into each treatment system is drawn.

There are also several important contaminated water collection systems that are described in subsequent sections for each treatment system.

5.2 Mill Water Treatment System

5.2.1 Overview

The Faro pit pumping/treatment program has become established as an annual seasonal (summer) program. The program uses a water pumping system that was initially installed in 1997 to provide recycle water to the mill (an estimated minimum 95%) prior to mine shut down in February 1998. Since mine shut down, the system has been used exclusively to pump water from the Faro Main Pit for treatment and release to Rose Creek. This program maintains the in-pit water level within the pre-determined "safe" range that protects against an inadvertent release of contaminated water.

The water pumping system is made up of the following primary components:

1. Three electric pumps mounted on a floating barge in the pit rated at providing 5,000 USgpm each to the mill (only one or occasionally two pumps are utilized for effluent discharge);
2. 30" sclair pipeline from the barge to the mill with flexible sections near the barge to prevent damage to the pipeline which might otherwise result from vertical movement of the barge; and
3. Overhead powerline from the substation adjacent to the mill to the pumping barge. A new line was installed in 2005 that provides the electricity required for the pumps in a more efficient and safe manner.

From 1997 through 2001, water pumped from the Main pit was mixed with lime slurry in an open mix box at the mill and allowed to flow to the Intermediate Impoundment for settlement of lime sediments. This was an inefficient use of lime but provided for pre-treatment of a dominant inflow into the Intermediate Pond such that the requirement for treatment at the outflow of the Intermediate Pond was reduced compared to what would otherwise have been required. That is, pre-treatment of the Main pit water provided a large inflow of high-pH water into the Intermediate Pond.

In 1997 and 1998, outflow from the Intermediate Pond (location X4) became compliant with the Water Licence (<0.5 mg/L zinc) following approximately 4 to 6 weeks of inflow of pre-treated water from the Main pit. As a result, lime treatment of the outflow was discontinued for the remainder of those pumping/treatment programs. The lag-time was anticipated given the need for displacement of non-compliant water that was in the pond initially. In 1999, 2000 and 2001, the concentration of zinc in the Intermediate Pond effluent (location X4) was reduced but not to the licence limit and, therefore, treatment of the effluent in the outflow spillway was continued for the duration of the pumping/treatment program.

This manner of treatment was an inefficient use of lime and created risk at the Intermediate Dam by having the pond water constantly at the full supply level. The risk was related to both the physical stability of the dam and to the lack of any emergency freeboard to contain and hold high or unexpected flow events. Therefore, to mitigate these risks and to provide for a more efficient treatment process, part of the mill was "retrofitted" in 2001 to serve as a water treatment system.

This included both activation of existing equipment and installation of new equipment. Further refinements and optimizations have been implemented since 2001.

The general objective for the mill treatment system is to remove zinc from the Main pit water such that the effluent is compliant with the Water Licence (0.5 mg/L total zinc) at a flow rate that is high enough to treat the required annual volume of water in the summer season. Compliant effluent can be discharged either into the Cross Valley Pond or into Rose Creek via the Cross Valley Dam outflow spillway (location X5). In the event of an upset condition in the plant that results in temporarily non-compliant effluent, the plant water can be released into the Intermediate Pond. Treatment sediments are temporarily stored in the plant and periodically removed from the system.

The clarity and quality of the influent water (from the Main pit) has, to date, been acceptable for reagent mixing and there has been no need for a freshwater supply for this purpose.

The mill treatment system was constructed and debugged in 2001 and has been successfully operated since 2002. As outlined in previous section, in 2007 water from the ETA is collected in the collection sump and transported by pipeline to the Intermediate Pond. The water from the Intermediate Pond is then pumped using the floating barge system to the Mill Water Treatment System to be mixed with the Faro Pit water for a total flow of approximately 5000 USgpm to the Mill Water Treatment System at a ratio of 60% Faro Pit Water and 40% Intermediate pond water.

The ETA/Intermediate Pond water pumping system is made up of the following primary components:

1. Concrete sump and 6 inch pipeline installed along the Down Valley access road and out into the wet zone of the Intermediate Pond;
2. Two pumps installed in the sump for conveyance of water to the Intermediate Pond: a 5.4 HP Flyte pump and a 30 HP Flyte pump, both with a 4 inch discharge; and
3. Barge mounted diesel-driven vertical turbine 450 HP pump at the intermediate Pond.

To enable the Mill Water Treatment System to handle the poorer water quality coming from the Intermediate Pond the system was modified to handle high density sludge water treatment through the installation of high intensity conditioners and additional lime conditioning cell (ex. flotation units). With this system, water is pumped from the Intermediate Pond into two high intensity conditioners. Operational monitoring identified that the agitators were too aggressive in breaking down the flocs and as a result hindered settlement. In response, the agitators were shutdown allowing the conditioning tanks to operate as an extension of the intermediate pipeline within the mill, where the water is directed to the head-end of the mill circuit for pH adjustment by the addition of lime.

The mill treatment system includes the following primary components:

1. New 24-inch influent pipeline from the Main pit;
2. Existing lime handling, storage and mixing system;
3. Lime conditioning in two sets of flotation cells operated in parallel with automated control on lime addition;
4. New 24-inch pipeline to settlement tanks;
5. Two settlement tanks (previous thickener and clarifier) operated in series or in parallel with optional lime and flocculant addition;
6. New instrumentation and control systems;
7. New flocculant mixing and distribution system;
8. Sediment storage tank (previous clarifier);
9. New 24-inch effluent pipeline with optional discharge into the Cross Valley Pond;
10. Treatment sediment removal and storage system (installed 2005); and
11. High Intensity conditioners and additional lime conditioning cells (2007).

The new system provides many benefits over the previous treatment methods that include:

- Reduction in lime consumption (and resultant cost savings);
- Increased confidence in achieving objectives;
- Improved control on operating parameters including automated controls;
- Incorporation of contingency/emergency procedures;
- Reduction in deposition of treatment sediments in Cross Valley Pond;
- Productive use of existing infrastructure;
- Elimination of reliance on the Down Valley System to treat water from the Intermediate Pond.
- Reduction in loading to groundwater from flow from the ETA; and
- Improvement of water quality in the Cross Valley Pond and elimination of water requiring treatment at this location.

5.2.2 Clean Water Diversions

Clean water is diverted around the Main pit to as great a degree as practical through the Faro Creek Diversion and the Faro Valley Interceptor Ditch. Additionally, in 2005 water diversions above the north area of the Faro Main pit were upgraded, to improve the diversion of clean water away from the pit and into the catchment area of the North Wall Interceptor Ditch.

5.2.2.1 Faro Creek Diversion

The Faro Creek Diversion collects water from the original Faro Creek channel upstream of the Main pit and diverts the water around the northeast side of the Main pit and into the North Fork of Rose Creek. Some flow in the old Faro Creek drainage area cannot be collected by gravity into the Faro Creek Diversion and continues to flow directly into the Faro Main Pit. During historical mine operations, this excess flow was pumped around the pit perimeter at times.

Important maintenance work was performed on sections of the diversion channel in 2002 and 2003 that is considered to have substantially reduced leakage from the channel into the Main pit. The work consisted of bottom grading, excavation of a pilot channel for low winter flows and placement of a geomembrane liner and rip rap erosion protection in select locations. Follow up work has also been completed since 2003 that includes maintenance of roadside ditches and grading of the road surface away from weaker areas of the pit wall. Site management noted a reduction in pit inflows following the 2002/03 work. A review of whether the benefits of this work are evident in a simple water balance for the pit is provided in Section 2.1.3.

On May 16, 2007, a seepage event initiated at the toe of the upper section of the Faro Creek Diversion with significant seepage discharge being observed occurring from the toe of the diversion roadway embankment. BGC Engineering Inc. (BGC) was notified and travelled to site to assist in the assessment and development of remediation measures. Full details of this event and associated follow-up mitigation and remediation are provided in Section 8.6.

5.2.2.2 Faro Valley Interceptor Ditch

Runoff from the hillsides north and northwest of the Faro Valley Rock Dump is intercepted by the Faro Valley Interceptor Ditch and directed into the Faro Creek Diversion. The ditch is a simple excavation into the native surficial soil and rock.

Important maintenance work has been performed on the ditch from 2002 through 2005 that substantially restored its effectiveness in passing clean runoff water to the Faro Creek Diversion. The work consisted primarily of bottom grading and excavation of slumped and eroded sections of the ditch.

These improvements to the Faro Valley Interceptor Ditch also contribute to the improvements and benefits described for the Faro Creek Diversion.

5.2.3 Contaminated Water Collection

Contaminated water is collected in the backfilled Zone II pit. This water is runoff and seepage through the various rock dumps that lie within the catchment area of the Zone II Pit. Water accumulates in the pit and is pumped into the Main pit at the south end. Pumping is typically required on an occasional basis through the summer season only.

As of 2007 contaminated water from the ETA, Old Faro Creek, Lower Guardhouse Creek and Intermediate Pond area collected in the Intermediate Pond was also pumped to the Mill Water Treatment System.

5.2.4 2007 Operations

5.2.4.1 Water Quantities

An estimated 1.48 million m^3 was treated through the Mill in 2007: 1.15 million m^3 from the Faro Main Pit and 0.33 million m^3 from the Intermediate Pond. There was a total of 133 pumping days to the Mill Water Treatment System from April 18 to September 10, inclusive of occasional brief shut downs for maintenance. Details on the Main Pit water balance for 2007 is presented in Section 2.1.3.

5.2.4.2 Lime Usage

A total of 428 t (480 short tons) of lime was utilized in 2007 for an overall lime usage rate of 0.29 g/L. Lime usage has been reported in these Annual Environmental Reports since 2004 as listed in Table 5-1.

Table 5-1. Summary of Faro Lime Usage

Year	Mill Est. Lime Usage (g/L)	Down Valley Est. Lime Usage (g/L)	Total Lime Usage (g/L)
2004	0.12	0.26	0.38
2005	0.11	0.34	0.45
2006	0.16	0.48	0.64
2007	0.29	0.00	0.29

Table 5-1 shows that mill lime usage was higher in 2007 than previous years due to the incorporation of the treatment of water from the Intermediate Pond (and ETA) though the Mill Water Treatment System. Overall, though the total lime usage on the Faro side is down when compared to previous year when the Down Valley System was being used.

5.2.4.3 Water Quality

In order to monitor the treatment performance of the Mill, water samples of the (treated) Mill outflow were routinely collected and analysed in-house each morning for total zinc. This verified compliance and served as a management control tool for plant operations. Water samples were collected more frequently and at additional locations as required to manage the system. The Water Licence does not regulate the quality of water within the Mill water treatment system.

WTP operators recorded manual pH readings at the outflow of the Mill at least twice per day as a check on the automated pH monitoring probes. The pH readings through 2007 ranged from 10.33 to 11.98. Manual checks were recorded more frequently and at additional locations as required to manage the system.

Water that is treated in the Mill was not discharged directly to Rose Creek in 2007. The water was released into the southeast corner of the Cross Valley Pond, using a new inflow area that had been prepared for this purpose in early 2005. The inflow area provides a discharge/stilling well (vertical culvert pipe) to dissipate the energy of the incoming water and a (rock) bermed settlement area to contain solids and to further still the water prior to flowing into the pond.

This practice replaced the previous practice of releasing (treated) mill water into the Intermediate Dam spillway where it would then mix with water syphoned from the Intermediate Pond as it flowed into the Cross Valley Pond. This system was implemented to provide the following advantages:

- the reduction of flows in the spillway reduces the risk of water "short-circuiting" from the inflow spillway to the outflow syphons;
- the energy dissipation structures provide for good settlement and containment of any residual solids in the (treated) mill water;
- improved containment of solids facilitates more effective removal of those solids from the pond; and
- improved containment of solids reduces the risk that metals might be remobilized within the pond as a result of wave action.

Site management's observations in 2007 confirmed that this practice continued to work well and successfully provided the anticipated benefits.

The water released from the Cross Valley Pond (location X5) is the final effluent discharged to Rose Creek and includes water treated in the Mill from both the Faro Pit and the Intermediate Pond. Water quality for the final effluent (location X5) is described in Section 3.3. In 2007, the intake of the effluent discharge syphon was suspended on a floating raft that maintained a consistent depth of water over the intake. This ensured that effluent was discharged from the near-surface zone of the pond, as desired.

5.2.4.4 Treatment Sediments

Treatment sediments from the Mill were deposited in the Intermediate Pond of the Rose Creek Tailings Facility from 2001 to 2004. This was accomplished by periodically flushing the sediment storage tank in the Mill into the pipeline that passes across the emergency tailings to below the mine access road.

A sediment management study was completed by SRK Consulting and submitted to the Water Board in 2004 as required under Part F, Item 51 of the Water Licence. The study recommended that sediments from the Mill be deposited within a containment berm on the Original Impoundment. This location is already disturbed by mining development (tailings) and provides an adequately large working space. The 2004 sediment study provided an estimated annual sediment production rate of 4,400 m^3/month for the mill, based largely on data from the 2003 operating season.

The disposal area and a gravity-operated pipeline from the mill were constructed during winter 2004/05 to take advantage of frozen conditions on the tailings for construction of a containment berm. The containment berm was constructed by excavation of tailings (cut and fill) to a size estimated to contain treatment sediments for several years of operation.

The disposal of treatment sediments (sludge) to this area began in 2006 and continued to be successfully utilized in 2007. In the fall of 2007 bulking up of the sludge in the containment area was initiated to make room for the 2008 water treatment season.

Beginning in summer 2006, a vacuum truck system was used to enhance the sediment recovery process from the Cross Valley Pond. A vacuum truck was used to recover sediment from the pond inflow area and pump the sediment to a contained inner storage cell. The majority of the sediment that had been consolidated in the storage cell was hauled (by truck) to the disposal area in November and December 2006, and January 2007 for an estimated total of 1494 m^3 (166 truck loads).

5.2.4.5 2007 Operating Issues

The largest operating issue in 2007 was associated with the high intensity conditioners (HCI). As discussed the Down Valley system was not operated in 2007 due to the installation of barge and pumping system at the Intermediate pond. Water was pumped directly to the mill water treatment plant to high intensity conditioners (HCI) and settling occurred at the thickener and then discharged down valley via the 20" pipe into the stilling culvert at the southeast corner of the polishing pond.

Due to over agitation of the HIC's, the agitators were shutdown as they were breaking up the flocs formed making it difficult to settle at the thickener. The water was pumped from the bottom of the HIC's to the head-end of the mill conditioning circuit prior to settling.

The HIC transfer pumps were slightly under designed, bottle necking the proposed volume (estimated at 2,000 USgpm) to be pumped from the Intermediate Pond.

In addition to the items noted above, the operator's log book describes minor maintenance issues that were not of the type that affected the overall performance of the system. The issues were all managed to prevent any negative effect on the treatment system.

Some general maintenance issues that were addressed in 2007 included the following:

- Due to severe cold conditions in November and December of 2006, various section of the Faro barge pipeline separated, requiring repair using a rented specialized fusion machine to reconnect the pipe prior to Mill Treatment Plant start-up;
- Shutdown of Faro barge pump #1 due to over-amperage which was pulled, inspected and send out for repairs at the end of the treatment season; and
- Repair of water leak in the gearbox oil cooling system of the Intermediate Barge.

5.2.4.6 Comments for 2008 Operations

The performance of the Mill system as regards to water quality and mechanical availability has continued to be excellent. There is no reason to anticipate any major mechanical issues beyond some generally anticipated "start-up" issues that can be managed by careful monitoring and management of the system as it is brought on-line.

The operators maintain a detailed log book of activities and pH readings. The on-site laboratory provides daily zinc assays for management of the system. The site manager maintains a monthly status report that also documents unusual events or repairs. These practices should continue and be expanded as necessary to provide the same level of control and reporting.

To allow for increased pumping capacity from the Intermediate Pond pumping system, a bypass will be installed in the HIC circuit including pumps and direct feed into the head-end of the mill conditioning circuit.

5.3 Down Valley Water Treatment System

5.3.1 Overview

The Intermediate Impoundment was used for tailings deposition from 1986 to 1992. Following the cessation of tailings deposition in 1992 and until 1997, there was a general increase in the concentration of zinc in water flowing through the Intermediate Pond. This was the anticipated trend attributed to:

- The removal of a large inflow of alkalinity that previously entered the pond via the tailings slurry;
- The continued inflow of contaminated rock dump seepage water via location X23; and
- The continued flushing of contaminants by run off over beached (exposed) tailings in the upstream portion of the Intermediate Impoundment.

Water treatment at the outflow of the Intermediate Pond (the "Down Valley") was started in 1992 to ensure that surface outflow from the Cross Valley Pond met the allowable discharge limits. Water treatment has continued, on an as-required basis, since that time. The methods employed for the treatment have involved raising the pH of the Intermediate Pond effluent with lime or sodium hydroxide and subsequently utilizing the Cross Valley Pond for settlement of the treatment sediments. The pH modification has been accomplished at various times by:

- Hauling lime slurry mixed in the mill to a gravity feed tank for addition into the outflow spillway;
- Delivering lime slurry mixed in the mill to the outflow spillway via an overland pipeline;
- Hauling lime slurry mixed in the Grum/Vangorda Water Treatment Plant to the south abutment of the dam for addition into a syphon line;
- Adding sodium hydroxide into a syphon line at the south abutment;

- Inflow into the upstream end of the Intermediate Pond of water pumped from the Faro Main Pit that was pre-treated with lime at the mill in conjunction with supplemental treatment with lime slurry delivered to the outflow spillway; and
- Mixing of lime slurry at the Intermediate Dam outflow spillway and addition into overflow or syphoned outflow entering the Cross Valley Pond.

From late 1997 through 2001 (the second to last bullet above), water flowing from the Intermediate Pond was treated with lime slurry delivered to the outflow spillway via either an overland pipeline or tanker truck to a stationary tank (~10,000 gal) with gravity feed into the spillway. This was an inefficient use of lime and an awkward and labour intensive system. The overland pipeline was prone to breaks, sanding up and freezing. Haulage via tanker truck required numerous trips and near-continuous attendance at the gravity drain tank/valve. Settlement of lime in either the overland pipeline or the stationary tank was also problematic as regards to sanding of pipes and valves and inefficient use of lime. Additionally, this approach produced a large build up of sediment at the base of the spillway due to inefficient lime mixing and general over-addition of lime.

In 2002, the manner of treatment at the Intermediate Dam outflow spillway was upgraded with the installation of a treatment system which mixes lime slurry from dry lime for direct addition into the contaminated water. Water is syphoned from the Intermediate Pond into a mixing tank where the lime slurry is added. Water from the mixing tank then flows into the Cross Valley Pond for settlement of treatment sediments. Refinements and improvements to this system have been implemented since 2002 and the system continued to be effectively used through 2006.

The system consists of the following primary components:

- 14-inch syphon line from the Intermediate Pond to the water mixing box;
- dry lime hopper with capacity of approximately 3 tons;
- portable water pump and associated pipeline to provide lime mix water (from the Cross Valley Pond);
- lime feed pump and pipeline from lime tank to water mixing box;
- pipeline from the water mixing box to the Cross Valley Pond;
- portable diesel generator; and
- portable office for operator use.

The system was operated successfully through 2006 to maintain the Intermediate Pond level below the overflow spillway, per the established management strategy.

In 2007 water from the Intermediate Pond was pumped to the Mill for treatment eliminating the need for the Down Valley system. This is described in Section 5.1.2.

5.3.2 Clean Water Diversions

Clean water is diverted around the Intermediate Pond to as great a degree as practical through the North Wall Interceptor Ditch and the Rose Creek Diversion Canal.

5.3.2.1 North Wall Interceptor Ditch

The North Wall Interceptor Ditch intercepts clean runoff from the north side of the Rose Creek Valley and diverts it around the north abutment of the Cross Valley Dam.

The North Wall Interceptor Ditch is an open ditch excavated in a variety of materials, ranging from silty sand and gravel till to coarse sand and gravel alluvium and bedrock. The ditch has performed reasonably well although erosion and sedimentation have caused partial blocking of this ditch at times. Periodic maintenance and repairs have been completed as required. In 2005, water diversions above the north area of the Faro Main Pit were upgraded, which will improve the diversion of clean water away from the pit and into the catchment area of the North Wall Interceptor Ditch.

5.3.2.2 Rose Creek Diversion Canal

The Rose Creek Diversion Canal passes Rose Creek water around the Rose Creek Tailings Facility. The Diversion was developed in two stages, referred to as the Upper and Lower Diversions. The Upper Diversion was constructed in 1974 in conjunction with the development of the Second Tailings Impoundment. The Lower Diversion is an extension of the Upper Diversion. It was constructed in 1980-81 in conjunction with the development of the Intermediate Impoundment.

Water from both the South and North Forks of Rose Creek enters the upper section of the Rose Creek Diversion Channel. The upper section is a predominantly straight channel that includes a number of drop weirs in addition to riprap for erosion protection.

The lower section passes water along the south side of the Intermediate Impoundment and returns flow into the natural Rose Creek Channel downstream of the Cross Valley Dam. The lower section includes a series of boulder-lined drop structures and a sharp corner at the downstream end. The lower section is constrained by natural slopes on the south side and by a till dyke on the north side. The crest of the diversion dam, which diverts the flow from the upper section into the lower section, was constructed approximately 1 m lower than the crest of the adjacent diversion canal dyke, and armoured with riprap. This was done to ensure that any flows in excess of the design flow overtop the diversion dam at that location into the Intermediate Impoundment. In 2004, the containment dyke (roadway) along portions of the lower section was rebuilt to restore the freeboard necessary to safely pass the design (1:500 year) flood.

The canal is prone to ice build up over the winter and clearing of ice has been required on occasion. Visual inspection and instrumentation have been used to monitor the condition of the

canal. Repairs to the backslope and dyke crest have been completed to maintain conformance with design parameters.

5.3.3 Contaminated Water Collection

In previous years, contaminated water flows to the Intermediate Pond by gravity drainage via (lower) Guardhouse Creek, the old Faro Creek channel and across exposed tailings. Lower Guardhouse Creek is a small portion of the original catchment of Guardhouse Creek that receives some of the runoff from the plantsite area. The old Faro Creek channel being the drainage path for seepage from the rock dumps and plantsite areas. These channels are relatively short and lie completely within the Intermediate Pond catchment area such that little maintenance is required. Maintenance work has been focused on maintaining culverts at road crossings.

The changes implemented in 2007 included the capture of contaminated water from the Faro rock piles (location X23) and the emergency tailings area. This is described in Section 5.1.2. The new system passes this water directly to the Intermediate Pond via a gravity flow pipe, thereby eliminating seepage losses to the aquifer. Any water not captured by this system continues to flow to the Intermediate Pond via the Old Faro Creek channel. Water from the Intermediate Pond is then pumped directly to the Mill water treatment system.

5.3.4 2007 Operations

No water was treated through the Down Valley system in 2007.

5.4 Grum/Vangorda Water Treatment System

5.4.1 Overview

The Grum/Vangorda Water Treatment Plant (the “WTP”) is a conventional lime treatment system that was constructed in 1990. The WTP was successfully utilized during mine operations at the Vangorda Plateau mine site (1990 through 1997) to treat water pumped from the Grum and Vangorda Pits. The WTP was closed when mine operations were suspended in early 1998 and was reactivated in 2002.

The need for reactivation of the WTP stemmed from the level of water in the Vangorda Pit. In early 2002, the water level had reached the maximum desired elevation and, therefore, the water level needed to be drawn down in order to maintain adequate emergency storage capacity. The maximum desired water elevation was suggested to be 1091.8 m in a memo prepared by Gartner Lee Limited dated February 13, 2001. This memo brings hydrologic data forward from the 1996 Integrated Comprehensive Abandonment Plan that provided a rationale an elevation of 1091.8 m, approximately 30.7 m below the assumed overflow elevation out of the pit.

From 2002 through 2005, the WTP was operated during the summer season fundamentally as it had been during mine operations (pre-1998) although some mechanical and electrical upgrades were installed. Water was pumped to the WTP from the Vangorda Pit on a seasonal summer basis to draw the pit water level down so that it remained below the recommended maximum elevation. There was no other water at the Vangorda Plateau mine site that required treatment through the WTP since water from Little Creek Dam is incorporated into the Vangorda Pit.

In 2007, as in 2006, the WTP was not operated because a sufficiently large volume of water from the Vangorda pit had been treated in 2005 such that the pit did not require pumping in 2006 and 2007. Operation of the WTP is scheduled again for 2008.

The WTP was designed by Cominco Engineering Services Limited (CESL) and constructed in 1990. The process is a "conventional" lime treatment system that was designed to treat 2,000 USgpm (454 m^3/hr) at the water influent quality predicted for mine operations. The primary components of the treatment system are as follows:

- Lime storage silo;
  Capacity of approximately 40 tons,
- Freshwater supply for reagent mixing;
  Was initially groundwater and changed to clean surface water for 2002.
- Lime mixing system;
  Does not include any grinding or heat-controlled slaking.
- Lime addition system;
  Can be managed manually or by automated pH control circuitry.
- Dual lime conditioning tanks;
  Provides total 14 minutes strong mixing at maximum design flow (2,000 USgpm/454 m^3/hr).
- Flocculant mixing system;
  Can be managed manually or by automated control circuitry.
- Flocculant addition system;
  Can be managed manually or by automated control circuitry.
- Flocculant agitation tank;
  Provides 2 minutes light mixing at maximum design flow (2,000 USgpm/454 m^3/hr).
- Clarification pond influent pipe; and
  Was initially underground and changed to above ground for 2002.
- Clarification pond.
  Provides design 36 hours retention time at maximum design flow (2,000 USgpm/454 m^3/hr*).*

When the plant was reactivated in 2002, there was some uncertainty regarding the flow rate that could be achieved, given that the influent water quality was substantially poorer than it had been during mine operations. However, four years of performance data (2002 to 2005) have demonstrated that the initially designed flow rate of 2,000 USgpm (454 m^3/hr) remains valid.

5.4.2 Changes from Previous Operations

There are several substantial changes to the current water pumping and treatment systems as compared to previous operations (i.e. pre-1998). The most significant of those are summarized as follows:

Influent Water Quality: The general quality of the current influent is substantially poorer than pre-1988 due to the source of the water. Prior to 1998, the source of influent was a combination of water from the Vangorda Pit/Little Creek Dam and the Grum Pit whereas the single source of influent since reactivation of the plant has been the Vangorda Pit, which has historically (and currently) contained poorer quality water than Grum Pit. For example, the average concentration of total zinc in WTP influent through 1996 and 1997 was 18.6 mg/L as compared to the concentration of total zinc in the Vangorda Pit in 2005, which ranged from 65 mg/L to 98 mg/L.

Pumping System: The current pumping system was installed in 2001 in preparation for reactivation of the WTP. The system is an overland system from the Vangorda Pit that replaces the previously utilized buried pipeline from Little Creek Dam. The new system reduces the risk of environmental contamination due to pipeline breaks by providing for visual inspection of the pipeline and, specifically, by eliminating the buried haul road crossing where the pipeline of raw WTP influent lay directly atop the culvert passing clean Vangorda Creek water in the opposite direction. Additionally, the new system is capable of delivering 2,000 USgpm (454 m^3/hr) to the WTP whereas the previous system could deliver an estimated 1,200 USgpm (272 m^3/hr), which was acceptable at that time given that WTP influent was also sourced from the Grum Pit. The new system includes an automatic shut-off for emergency conditions such as a break in the pipe.

WTP Operators: Dedicated operator attention has been provided since reactivation of the plant. During previous operations, the WTP was operated by the pit dewatering crew, who also had numerous other duties around the mine site (related primarily to dewatering the pits). Since reactivation, a dedicated crew of two persons, operator and supervisor, have been fully dedicated to operating the system on a 24-hour basis. Additionally, a site foreman is dedicated to managing the WTP operating crews and other maintenance activities required for successful operation of the WTP.

2001 Preparatory Work: A large portion of the preparatory work for reactivation of the WTP was completed in 2001, in anticipation of the need for operation in 2002. This work can be summarized as follows:

- design and installation of an overland pipeline from the Vangorda Pit to the Grum/Vangorda Water Treatment Plant;
- installation of an overhead powerline to the pumping station in the Vangorda Pit;
- design, construction and installation of a barge with primary pump station in the Vangorda Pit;
- design and installation of a booster pump station at the top of the pit perimeter;
- excavation of treatment sediments from the clarification pond to the Vangorda Pit;
- cleaning of sloughed soil and placement of rip rap in the Grum Interceptor Ditch;

- placement of a rip rap apron at the inflow to the Sheep Pad Pond;
- mechanical and electrical checks and maintenance in the Water Treatment Plant;
- installation of a new inlet pipe and header into the Clarification Pond;
- modifications to the freshwater supply pond for supply of reagent mix water; and
- in-pit field testing of lime treatment of Vangorda Pit water.

5.4.3 Clean Water Diversions

Clean water is diverted around the Vangorda Pit to as great a degree as practical via the following systems:

5.4.3.1 Vangorda Creek Diversion Flume

The Vangorda Creek Diversion Flume is a 2.4 m diameter half-culvert placed in a rock cut channel on the upper benches of the north wall of the pit. The upper reach of the channel is cut into native soils beyond the pit wall. The flume passes the substantial flow of Vangorda Creek around the pit to its natural channel below the mine haul road. The flume was constructed in 1991 and has experienced localized failures and damage due to soil slumping, rock falls and large flow events.

Substantial restorative and repair work has been completed from 2002 to 2006 that has resulted in the general restoration of a continuous positive grade, reduction in risks of rock falls, reduction in risk of overtopping, and a general improvement in the physical condition and stability of the flume sections. In 2005, an emergency overflow channel was excavated at the headworks dam that would allow extreme flood flows to pass directly into the Vangorda Pit, thereby reducing the risks of overtopping and damage to the flume.

5.4.3.2 Northeast Interceptor Ditch

The Northeast Interceptor Ditch is an open ditch excavated into the native soils with plastic liners in certain locations where water has been observed, in the past, to seep into the ground and resurface into the Vangorda Pit. Important maintenance work was performed on this ditch in 2001, which substantially restored its effectiveness in diverting clean water around the pit northeast area of the pit to Shrimp Creek.

The maintenance work is thought to have caused, at least in part, positive effects in the Vangorda Pit. Specifically, the reduction of clean water seeping into the pit is thought to have caused, at least in part, the sharp increase in zinc concentration that was observed in 2002 (Section 4.2.3). This positive effect is also likely related to the interception of clean water from the Old Vangorda Creek channel beginning in 2002.

5.4.3.3 Northwest Interceptor Ditch

The Northwest Interceptor Ditch is an open ditch excavated into the native soils and surficial bedrock above the Vangorda Creek Diversion Flume at the top of the northwest wall of the

Vangorda Pit. This ditch passes clean water around the northwest area of the pit to Vangorda Creek.

Important maintenance was performed on this ditch in 2003, which restored some ditch efficiency although the nature of the ground in the area allows for some continued leakage into the Vangorda Creek Diversion Flume and the Vangorda Pit.

5.4.3.4 Old Vangorda Creek Channel

Natural runoff water collects in the old Vangorda Creek channel immediately above the Vangorda Pit. This is a small catchment area that lies below the Vangorda Creek Diversion Flume. Without intervention, this clean water flows into the Vangorda Pit and becomes contaminated by flushing contaminants from the pit walls. Since 2002, this water has been pumped into the Vangorda Creek Diversion Flume during the summer season from a natural depression in the old Vangorda Creek channel. This is a reactivation of a procedure that was previously utilized during mine operations.

The interception and diversion of this water is thought to have caused, at least in part, positive effects in the Vangorda Pit. Specifically, the reduction of clean water entering the Pit is thought to have caused, at least in part, the sharp increase in zinc concentration that was observed in 2002 (Section 4.2.3). This positive effect is also likely related to the maintenance work completed at the Northeast Interceptor Ditch in 2001.

5.4.4 Contaminated Water Collection

Contaminated water is actively collected from two locations related to the WTP.

5.4.4.1 Vangorda Rock Dump Seepage Collector Ditch

Runoff and seepage water from the Vangorda rock dump is contaminated with metals and requires treatment before it can be released to Vangorda Creek. An open ditch around the toe of the rock dump intercepts runoff and seepage water that would otherwise enter Vangorda Creek directly. The ditch directs water into Little Creek Dam Pond where it becomes incorporated into the treatment system.

5.4.4.2 Little Creek Dam

Little Creek Dam is a water retention dam that forms Little Creek Dam Pond. The water retained behind Little Creek Dam originates from the Vangorda rock dump seepage collector ditch and from direct runoff and seepage from the Vangorda rock dump.

This water is pumped into the Vangorda pit as required where it is incorporated into the treatment system. Pumping has typically been required on one or two occasions during the summer.

5.4.5 2007 Operations

5.4.5.1 2007 Maintenance Work

The WTP was not operated in 2007 but was carried out at the clarification pond in preparation for the 2008 treatment season.

An estimated 4,000 m^3 of treatment sediments were transferred to the containment cell in the Grum Overburden Dump.

There was a significant slump inside the clarification pond, which required the excavation of material and the placement and compaction of new material. Approximately 700 m^3 of compactable material, obtained from the borrow source area downstream of the Faro Rock Drain, was used for this purpose. In addition, the water collection ditch immediately above the Vangorda Clarification Pond was upgraded to a lined rip rap ditch to prevent excessive moisture from impacting the side of the clarification pond where the slump had developed.

A new discharge header was installed at the inlet to the pond where the conditioned water enters. As well, a new piping system was installed to enable the vacuum truck directly hook up and remove the treatment sediments on an as required basis without having to shut down operations.

5.4.5.2 Comments for 2008 Operations

There are no substantive planned or recommended changes for future operations, planned in 2008. The performance of the WTP in the past years with respect to water quality and mechanical availability has been excellent. The WTP operators will continue to maintain a detailed log book of activities and pH readings and the site manager will maintain a monthly status report to document unusual events or repairs.

The plant and related equipment should undergo a thorough mechanical and electrical check before re-activation in 2008. The start up phase for the WTP at the beginning of the 2008 treatment season will follow the established procedure of filling the Clarification Pond with treated water (90% full) for final testing.

6. Biological Monitoring

6.1 Benthic Invertebrates

The biological monitoring program as described in Schedule 'B' of the Water Licence requires that the established program for monitoring benthic invertebrates be carried out in alternating years in the Rose Creek and the Vangorda Creek drainage systems. In 2007, the program was conducted in the Vangorda Creek drainage by Laberge Environmental Services of Whitehorse. A detailed report discussing the results of the benthic invertebrate sampling program can be found in Appendix 8. A summary of the report findings follows.

Four sampling stations in Vangorda Creek, identified as stations V1, V5, V8 and V27, were sampled for benthic invertebrates. Sampling was conducted using artificial substrate samplers, which were installed in the stream and left to colonize for a period of five weeks. The samplers were then removed, and the invertebrates removed for identification.

The phyla Diptera was the dominant or co-dominant order at all sites, ranging from 32% of the population at site V27, to 54% of the population at V5. The order Ephemeroptera was co-dominant at site V27, with the order Plecoptera co-dominant at V5 and V8, and sub-dominant at site V1 and V27. The co or sub-dominance of Ephemeroptera is significant, as the order is sensitive to chemical pollution, and its presence indicates favourable water and sediment conditions.

Populations were down at all four of the sites as compared with 2005, although all populations remain robust. Changes in populations are most likely due to natural fluctuation. There appears to be a trend in increasing diversity at all sampling sites, and all sites possessed several pollution sensitive species, indicating low impacts from mining related activities.

6.2 Stream Sediments

The Water Licence requires that stream sediment sampling for metals concentrations be carried out in conjunction with benthic invertebrate sampling. Laberge Environmental Services collected sediment samples in conjunction with their August field visit. A detailed report discussing the findings of the stream sediment sampling is provided in Appendix 8.

Metals levels in sediment were highest at site V27. As this site is directly downstream of the Vangorda pit, it receives the greatest impact from mining related activities. The probable effects level (PEL) was exceeded at V27 for both lead and zinc in the sediment collected. Concentrations of metals were lower at all other sampling sites. The Interim Sediment Quality Guideline for copper, lead and zinc was exceeded at sites V1 and the ISPG for lead and zinc was exceeded at V8, however concentrations were below the probable effects level. In general, it appears metals

concentrations at all Vangorda sampling sites have remained relatively stable since sampling began.

6.3 Fish

The Water Licence for the mine site also requires an annual fish monitoring program be undertaken. Fish sampling was completed in August 2007 by White Mountain Environmental Consulting of Whitehorse. The complete report, prepared by White Mountain Consulting, is available in Appendix 9.

Fish sampling sites include R1, R2, and R4, on Rose Creek, R6A on Anvil Creek, and V8 and B1, on Vangorda Creek and Blind Creek, respectively. Each site consists of a 100 m stretch of stream. Fish habitat characteristics including velocity, channel configuration, bank stability, temperature, cover and riparian vegetation were recorded at each site.

Sampling methods consisted mainly of electrofishing. Gee type minnow trapping, as well as beach seining and angling, were also used to a lesser extent.

Sampling resulted in slimy sculpin being captured at all sites, Arctic grayling being captured at all sites except for R6A, burbot being captured at 3 sites (R4, R6A and V8), juvenile Chinook salmon being captured at 2 sites (B1 and V8), and one round whitefish captured at site V8.

Arctic grayling and slimy sculpin were collected from each site and submitted for metals testing. Metals concentrations in Arctic grayling were found to be lower in 2007 than in any previous sampling. In slimy sculpin, trends vary depending on the metal. In 2007, manganese concentrations in slimy sculpin flesh rose significantly from previous years at sites R2 and R4.

7. Physical Stability Monitoring

7.1 Faro Mine Site

The geotechnical monitoring program required under Part G, Item 66 of the Water Licence was performed in 2007 by BGC Engineering Inc. (BGC). The full report prepared by BGC accompanies this report under separate cover.

The geotechnical instrumentation installed in and around the Rose Creek Diversion Canal, the Intermediate Dam, the Cross Valley Dam and the Freshwater Dam was monitored by site personnel. The raw data and an interpretation of the data are included in the BGC report (Part G, Items 66 and 67 of the Water Licence).

BGC staff undertook two inspections (June and September) of various facilities. The inspections looked at the geotechnical performance and stability of the following structures:

- Cross Valley Dam and emergency spillway;
- Intermediate Dam and emergency spillway;
- Rose Creek Diversion Channel; dike crest, top of backslope and toe of slope;
- North Valley Wall Interceptor Ditch;
- North Fork Rose Creek flow-through rock drain;
- Selected portions of the Faro rock dumps;
- Secondary tailings impoundment; and
- Faro Creek Diversion Channel above the Faro Pit.

In May 2007 a “seepage event” occurred within the north-south leg of the Faro Creek Diversion Channel. Two additional site visits were performed to address the concerns related to the seepage. The first site visit occurred immediately following discovery of the seepage and the second was in early September when remedial construction was performed. Full details of this event and associated remedial action is provided in Section 8.6. During these two additional site visits some of the other structures were visited by BGC staff.

The annual inspection does not include the Fresh Water Supply Dam as it has in the past. The dam was breached in 2003 and inspection of the breach and channel works constructed during the breach is reported by BGC under a separate water licence.

BGC presented their observations, conclusions and recommendations resulting from the field inspection and interpretation of instrumentation data in their report. Although the physical structures that were inspected appeared to be functioning acceptably well, some maintenance work was recommended.

7.2 Vangorda Plateau Mine Site

The annual geotechnical/physical monitoring program that is required under Part G, Item 66 of the Water Licence was performed, in 2007, by Steffen, Robertson and Kirsten (Canada) Inc. ("SRK") who have conducted all of these inspections in the past. The full report prepared by SRK accompanies this report under separate cover.

The geotechnical instrumentation installed in and around the Vangorda rock dump and Little Creek Dam was monitored by site personnel. The raw data and an interpretation of the data are included in the SRK report (Part G, Item 66 of the Water Licence).

SRK undertook two inspections (June and September) of various facilities. The inspection looked at the geotechnical performance and stability of the following structures:

- Vangorda rock dump and seepage collection system;
- Little Creek Dam;
- Vangorda Creek diversion;
- Sludge Pond Embankments at the Water Treatment Plant Clarification Pond;
- WTP Freshwater Supply Pond;
- Grum Settling Pond;
- Grum Interceptor Ditch;
- Sheep Pad Ponds; and
- Lower slopes of the Grum rock dump.

SRK presented their observations, conclusions and recommendations resulting from the field inspection and interpretation of instrumentation data in their report. Although the physical structures that were inspected appeared to be functioning acceptably well, some maintenance work was recommended.

8. Maintenance Activities

8.1 General

Some maintenance tasks are routine activities that are performed by on-site personnel on a routine basis. These may include:

- Mechanical maintenance of light and heavy equipment;
- Steaming of road culverts;
- Minor repairs and cleaning of debris and ice from ditches;
- Road grading and general road maintenance to maintain safe access;
- Repairs and maintenance of electrical instrumentation;
- Replacement and maintenance of flow monitoring weirs;
- Maintenance of Anvil Range-owned houses in Faro;
- Management provisions for a safe workplace; and
- Other routine activities.

These routine activities are not described further in this report. However, a number of more substantive maintenance tasks were undertaken in 2007 that are described below. All of these tasks were completed in consultation with the Water Inspector and with input, as appropriate, from the Interim Receiver, the Faro Project Management Team and technical consultants. These tasks were completed using mine-owned equipment and employee operators or First Nations contractors, wherever possible.

8.2 Site Operating Manuals

Updates to a number of the site operating manuals which were initiated in 2006, were completed in 2007. These included:

- Emergency Response Manual;
- Employee Health and Safety Manual;
- Environmental Lab Sampling and Assay Procedures;
- Water Treatment Operation Manuals; and
- Communications Systems Maintenance Procedures.

Specifically related to the Employee Health and Safety Manual two key modifications were made. The employee blood lead testing process was updated to ensure compliance with all regulatory requirements. The included changes in the units for reporting blood lead levels from micromole/litre (µmole/L) to microgram/100 mL (µgram/100 mL) to be consistent with the limits

stipulated in the Yukon Occupational Health and Safety Act. All employees were found to be within the acceptable limits as a result of the correction in reporting units.

In addition, with respect to confined space entry, modifications were made to the manual to take into consideration the findings of the investigation into the Sullivan Mine accident.

8.3 Rip Rap Rock

Tim Moon contracting of Ross River screened an estimated 13,000 m^3 of rip rap for general (future) use on the property. The rip rap was obtained from the rock quarry on the west side of the Grum rock dump. This task represented an efficient way of providing good quality rip rap rock to serve the needs of the site for some time into the future.

8.4 Waste Oil

A waste oil burning permit was issued in 2005 that allows for the burning of waste oil generated on-site in the approved incinerator. A waste oil separator was installed on-site. Waste oil was subsequently tested according to the terms of the permit and burned for heating in the maintenance building that is utilized in the winter season. An estimated 300 L/day was being consumed.

In 2006, two new enviro-tanks were installed and all used oil was transferred from the old tanks to the new. The old tanks were disassembled. New piping was installed directly from the new tanks to the burner. Improvements were made to the incinerator in 2006 to improve fire-protection and reduce filter clogging.

In 2007, filtering of waste oil continued on a regular basis for utilization in the waste oil heaters on site. Approximately 10,000 L of waste oil was used in 2007. Residual filter sludge and glycol are stored on site pending their final disposal. Application for the renewal of the Special Waste Permit was submitted to the Department of Environment prior to the deadline of Dec. 31, 2007.

8.5 Emergency Tailings Area

In 2006, work was initiated to provide for better control of the highly contaminated water that passes through the emergency tailings area. This water includes seepage from the toe of the Faro rock piles at location X23. The intent is to reduce seepage losses of contaminated water to the Rose Creek valley aquifer by piping this water directly to the Intermediate Pond and providing the means to pump this water directly to the Mill water treatment system, if desired.

Investigations and designs were completed through the summer of 2006 and construction took place from the fall 2006 through early winter of 2007. The system was put into operation on May 22, 2007.

8.6 Faro Creek Diversion Channel

On May 16, 2007, a seepage event initiated at the toe of the upper section of the Faro Creek Diversion with significant seepage discharge being observed occurring from the toe of the diversion roadway embankment. Mine staff undertook a number of measures to mitigate the seepage including:

- Removal of an ice blockage from the channel which reduced the water level and subsequently reduced the toe seepage volume;
- Conducted some salt/conductivity tracer tests to locate the seepage inlet point which indicated that the seepage occurred adjacent to upper end of the GCL liner; and
- Placed and compacted some fine-grained soil into the channel bottom at the seepage intel location.

BGC Engineering Inc. (BGC) was notified and travelled to site to assist in the assessment and development of remediation measures. A diversion berm and diversion pipe was placed in the channel bottom to divert flow around the seepage location. In addition a plug was installed at the bottom of the channel at the seepage inlet location. This was found to be ineffective at reducing seepage flow. Decision was then made to construct a channel by-pass to reduce the hydraulic head in the channel. The seepage inlet was then plugged again. This resulted in a significant reduction of the amount of seepage flow. Full details of the seepage event and remediation efforts can be found in Appendix 10A.

On June 13, BGC returned to site to further investigate the seepage location. Two test pits were excavated to determine the cause of the seepage event and support the design of a repair option. In addition, geotextile and armour rock was placed on the upstream slope. Details of this site visit and channel rehabilitation needs is presented in Appendix 10B.

In June there were several events at the Faro Creek Diversion Channel. On June 12, a small section of a high side slope had sloughed into the diversion channel and attempts to reslope the back were unsuccessful due to the wet ground conditions. On June 15 a slough on the ditch side of the road was identified. The area was staked, taped off, and monitored daily until ground conditions were dry enough to facilitate repairing.

In September, BGC returned to site to oversee the repair work to the Faro Creek Diversion Channel. The repair work consisted of:

- Excavation of dike fill in the vicinity of the previously identified void;
- Replacement of the dike fill with compacted granular fill;
- Replacement of any weak/soft substrate within the channel section;
- Placement of a bituminous geomembrane liner (BGL) within the channel section; and
- Placement of appropriate channel rip rap over the liner.

A complete summary of this remediation is presented in Appendix 10C.

8.7 Faro Site Miscellaneous Tasks

Various other maintenance tasks were completed at the Faro site as follows:

- Tunnel between mine dry and mill was found to be flooded and potentially oxygen depleted. Access to the area was sealed and confined space signs were posted.
- Repairs were made to one area of the containment berm for the sediment disposal cell on the Original Tailings Impoundment where slumping had occurred.
- 300 m^3 of rip rap was used to repair the Cross Valley Dam Spillway as per BGC's recommendations.
- 153 loads of rip rap placed at the water level of the Intermediate Dam.
- Toe drain on the Intermediate Dam was exposed and entire area run over with a packer.
- Small shrubs on the upstream edge of the Intermediate Dam and the upstream and downstream edge of the Cross Valley Dam were removed.
- 4 loads of rip rap was place on the erosion scrap o the face of Rose Creek Dam.
- Trees were grubbed out of the finger drains of Rose Creek Dam.
- Two diesel tanks from the main Faro refuelling area were removed, cut into pieces and hauled to the Salvage Tank Storage Area.
- Diesel tank for the Emergency Generator System was removed and hauled to Salvage Tank Storage Area.
- Sulphide material from Stockpile #2 on Faro Upper NW Dump was relocated to Low Grad Stockpile C and three leach pads were constructed.
- Removal of steel and garbage from top of Faro Dump area.
- Ice clearing was required at the Faro Creek diversion channel in January and February and a ditch was excavated in the centre of the channel to maintain flow through the diversion.
- The landfill was operated according to the Operating Plan and was inspected by Yukon Government with no concerns raised.
- Additional survey prisms were professionally installed and monitored in the Faro Main pit as an enhanced means of monitoring the rate of regression. The work is conducted and monitoring results reviewed under the guidance of Golder Associates.

8.8 Vangorda Creek Diversion Flume

Although, the Vangorda Creek Diversion Flume performed well during the winter months, there was significant ice extraction from November 2006 to January 2008. Miscellaneous maintenance was performed on the flume including repairs to cross-braces and holes in the structure.

8.9 Vangorda Site Miscellaneous Tasks

Various other maintenance tasks were completed at the Vangorda Plateau site as follows:

- Pumping from Sheep Pad Ponds in April to make room for the start of freshet and provide sufficient settling time.
- Redirection of water from location V15 to V2A via pumping throughout 2007 for the preservation of downstream water quality due to elevated zinc concentrations observed at location V15. The Government of Yukon Water Resources Branch was notified of the action plan for water redirection prior to initiation (refer to Section 9.8).
- Slough in wall of Vangorda WTP Clarification Pond was repaired.
- Vangorda Waste Dump erosion gullies were re-graded.
- Approximately 300 m^3 of rip rap was placed in the Grum Interceptor Ditch to re-armour sections of the ditch.
- Sections of Little Creek Dam were re-armoured with 50 m^3 or rip rap.
- Ongoing biological treatment of the water in Grum Pit.

8.10 Other Activities

Several other site maintenance activities were undertaken in 2007 that are not requirements of the Water Licence but are of general interest. These included:

- Sale and removal from site of various mill equipment and machinery;
- A scrap steel program (funded by DIAND and managed by the Interim Receiver) that continued the cutting of heavy steel for off-site recycle; and
- Major technical studies and field programs (managed by the Interim Receiver on behalf of the Faro Project Management Team (FPMT)) related to development of the FCRP, including extensive drill programs.

9. Studies and Plans

9.1 Overview

There are a number of studies and plans that are required under Parts A and F of the Water Licence. The concepts for these studies and plans were generally initiated through the Environmental Assessment and regulatory review process that led to their inclusion into the Water Licence. The studies and plans have various timelines, including some had been completed by 2007, as summarized in Table 9-1. A brief description of the status of each of the studies and plans that are listed in the Water Licence is provided in Table 9-1 with additional discussion following.

Table 9-1. Summary of Studies and Plans

Study or Plan	Submittal Date	Status
A.16, Contingency Plans.	30 days after effective date of Water Licence.	Complete.
F.49, Terrestrial Effects Study.	December 31, 2005.	Complete.
F.50, Town of Faro Water Supply Study.	2005 Annual Report (by February 28, 2006).	Complete.
F.51, Water Treatment Sludge Management Study.	June 30, 2004.	Complete.
F.52, Grum Pit Water Management Plan.	June 30, 2004.	Complete.
F.53, Aquatic Life Sampling and Testing Program.	April 30, 2004.	Complete. Annual Report Appended.
F.54, Adaptive Management Plan.	June 30, 2004.	Complete. Annual Report Appended.
F.55, Comprehensive Risk Assessment	Updated annually in the annual report.	Annual Update Below.
F.56, Rose Creek Tailings Facility Water Management Plan	March 31, 2005.	Complete.
F.57, Plan for the Management of Oxide Fines	July 30, 2004 or 90 days prior to work	Report Submitted. Follow-up Report to be Provided.
F.58, Final Closure and Reclamation Plan	February 2009.	Underway by FPMT.

9.2 Contingency Plans

Part A, Item 16 of the Water Licence requires that Contingency Plans be submitted to the Board by 30 days after the effective date of the Water Licence. The Contingency Plans are to address fuel spills, pipeline breaks, loss of electrical power, pump failure, loss of road access to the site, and loss of communications to the site. The plans are also to include a communication plan that "addresses how communities and downstream water users will be notified of accidents,

malfunctions and spills at the site". The plans were completed and were submitted to the Board on time.

The plans are to be kept current and revisions are to be submitted to the Water Board within 10 days of revision. The plan was reviewed in 2007 and no revisions to the initial submission were necessary.

9.3 Terrestrial Effects Study

Part F, Item 49 of the Water Licence describes a Terrestrial Effects Study that is to be completed and submitted to the Board by December 31, 2005. The study was completed according to the description provided to the Board in the Water Licence Renewal Application. A project report containing substantive information that had undergone technical review and discussion with the First Nations was submitted to the Board on time.

Because of the complex scheduling of various aspects of the project, not all technical results were available at December 31, 2005. Written updates on the project were provided to the Board in December 2005 and June 2006. A final submission was provided on September 29, 2006. That submission consisted of 2 reports and concluded that "Given the results of the HHERA (Human Health Risk Assessment), there is no need for short-term mitigation to ensure animals and people are adequately protected from risks while the Final Closure and Reclamation Plan is being developed". A copy of the cover letter from the September 2006 submission was provided in the 2006 Annual Environmental Report.

9.4 Town of Faro Water Supply Study

Part F, Item 50 of the Water Licence describes a study to "determine the relationship between water flowing in Vangorda Creek and water obtained from the Town of Faro water supply wells and to assess the potential for contamination from Vangorda creek to enter the wells". The results of the study were submitted to the Board as part of the annual report for the year 2005, as required.

The study recommended that follow-up monitoring be conducted 2006 and a report on that monitoring program was provided to the Yukon Water Board as part of the Annual Environmental Report for 2006. The 2006 report recommended investigation of the source of elevated nitrate and chloride concentrations detected in water quality samples from Lower Vangorda Creek. A sampling and analytical program was conducted in 2007 to address this recommendation as well as assess the need for future studies and monitoring efforts. The focused monitoring program was carried out at four locations along Vangorda Creek during the months of June and October.

The following findings and conclusions are presented in the 2007 report, taking into consideration the previous studies reported in the 2006 report.

- Water is being recharged to the Town of Faro water supply aquifer by Vangorda Creek. Year-round the wells receive varying portions of their water from Vangorda Creek and the Pelly River.
- Surface water quality in Vangorda Creek is generally very good when compared to Drinking Water Quality Guidelines.
- Elevated chloride levels detected in lower Vangorda Creek, relative to Pelly River, are not related to mining-related sources. Chloride concentrations detected in lower Vangorda Creek are well below Canadian Drinking Water Quality guidelines.
- Elevated levels of nitrate concentrations in Vangorda Creek, relative to Pelly River, may be related to mining-related activities and land uses. Nitrate concentrations observed downstream of the mine site pose minimal risks to the Town of Faro water supply.
- The Town of Faro water supply is of very good quality, including low metal concentrations, as compared to Canadian Drinking Water Quality Guidelines.
- The potential influence of Vangorda Creek on the Town of Faro water supply has been adequately investigated, as a condition of Anvil Range water licence QZ03-059.

The report on the 2007 Town of Faro Water Wells Investigation is provided as Appendix 11.

9.5 Water Treatment Sludge Management Study

Part F, Item 51 of the Water Licence requires that a water treatment sludge management plan be submitted to the Board by June 30, 2004. This plan was completed and was submitted to the Board on time.

There are no further requirements for submissions under this plan.

9.6 Grum Pit Water Management Plan

Part F, Item 52 of the Water Licence requires that a water management plan for the Grum pit be submitted to the Board by June 30, 2004. This plan was completed and was submitted to the Board on time.

There are no further requirements for submissions under this plan.

9.7 Aquatic Life Sampling and Testing Program

Part F, Item 53 of the Water Licence requires that a plan for an aquatic life sampling and testing program be submitted to the Board by April 30, 2004. This plan was completed and was submitted to the Board on time.

There are no further requirements for submissions under this plan. The sampling and testing work that is described in the plan was carried out in 2007 and is reported herein, in Section 6.3.and Appendix 9.

9.8 Adaptive Management Plan

Part F, Item 54 of the Water Licence requires that an adaptive management plan for the facilities authorized by the Water Licence be submitted to the Board by June 30, 2004. This plan was completed and was submitted to the Board on time.

The Plan provides for the submission of an annual review of the program each year. The annual review for 2007, as prepared by Gartner Lee Limited, is provided in Appendix 12. The Summary of that report is repeated below for ease of reference.

Excerpted Summary from Appendix 12:

The Water Licence for the Anvil Range Mine (QZ03-059) provides primarily for the continuation of environmental care and maintenance activities to the end of 2008, when a Final Closure and Reclamation Plan is scheduled to be in place. In addition to water and facilities that will receive active management, there are other waters and facilities on the mine site that are recognized as representing potential environmental risks but which do not require immediate intervention. Long term management of these waters and facilities will be addressed in the Final Closure and Reclamation Plan. However, a short term management strategy is required to monitor for potential degradation of conditions to the point where active intervention might be necessary prior to the end of February 2009 and to provide a framework for ensuring that appropriate management actions are implemented.

Such a strategy is provided for in the Water Licence through the Adaptive Management Plan ("AMP"). A conceptual AMP was developed and reviewed by parties to the Environmental Assessment and Water Licencing processes through 2002 and 2003. The Water Licence then required that a detailed AMP Implementation Protocol be developed that follows from the conceptual plan. The AMP Implementation Protocol was filed with the Water Board in June 2004. The Implementation Protocol also requires that an annual review of the AMP program be undertaken. The annual review provides a mechanism whereby any necessary or beneficial modifications to the AMP program can be identified and proposed to the Water Board on a regular basis.

Eight AMP "events" were developed through the Environmental Assessment and Water Licence Renewal processes. These events represent possible future environmental conditions that would require a management response, if they were to occur.

The eight events are as follows with a summary for 2007 activities:

1. Degraded Groundwater Quality in Rose Creek Valley Aquifer;
   Two new triggers activated in 2007 at the 2003 Multi-level Wells: sulphate at P03-09-6, P03-09-07, P03-04-2 and P03-04-3.
2. Degraded Water Quality in Vangorda Creek Downstream of the Mine Facilities;
   No triggers activated in 2007.
3. Degraded Water Quality in Rose Creek Downstream of the Mine Facilities;
   One trigger activated in 2007 for sulphate. Data analysis demonstrated that this was due to the elevated sulphate concentrations during winter low flow period, consistent with historical trends, particularly during periods of discharge of compliant effluent during low flow conditions.
4. Degraded Seepage Quality from the Grum Rock Dump;
   No new triggers at V2 in 2007. A consistent rise in dissolved zinc concentration observed at V15 in 2007. The transfer of water from station V15 to station V2A was implemented in 2007, via Grum Creek diversion as a proactive intervention.
5. Degraded Water Quality in the North Fork of Rose Creek;
   One new trigger at X2 for zinc in 2007. Specifically, three consecutive zinc concentrations above the threshold value. A comprehensive analysis of these triggers is presently underway, incorporating new information that has been generated as part of the ongoing development of the Final Closure and Reclamation Plan by the Faro Project Management Team.
6. Water level in Grum Pit Reaches Maximum Desired Elevation;
   No triggers activated in 2007.
7. Disruption of Fannin Sheep Migration Through the Mine Site; and
   No triggers activated in 2007.
8. Wind Dispersed Tailings Result in Adverse Effects in the Terrestrial Environment.
   No triggers activated in 2007.

Other than the specific recommendations listed above, the AMP program functioned in 2007 as intended and no other changes should be made.

9.9 Comprehensive Risk Assessment

Part F, Item 55 of the Water Licence requires that the Comprehensive Risk Assessment that was submitted as part of the Water Licence Application be updated annually and submitted to the Board as part of the annual report (i.e., by February 28 of the following year).

The following update to the Comprehensive Risk Assessment has been prepared by the Interim Receiver.

The Interim Receiver's planning and financial year runs from April 1 to March 31 and is aligned with the fiscal year of the Federal Government. As a result, this update to the Comprehensive Risk Assessment (CRA) refers to the fiscal year timeframe as work in this area is aligned with this reporting period.

In 2001, funding was approved by DIAND to initiate the development of a CRA for the entire Anvil Range mine complex with the objective of providing a framework for prioritizing and managing environmental issues over the next five years. The basis of the need for this assessment was that historically, the annual planning process for care and maintenance activities focused on short-term compliance and management issues. It was recognized however, by the Interim Receiver, that a proactive, risk-based perspective was essential in managing environmental issues on this property. This would involve the ability to identify and address issues that may not present an immediate concern with respect to non-compliance but that have the potential to develop into serious problems if left unaddressed.

The risk assessment process continues to form part of the Interim Receiver's management approach. It has proven particularly helpful in identifying priorities related to care and maintenance activities, and investigations required to address information gaps. It has also been useful as a tool to communicate those priorities to mine site management and DIAND.

In 2001, the first CRA was completed. The process utilized well-defined risk assessment methodology and involved the prioritization of the site elements that posed a risk to human health and the environment. At that time, a total of 106 key elements, grouped in categories (i.e., dams, diversions, ponds, dumps, tailings, water, infrastructure, buildings and yards) were identified and ranked according to their risk profile. Participation in the process included outside engineering consultants who were familiar with the site through many years of site assessment and inspection activities. There was also significant input from DIAND Water Resources (Whitehorse personnel) and Anvil Range Mine management, as well as Deloitte & Touche personnel with expertise in this area. The process involved extensive efforts to define and understand the risks at the mine with considerable input and discussion amongst the participants.

The CRA process is dynamic, and requires regular updating and evaluation to ensure that it is relevant, and addresses issues in order of highest priority. CRA updates are conducted annually and involve a review of each risk element to reassess controls, and the studies and activities that were conducted over the previous year. The review process can result in changes to the risk classifications assigned to the risk elements. The results of the annual review process are integrated into the prioritization and planning process for each fiscal year.

As such, the 2001 CRA was reviewed and updated to reflect the 2002-2003, 2003-2004, 2004-2005, 2005-2006, Care and Maintenance Activities as well as the results of numerous special projects completed during the timeframe. A major part of the 2004-2005 review was to re-align the existing rankings with the new Indian and Northern Affairs Canada (INAC) – Northern Affairs Contaminated Site Program Risk Matrix. Re-alignment required an adjustment in terminology and risk categories, however, the overall methodology for annual assessment remained the same.

The process was also conducted for the 2006-2007 operating field season. As a result a number of additional studies were completed, the following being of particular importance.

- Investigation of the Grum transfer pad soils makeup and evaluation of impact on the aquifer.
- Carrying out a proactive intervention relating to the Grum waste rock contaminated seeps to reduce the risk of contamination occurring at the Vangorda Creek (Relates to number 4 on the AMP program listing).
- Continued ARD monitoring and laboratory studies including spring and fall seeps surveys which have been ongoing since the 2002-03 operating year.
- Continued dump water wells investigations including monitoring installed instrumentation. This program has been ongoing since 2003-2004.
- Overall site water balance investigation. This work includes an update of the preliminary model that was prepared in 2002-2003.
- Monitoring tailings and Vangorda Waste Dump cover trials.
- Continuation of the bioremediation field program relating to the Grum Pit.
- Continuation of seepage investigations with particular emphasis relating to the ETA Seeps contaminant loading. It was determined that the loading can be significantly reduced through a collection and piping system of the ETA contaminated seeps to the Intermediate Pond for treatment in the Faro Mill Water Treatment operation. Construction of the system was carried out during the fall and winter of 2006.
- Ongoing program to re-evaluation the rate of regression of the Faro Pit wall on an annual basis to reassess the life expectancy of the Faro Creek Diversion located near the pit wall.
- Continuation of the tailing ground water studies including monitoring of wells that have been installed since the 2002-2003 operating year.
- Completion of the Cross Valley Dam seismic stability investigations to determine if the current structure is of minimal risk until the final closure plan has been determined over the next several years.
- Continued monitoring relating to the Town of Faro drinking water investigation that was carried out over the past 2 year period.
- Continuation of the scrap steel recovery program to remove significant quantities of scrap steel from the property and transport offsite for recycling.

In September 2007, the CRA was updated to reflect the 2006-07 care and maintenance activities as well as the information gained through the numerous studies undertaken. As a result of the above, the risk classification of a number of elements was impacted. Specifically, as illustrated in the Table 9-2 as well as in the attached Summary Risk Assessment Classification Matrix (Figure 9-1), when compared against the 2001 Risk Assessment results, significant changes, in terms of number of elements, were observed in the “High”, “Moderately High”, and “Moderate” risk categories, which experienced a 28%, 32% and 23% decrease in the number of elements, respectively. This shift impacted the “Low” risk category, which is the combined “Low” and “Lowest Risk” categories from the original CRA framework, as evidenced by an increase of 72% in the number of elements in these categories.

The Emergency Tailings Area was the only risk element ranked as a “Very High” risk after the 2005-2006 CRA process. With the installation of an engineered capture system in fall/winter 2006, the likelihood and cost consequence for this element were reduced, resulting in a reduction to a “High” risk rating. Retired elements include the North Fork Rose Creek Diversion, Fresh Water

Reservoir, Copper Sulphate Plant Pond, South Fork Rose Creek, FWSD Access Road, Copper Sulphate Plant, Bulk Explosives Plant, and Grum Miscellaneous Buildings & Yards.

Table 9-2. Summary of Changes in Risk Classification

Number of elements in category	2001 Risk Assessment	2002-03 Update	2003-04 Update	INAC Risk Matrix	2004-05 Update	2005-06 Update	2006-07 Update	% Change from 2001
Highest Risk	1	1	0	**Very High**	3	1	0	100% Decrease
High	29	16	15	**High**	18	21	21	27.6% Decrease
Moderately High	25	28	26	**Moderately High**	19	18	17	32.0% Decrease
Moderate	26	26	21	**Moderate**	18	18	20	23.1% Decrease
Low	25	34	38	**Low**	43	43	43	72.0% Increase
Lowest Risk	0	1	2					
Element no longer exists or poses no risk	N/A	N/A	5	**Elements Retired Since 2001, and No Longer Pose a Risk**	7	8	8	
TOTAL	**106**	**106**	**107**		**108**	**109**	**109**	

Figure 9-1. Summary Risk Assessment Classification Matrix July 2006 Update (reflecting the 2005-2006 care and Maintenance activities and investigations)

Likelihood of the Event	Consequence Severity: Low	Minor	Moderate	Major	Critical
Almost Certain	IV.1; IV.6;	IV.7; IV.12; VI.3; VII.22;	IV.4; VI.8;		
Likely	IV.5;	III.4; III.13; IV.9; IV.11; VII.10; VII.23;	IV.3; IV.8; VII.21; VIII.11; VIII.16;	II.1;	
Possible	VII.13;	V.4; V.9; VII.24; VIII.4; VIII.15;	II.7; II.8; III.5;	I.3; III.1; III.9; III.10; V.5; V.7; VI.7; VIII.2; VIII.3; VIII.7; VIII.18;	I.2; V.1; V.2; V.3; VI.1; VI.2; VI.6;
Unlikely	I.10; II.4; II.5; II.9; II.10; III.7; III.14; V.6; VII.3; VII.6; VII.7; VII.8; VII.14; VII.15; VIII.5;	I.1; I.6; I.8; I.11; III.8; III.12; III.15; V.8; VII.1; VII.2; VII.4; VII.16; VII.18; VIII.6; VIII.8; VIII.17;	I.4; I.7; II.2; III.2; VII.5; VII.19;	IV.2; VI.5; VII.25; VIII.1;	I.12;
Very Unlikely	I.9; II.6; VII.9; VII.20;	I.5; III.11; VII.17; VIII.13;	IV.10; VII.12; VIII.12;		
		II.3; III.3; III.6; VI.4; VII.11; VIII.9; VIII.10; VIII.14;			

Note: Likelihood and consequence categories reflect the realignment to INAC risk

Risk Ranking Legend:		Changes in 2005/06 Review (Completed July 06)
Very High	Black	Risk ranking did not change
High	Blue	Risk ranking changed due to 2005/06 care and maintenance activities
Moderately High	Green	Risk ranking changed due to the overall consequence cost
Moderate	Purple	Risk ranking changed due to the review of legal consequences
Low	Brown	Risk ranking changed due to the review of likelihood ratings
Element Retired	Turquoise	Risk ranking changed due to the addition/modification of an event

9.10 Rose Creek Tailings Facility Water Management Plan

Part F, Item 56 of the Water Licence describes a water management plan for the Rose Creek Tailings Facility that is to be completed and submitted to the Board by March 31, 2005. This plan was completed and was submitted to the Board on time.

There are no further requirements for submissions under this plan.

9.11 Plan for the Management of Oxide Fines

Part F, Item 57 of the Water Licence requires that a long term plan for the management of oxide fines be submitted to the Board by July 30, 2004 or no later than 90 days prior to the proposed implementation date, whichever comes first. This plan was completed and was submitted to the Board on time.

The Plan provides for the submission of a design report to the Water Board at least 90 days prior to the commencement of work.

9.12 Final Closure and Reclamation Plan

Water Use Licence QZ03-059 was issued to Deloitte & Touche Inc. in its appointed capacity as Interim Receiver of Anvil Range Mining Corporation in March 2004. Clause 58 of the licence required the Licencee to submit a final closure and reclamation plan by December 31, 2006.

The Interim Receiver submitted an application to amend Clause 58 of the licence, to extend the date for filing of the final closure and reclamation plan from December 31, 2006 to February 28, 2009.

Amendment #1 to Water Use Licence QZ03-059 was released in December 2006 and Clause 58 was amended as proposed by the Licencee. A final closure and reclamation plan is to be submitted to the Board by February 28, 2009. An additional condition was added to Clause 58, which is as follows:

> "Beginning June 30, 2007, and every three months thereafter, the Licencee shall submit to the Board a report regarding the status of key activities related to the development of the final closure and reclamation plan. The report will address those activities that are identified in the document entitled 'Targets for Development of Faro Mine Closure and Remediation Plan' which is included in water use register QZ06-075 as part of exhibit 1.2.5."

In the Interim Receiver's application to amend Clause 58, they included a letter signed by representatives from the Governments of Canada and the Yukon, and attached to their letter was the above referenced chart which sets out the remaining activities and associated timelines which the Governments plan to meet so that a final closure and reclamation plan can be submitted by February 28, 2009.

The Interim Receiver has submitted to the Board on a quarterly basis a letter updating the Board on the status of the closure planning process. Each quarter they have received from Mr. Stephen Mead, the Senior Project Manager of the Faro Project Management Team, a letter and attached thereto an updated activities schedule. As noted in Mr. Mead's December 31, 2007 letter, the project continues to be on track as per the original timelines. The Interim Receiver will continue to file with the Board quarterly update reports.

9.13 Community Liaison Committee

The Community Liaison Committee is a voluntary continuation of the Technical Advisory Committee (TAC) that was a requirement of a previous water licence. The Interim Receiver arranges for an annual summer meeting and site tour in Faro and distributes other information of interest throughout the year.

The distribution list for the committee includes:

- The Department of Fisheries and Oceans;
- The Department of Indian Affairs and Northern Development;
- Environment Canada;
- Faro Mine Closure Planning Office;
- Selkirk First Nation;
- Selkirk Renewable Resources Council;
- Ross River Dena Council;

- Town of Faro;
- Type II Mines Office;
- Yukon Government;
- Yukon Conservation Society; and
- Yukon Salmon Committee.

The fourth annual meeting of the Community Liaison Committee was held in Faro on July 4, 2007. The Interim Receiver provided a presentation on the care and maintenance activities and the Faro Mine Closure Planning Office provided an update on its activities. A tour of the mine site was provided by the Interim Receiver.

Appendix 1

Schedule A of Water Licence QZ03-059

SCHEDULE A, PART I
MONITORING STATIONS

Faro Mine Site:

Station	Location
X2	North Fork of Rose Creek at access road
X3	Pumphouse pond
X4	Intermediate pond at spillway
X5	Cross Valley pond surface outflow
X5P	Cross Valley pond at spillway
X11	Cross Valley Dam North Seep
X12	Cross Valley Dam South Seep
Weir 3	Cross Valley Dam Central Seep
X13	Cross Valley Dam Combined Seepage
X14	Rose Creek after mixing downstream of the diversion canal confluence
X22b	Faro Main Pit at Pumping Barge
X23	Old Faro Creek channel near the toe of the main (southwest) rock dumps.
X26	Faro Zone II Pit Pumped Discharge
R1	South Fork Rose Creek upstream of pumphouse pond
R2	Rose Creek downstream of mixing zone
R3	Rose Creek mid length
R4	Rose Creek just above Anvil Creek
R5	Anvil Creek just below the confluence of Rose Creek
R6	Anvil Creek immediately upstream of Rose Creek
Faro Cr	Outlet of Faro Creek Diversion
R7	North Fork of Rose Creek upstream of the confluence with the Faro Creek Diversion
R8	North Fork of Rose Creek, 100 m downstream of confluence with Faro Creek Diversion
R9	North Fork of Rose Creek, adjacent to Zone 2 Rock Dumps
R10	North Fork of Rose Creek, downstream of Zone 2 Rock Dumps and 100 metres downstream of R9
X16	Downstream of Rose Creek Tailings Facility
X17	Downstream of Rose Creek Tailings Facility
X18	Downstream of Rose Creek Tailings Facility
X21-96	Rose Creek Tailings Facility
X24-96	Rose Creek Tailings Facility
X25-96	Rose Creek Tailings Facility
P01-01 to 11	Rose Creek Tailings Facility
TH86-26	Upstream of Rose Creek Tailings Facility
BH1	Zone 2 Rock Dumps
BH2	Zone 2 Rock Dumps
BH4	Zone 2 Rock Dumps
BH12	Northeast Rock Dumps
BH13	Northeast Rock Dumps
BH14	Northeast Rock Dumps
P96-6	Main/Intermediate Rock Dumps
P96-7	Main/Intermediate Rock Dumps

Faro Mine Site (continued):

Station	Location
P96-8	Main/Intermediate Rock Dumps
S1	Main/Intermediate Rock Dumps
S2	Main/Intermediate Rock Dumps
S3	Main/Intermediate Rock Dumps
FDU	Faro Creek Diversion, upstream end
FDL	Faro Creek Diversion
FCO	Old Faro Creek, upstream of Faro Valley Dump
A30	Flow to Main Pit from Faro Valley Dump
A25	Main Pit, northwest wall
SP5/6	Internal Surface Flow on Faro Rock Dump
NE1	North Seep to North Fork from Northeast Dumps
NE1	Central Seep to North Fork from Northeast Dumps
NE1	South Seep to North Fork from Northeast Dumps
NF1	Upstream side of rock drain
NF2	Downstream side of rock drain
W5	East Dump
W8	Upper Guardhouse Creek downstream of Northwest Dump
W10	Upper Guardhouse Creek upstream of Northwest Dump
GDHSECK	Guardhouse Creek at Intermediate Pond
IDSEEP	Intermediate Dam toe seep, south side
X7	Seep downstream of emergency tailings area
K8	Tributary of Rose Creek upstream of the site of the freshwater dam
Grum Corner	Tributary of Rose Creek upstream of the site of the freshwater dam
Anvil Cr	Anvil Creek above the confluence with the Pelly River

Vangorda Mine Site:

Station	Location
V1	Vangorda Creek upstream of Vangorda Pit
V2	Grum Creek upstream of confluence with Vangorda Creek
V2A	Grum Creek upstream of confluence with Moose Pond
V4	Shrimp Creek upstream of confluence with Vangorda Creek
V5	West Fork of Vangorda Creek at gravel pit
V6A	AEX Creek
VG Main	Main Stem of Vangorda Creek
V8	Lower Vangorda Creek at the footbridge
V14	Grum Rock Dump at North toe seep
V15	Grum Rock Dump at central toe seep
V16	Grum Rock Dump at South toe seep
V17A	Creek from Grum ore transfer pad
V19	Vangorda Pit northwest diversion ditch
V20	Vangorda Pit, northeast diversion ditch
LCD	Little Creek Dam Pond at old pumphouse
V22	Vangorda Pit at pumping barge

Vangorda Mine Site (continued):

Station	Location
V23	Grum Pit at Haul Road
V24	Influent to water treatment plant
V25	Effluent from clarification pond
V25BSP	Grum Interceptor Ditch below Sheep Pad Pond
V27	Main Stem of Vangorda Creek upstream of Shrimp Creek
V29	Vangorda Dump drain #2
V30	Vangorda Dump drain #3
V31	Vangorda Dump drain #4
V32	Vangorda Dump drain #5
V33	Vangorda Dump drain #6
V37	Vangorda Rock Dump, GW94-01
V38	Vangorda Rock Dump, GW94-02
V39	Vangorda Rock Dump, GW94-03
V40	Vangorda Rock Dump, GW94-04
P96-9	Grum Rock Dump
P01-01 to 03	Vangorda Rock Dump

SCHEDULE A, PART II
MONITORING SCHEDULE LEGEND

Frequency:

C = Continuously
WD = Weekly when discharging
MD = Monthly when discharging
M = Monthly
SF = Spring and Fall
SSF = Spring, Summer and Fall
WS = Winter and Summer
Q = Quarterly

Parameters:

ICP-T = ICP Total Metals including all metals listed in the effluent quality standards specified in Part C of this licence.

ICP-D = ICP Dissolved Metals including all metals listed in the effluent quality standards specified in Part C of this licence.

Other = field pH, field temperature, field conductivity, total suspended solids, sulphate (SO_4), ammonia (as N). For groundwater samples, "Other" also includes purge volume, purge rate, purge time and sampling time.

SCHEDULE A, PART III
MONITORING SCHEDULE
(FARO MINE SITE)

	Parameter				
Station	**ICP-T**	**ICP-D**	**Other**	**Hardness**	**Flow/Level**
X2	M	M	M	M	M
X3	M	M	M	M	-
X4	M	M	M	-	M
X5	WD	WD	WD	WD	WD
X5P	M	M	M	-	M
X11	WS	WS	WS	-	W
X12	WS	WS	WS	-	W
Weir 3	WS	WS	WS	-	W
X13	M	M	M	M	W
X14	WD/M	WD/M	WD/M	WD/M	C
X22B	M	M	M	-	M
X23	M	M	M	-	M
X26	MD	MD	MD	-	M
R1	WS	WS	WS	WS	WS
R3	WS	WS	WS	WS	WS
R4	WS	WS	WS	WS	WS
R5	WS	WS	WS	WS	WS
R6	WS	WS	WS	WS	WS
Faro Cr	M	M	M	-	-
R7	M	M	M	-	C
R8	M	M	M	-	-
R9	M	M	M	-	-
R10	M	M	M	-	-
X16	-	SF	SF	-	SF
X17	-	SF	SF	-	SF
X18	-	SF	SF	-	SF
X21-96	-	SF	SF	-	SF
X24-96	-	SF	SF	-	SF
X25-96	-	SF	SF	-	SF
P01-01to 11	-	SF	SF	-	SF
TH86-26	-	SF	SF	-	SF
BH1	-	SF	SF	-	SF
BH2	-	SF	SF	-	SF
BH4	-	SF	SF	-	SF
BH12	-	SF	SF	-	SF
BH13	-	SF	SF	-	SF
BH14	-	SF	SF	-	SF

	Parameter				
Station	**ICP-T**	**ICP-D**	**Other**	**Hardness**	**Flow/Level**
P96-6	-	SF	SF	-	SF
P96-7	-	SF	SF	-	SF
P96-8	-	SF	SF	-	SF
S1	-	SF	SF	-	SF
S2	-	SF	SF	-	SF
S3	-	SF	SF	-	SF
FDU	SF	SF	SF	-	SF
FDL	SF	SF	SF	-	SF
FCO	SF	SF	SF	-	SF
A30	SF	SF	SF	-	SF
A25	SF	SF	SF	-	SF
SP5/6	SF	SF	SF	-	SF
NE1	SF	SF	SF	-	SF
NE2	SF	SF	SF	-	SF
NE3	SF	SF	SF	-	SF
NF1	SF	SF	SF	-	SF
NF2	SF	SF	SF	-	SF
W5	SF	SF	SF	-	SF
W8	SF	SF	SF	-	SF
W10	SF	SF	SF	-	SF
GDHSECK	SF	SF	SF	-	SF
IDSEEP	SF	SF	SF	-	SF
X7	SF	SF	SF	-	SF
K8	M	M	M	M	-
Grum Corner	M	M	M	M	-
Anvil Cr	WS	WS	WS	-	-

SCHEDULE A, PART IV
MONIORING SCHEDULE
(VANGORDA MINE SITE)

	Parameter				
Station	**ICP-T**	**ICP-D**	**Other**	**Hardness**	**Flow/Level**
V1	Q	Q	Q	Q	Q
V2	M	M	M	M	M
V2A	M	M	M	-	M
V4	SSF	SSF	SSF	SSF	-
V5	M	M	M	M	Q
V6A	Q	Q	Q	Q	Q
VGMain	M	M	M	M	-
V8	M	M	M	M	C
V14	SF	SF	SF	-	SF
V15	M	M	M	-	M
V16	SF	SF	SF	-	SF
V17A	SF	SF	SF	-	SF
V19	SF	SF	SF	-	SF
V20	SF	SF	SF	-	SF
LCD	SF	SF	SF	-	M
V22	Q	Q	Q	-	M
V23	Q	Q	Q	-	M
V24	WD	WD	WD	-	WD
V25	WD	WD	WD	-	WD
V25BSP	WD/M	WD/M	WD/M	WD/M	WD/M
V27	SSF	SSF	SSF	SSF	-
V29	-	SF	SF	-	SF
V30	-	SF	SF	-	SF
V31	-	SF	SF	-	SF
V32	-	SF	SF	-	SF
V33	-	SF	SF	-	SF
V37	-	SF	SF	-	SF
V38	-	SF	SF	-	SF
V39	-	SF	SF	-	SF
V40	-	SF	SF	-	SF
P96-9	-	SF	SF	-	SF
P01-01 to 03	-	SF	SF	-	SF

Appendix 2

UTM Coordinates for Surface Water Sampling Locations

Gartner Lee

Waypoint List

Map Name : 59_16_321relief.ecw
Map File : C:\OziExplorer\Index Maps\Mine site waypoints.map

Datum : NAD27 Canada

Waypoint File : C:\OziExplorer\OziExplorer\Mine site waypoints\Water Sample Sites.wpt

2/14/05 7:59:56 AM

Num	Name	Zone	Easting	Northing	Alt(m)	Description
1	A 25	8V	584126	6915446	1289	Water Sample Site - Spring & Fall
2	A 30	8V	584654	6915329	1240	Water Sample Site - Spring & Fall
3	ANVIL CRK	8V	545325	6923988	616	Water Sample Site - Winter & Summer
4	F C O	8V	585012	6915863	1290	Water Sample Site - Spring & Fall
5	F C U	8V	585485	6916579	1320	Water Sample Site - Spring & Fall
6	F D L	8V	585585	6914758	1287	Water Sample Site - Spring & Fall
7	FARO CRK	8V	586497	6914212	1119	Water Sample site - Monthly
8	FWSB 1	8V	587247	6909192	1144	Water Sample Site - Twice A Month (April - August)
9	FWSB 5	8V	585462	6911216	1087	Water Sample Site - Twice A Month (April - August)
10	GDHSECK	8V	581791	6913866	1067	Water Sample Site - Spring & Fall
11	GRUMCORNER	8V	589930	6907213	1221	Water Sample Site - Monthly
12	ID SEEP	8V	580400	6913775	1037	Water Sample Site - Spring & Fall
13	K 8	8V	586426	6910560	1119	Water Sample Site - Monthly
14	L C D	8V	593369	6902955	1106	Water Sample Site - Spring & Fall
15	NE 1	8V	586120	6914184	1152	Water Sample Site - Spring & Fall
16	NE 2	8V	585940	6913991	1146	Water Sample Site - Spring & Fall
17	NF 1	8V	584950	6913020	1100	Water Sample Site - Spring & Fall
18	NF 2	8V	584849	6912854	1094	Water Sample Site - Spring & Fall
19	R 02	8V	579350	6914862	1017	Water Sample Site - (Laberge Environmental)
20	R 03	8V	575473	6916623	979	Water Sample Site - Winter & Summer
21	R 04	8V	567948	6921614	922	Water Sample Site - Winter & Summer
22	R 05	8V	568061	6921757	923	Water Sample Site - Winter & Summer
23	R 06	8V	568016	6921619	928	Water Sample Site - Winter & Summer
24	R 07	8V	586515	6914190	1120	Water Sample Site - Monthly
25	R 08	8V	586422	6914219	1121	Water Sample Site - Monthly
26	R 09	8V	585301	6913468	1099	Water Sample Site - Monthly
27	R 10	8V	585232	6913301	1098	Water Sample Site - Monthly
28	R O1	8V	584129	6912224	1074	Water Sample Site - Winter & Summer
29	SP 5-6	8V	585121	6914057	1185	Water Sample Site - Spring & Fall
30	V 01	8V	594573	6903951	1175	Water Sample Site - Quarterly
31	V 02	8V	592893	6902976	1083	Water Sample Site - Monthly, Quarterly Bio-assay
32	V 02A	8V	593138	6903085	1106	Water Sample Site - Monthly
33	V 04	8V	591784	6901660	962	Water Sample Site - Spring, Summer & Fall
34	V 05	8V	586251	6901938	787	Water Sample Site - Monthly
35	V 06A	8V	590534	6906425	1210	Water Sample Site - Quarterly
36	V 08	8V	584904	6900415	666	Water Sample Site - Monthly
37	V 14	8V	592731	6903176	1106	Water Sample Site - Spring & Fall
38	V 15	8V	592766	6903178	1103	Water Sample Site - Monthly
39	V 16	8V	592858	6903187	1105	Water Sample Site - Spring & Fall
40	V 17A	8V	591379	6906059	1285	Water Sample Site - Spring & Fall
41	V 19	8V	594725	6903038	1175	Water Sample Site - Spring & Fall
42	V 20	8V	594919	6902425	1170	Water Sample Site - Spring & Fall
43	V 22	8V	594182	6903143	1130	Water Sample Site - Quarterly
44	V 23	8V	592334	6904879	1188	Water Sample Site - Quarterly
45	V 24	8V	593235	6905011	1308	Water Sample Site - Weekly When Discharging
46	V 25	8V	593425	6904811	1300	Water Sample Site - Weekly When Discharging
47	V 25BSP	8V	593579	6903471	1153	Water Sample Site - Daily, Weekly When Discharging, Mont

Waypoint List continued .....

Num	Name	Zone	Easting	Northing	Alt(m)	Description
48	V 27	8V	591745	6901915	953	Water Sample Site - Spring, Summer & Fall
49	V 29	8V	593582	6902323	1118	Water Sample Site - Spring & Fall
50	V 30	8V	593328	6902395	1120	Water Sample Site - Spring & Fall
51	V 31	8V	593430	6902799	1122	Water Sample Site - Spring & Fall
52	V 32	8V	593545	6902857	1116	Water Sample Site - Spring & Fall
53	V 33	8V	593633	6902903	1119	Water Sample Site - Spring & Fall
54	VG MAIN	8V	585790	6901334	726	Water Sample Site - Monthly
55	W 05	8V	585772	6914062	1165	Water Sample Site - Spring & Fall
56	W 08	8V	583366	6915344	1289	Water Sample Site - Spring & Fall
57	W 10	8V	583402	6915400	1290	Water Sample Site - Spring & Fall
58	WEIR 3	8V	580127	6914199	1014	Water Sample Site - Winter & Summer
59	X 02	8V	584193	6912601	1074	Water Sample Site - Monthly
60	X 03	8V	583418	6912325	1061	Water Sample site - Monthly
61	X 04	8V	580604	6914328	1040	Water Sample Site - Monthly
62	X 05	8V	580088	6914450	1048	Water Sample Site -Daily, Weekly When Discharging, Month
63	X 07	8V	582929	6913807	1104	Water Sample Site - Spring & Fall
64	X 10	8V	579526	6914679	1018	Water Sample Site - Monthly
65	X 11	8V	580118	6914268	1018	Water Sample Site - Winter & Summer
66	X 12	8V	580096	6914099	1017	Water Sample Site - Winter & Summer
67	X 13	8V	580087	6914260	1017	Water Sample Site - Monthly, Quarterly Bio-assay
68	X 14	8V	579460	6914896	1015	Water Sample Site - Weekly When Discharging, Monthly
69	X 22B	8V	584320	6914832	1157	Water Sample Site - Monthly
70	X 23	8V	583343	6913898	1114	Water Sample Site - Monthly
71	X 26	8V	584990	6914105	1156	Water Sample site - Monthly

Map Feature Waypoints

Appendix 3

2007 Surface Water Quality Data

-Rose Creek Drainage

Gartner Lee

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
A25	11-Jun-07		395		0.02	32.2	3	4.1	7.4
A25	01-Oct-07		369	193	< 0.01	18.6	< 1	5.2	6.5
A30	12-Jun-07		611		< 0.01	271	1	4	3.2
A30	01-Oct-07		721	252	0.03	387	17	4.3	3.2
FAROCR	19-Jun-07		48	19	< 0.01	2.82	< 1	7.4	7.6
FAROCR	17-Jul-07		41	14	< 0.01	3.26	< 1	10.7	7.5
FAROCR	14-Aug-07		47	21	0.02	2.78	< 1	10.1	7.4
FAROCR	11-Sep-07		38	16	0.01	2.8	3	6.3	7.4
FAROCR	23-Oct-07		71	33	< 0.01	5.97	< 1	0.2	7.9
FAROCR	14-Nov-07		64	29	0.01	4.25	< 1	0	8.1
FAROCR	09-Dec-07		83	32	< 0.01	5.18	< 1	0	7.5
	average		56	23	0.01	3.87	1.3	5.0	7.6
	minimum		38	14	< 0.01	2.78	<1	0	7.4
	maximum		83	33	0.02	5.97	3	10.7	8.1
	N > DL	0	7	7	3	7	1	7	7
	median		48	21	0.01	3.26	1	6.3	7.5
FCO	11-Jun-07		63		0.02	19	9	2.1	6.3
FCO	02-Oct-07		188	71	0.01	72.9	11	0.6	6.7
FDL	11-Jun-07		23		0.01	1.74	31	5.4	6.6
FDL	02-Oct-07		36	13	< 0.01	2.27	< 1	0.7	7.7
FDU	11-Jun-07		21		< 0.01	1.04	1	4.6	7.1
FDU	02-Oct-07		33	11	0.02	1.99	< 1	1	7.2
FWSD6	29-May-07	66.9	334	182	0.01	132	2	11.6	8.1
GCULV	15-Jan-07	58	114	55	0.01	6.62	< 1	0	7.8
GCULV	13-Feb-07	59.5	123	58	0.02	5.96	< 1	-0.2	7.8
GCULV	11-Mar-07	72.5	136	64	0.02	7.04	< 1	0	7.8
GCULV	18-Apr-07	67.8	137	60	< 0.01	6.3	< 1	0.1	7.4
GCULV	14-May-07	29.9	71	30	0.02	10.3	3	0.2	7.8
GCULV	18-Jun-07	17.7	41	16	< 0.01	4.04	2	7.7	7.6
GCULV	16-Jul-07	20.8	49	15	< 0.01	4.08	2	10.4	7.2
GCULV	13-Aug-07	26.8	63	25	0.03	6.05	< 1	8.6	7.3
GCULV	10-Sep-07	25.4	60	21	0.02	6.97	< 1	7.8	7.4
GCULV	22-Oct-07	24	66	27	< 0.01	8.4	< 1	0.2	7.8
GCULV	13-Nov-07	36.2	72	32	0.02	7.72	< 1	0.1	7.4
GCULV	09-Dec-07	39.7	96	37	0.02	6.94	< 1	1.2	7.5
	average	39.9	85.7	36.7	0.02	6.7	1.3	3.0	7.6
	minimum	17.7	41	15	< 0.01	4.04	< 1	-0.2	7.2
	maximum	72.5	137	64	0.03	10.3	3	10.4	7.8
	N > DL	12	12	12	8	12	3	12	12

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	median	33.05	71.5	31	0.02	6.78	1	0.2	7.55
GHSCR1	11-Jun-07		1250		< 0.01	614	< 1	2.5	7.9
GHSCR1	02-Oct-07		1080	614	< 0.01	503	< 1	1.3	8
K8	13-Feb-07	79.7	174	83	0.02	13.2	< 1	-0.2	7.9
K8	11-Mar-07	102	216	106	0.01	20.4	< 1	0	7.9
K8	18-Apr-07	83.3	177	80	0.01	13.7	< 1	0	7.8
K8	14-May-07	63.8	142	70	0.01	13.5	< 1	0	7.8
K8	18-Jun-07	26.1	58	23	< 0.01	3.76	< 1	4.6	7.9
K8	16-Jul-07	31.9	71	26	< 0.01	4.54	< 1	8	7.4
K8	13-Aug-07	52.8	115	60	0.02	9.44	< 1	5.9	7.7
K8	10-Sep-07	43.9	96	38	0.02	7.41	< 1	6.1	7.5
K8	22-Oct-07	40.9	107	42	< 0.01	10.2	< 1	0.2	7.7
K8	13-Nov-07	50.2	117	57	0.01	10.9	< 1	0.6	7.5
K8	09-Dec-07	56.7	140	58	< 0.01	11.9	< 1	1.3	7.5
	average	57.4	128.5	58.5	0.01	10.8	1	2.4	7.7
	minimum	26.1	58	23	< 0.01	3.76	< 1	-0.2	7.4
	maximum	102	216	106	0.02	20.4	< 1	8	7.9
	N > DL	11	11	11	7	11	0	11	11
	median	52.8	117	58	0.01	10.9	1	0.6	7.7
NE1	12-Jun-07		352		< 0.01	106	< 1	4.8	7.5
NE1	01-Oct-07		560	286	0.01	178	< 1	2	7.7
NE2	12-Jun-07		1620		< 0.01	652	< 1	1.8	7.7
NE2	01-Oct-07		1060	635	< 0.01	464	2	2.6	7.8
NF1	12-Jun-07		72		0.02	3.85	15	6.3	7.4
NF1	01-Oct-07		186	82	< 0.01	11.3	< 1	1.6	7.4
NF2	11-Jun-07		77		< 0.01	4.36	9	4.2	7
NF2	01-Oct-07		172	87	0.01	11.4	< 1	1	7.4
R1	17-Aug-07	84.2	173	85	0.07	15.4	< 1	8	7.5
R2	20-Feb-07	203	815	425	0.19	288	1	-0.4	7.6
R2	17-Aug-07	109	471	207	0.19	150	2	9.5	7.7
R3	20-Feb-07	180	619	327	0.08	187	< 1	-0.3	8.2
R3	17-Aug-07	109	406	189	0.08	131	< 1	13.9	7.9
R4	20-Feb-07	163	514	262	0.02	126	< 1	-0.3	8.4
R4	17-Aug-07	110	380	180	0.04	113	< 1	10.8	8
R5	17-Aug-07	137	270	135	< 0.01	25.2	< 1	8.8	8.1
R6	20-Feb-07	159	301	166	0.02	19.5	< 1	-0.2	8.3
R6	17-Aug-07	140	263	132	< 0.01	20.2	< 1	9.3	8.1
R7	14-Feb-07		264	141	0.02	9.86	< 1	-0.1	7.8
R7	12-Mar-07		260	147	0.03	10.5	< 1	0.2	8

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
R7	19-Apr-07		275	139	< 0.01	11.1	< 1	0.2	7.7
R7	15-May-07		95	47	0.02	8.22	21	0.4	7.6
R7	19-Jun-07		126	66	< 0.01	6.36	3	5.5	7.9
R7	17-Jul-07		126	53	< 0.01	5.62	3	7.9	7.7
R7	14-Aug-07		151	79	0.02	7.28	2	7.5	7.7
R7	11-Sep-07		131	57	0.02	6.9	5	6.8	7.5
R7	23-Oct-07		192	96	< 0.01	9.33	< 1	0.4	7.8
R7	14-Nov-07		213	112	0.02	9.18	< 1	0	7.6
R7	09-Dec-07		234	110	0.02	9.73	< 1	0	7.4
	average		187.9	95.2	0.02	8.6	3.6	2.6	7.7
	minimum		95	47	< 0.01	5.62	< 1	-0.1	7.4
	maximum		275	147	0.03	11.1	21	7.9	8
	N > DL	0	11	11	7	11	5	11	11
	median		192	96	0.02	9.2	1	0.4	7.7
R8	15-May-07		93	51	< 0.01	8.2	141	0.3	7.6
R8	19-Jun-07		117	56	< 0.01	5.99	3	5.8	7.9
R8	17-Jul-07		122	51	0.01	5.3	3	8.3	7.6
R8	14-Aug-07		141	73	0.02	6.88	< 1	8	7.7
R8	11-Sep-07		118	50	0.02	6.26	3	6.5	7.5
R8	23-Oct-07		182	94	< 0.01	8.99	< 1	0.2	7.7
R8	14-Nov-07		203	106	0.02	8.76	< 1	0	7.8
R8	09-Dec-07		226	103	0.01	9.41	< 1	0	7.5
	average		150.3	73.0	0.02	7.5	19.3	3.6	7.7
	minimum		93	50	< 0.01	5.3	< 1	0	7.5
	maximum		226	106	0.02	9.41	141	8.3	7.9
	N > DL	0	8	8	5	8	4	8	8
	median		131.5	64.5	0.02	7.5	2	3.1	7.7
R9	15-Jan-07		295	149	0.01	18.3	< 1	-0.1	7.6
R9	14-Feb-07		290	151	0.03	17.4	< 1	0	8
R9	15-May-07		102	54	0.01	8.99	22	0.4	7.5
R9	19-Jun-07		129	65	< 0.01	8.03	3	6.3	7.7
R9	17-Jul-07		126	54	< 0.01	7.32	2	8.6	7.5
R9	14-Aug-07		150	79	0.02	8.89	1	7.1	7.7
R9	11-Sep-07		126	55	0.02	7.62	6	5.1	8
R9	23-Oct-07		206	103	< 0.01	14.7	< 1	1.5	7.6
R9	14-Nov-07		211	113	0.02	15	1	0	7.6
R9	09-Dec-07		247	115	0.02	16.5	< 1	0.1	7.5
	average		188.2	93.8	0.02	12.3	3.9	2.9	7.7
	minimum		102	54	< 0.01	7.32	< 1	-0.1	7.5

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	maximum		295	151	0.03	18.3	22	8.6	8
	N > DL	0	10	10	7	10	6	10	10
	median		178	91	0.02	11.845	1	0.95	7.6
R10	15-Jan-07		298	147	0.01	18.5	< 1	-0.2	7.5
R10	14-Feb-07		287	153	0.03	17.6	< 1	0.2	7.9
R10	19-Apr-07		302	144	0.02	17	< 1	0.1	7.4
R10	15-May-07		102	51	0.01	9.05	22	0.2	7.4
R10	19-Jun-07		125	67	< 0.01	8.17	3	6.3	7.6
R10	17-Jul-07		126	55	< 0.01	7.37	2	8.6	7.5
R10	14-Aug-07		151	77	0.02	9.03	2	7	7.7
R10	11-Sep-07		125	54	0.01	7.61	7	5.2	7.4
R10	23-Oct-07		205	103	< 0.01	14.9	< 1	1.5	7.7
R10	14-Nov-07		224	114	0.02	15.3	1	0.3	7.7
R10	09-Dec-07		248	115	< 0.01	16.8	< 1	0.2	7.4
	average		199	98	0.01	12.8	3.8	2.7	7.6
	minimum		102	51	< 0.01	7.37	< 1	-0.2	7.4
	maximum		302	153	0.03	18.5	22	8.6	7.9
	N > DL	0	11	11	7	11	6	11	11
	median		205	103	0.01	14.9	1	0.3	7.5
R11	20-Feb-07	151	337	185	0.03	47.9	< 1	-0.2	8.2
R11	17-Aug-07	116	285	135	< 0.01	50.4	< 1	10.7	8
SP5-6	12-Jun-07		948		< 0.01	363	5	3.2	6.8
SP5-6	02-Oct-07		1180	688	< 0.01	537	3	2	7.7
W5	12-Jun-07		1740		0.02	713	29	1.8	7.1
W5	01-Oct-07		1030	560	< 0.01	423	< 1	1.7	7.4
W8	11-Jun-07		62		< 0.01	3.23	2	3	7
W8	02-Oct-07		136	49	< 0.01	6.87	< 1	2.7	7.5
W10	11-Jun-07		55		0.04	2.5	3	3.2	7.2
W10	02-Oct-07		106	45	< 0.01	4.11	< 1	1.1	7.7
WEIR3	20-Feb-07	285	1330	821	0.52	650	2	-1.2	7.4
WEIR3	17-Aug-07	309	1690	831	0.64	714	7	5.4	6.8
X2	18-Apr-07		342	170	0.01	33.7	< 1	0.2	7.2
X2	14-May-07		136	67	0.04	12.8	3	0.3	7.4
X2	18-Jun-07		121	61	0.01	9.25	5	5.8	7.6
X2	16-Jul-07		132	59	< 0.01	10.1	4	7.9	7.3
X2	13-Aug-07		191	90	0.03	15.3	< 1	6.1	7.4
X2	10-Sep-07		171	73	0.02	14.2	< 1	6.4	7.1
X2	22-Oct-07		210	110	< 0.01	19.9	< 1	0.2	7.5
X2	13-Nov-07		229	127	0.02	24.5	< 1	0	7.3

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
X2	09-Dec-07		278	130	0.02	28.1	1	2.3	7.3
	average		201	99	0.02	18.7	2.0	3.2	7.3
	minimum		121	59	< 0.01	9.25	< 1	0	7.1
	maximum		342	170	0.04	33.7	5	7.9	7.6
	N > DL	0	9	9	7	9	4	9	9
	median		191	90	0.02	15.3	1	2.3	7.3
X3	15-Jan-07		328	168	0.02	34.3	< 1	0	7.6
X3	13-Feb-07		338	173	0.03	34.7	< 1	-0.3	7.4
X3	11-Mar-07		356	181	0.02	45.9	< 1	-0.1	7.3
X3	18-Apr-07		336	164	0.03	33.5	< 1	0.2	7.2
X3	14-May-07		139	65	0.02	13.1	3	0.9	7.8
X3	18-Jun-07		115	59	< 0.01	9.29	5	6.8	7.9
X3	16-Jul-07		129	57	< 0.01	10.2	3	8.8	7.4
X3	13-Aug-07		186	92	0.03	15.8	2	6.5	7.8
X3	10-Sep-07		174	76	0.05	14.5	< 1	6.8	7.5
X3	22-Oct-07		215	110	< 0.01	20.3	< 1	0.2	7.6
X3	13-Nov-07		224	125	0.18	23.5	< 1	0	7.2
X3	09-Dec-07		276	127	0.06	27.6	2	1.6	7.1
	average		235	116	0.05	24	1.8	2.6	7.5
	minimum		115	57	< 0.01	9.29	< 1	-0.3	7.1
	maximum		356	181	0.18	45.9	5	8.8	7.9
	N > DL	0	12	12	9	12	5	12	12
	median		219.5	117.5	0.03	21.9	1	0.55	7.45
X4	16-Jan-07		1420	762	0.25	848	7	-0.2	6.8
X4	15-Feb-07		1460		0.24	903	3	-0.1	7.1
X4	12-Mar-07		1310	770	0.26	905	2	-0.1	6.9
X4	19-Apr-07		1420	756	0.22	841	4	4.1	6.8
X4	15-May-07		1250	633	0.17	694	10	5.4	6.3
X4	19-Jun-07		1110		0.14	633	2	15.5	4.4
X4	16-Jul-07		1250	642	0.16	775	< 1	15.5	3.9
X4	13-Aug-07		1230	682	0.17	772	1	14	4.3
X4	10-Sep-07		1250	625	0.14	812	1	10.4	4.1
X4	23-Oct-07		1400	719	0.14	854	2	0.4	3.3
X4	14-Nov-07		1460	705	0.18	743	25	1	6
X4	10-Dec-07		1510	655	0.16	859	3	0.3	4.5
	average		1339	695	0.19	803	5.1	5.5	5.4
	minimum		1110	625	0.14	633	< 1	-0.2	3.3
	maximum		1510	770	0.26	905	25	15.5	7.1
	N > DL	0	12	10	12	12	11	12	12

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	median		1355	693.5	0.17	826.5	2.5	2.55	5.25
X5	10-Apr-07	280	2260	1140	0.77	1180	< 1	3.6	7.1
X5	14-May-07	29.8	297	266	0.08	103	< 1	0.8	8.8
X5	22-May-07	97.8	1180	632	0.53	593	1	6.3	7.8
X5	29-May-07	106	1060	583	0.51	541	< 1	10.2	7.7
X5	05-Jun-07	119	1170	633	0.57	587	< 1	13.7	7.9
X5	12-Jun-07	123	1200	737	0.6	599	< 1	12	8
X5	18-Jun-07	113	1260	658	0.59	622	< 1	15	8.2
X5	19-Jun-07	118	1290	680	0.58	645	< 1	14.8	7.9
X5	26-Jun-07	112	1300	688	0.63	632	5	14.4	8
X5	03-Jul-07	106	1290	649	0.7	646	< 1	14.9	8.1
X5	10-Jul-07	112	1320	665	0.75	659	2	14.3	8
X5	16-Jul-07	99.9	1290	713	0.9	689	< 1	14.7	8.1
X5	17-Jul-07	105	1280	683	0.79	684	< 1	15	8.1
X5	24-Jul-07	101	1290	756	0.91	654	< 1	16.5	8.1
X5	31-Jul-07	98.6	1280	689	0.89	625	< 1	16.1	8
X5	07-Aug-07	116	1330	686	0.91	700	< 1	14.7	7.6
X5	13-Aug-07	105	1270	729	0.96	678	< 1	13.1	7.8
X5	14-Aug-07	125	1360	747	0.83	694	< 1	12.9	7.4
X5	21-Aug-07	121	1310	638	0.89	683	< 1	14.5	7.6
X5	28-Aug-07	119	1320	714	0.91	676	< 1	11.8	7.6
X5	04-Sep-07	122	1470	707	0.97	714	< 1	10.5	7.7
X5	10-Sep-07	132	1500	754	0.93	74.2	< 1	10.4	7.5
X5	11-Sep-07	121	1470	786	0.96	688	< 1	10.7	7.6
X5	17-Sep-07	153	1540	763	0.72	748	< 1	8.6	7.5
X5	23-Oct-07	193	2050	973	0.81	880	< 1	0.9	7.5
X5	29-Oct-07	204	2040	899	0.76	906	< 1	2.5	7.3
	average	124	1363	714	0.75	650	1.2	11.3	7.8
	minimum	29.8	297	266	0.08	74.2	< 1	0.8	7.1
	maximum	280	2260	1140	0.97	1180	5	16.5	8.8
	N > DL	26	26	26	26	26	3	26	26
	median	117	1295	698	0.78	667.5	1	13	7.8
X5P	16-Jan-07	271	1940	948	0.8	836	1	-1.2	7.4
X5P	15-Feb-07	267	1820	952	0.76	804	2	-0.2	7.4
X5P	12-Mar-07	280	1480	902	0.8	813	< 1	-0.1	7.3
X5P	19-Apr-07	279	1480	830	0.69	683	< 1	0.2	7.2
X5P	15-May-07	27.9	883	524	0.18	425	< 1	2.8	9
X5P	14-Nov-07	211	1820	946	0.76	823	< 1	1	7.4
X5P	10-Dec-07	215	1800	873	0.82	870	1	0.2	7.1

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	average	222	1603	854	0.69	751	1.1	0.4	7.5
	minimum	27.9	883	524	0.18	425	< 1	-1.2	7.1
	maximum	280	1940	952	0.82	870	2	2.8	9
	N > DL	7	7	7	7	7	3	7	7
	median	267	1800	902	0.76	813	1	0.2	7.4
X7	11-Jun-07		9690		1.02	5910	106	4.5	5.4
X7	02-Oct-07		11000	3360	1.14	7280	111	3	5.6
X10	16-Jan-07	157	310	171	0.03	34.3	< 1	-0.2	7.6
X10	15-Feb-07	159	317	176	0.02	30.4	< 1	0.5	7.5
X10	12-Mar-07	173	339	179	0.02	36.4	< 1	-0.3	7.6
X10	19-Apr-07	167	330	170	0.02	33.8	< 1	0.5	7.4
X10	15-May-07	61.4	134	65	< 0.01	12.3	10	0.5	7.8
X10	19-Jun-07	69.3	152	70	< 0.01	11.5	2	8.9	8.2
X10	16-Jul-07	72.3	153	69	< 0.01	11.4	2	9.5	7.7
X10	13-Aug-07	99.9	204	109	0.03	17.6	< 1	7.9	8.1
X10	10-Sep-07	90	187	88	0.03	15.9	< 1	7.3	8
X10	23-Oct-07	102	246	121	< 0.01	23	< 1	0.3	7.6
X10	14-Nov-07	109	242	125	0.03	25.1	< 1	2	7.5
X10	10-Dec-07	122	294	134	0.03	28.5	< 1	1.4	7.3
	average	115	242	123	0.03	23.4	1.9	3.2	7.7
	minimum	61.4	134	65	< 0.01	11.4	< 1	-0.3	7.3
	maximum	173	339	179	0.03	36.4	10	9.5	8.2
	N > DL	12	12	12	8	12	3	12	12
	median	105.5	244	123	0.03	24.05	1	0.95	7.6
X11	20-Feb-07	270	2190	1200	0.59	1100	9	0.8	7.4
X11	17-Aug-07	275	2110	1040	0.64	1060	4	5.5	6.8
X12	17-Aug-07	240	1090	554	< 0.01	435	< 1	7	7.1
X13	16-Jan-07	290	1990	1080	0.62	902	5	1.8	7.4
X13	15-Feb-07	283	1810	980	0.61	770	5	0.7	7.5
X13	12-Mar-07	295	1530	765	0.64	761	5	1.5	7.2
X13	19-Apr-07	298	1680	872	0.75	817	4	2.4	7.2
X13	15-May-07	292	1990	1010	0.61	750	5	4.9	7
X13	19-Jun-07	290	1970	907	0.64	812	5	8.5	7.2
X13	16-Jul-07	270	1910	820	0.58	842	3	7.1	7.1
X13	13-Aug-07	287	1640	1007	0.58	792	3	6.2	7.2
X13	10-Sep-07	288	1780	874	0.61	797	4	5.9	7.1
X13	23-Oct-07	283	2260	1120	0.69	939	6	2.2	7.2
X13	14-Nov-07	280	1800	1040	0.62	768	4	3.7	7
X13	10-Dec-07	281	2700	907	0.64	863	5	2.3	7

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	average	286	1922	949	0.63	818	5	3.9	7.2
	minimum	270	1530	765	0.58	750	3	0.7	7
	maximum	298	2700	1120	0.75	939	6	8.5	7.5
	N > DL	12	12	12	12	12	12	12	12
	median	287.5	1860	943.5	0.62	804.5	5	3.05	7.2
X14	16-Jan-07	189	699	354	0.14	225	1	0	7.6
X14	15-Feb-07	196	801	409	0.15	273	1	-0.1	7.6
X14	12-Mar-07	233	1030	547	0.26	420	4	0.2	7.5
X14	10-Apr-07	240	1630	812	0.5	704	46	3.4	7.4
X14	19-Apr-07	193	669	363	0.12	216	< 1	0.4	7.5
X14	14-May-07	72.2	208	97	0.04	31.1	6	0.5	7.7
X14	15-May-07	69.7	197	98	0.01	29.4	12	0.9	7.7
X14	22-May-07	47.1	194	88	0.05	46	14	0.8	7.7
X14	29-May-07	49.6	176	84	0.03	42.9	23	4.7	7.5
X14	05-Jun-07	32.5	112	54	0.04	22.9	30	5.9	7.4
X14	12-Jun-07	47.6	156	75	0.04	31.4	19	7.3	7.5
X14	18-Jun-07	73.4	274	99	0.05	66	4	10.5	8
X14	19-Jun-07	79.1	315	139	0.06	82.6	3	9.7	8
X14	26-Jun-07	73.6	239	102	0.04	45.6	< 1	7.7	7.8
X14	03-Jul-07	72.9	253	108	0.06	53.6	3	9.5	7.7
X14	10-Jul-07	95.6	384	165	0.18	99.3	4	9	7.8
X14	16-Jul-07	76.3	290	134	0.06	68	3	9.8	7.5
X14	17-Jul-07	76.2	281	112	0.06	135	3	9.9	7.6
X14	24-Jul-07	101	402	215	0.14	110	3	10.8	8.1
X14	31-Jul-07	97.4	391	191	0.11	111	2	11.4	7.7
X14	07-Aug-07	108	391	177	0.13	118	3	9.3	7.8
X14	13-Aug-07	109	494	235	0.26	158	6	8.6	7.7
X14	14-Aug-07	104	391	191	0.14	121	2	8.5	8
X14	21-Aug-07	112	502	217	0.17	163	3	10.8	7.9
X14	28-Aug-07	104	425	197	0.13	117	< 1	5.8	7.6
X14	04-Sep-07	104	433	195	0.14	132	< 1	6.1	7.7
X14	10-Sep-07	103	402	175	0.12	122	< 1	7.6	7.7
X14	11-Sep-07	81.4	286	154	0.09	78.4	4	7	7.7
X14	17-Sep-07	88.5	318	142	0.12	81.1	< 1	5.7	7.7
X14	23-Oct-07	131	647	322	0.18	219	3	0.5	7.7
X14	29-Oct-07	124	574	263	0.13	183	< 1	2.9	7.8
X14	14-Nov-07	124	373	203	0.06	81.5	< 1	1.4	7.5
X14	10-Dec-07	146	541	246	0.08	135	1	0.4	7.2
	average	108	439	211	0.12	137	6.4	5.7	7.7

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
	minimum	32.5	112	54	0.01	22.9	< 1	-0.1	7.2
	maximum	240	1630	812	0.5	704	46	11.4	8.1
	N > DL	33	33	33	33	33	25	33	33
	median	101	391	177	0.12	111	3	6.1	7.7
X22B	14-Jan-07		1230	626	1.46	662	< 1	-0.2	7.5
X22B	13-Feb-07		1220		1.47	648	< 1	0.2	7.5
X22B	11-Mar-07		1170	609	1.59	647	< 1	-0.3	7.4
X22B	18-Apr-07		1220	614	1.54	614	< 1	0.2	7.3
X22B	15-May-07		1230	614	1.6	596	< 1	4.6	7.1
X22B	18-Jun-07		1230		1.64	606	< 1	6.9	7.3
X22B	17-Jul-07		1210	602	1.61	635	< 1	10.1	6.5
X22B	13-Aug-07		1090	587	1.41	559	< 1	12.9	7.4
X22B	10-Sep-07		1110	570	1.34	581	< 1	10.7	7.3
X22B	22-Oct-07		1160	615	1.46	623	< 1	3.4	7.1
X22B	13-Nov-07		1150	622	1.38	646	< 1	0.9	7
X22B	10-Dec-07		1220	567	1.43	624	< 1	1	7
	average		1187	603	1.49	620	1	4.2	7.2
	minimum		1090	567	1.34	559	< 1	-0.3	6.5
	maximum		1230	626	1.64	662	< 1	12.9	7.5
	N > DL	0	12	10	12	12	0	12	12
	median		1215	611.5	1.465	623.5	1	2.2	7.3
X23	15-Jan-07		8800	4850	0.9	5630	82	1.3	7
X23	15-Feb-07		8100		0.92	5900	95	0.3	7.2
X23	12-Mar-07		8330	4430	0.89	5080	75	1.3	6.9
X23	19-Apr-07		6300	4270	0.92	5020	107	2.3	6.9
X23	15-May-07		7810	4670	0.95	4900	120	8.3	6.8
X23	19-Jun-07		8590		0.96	5190	139	11.3	6.8
X23	17-Jul-07		8970	4180	1	5180	98	8.6	6.5
X23	13-Aug-07		6210	5040	0.98	5100	99	8	6.7
X23	10-Sep-07		9250	4390	1.01	5090	105	9	6.4
X23	23-Oct-07		9020	4900	1	5240	89	3.8	6.5
X23	14-Nov-07		8600	4880	0.86	5290	71	1.6	6.9
X23	10-Dec-07		8640	4300	0.86	5180	22	1.2	7
	average		8218	4591	0.94	5233	92	4.8	6.8
	minimum		6210	4180	0.86	4900	22	0.3	6.4
	maximum		9250	5040	1.01	5900	139	11.3	7.2
	N > DL	0	12	10	12	12	12	12	12
	median		8595	4550	0.935	5180	96.5	3.05	6.85
X26	18-Jun-07		4800		1.08	2350	36	2.4	6.3

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	SAMPLE DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
X26	16-Jul-07		4680	2300	1.34	2590	24	3.7	6
X26	13-Aug-07		4540	2970	1.4	2740	36	3.3	6.1
X26	10-Sep-07		5150	2680	1.35	2660	36	2.2	6.5
	average		4793	2650	1.29	2585	33	2.9	6.2
	minimum		4540	2300	1.08	2350	24	2.2	6
	maximum		5150	2970	1.4	2740	36	3.7	6.5
	N > DL	0	4	3	4	4	4	4	4
	median		4740	2680	1.345	2625	36	2.85	6.2

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
A25	11-Jun-07	< 0.00025	0.044	< 0.001	0.078	< 0.001	< 0.001	< 0.05	62.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.24	< 0.00002	1.9	0.008	17	0.005	0.0007	3.6	< 0.001	0.002	< 0.15	< 0.001	< 0.001	1.7	< 0.001	0.71	< 0.001	< 0.0005	0.002	< 0.0001	0.0017	< 0.001	< 0.005	< 0.01
A25	01-Oct-07	< 0.00025	0.017	< 0.001	0.073	< 0.001	< 0.001	< 0.05	54.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	2	0.008	13.7	< 0.001	0.0005	2.83	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.1	< 0.001	0.57	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	< 0.005	< 0.01
A30	12-Jun-07	0.0004	3.23	< 0.001	0.028	0.001	< 0.001	< 0.05	21.9	0.034		0.07	0.001	0.39	1.38	< 0.00002	1.2	0.013	31.6	2.22	< 0.0005	2.16	0.068	0.36	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.11	< 0.001	< 0.0005	0.004	0.0002	0.0029	< 0.001	24	< 0.01
A30	01-Oct-07	0.0004	4.15	< 0.001	0.021	0.002	< 0.001	< 0.05	34.7	0.048		0.09	< 0.001	0.48	0.46	< 0.00002	1.1	0.021	40.1	2.68	< 0.0005	3.25	0.1	0.52	< 0.15	< 0.001	< 0.001	8.2	< 0.001	0.16	< 0.001	< 0.0005	0.004	0.0002	0.004	< 0.001	35.1	< 0.01
FAROCR	19-Jun-07	< 0.00025	0.094	< 0.001	0.017	< 0.001	< 0.001	< 0.05	5.67	< 0.0002		< 0.001	< 0.001	0.003	0.11	< 0.00002	0.4	< 0.005	1.19	0.003	< 0.0005	1.62	0.002	0.004	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.027	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.014	< 0.01
FAROCR	17-Jul-07	< 0.00025	0.11	< 0.001	0.016	< 0.001	< 0.001	< 0.05	4.16	< 0.0002		< 0.001	< 0.001	0.003	0.1	< 0.00002	0.2	< 0.005	0.93	0.003	< 0.0005	1.55	0.001	0.006	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.025	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.028	< 0.01
FAROCR	14-Aug-07	< 0.00025	0.065	< 0.001	0.02	< 0.001	< 0.001	< 0.05	6.19	< 0.0002		< 0.001	< 0.001	0.002	< 0.05	< 0.00002	0.3	< 0.005	1.33	0.001	< 0.0005	1.92	0.001	0.004	< 0.15	< 0.001	< 0.001	7.1	< 0.001	0.031	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.01	< 0.01
FAROCR	11-Sep-07	0.0006	0.17	< 0.001	0.02	< 0.001	< 0.001	< 0.05	4.37	0.0007		< 0.001	< 0.001	0.003	0.23	< 0.00002	0.3	0.001	1.34	0.007	0.0008	1.55	0.002	0.018	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.025	< 0.001	0.0009	0.005	0.0007	0.0011	< 0.001	0.027	< 0.01
FAROCR	23-Oct-07	< 0.00025	0.062	< 0.001	0.024	< 0.001	< 0.001	0.06	9.54	< 0.0002		< 0.001	< 0.001	0.002	0.05	< 0.00002	0.3	0.002	2.22	0.001	0.0006	2.1	0.001	0.002	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.044	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.01	< 0.01
FAROCR	14-Nov-07	< 0.00025	0.058	< 0.001	0.02	< 0.001	< 0.001	< 0.05	8.16	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.4	0.002	2.04	0.001	0.0006	2.01	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	6.9	< 0.001	0.038	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.007	< 0.01
FAROCR	09-Dec-07	< 0.00025	0.024	< 0.001	0.024	< 0.001	< 0.001	< 0.05	9.19	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.4	< 0.001	2.11	< 0.001	0.0006	1.91	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	6	< 0.001	0.046	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.009	< 0.01
	average	0.0003	0.083	0.001	0.020	0.001	0.001	0.051	6.75	0.000271		0.001	0.001	0.0021	0.091	0.00002	0.3	0.003	1.59	0.002	0.0006	1.81	0.001	0.005	0.15	0.001	0.001	6.2	0.001	0.034	0.001	0.0006	0.002	0.0002	0.0006	0.001	0.015	0.01
	minimum	< 0.00025	0.024	< 0.001	0.016	< 0.001	< 0.001	< 0.05	4.16	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.2	< 0.001	0.93	< 0.001	< 0.0005	1.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.025	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.007	< 0.01
	maximum	0.0006	0.17	< 0.001	0.024	< 0.001	< 0.001	0.06	9.54	0.0007		< 0.001	< 0.001	0.003	0.23	< 0.00002	0.4	0.002	2.22	0.007	0.0008	2.1	0.002	0.018	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.046	< 0.001	0.0009	0.005	0.0007	0.0011	< 0.001	0.028	< 0.01
	N > DL	1	7	0	7	0	0	1	7	1	0	0	0	5	4	0	7	3	7	6	4	7	5	5	0	0	0	7	0	7	0	1	4	1	2	0	7	0
	median	0.00025	0.065	0.001	0.02	0.001	0.001	0.05	6.19	0.0002		0.001	0.001	0.002	0.05	0.00002	0.3	0.002	1.34	0.001	0.0006	1.91	0.001	0.004	0.15	0.001	0.001	6	0.001	0.031	0.001	0.0005	0.002	0.0001	0.0005	0.001	0.01	0.01
FCO	11-Jun-07	< 0.00025	0.3	0.001	0.036	< 0.001	< 0.001	< 0.05	5.4	0.0011		0.004	< 0.001	0.028	0.73	< 0.00002	0.6	< 0.005	2.1	0.22	< 0.0005	0.9	0.004	0.022	< 0.15	< 0.001	< 0.001	2.2	< 0.001	0.025	< 0.001	< 0.0005	0.048	< 0.0001	< 0.0005	< 0.001	0.75	< 0.01
FCO	02-Oct-07	< 0.00025	1.58	< 0.001	0.045	< 0.001	< 0.001	< 0.05	18.4	0.0059		0.01	< 0.001	0.21	1.41	< 0.00002	0.6	0.006	5.99	0.22	< 0.0005	2.57	0.02	0.002	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.077	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	3.87	< 0.01
FDL	11-Jun-07	< 0.00025	0.52	< 0.001	0.038	< 0.001	< 0.001	< 0.05	2.66	< 0.0002		< 0.001	0.001	0.004	0.77	< 0.00002	0.3	< 0.005	0.63	0.016	< 0.0005	1.25	0.001	0.063	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.017	< 0.001	< 0.0005	0.017	< 0.0001	< 0.0005	0.001	0.03	< 0.01
FDL	02-Oct-07	< 0.00025	0.062	< 0.001	0.017	< 0.001	< 0.001	< 0.05	3.87	< 0.0002		< 0.001	< 0.001	< 0.001	0.05	< 0.00002	0.1	0.001	0.76	0.001	< 0.0005	1.83	< 0.001	0.002	< 0.15	< 0.001	< 0.001	6.3	< 0.001	0.023	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
FDU	11-Jun-07	< 0.00025	0.18	< 0.001	0.013	< 0.001	< 0.001	< 0.05	2.07	< 0.0002		< 0.001	< 0.001	0.001	0.14	< 0.00002	0.2	< 0.005	0.4	0.004	< 0.0005	1.2	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.014	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.011	< 0.01
FDU	02-Oct-07	< 0.00025	0.057	< 0.001	0.013	< 0.001	< 0.001	< 0.05	3.37	< 0.0002		< 0.001	< 0.001	0.003	0.05	< 0.00002	< 0.1	0.002	0.65	0.002	< 0.0005	1.86	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	0.02	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
FWSD6	29-May-07	< 0.00025	0.082	< 0.001	0.057	< 0.001	< 0.001	< 0.05	44.9	< 0.0002		< 0.001	< 0.001	0.002	0.17	< 0.00002	3.2	< 0.005	16.9	0.004	0.0011	1.17	< 0.001	0.001	< 0.15	< 0.001	< 0.001	0.9	< 0.001	0.58	< 0.001	< 0.0005	0.002	< 0.0001	0.0015	< 0.001	0.01	< 0.01
GCULV	15-Jan-07	< 0.00025	0.016	< 0.001	0.045	< 0.001	< 0.001	< 0.05	17.2	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	0.001	3	0.005	< 0.0005	2.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.087	< 0.001	< 0.0005	0.001	< 0.0001	0.0014	< 0.001	<0.005	< 0.01
GCULV	13-Feb-07	< 0.00025	0.017	< 0.001	0.044	< 0.001	< 0.001	< 0.05	17.8	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.09	< 0.00002	0.5	0.001	3.19	0.001	< 0.0005	2.52	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.086	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	<0.005	< 0.01
GCULV	11-Mar-07	< 0.00025	0.025	< 0.001	0.052	< 0.001	< 0.001	< 0.05	19.4	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.1	< 0.00002	0.8	0.002	3.7	0.003	0.0006	2.72	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.099	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	0.01	< 0.01
GCULV	18-Apr-07	< 0.00025	0.058	< 0.001	0.051	< 0.001	< 0.001	< 0.05	18.7	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.7	< 0.001	3.12	0.002	0.0007	2.22	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	0.006	0.09	< 0.001	< 0.0005	0.002	< 0.0001	0.0021	< 0.001	0.006	< 0.01
GCULV	14-May-07	< 0.00025	0.085	< 0.001	0.031	< 0.001	< 0.001	< 0.05	9.33	< 0.0002	0.0086	< 0.001	0.001	0.001	0.36	< 0.00002	1.3	< 0.005	1.68	0.024	0.0009	1.48	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.055	< 0.001	< 0.0005	0.003	< 0.0001	0.0007	< 0.001	<0.005	< 0.01
GCULV	18-Jun-07	< 0.00025	0.052	< 0.001	0.017	< 0.001	< 0.001	< 0.05	5.07	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.16	< 0.00002	0.5	< 0.005	0.77	0.008	< 0.0005	1.24	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.4	< 0.001	0.031	< 0.001	< 0.0005	0.001	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	16-Jul-07	< 0.00025	0.053	< 0.001	0.02	< 0.001	< 0.001	< 0.05	4.78	< 0.0002	0.0061	< 0.001	< 0.001	< 0.001	0.14	< 0.00002	0.2	< 0.005	0.75	0.01	< 0.0005	1.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.034	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	13-Aug-07	< 0.00025	0.026	< 0.001	0.024	< 0.001	< 0.001	< 0.05	7.65	< 0.0002	0.0054	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.3	< 0.005	1.46	0.006	< 0.0005	1.52	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.046	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	10-Sep-07	< 0.00025	0.015	< 0.001	0.026	< 0.001	< 0.001	< 0.05	6.66	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.09	< 0.00002	0.3	< 0.001	1	0.006	< 0.0005	1.49	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.045	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	22-Oct-07	< 0.00025	0.017	< 0.001	0.024	< 0.001	< 0.001	< 0.05	8.38	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.3	< 0.001	1.41	0.004	< 0.0005	1.72	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.048	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	13-Nov-07	< 0.00025	0.044	< 0.001	0.029	< 0.001	< 0.001	< 0.05	10.3	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.11	< 0.00002	0.4	< 0.001	1.56	0.005	< 0.0005	1.92	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.055	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	<0.005	< 0.01
GCULV	09-Dec-07	< 0.00025	0.018	< 0.001	0.033	< 0.001	< 0.001	< 0.05	11.9	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.4	< 0.001	1.87	0.003	< 0.0005	1.93	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.067	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	<0.005	< 0.01
	average	0.00025	0.036	0.001	0.033	0.001	0.001	0.05	11.4	0.0002	0.00543	0.001	0.001	0.001	0.12	0.00002	0.5	0.002	1.96	0.006	0.0006	1.86	0.001	0.001	0.15	0.001	0.001	3.8	0.001	0.062	0.001	0.0005	0.001	0.0001	0.0010	0.001	0.008	0.01
	minimum	< 0.00025	0.015	< 0.001	0.017	< 0.001	< 0.001	< 0.05	4.78	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.2	< 0.001	0.75	0.001	< 0.0005	1.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.4	< 0.001	0.031	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.085	< 0.001	0.052	< 0.001	< 0.001	< 0.05	19.4	< 0.0002	0.0086	< 0.001	0.001	0.002	0.36	< 0.00002	1.3	0.002	3.7	0.024	0.0009	2.72	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	0.006	0.099	< 0.001	< 0.0005	0.003	< 0.0001	0.0026	< 0.001	0.01	< 0.01
	N > DL	0	12	0	12	0	0	0	12	0	3	0	1	2	10	0	12	3	12	12	3	12	0	0	0	0	0	12	1	12	0	0	5	0	6	0	2	0
	median	0.00025	0.0255	0.001	0.03	0.001	0.001	0.05	9.815	0.0002	0.005	0.001	0.001	0.001	0.095	0.00002	0.45	0.001	1.62	0.005	0.0005	1.82	0.001	0.001	0.15	0.001	0.001	4.1	0.001	0.055	0.001	0.0005	0.001	0.0001	0.00055	0.001	0.005	0.01
GHSCR1	11-Jun-07	< 0.00025	0.013	< 0.001	0.038	< 0.001	< 0.001	< 0.05	208	0.0017		< 0.001	< 0.001	0.004	0.16	< 0.00002	4.6	0.008	64.3	0.02	< 0.0005	9.34	0.007	0.008	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.91	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	2.28	< 0.01
GHSCR1	02-Oct-07	< 0.00025	0.017	< 0.001	0.038	< 0.001	< 0.001	< 0.05	170	0.0014		< 0.001	< 0.001	0.003	0.09	< 0.00002	3.8	0.008	46.2	0.066	< 0.0005	8.81	0.006	0.002	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.71	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	1.91	< 0.01
K8	13-Feb-07	< 0.00025	0.006	< 0.001	0.032	< 0.001	< 0.001	< 0.05	27.3	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.7	0.002	3.65	< 0.001	< 0.0005	2.54	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0048	< 0.001	< 0.005	< 0.01
K8	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.04	< 0.001	< 0.001	< 0.05	34.2	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.06	< 0.00002	1	0.003	4.99	0.001	< 0.0005	2.9	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0084	< 0.001	< 0.005	< 0.01
K8	18-Apr-07	< 0.00025	0.007	< 0.001	0.032	< 0.001	< 0.001	< 0.05	26.6	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	< 0.05	< 0.00002	0.8	< 0.001	3.33	0.001	< 0.0005	2.22	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0048	< 0.001	0.007	< 0.01
K8	14-May-07	0.0027	0.036	< 0.001	0.034	< 0.001	< 0.001	< 0.05	22.4	< 0.0002	0.0085	< 0.001	0.001	0.002	0.15	< 0.00002	1.4	< 0.005	3.3	0.002	0.0008	2.12	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.14	< 0.001	< 0.0005	0.001	< 0.0001	0.0042	< 0.001	< 0.005	< 0.01
K8	18-Jun-07	< 0.00025	0.022	< 0.001	0.014	< 0.001	< 0.001	< 0.05	7.38	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.005	1.02	0.005	< 0.0005	1.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.043	< 0.001	< 0.0005	< 0.001	0.0001	0.0005	< 0.001	0.02	< 0.01
K8	16-Jul-07	< 0.00025	0.025	< 0.001	0.019	< 0.001	< 0.001	< 0.05	8.65	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.3	< 0.005	1.13	< 0.001	< 0.0005	1.57	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.06	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
K8	13-Aug-07	< 0.00025	0.018	< 0.001	0.032	< 0.001	< 0.001	< 0.05	19.8	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.005	2.64	< 0.001	< 0.0005	2.3	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	< 0.005	< 0.01
K8	10-Sep-07	< 0.00025	0.008	< 0.001	0.024	< 0.001	< 0.001	< 0.05	12.6	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.4	< 0.001	1.55	< 0.001	< 0.0005	1.86	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	0.001	0.083	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	< 0.005	< 0.01
K8	22-Oct-07	< 0.00025	0.006	< 0.001	0.02	< 0.001	< 0.001	< 0.05	13.9	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.4	0.001	1.76	< 0.001	< 0.0005	1.85	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.087	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	0.001	< 0.005	< 0.01
K8	13-Nov-07	< 0.00025	0.031	< 0.001	0.025	< 0.001	< 0.001	< 0.05	18.6	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	0.001	2.46	< 0.001	< 0.0005	2.08	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	< 0.005	< 0.01
K8	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.026	< 0.001	< 0.001	< 0.05	19.2	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.001	2.5	< 0.001	< 0.0005	1.91	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0027	< 0.001	< 0.005	< 0.01
	average	0.00047	0.015	0.001	0.027	0.001	0.001	0.05	19.1	0.0002	0.00532	0.001	0.001	0.001	0.06	0.00002	0.6	0.003	2.58	0.001	0.0005	2.07	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.118	0.001	0.0005	0.001	0.0001	0.0028	0.001	0.007	0.01
	minimum	0.0027	< 0.005	< 0.001	0.014	< 0.001	< 0.001	< 0.05	7.38	< 0.0002	0.0085	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.3	< 0.001	1.02	< 0.001	< 0.0005	1.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.043	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	0.0027	0.036	< 0.001	0.04	< 0.001	< 0.001	< 0.05	34.2	< 0.0002	0.0085	< 0.001	0.001	0.002	0.15	< 0.00002	1.4	0.003	4.99	0.005	0.0008	2.9	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	0.001	0.21	< 0.001	< 0.0005	0.001	0.0001	0.0084	< 0.001	0.02	< 0.01
	N > DL	1	9	0	11	0	0	0	11	1	1	0	1	2	2	0	11	4	11	4	1	11	0	0	0	0	0	11	2	11	0	0	1	1	10	0	2	0
	median	0.00025	0.008	0.001	0.026	0.001	0.001	0.05	19.2	0.0002	0.005	0.001	0.001	0.001	0.05	0.00002	0.5	0.002	2.5	0.001	0.0005	2.08	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.12	0.001	0.0005	0.001	0.0001	0.0017	0.001	0.005	0.01
NE1	12-Jun-07	< 0.00025	0.006	< 0.001	0.011	< 0.001	< 0.001	< 0.05	45.1	< 0.0002		< 0.001	< 0.001	0.004	0.09	< 0.00002	2.1	0.007	15	0.001	0.0044	3.19	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.006	< 0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
NE1	01-Oct-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.001	< 0.001	< 0.05	75.3	< 0.0002		< 0.001	< 0.001	0.002	0.07	< 0.00002	2.9	0.011	23.7	< 0.001	0.0071	4.47	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.38	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	< 0.005	< 0.01
NE2	12-Jun-07	< 0.00025	0.005	< 0.001	0.064	< 0.001	< 0.001	< 0.05	132	< 0.0002		< 0.001	< 0.001	0.002	0.15	< 0.00002	3.6	0.015	130	0.001	< 0.0005	7.45	0.002	< 0.001	< 0.15	< 0.001	0.003	4	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0048	< 0.001	< 0.005	< 0.01
NE2	01-Oct-07	< 0.00025	0.049	< 0.001	0.034	< 0.001	< 0.001	< 0.05	108	< 0.0002		< 0.001	< 0.001	0.002	0.12	< 0.00002	2.8	0.017	88.5	0.001	< 0.0005	6.21	0.005	< 0.001	< 0.15	< 0.001	0.001	4.9	< 0.001	0.52	< 0.001	< 0.0005	0.002	< 0.0001	0.0051	< 0.001	0.071	< 0.01
NF1	12-Jun-07	< 0.00025	0.4	0.001	0.036	< 0.001	< 0.001	< 0.05	9.63	< 0.0002		< 0.001	< 0.001	0.003	0.64	< 0.00002	0.6	< 0.005	1.99	0.029	< 0.0005	1.25	0.001	0.006	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.044	< 0.001	< 0.0005	0.014	< 0.0001	< 0.0005	0.001	0.011	< 0.01
NF1	01-Oct-07	< 0.00025	0.021	< 0.001	0.044	< 0.001	< 0.001	< 0.05	24.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.19	< 0.00002	0.6	0.003	5.39	0.042	< 0.0005	2.07	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.094	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.016	< 0.01
NF2	11-Jun-07	< 0.00025	0.23	0.001	0.032	< 0.001	< 0.001	< 0.05	9.87	< 0.0002		< 0.001	< 0.001	0.002	0.47	< 0.00002	0.6	< 0.005	1.99	0.021	< 0.0005	1.27	0.002	0.004	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.045	< 0.001	< 0.0005	0.009	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
NF2	01-Oct-07	< 0.00025	0.026	< 0.001	0.047	< 0.001	< 0.001	< 0.05	25.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.19	< 0.00002	0.6	0.003	5.64	0.032	< 0.0005	2.28	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.009	< 0.01
R1	17-Aug-07	< 0.00025	0.011	< 0.001	0.052	< 0.001	< 0.001	< 0.05	26.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.28	< 0.00002	0.8	< 0.005	4.68	0.052	< 0.0005	2.17	< 0.001	< 0.001	< 0.15	< 0.001	0.001	3.4	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	< 0.005	< 0.01
R2	20-Feb-07	< 0.00025	0.009	< 0.001	0.073	< 0.001	< 0.001	< 0.05	126	< 0.0002		0.002	< 0.001	0.002	0.37	< 0.00002	2.7	0.009	26.9	3.02	0.0009	12.7	0.006	< 0.001	< 0.15	< 0.001	< 0.001	6.2	< 0.001	0.39	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0033	< 0.001	0.031	< 0.01
R2	17-Aug-07	< 0.00025	0.015	< 0.001	0.053	< 0.001	< 0.001	< 0.05	60.2	< 0.0002		0.001	< 0.001	< 0.001	0.28	< 0.00002	1.8	0.008	13.7	1.14	0.0005	5.49	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.033	< 0.01
R3	20-Feb-07	0.0004	0.006	< 0.001	0.076	< 0.001	< 0.001	< 0.05	96.6	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	2.1	0.006	20.6	1.16	0.0006	8.74	0.003	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	0.017	< 0.01
R3	17-Aug-07	< 0.00025	0.007	< 0.001	0.052	< 0.001	< 0.001	< 0.05	55	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	1.6	0.006	12.4	0.8	0.0007	5.59	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	0.019	< 0.01
R4	20-Feb-07	< 0.00025	0.006	< 0.001	0.089	< 0.001	< 0.001	< 0.05	77.6	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	1.8	0.004	16.4	0.026	0.0006	5.91	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	< 0.005	< 0.01
R4	17-Aug-07	< 0.00025	0.008	< 0.001	0.064	< 0.001	< 0.001	< 0.05	52.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.17	< 0.00002	1.6	0.005	12	0.47	0.0005	4.94	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	0.012	< 0.01
R5	17-Aug-07	< 0.00025	0.017	< 0.001	0.077	< 0.001	< 0.001	< 0.05	36.3	< 0.0002		< 0.001	< 0.001	0.001	0.17	< 0.00002	1	< 0.005	10.8	0.037	0.001	1.87	< 0.001	< 0.001	< 0.15	< 0.001	0.001	3.4	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	< 0.005	< 0.01
R6	20-Feb-07	< 0.00025	0.013	< 0.001	0.092	< 0.001	< 0.001	< 0.05	48.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	1.4	0.002	10.7	0.011	0.0012	2.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
R6	17-Aug-07	< 0.00025	0.014	< 0.001	0.078	< 0.001	< 0.001	< 0.05	35.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.16	< 0.00002	1	< 0.005	10.7	0.01	0.0009	1.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	< 0.005	< 0.01
R7	14-Feb-07	< 0.00025	0.007	< 0.001	0.071	< 0.001	< 0.001	< 0.05	42.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	1	0.008	8.57	0.007	0.0007	3.34	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0025	< 0.001	< 0.005	< 0.01
R7	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.083	< 0.001	< 0.001	< 0.05	43.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	1.2	0.011	9.05	0.008	0.0009	3.71	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.8	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.003	< 0.001	< 0.005	< 0.01
R7	19-Apr-07	< 0.00025	0.007	< 0.001	0.076	< 0.001	< 0.001	< 0.05	42.3	< 0.0002		< 0.001	< 0.001	0.002	0.13	< 0.00002	1.2	0.007	8.08	0.012	0.0009	3.15	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	0.016	< 0.01
R7	15-May-07	< 0.00025	0.35	0.002	0.047	< 0.001	< 0.001	< 0.05	14.1	< 0.0002		< 0.001	0.002	0.002	1.41	< 0.00002	1.6	< 0.005	2.79	0.14	0.0008	1.14	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.061	< 0.001	< 0.0005	0.014	< 0.0001	0.0005	0.001	0.007	< 0.01
R7	19-Jun-07	< 0.00025	0.095	< 0.001	0.039	< 0.001	< 0.001	< 0.05	18.9	< 0.0002		< 0.001	< 0.001	0.001	0.27	< 0.00002	0.6	< 0.005	4.61	0.016	0.0005	1.6	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.067	< 0.001	< 0.0005	0.004	< 0.0001	0.0008	< 0.001	0.017	< 0.01
R7	17-Jul-07	< 0.00025	0.06	< 0.001	0.038	< 0.001	< 0.001	< 0.05	15.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.16	< 0.00002	0.3	< 0.005	3.45	0.012	< 0.0005	1.38	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.067	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R7	14-Aug-07	< 0.00025	0.1	< 0.001	0.045	< 0.001	< 0.001	< 0.05	23.3	0.0004		< 0.001	< 0.001	< 0.001	0.18	< 0.00002	0.5	< 0.005	5.09	0.014	0.0007	1.91	0.001	< 0.001	< 0.15	< 0.001	0.002	4.2	< 0.001	0.09	0.001	< 0.0005	0.003	0.0002	0.001	< 0.001	< 0.005	< 0.01
R7	11-Sep-07	< 0.00025	0.083	< 0.001	0.041	< 0.001	< 0.001	< 0.05	16.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.3	< 0.00002	0.5	< 0.001	3.63	0.027	< 0.0005	1.59	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.07	< 0.001	< 0.0005	0.004	< 0.0001	0.0007	< 0.001	0.011	< 0.01
R7	23-Oct-07	< 0.00025	0.01	< 0.001	0.052	< 0.001	< 0.001	< 0.05	27.9	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.7	0.004	6.35	0.015	< 0.0005	2.44	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	< 0.005	< 0.01
R7	14-Nov-07	< 0.00025	0.04	< 0.001	0.056	< 0.001	< 0.001	< 0.05	33.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	0.8	0.004	6.74	0.013	0.0006	2.44	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R7	09-Dec-07	< 0.00025	0.021	< 0.001	0.059	< 0.001	< 0.001	< 0.05	33.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.8	0.002	6.48	0.012	0.0005	2.36	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	< 0.005	< 0.01
	average	0.00025	0.071	0.0011	0.055	0.001	0.001	0.05	28.3	0.000218		0.001	0.0011	0.0012	0.27	0.00002	0.8	0.005	5.89	0.025	0.0006	2.28	0.001	0.001	0.15	0.001	0.0011	4.7	0.001	0.114	0.001	0.0005	0.003	0.0001	0.0014	0.001	0.008	0.01
	minimum	< 0.00025	0.007	< 0.001	0.038	< 0.001	< 0.001	< 0.001	14.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	0.3	< 0.001	2.79	0.007	< 0.0005	1.14	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.061	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.35	0.002	0.083	< 0.001	< 0.001	< 0.001	43.8	0.0004		< 0.001	0.002	0.002	1.41	< 0.00002	1.6	0.011	9.05	0.14	0.0009	3.71	0.001	< 0.001	< 0.15	< 0.001	0.002	5.8	< 0.001	0.19	0.001	< 0.0005	0.014	0.0002	0.003	0.001	0.017	< 0.01
	N > DL	0	10	1	11	0	0	0	11	1	0	0	1	3	11	0	11	6	11	11	8	11	2	0	0	0	1	11	0	11	1	0	5	1	10	1	4	0
	median	0.00025	0.04	0.001	0.052	0.001	0.001	0.05	27.9	0.0002		0.001	0.001	0.001	0.13	0.00002	0.8	0.005	6.35	0.013	0.0006	2.36	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.12	0.001	0.0005	0.001	0.0001	0.0012	0.001	0.005	0.01
R8	15-May-07	< 0.00025	2.26	0.002	0.074	< 0.001	< 0.001	< 0.05	14.4	< 0.0002		0.002	0.008	0.008	4.46	< 0.00002	2.1	0.006	3.65	0.18	0.0009	1.15	0.009	0.023	< 0.15	< 0.001	< 0.001	6.7	< 0.001	0.065	< 0.001	0.0005	0.11	< 0.0001	0.0007	0.007	0.03	< 0.01
R8	19-Jun-07	< 0.00025	0.074	< 0.001	0.032	< 0.001	< 0.001	< 0.05	16	< 0.0002		< 0.001	< 0.001	0.001	0.22	< 0.00002	0.5	< 0.005	3.79	0.012	< 0.0005	1.43	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.055	< 0.001	< 0.0005	0.003	< 0.0001	0.0007	< 0.001	0.013	< 0.01
R8	17-Jul-07	< 0.00025	0.072	< 0.001	0.037	< 0.001	< 0.001	< 0.05	14.7	< 0.0002		< 0.001	< 0.001	0.001	0.14	< 0.00002	0.4	< 0.005	3.42	0.011	< 0.0005	1.48	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.063	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R8	14-Aug-07	< 0.00025	0.055	< 0.001	0.043	< 0.001	< 0.001	< 0.05	21.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.13	< 0.00002	0.4	< 0.005	4.68	0.011	< 0.0005	1.83	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.083	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	< 0.005	< 0.01
R8	11-Sep-07	< 0.00025	0.086	< 0.001	0.037	< 0.001	< 0.001	< 0.05	14.8	< 0.0002		< 0.001	< 0.001	0.001	0.29	< 0.00002	0.4	< 0.001	3.22	0.024	< 0.0005	1.55	< 0.001	0.004	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.061	< 0.001	< 0.0005	0.003	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
R8	23-Oct-07	< 0.00025	0.011	< 0.001	0.051	< 0.001	< 0.001	< 0.05	27.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.6	0.003	6.08	0.016	0.0006	2.43	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	< 0.005	< 0.01
R8	14-Nov-07	< 0.00025	0.035	< 0.001	0.055	< 0.001	< 0.001	< 0.05	31.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	0.7	0.004	6.39	0.012	0.0006	2.38	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R8	09-Dec-07	< 0.00025	0.022	< 0.001	0.057	< 0.001	< 0.001	< 0.05	31.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.13	< 0.00002	0.7	0.002	6.06	0.013	< 0.0005	2.24	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	< 0.005	< 0.01
	average	0.00025	0.327	0.0011	0.048	0.001	0.001	0.05	21.5	0.0002		0.001	0.002	0.002	0.70	0.00002	0.73	0.004	4.66	0.035	0.0006	1.81	0.002	0.004	0.15	0.001	0.001	4.8	0.001	0.085	0.001	0.0005	0.015	0.0001	0.0009	0.002	0.009	0.01
	minimum	< 0.00025	0.011	< 0.001	0.032	< 0.001	< 0.001	< 0.05	14.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	0.4	< 0.001	3.22	0.011	< 0.0005	1.15	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.055	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.013	< 0.01
	maximum	< 0.00025	2.26	0.002	0.074	< 0.001	< 0.001	< 0.05	31.8	< 0.0002		0.002	0.008	0.008	4.46	< 0.00002	2.1	0.006	6.39	0.18	0.0009	2.43	0.009	0.023	< 0.15	< 0.001	< 0.001	6.7	< 0.001	0.13	< 0.001	0.0005	0.11	< 0.0001	0.0017	0.007	0.03	< 0.01
	N > DL	0	8	1	8	0	0	0	8	0	0	1	1	4	8	0	8	4	8	8	3	8	1	2	2	0	0	8	0	8	0	1	4	0	7	1	2	0
	median	0.00025	0.0635	0.001	0.047	0.001	0.001	0.05	18.7	0.0002		0.001	0.001	0.001	0.135	0.00002	0.55	0.0045	4.235	0.0125	0.0005	1.69	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.074	0.001	0.0005	0.0015	0.0001	0.0007	0.001	0.005	0.01
R9	15-Jan-07	< 0.00025	0.006	< 0.001	0.078	< 0.001	< 0.001	< 0.05	44	< 0.0002		< 0.001	< 0.001	< 0.001	0.06	< 0.00002	1	0.008	9.38	0.013	0.0008	3.16	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	< 0.005	< 0.01
R9	14-Feb-07	< 0.00025	0.009	< 0.001	0.076	< 0.001	< 0.001	< 0.05	44.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	1.1	0.008	9.63	0.01	0.0008	3.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	< 0.005	< 0.01
R9	15-May-07	< 0.00025	0.35	0.001	0.046	< 0.001	< 0.001	< 0.05	16.3	< 0.0002		< 0.001	0.002	0.003	1.16	< 0.00002	1.8	< 0.005	3.32	0.082	0.0009	1.29	0.002	0.003	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.073	< 0.001	< 0.0005	0.014	< 0.0001	0.0006	0.001	0.009	< 0.01
R9	19-Jun-07	< 0.00025	0.088	< 0.001	0.036	< 0.001	< 0.001	< 0.05	18.4	< 0.0002		< 0.001	< 0.001	0.001	0.25	< 0.00002	0.6	< 0.005	4.56	0.013	< 0.0005	1.63	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.065	< 0.001	< 0.0005	0.003	< 0.0001	0.0008	< 0.001	0.01	< 0.01
R9	17-Jul-07	< 0.00025	0.061	< 0.001	0.035	< 0.001	< 0.001	< 0.05	15.8	< 0.0002		< 0.001	< 0.001	0.001	0.14	< 0.00002	0.4	< 0.005	3.64	0.011	< 0.0005	1.47	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.071	< 0.001	< 0.0005	0.002	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
R9	14-Aug-07	< 0.00025	0.034	< 0.001	0.046	< 0.001	< 0.001	< 0.05	23	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	0.5	< 0.005	5.09	0.012	< 0.0005	1.91	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.091	< 0.001	< 0.0005	0.001	< 0.0001	0.0007	< 0.001	< 0.005	< 0.01
R9	11-Sep-07	< 0.00025	0.11	< 0.001	0.041	< 0.001	< 0.001	< 0.05	16.1	< 0.0002		< 0.001	< 0.001	0.001	0.35	< 0.00002	0.5	0.001	3.57	0.031	< 0.0005	1.61	< 0.001	0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.069	< 0.001	< 0.0005	0.004	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R9	23-Oct-07	< 0.00025	0.007	< 0.001	0.053	< 0.001	< 0.001	< 0.05	30.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.7	0.004	6.84	0.017	0.0005	2.51	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R9	14-Nov-07	< 0.00025	0.037	< 0.001	0.056	< 0.001	< 0.001	< 0.05	33.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	0.8	0.004	7.17	0.015	0.0006	2.51	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.005	< 0.01
R9	09-Dec-07	< 0.00025	0.012	< 0.001	0.061	< 0.001	< 0.001	< 0.05	34.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	0.8	0.002	7.11	0.016	0.0005	2.39	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0019	< 0.001	0.006	< 0.01
	average	0.00025	0.071	0.001	0.053	0.001	0.001	0.05	27.6	0.0002		0.001	0.001	0.0012	0.26	0.00002	0.8	0.005	6.03	0.022	0.0006	2.19	0.001	0.001	0.15	0.001	0.001	4.8	0.001	0.112	0.001	0.0005	0.003	0.0001	0.0013	0.001	0.006	0.01
	minimum	< 0.00025	0.006	< 0.001	0.035	< 0.001	< 0.001	< 0.05	15.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.06	< 0.00002	0.4	< 0.005	3.32	0.01	< 0.0005	1.29	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.065	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.35	0.001	0.078	< 0.001	< 0.001	< 0.05	44.6	< 0.0002		< 0.001	0.002	0.003	1.16	< 0.00002	1.8	0.008	9.63	0.082	0.0009	3.37	0.002	0.003	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.18	< 0.001	< 0.0005	0.014	< 0.0001	0.0028	0.001	0.01	< 0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
	N > DL	0	10	1	10	0	0	0	10	0	0	0	1	4	10	0	10	6	10	10	6	10	1	2	2	0	0	10	0	10	0	2	5	0	10	1	4	0
	median	0.00025	0.0355	0.001	0.0495	0.001	0.001	0.05	26.55	0.0002		0.001	0.001	0.001	0.13	0.00002	0.75	0.005	5.965	0.014	0.0005	2.15	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.1055	0.001	0.0005	0.001	0.0001	0.00105	0.001	0.005	0.01
R10	15-Jan-07	< 0.00025	0.006	< 0.001	0.079	< 0.001	< 0.001	< 0.05	43.8	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	1	0.008	9.14	0.013	0.0008	3.1	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0025	< 0.001	0.01	< 0.01
R10	14-Feb-07	< 0.00025	0.012	< 0.001	0.074	< 0.001	< 0.001	< 0.05	44.9	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	1.1	0.008	9.81	0.012	0.0008	3.47	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.01	< 0.01
R10	19-Apr-07	< 0.00025	0.029	< 0.001	0.077	< 0.001	< 0.001	< 0.05	43.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.13	< 0.00002	1.3	0.007	8.57	0.02	0.0008	3.11	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.057	< 0.01
R10	15-May-07	< 0.00025	0.34	0.001	0.043	< 0.001	< 0.001	< 0.05	15.4	< 0.0002		< 0.001	0.002	0.003	1.1	< 0.00002	1.7	< 0.005	3.08	0.077	0.0009	1.23	0.002	0.003	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.068	< 0.001	< 0.0005	0.013	< 0.0001	0.0005	0.001	0.011	< 0.01
R10	19-Jun-07	< 0.00025	0.082	< 0.001	0.038	< 0.001	< 0.001	< 0.05	19.2	< 0.0002		< 0.001	< 0.001	0.001	0.24	< 0.00002	0.6	< 0.005	4.69	0.013	< 0.0005	1.68	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.072	< 0.001	< 0.0005	0.003	< 0.0001	0.0008	< 0.001	0.009	< 0.01
R10	17-Jul-07	< 0.00025	0.072	< 0.001	0.037	< 0.001	< 0.001	< 0.05	16.4	< 0.0002		< 0.001	< 0.001	0.001	0.18	< 0.00002	0.4	< 0.005	3.84	0.011	< 0.0005	1.54	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.074	< 0.001	< 0.0005	0.002	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
R10	14-Aug-07	< 0.00025	0.048	< 0.001	0.044	< 0.001	< 0.001	< 0.05	22.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	0.5	< 0.005	5.06	0.012	< 0.0005	1.87	0.004	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.09	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	< 0.005	< 0.01
R10	11-Sep-07	< 0.00025	0.12	< 0.001	0.04	< 0.001	< 0.001	< 0.05	15.8	< 0.0002		< 0.001	< 0.001	0.001	0.34	< 0.00002	0.5	0.001	3.5	0.031	< 0.0005	1.6	0.001	0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.067	< 0.001	< 0.0005	0.004	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R10	23-Oct-07	< 0.00025	0.015	< 0.001	0.053	< 0.001	< 0.001	< 0.05	30.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.13	< 0.00002	0.7	0.003	6.79	0.017	0.0006	2.42	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.006	< 0.01
R10	14-Nov-07	< 0.00025	0.04	< 0.001	0.055	< 0.001	< 0.001	< 0.05	33.9	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	0.8	0.004	7.16	0.014	0.0006	2.49	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.009	< 0.01
R10	09-Dec-07	< 0.00025	0.013	< 0.001	0.057	< 0.001	< 0.001	< 0.05	34.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.13	< 0.00002	0.8	0.002	7.18	0.021	0.0007	2.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	0.022	< 0.01
	average	0.00025	0.071	0.001	0.054	0.001	0.001	0.05	29.1	0.0002		0.001	0.001	0.0012	0.24	0.00002	0.9	0.005	6.26	0.022	0.0007	2.26	0.001	0.0012	0.15	0.001	0.001	4.8	0.001	0.120	0.001	0.0005	0.003	0.0001	0.0014	0.001	0.014	0.01
	minimum	< 0.00025	0.006	< 0.001	0.037	< 0.001	< 0.001	< 0.05	15.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	0.4	< 0.005	3.08	0.011	0.0006	1.23	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.067	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.34	0.001	0.079	< 0.001	< 0.001	< 0.05	44.9	< 0.0002		< 0.001	0.002	0.003	1.1	< 0.00002	1.7	0.008	9.81	0.077	0.0009	3.47	0.004	0.003	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.2	< 0.001	< 0.0005	0.013	< 0.0001	0.0028	0.001	0.057	< 0.01
	N > DL	0	11	1	11	0	0	0	11	0	0	0	1	4	10	0	11	7	11	11	7	11	3	2	0	0	0	11	0	11	0	0	4	0	11	1	8	0
	median	0.00025	0.04	0.001	0.053	0.001	0.001	0.05	30.1	0.0002		0.001	0.001	0.001	0.13	0.00002	0.8	0.005	6.79	0.014	0.0006	2.37	0.001	0.001	0.15	0.001	0.001	4.9	0.001	0.12	0.001	0.0005	0.001	0.0001	0.0013	0.001	0.009	0.01
R11	20-Feb-07	< 0.00025	0.009	< 0.001	0.08	< 0.001	< 0.001	< 0.05	54.6	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	1.6	0.003	11.7	0.005	0.001	3.69	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
R11	17-Aug-07	< 0.00025	0.019	< 0.001	0.07	< 0.001	< 0.001	< 0.05	38.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.12	< 0.00002	1.3	< 0.005	9.61	0.035	0.0009	2.99	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	< 0.005	< 0.01
SP5-6	12-Jun-07	< 0.00025	0.083	< 0.001	0.022	< 0.001	< 0.001	< 0.05	90	0.0065		0.006	< 0.001	0.014	0.25	< 0.00002	3.3	0.021	70.4	0.35	< 0.0005	5.64	0.024	0.003	< 0.15	< 0.001	0.001	4.5	< 0.001	0.4	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	4.81	< 0.01
SP5-6	02-Oct-07	< 0.00025	0.39	< 0.001	0.021	< 0.001	< 0.001	< 0.05	122	0.003		0.013	< 0.001	0.007	0.13	< 0.00002	3.6	0.025	92.8	0.59	< 0.0005	6.74	0.03	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0059	< 0.001	2.69	< 0.01
W5	12-Jun-07	< 0.00025	0.23	0.002	0.033	< 0.001	< 0.001	< 0.05	132	0.0047		0.003	< 0.001	0.005	1.12	< 0.00002	4.2	0.029	158	0.12	< 0.0005	8.68	0.061	0.01	< 0.15	< 0.001	0.004	4.9	< 0.001	0.64	< 0.001	< 0.0005	0.008	0.0002	0.013	< 0.001	5.55	< 0.01
W5	01-Oct-07	< 0.00025	0.058	< 0.001	0.027	< 0.001	< 0.001	< 0.05	113	0.0007		< 0.001	< 0.001	0.002	0.08	< 0.00002	2.9	0.017	67.2	< 0.001	< 0.0005	5.86	0.015	< 0.001	< 0.15	< 0.001	0.002	4.6	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0055	< 0.001	0.74	< 0.01
W8	11-Jun-07	< 0.00025	0.13	< 0.001	0.022	< 0.001	< 0.001	< 0.05	8.72	< 0.0002		< 0.001	< 0.001	0.003	0.17	< 0.00002	0.5	< 0.005	1.23	0.005	< 0.0005	1.31	< 0.001	0.003	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.032	< 0.001	< 0.0005	0.004	< 0.0001	< 0.0005	< 0.001	0.014	< 0.01
W8	02-Oct-07	< 0.00025	0.021	< 0.001	0.04	< 0.001	< 0.001	< 0.05	16.1	< 0.0002		< 0.001	< 0.001	0.002	0.08	< 0.00002	0.7	0.001	2.18	0.01	< 0.0005	1.79	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.056	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.036	< 0.01
W10	11-Jun-07	< 0.00025	0.13	< 0.001	0.011	< 0.001	< 0.001	< 0.05	7.67	< 0.0002		< 0.001	< 0.001	0.003	0.14	< 0.00002	0.4	< 0.005	1.04	0.003	< 0.0005	1.3	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.028	< 0.001	< 0.0005	0.003	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
W10	02-Oct-07	< 0.00025	0.02	< 0.001	0.014	< 0.001	< 0.001	< 0.05	15.1	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.4	< 0.001	1.81	0.007	< 0.0005	1.77	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.049	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.023	< 0.01
WEIR3	20-Feb-07	< 0.00025	0.01	0.001	0.067	< 0.001	< 0.001	< 0.05	248	< 0.0002		0.003	0.003	0.002	1.85	< 0.00002	4.9	0.008	49	7.42	0.0011	31.7	0.011	< 0.001	< 0.15	< 0.001	< 0.001	7.7	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0068	< 0.001	0.008	< 0.01
WEIR3	17-Aug-07	< 0.00025	< 0.005	0.001	0.077	< 0.001	< 0.001	< 0.05	247	< 0.0002		0.004	< 0.001	< 0.001	2.02	< 0.00002	4.7	0.009	51.9	8.79	0.0014	33.4	0.012	< 0.001	< 0.15	< 0.001	< 0.001	6.2	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	0.0001	0.0089	< 0.001	< 0.005	< 0.01
X2	18-Apr-07	< 0.00025	0.021	< 0.001	0.075	< 0.001	< 0.001	< 0.05	48	< 0.0002		< 0.001	< 0.001	< 0.001	0.29	< 0.00002	1.7	0.01	12.2	0.16	0.0008	3.97	0.002	< 0.001	< 0.15	< 0.001	< 0.001	6.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	0.18	< 0.01
X2	14-May-07	< 0.00025	0.1	< 0.001	0.039	< 0.001	< 0.001	< 0.05	19.6	< 0.0002		< 0.001	0.001	0.003	0.5	< 0.00002	1.7	< 0.005	4.47	0.068	< 0.0005	1.74	0.002	0.002	< 0.15	< 0.001	< 0.001	4	< 0.001	0.087	< 0.001	< 0.0005	0.003	< 0.0001	0.0008	< 0.001	0.068	< 0.01
X2	18-Jun-07	< 0.00025	0.11	< 0.001	0.036	< 0.001	< 0.001	< 0.05	17.3	< 0.0002		< 0.001	< 0.001	0.002	0.28	< 0.00002	0.6	< 0.005	4.32	0.03	< 0.0005	1.63	0.001	0.002	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.065	< 0.001	< 0.0005	0.005	< 0.0001	0.0007	< 0.001	0.029	< 0.01
X2	16-Jul-07	< 0.00025	0.098	< 0.001	0.037	< 0.001	< 0.001	< 0.05	16.7	< 0.0002		< 0.001	< 0.001	0.001	0.25	< 0.00002	0.5	< 0.005	4.15	0.026	< 0.0005	1.64	< 0.001	0.004	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.075	< 0.001	< 0.0005	0.003	< 0.0001	0.0005	< 0.001	0.025	< 0.01
X2	13-Aug-07	< 0.00025	0.021	< 0.001	0.044	< 0.001	< 0.001	< 0.05	26.1	0.0002		< 0.001	< 0.001	0.001	0.19	< 0.00002	0.6	< 0.005	6.08	0.044	0.0007	2.13	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	0.0002	0.0012	< 0.001	0.031	< 0.01
X2	10-Sep-07	< 0.00025	0.015	< 0.001	0.046	< 0.001	< 0.001	< 0.05	21.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	0.5	0.002	4.88	0.034	< 0.0005	1.93	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.077	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.025	< 0.01
X2	22-Oct-07	< 0.00025	0.03	< 0.001	0.056	< 0.001	< 0.001	< 0.05	31.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.3	< 0.00002	0.8	0.004	7.55	0.11	0.0006	2.54	0.001	0.004	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.12	< 0.001	< 0.0005	0.001	< 0.0001	0.0013	< 0.001	0.063	< 0.01
X2	13-Nov-07	< 0.00025	0.039	< 0.001	0.057	< 0.001	< 0.001	< 0.05	36.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	0.9	0.005	8.75	0.098	0.0006	2.85	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.068	< 0.01
X2	09-Dec-07	< 0.00025	0.009	< 0.001	0.063	< 0.001	< 0.001	< 0.05	37.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.2	< 0.00002	0.9	0.005	8.71	0.1	0.0005	2.61	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.097	< 0.01
	average	0.00025	0.049	0.001	0.050	0.001	0.001	0.05	28.3	0.0002		0.001	0.001	0.0013	0.26	0.00002	0.9	0.005	6.79	0.074	0.0006	2.34	0.001	0.002	0.15	0.001	0.001	4.8	0.001	0.115	0.001	0.0005	0.002	0.0001	0.0012	0.001	0.065	0.01
	minimum	< 0.00025	0.009	< 0.001	0.036	< 0.001	< 0.001	< 0.05	16.7	0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	0.5	< 0.005	4.15	0.026	< 0.0005	1.63	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.065	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.025	< 0.01
	maximum	< 0.00025	0.11	< 0.001	0.075	< 0.001	< 0.001	< 0.05	48	0.0002		< 0.001	0.001	0.003	0.5	< 0.00002	1.7	0.01	12.2	0.16	0.0008	3.97	0.002	0.004	< 0.15	< 0.001	< 0.001	6.3	< 0.001	0.21	< 0.001	< 0.0005	0.005	0.0002	0.0026	< 0.001	0.18	< 0.01
	N > DL	0	9	0	9	0	0	0	9	1	0	0	1	4	9	0	9	5	9	9	5	9	6	4	0	0	0	9	0	9	0	0	4	1	9	0	9	0
	median	0.00025	0.03	0.001	0.046	0.001	0.001	0.05	26.1	0.0002		0.001	0.001	0.001	0.25	0.00002	0.8	0.005	6.08	0.068	0.0005	2.13	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.11	0.001	0.0005	0.001	0.0001	0.0012	0.001	0.063	0.01
X3	15-Jan-07	< 0.00025	0.008	< 0.001	0.075	< 0.001	< 0.001	< 0.05	48	< 0.0002		< 0.001	< 0.001	< 0.001	0.15	< 0.00002	1.2	0.008	11.8	0.11	0.0007	3.35	0.001	< 0.001	< 0.15	< 0.001	0.001	5.6	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.081	< 0.01
X3	13-Feb-07	< 0.00025	0.008	< 0.001	0.073	< 0.001	< 0.001	< 0.05	49.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	1.2	0.008	12	0.09	0.0007	3.54	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.19	< 0.001	< 0.0005	0.002	< 0.0001	0.0027	< 0.001	0.061	< 0.01
X3	11-Mar-07	< 0.00025	0.058	< 0.001	0.079	< 0.001	< 0.001	< 0.05	51.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	1.4	0.01	13	0.13	0.0007	3.74	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0029	< 0.001	0.071	< 0.01
X3	18-Apr-07	< 0.00025	0.013	< 0.001	0.076	< 0.001	< 0.001	< 0.05	47.9	< 0.0002		< 0.001	< 0.001	< 0.001	0.29	< 0.00002	1.6	0.007	10.8	0.15	0.0007	3.6	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	0.14	< 0.01
X3	14-May-07	< 0.00025	0.096	< 0.001	0.036	< 0.001	< 0.001	< 0.05	18.9	< 0.0002		< 0.001	< 0.001	0.002	0.51	< 0.00002	1.5	< 0.005	4.25	0.066	< 0.0005	1.58	0.001	0.002	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.091	< 0.001	< 0.0005	0.003	< 0.0001	0.0008	< 0.001	0.039	< 0.01
X3	18-Jun-07	< 0.00025	0.067	< 0.001	0.033	< 0.001	< 0.001	< 0.05	17	< 0.0002		< 0.001	< 0.001	0.001	0.24	< 0.00002	0.7	< 0.005	3.96	0.023	< 0.0005	1.61	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.072	< 0.001	< 0.0005	0.003	< 0.0001	0.0007	< 0.001	0.014	< 0.01
X3	16-Jul-07	< 0.00025	0.061	< 0.001	0.035	< 0.001	< 0.001	< 0.05	16.4	< 0.0002		< 0.001	< 0.001	0.001	0.22	< 0.00002	0.5	< 0.005	3.8	0.024	< 0.0005	1.63	< 0.001	0.002	< 0.15	< 0.001	< 0.001	4	< 0.001	0.08	< 0.001	< 0.0005	0.002	< 0.0001	0.0006	< 0.001	0.013	< 0.01
X3	13-Aug-07	< 0.00025	0.027	< 0.001	0.044	< 0.001	< 0.001	< 0.05	27.2	< 0.0002		< 0.001	< 0.001	0.001	0.24	< 0.00002	0.7	< 0.005	5.75	0.046	< 0.0005	2.12	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.11	< 0.001	< 0.0005	0.001	< 0.0001	0.0011	< 0.001	0.026	< 0.01
X3	10-Sep-07	< 0.00025	0.02	< 0.001	0.045	< 0.001	< 0.001	< 0.05	22.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.17	< 0.00002	0.6	0.002	4.89	0.031	< 0.0005	1.95	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.094	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.015	< 0.01
X3	22-Oct-07	< 0.00025	0.023	< 0.001	0.05	< 0.001	< 0.001	< 0.05	32.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.24	< 0.00002	0.9	0.003	7.09	0.084	< 0.0005	2.48	< 0.001	0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.021	< 0.01
X3	13-Nov-07	< 0.00025	0.033	< 0.001	0.053	< 0.001	< 0.001	< 0.05	36.9	< 0.0002		< 0.001	< 0.001	< 0.001	0.14	< 0.00002	1	0.004	7.99	0.076	< 0.0005	2.63	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.044	< 0.01
X3	09-Dec-07	< 0.00025	0.016	< 0.001	0.062	< 0.001	< 0.001	< 0.05	37.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.2	< 0.00002	1	0.004	8.04	0.084	< 0.0005	2.5	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.053	< 0.01
	average	0.00025	0.0358	0.001	0.055	0.001	0.001	0.05	33.8	0.0002		0.001	0.001	0.0011	0.22	0.00002	1.03	0.006	7.78	0.076	0.0006	2.6	0.0011	0.001	0.15	0.001	0.001	4.7	0.001	0.142	0.001	0.0005	0.0015	0.0001	0.0016	0.001	0.048	0.01
	minimum	< 0.00025	0.008	< 0.001	0.033	< 0.001	< 0.001	< 0.05	16.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	0.5	< 0.005	3.8	0.023	< 0.0005	1.58	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.072	< 0.001	< 0.0005	0.001	< 0.0001	0.0006	< 0.001	0.013	< 0.01
	maximum	< 0.00025	0.096	< 0.001	0.079	< 0.001	< 0.001	< 0.05	51.1	< 0.0002		< 0.001	< 0.001	0.002	0.51	< 0.00002	1.6	0.01	13	0.15	0.0007	3.74	0.002	0.002	< 0.15	< 0.001	0.001	5.6	< 0.001	0.22	< 0.001	< 0.0005	0.003	< 0.0001	0.0029	< 0.001	0.14	< 0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
	N > DL	0	12	0	12	0	0	0	12	0	0	0	0	4	12	0	12	8	12	12	4	12	5	3	0	0	1	12	0	12	0	0	5	0	12	0	12	0
	median	0.00025	0.025	0.001	0.0515	0.001	0.001	0.05	34.55	0.0002		0.001	0.001	0.001	0.21	0.00002	1	0.0055	7.54	0.08	0.0007	2.49	0.001	0.002	0.15	0.001	0.001	4.95	0.001	0.14	0.001	0.0005	0.002	0.0001	0.0014	0.001	0.0415	0.01
X4	16-Jan-07	< 0.00025	0.012	< 0.001	0.016	< 0.001	< 0.001	< 0.05	213	0.0057		0.043	< 0.001	0.002	17.7	< 0.00002	4.5	0.016	55.4	14.2	0.0009	14.7	0.055	0.002	< 0.15	< 0.001	0.002	5.4	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	0.0008	0.0009	< 0.001	13.9	< 0.01
X4	15-Feb-07	< 0.00025	0.007	< 0.001	0.018	< 0.001	< 0.001	< 0.05	213	0.0073		0.043	< 0.001	< 0.001	4.7	< 0.00002	4.4	0.016	60.6	14.2	0.0005	15.6	0.055	0.002	< 0.15	< 0.001	< 0.001	4	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	0.001	< 0.0005	< 0.001	14.6	< 0.01
X4	12-Mar-07	< 0.00025	0.005	< 0.001	0.014	< 0.001	< 0.001	< 0.05	211	0.0075		0.042	< 0.001	0.001	4.18	< 0.00002	4.6	0.016	59.1	13.3	0.0008	15.2	0.055	0.003	< 0.15	< 0.001	< 0.001	4	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	0.001	< 0.0005	< 0.001	14.7	< 0.01
X4	19-Apr-07	< 0.00025	0.007	< 0.001	0.011	< 0.001	< 0.001	< 0.05	208	0.0078		0.046	< 0.001	0.006	3.01	< 0.00002	4	0.015	57.5	14.3	0.001	14.1	0.059	0.002	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0009	< 0.0005	< 0.001	16.5	< 0.01
X4	15-May-07	< 0.00025	0.049	< 0.001	0.017	< 0.001	< 0.001	< 0.05	173	0.0094		0.045	< 0.001	0.011	7.68	< 0.00002	3.4	0.013	48.8	10.9	< 0.0005	11.6	0.052	0.032	< 0.15	< 0.001	0.001	3.5	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	0.001	< 0.0005	< 0.001	15.3	< 0.01
X4	19-Jun-07	< 0.00025	0.074	< 0.001	0.015	< 0.001	< 0.001	< 0.05	142	0.012		0.043	< 0.001	0.023	14.2	< 0.00002	2.8	0.012	46.3	11	0.0006	9.35	0.054	0.22	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0012	< 0.0005	< 0.001	17.1	< 0.01
X4	16-Jul-07	< 0.00025	0.13	< 0.001	0.016	< 0.001	< 0.001	< 0.05	164	0.014		0.05	< 0.001	0.034	13.8	< 0.00002	3.3	0.015	56.5	12.5	0.0007	11.3	0.064	0.29	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	0.0014	< 0.0005	< 0.001	19.5	< 0.01
X4	13-Aug-07	< 0.00025	0.13	< 0.001	0.013	< 0.001	< 0.001	< 0.05	180	0.011		0.054	< 0.001	0.032	10.8	< 0.00002	3.5	0.015	56	13.5	0.001	11.7	0.063	0.21	< 0.15	< 0.001	0.001	3.4	< 0.001	0.58	< 0.001	< 0.0005	< 0.001	0.0014	0.0005	< 0.001	18.6	< 0.01
X4	10-Sep-07	< 0.00025	0.17	< 0.001	0.019	< 0.001	< 0.001	< 0.05	163	0.011		0.046	< 0.001	0.031	9.11	< 0.00002	3.2	0.012	52.9	12.4	0.0012	10.9	0.057	0.17	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.61	< 0.001	< 0.0005	< 0.001	0.0013	0.0007	< 0.001	19.2	< 0.01
X4	23-Oct-07	< 0.00025	0.36	< 0.001	0.013	< 0.001	< 0.001	< 0.05	180	0.012		0.055	< 0.001	0.057	11.1	< 0.00002	3.6	0.016	65	14.3	0.0012	12.9	0.067	0.21	< 0.15	< 0.001	< 0.001	4	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	0.0013	0.0008	< 0.001	23.3	< 0.01
X4	14-Nov-07	< 0.00025	0.17	< 0.001	0.013	< 0.001	< 0.001	< 0.05	195	0.0075		0.044	< 0.001	0.026	13.4	< 0.00002	4	0.014	53.1	16.4	0.0014	13	0.051	0.087	< 0.15	< 0.001	0.001	5.1	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	0.0009	0.001	< 0.001	13.7	< 0.01
X4	10-Dec-07	< 0.00025	0.23	< 0.001	0.011	< 0.001	< 0.001	< 0.05	175	0.011		0.05	< 0.001	0.046	7.66	< 0.00002	3.5	0.012	53.1	14.7	0.0011	10.8	0.063	0.15	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	0.0011	0.0007	< 0.001	18.9	< 0.01
	average	0.00025	0.112	0.001	0.015	0.001	0.001	0.05	185	0.0097		0.047	0.001	0.023	9.78	0.00002	3.7	0.014	55.4	13.5	0.0009	12.6	0.058	0.115	0.15	0.001	0.0011	3.9	0.001	0.65	0.001	0.0005	0.001	0.0011	0.0006	0.001	17.1	0.01
	minimum	< 0.00025	0.005	< 0.001	0.011	< 0.001	< 0.001	< 0.05	142	0.0057		0.042	< 0.001	0.001	3.01	< 0.00002	2.8	0.012	46.3	10.9	0.0005	9.35	0.051	0.002	< 0.15	< 0.001	0.001	2.7	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0008	0.0005	< 0.001	13.7	< 0.01
	maximum	< 0.00025	0.36	< 0.001	0.019	< 0.001	< 0.001	< 0.05	213	0.014		0.055	< 0.001	0.057	17.7	< 0.00002	4.6	0.016	65	16.4	0.0014	15.6	0.067	0.29	< 0.15	< 0.001	0.002	5.4	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	0.0014	0.001	< 0.001	23.3	< 0.01
	N > DL	0	12	0	12	0	0	0	12	12	0	12	0	11	12	0	12	12	12	12	11	12	12	12	0	0	4	12	0	12	0	0	0	12	6	0	12	0
	median	0.00025	0.102	0.001	0.0145	0.001	0.001	0.05	180	0.0102		0.0455	0.001	0.0245	9.955	0.00002	3.55	0.015	55.7	13.85	0.00095	12.3	0.056	0.1185	0.15	0.001	0.001	3.95	0.001	0.665	0.001	0.0005	0.001	0.00105	0.0005	0.001	16.8	0.01
X5	10-Apr-07	< 0.00025	< 0.005	0.001	0.02	< 0.001	< 0.001	< 0.05	343	< 0.0002		0.025	< 0.001	0.001	0.38	< 0.00002	5.7	0.017	69.6	26.5	0.0029	32.9	0.051	< 0.001	< 0.15	< 0.001	0.002	7.7	< 0.001	0.87	< 0.001	< 0.0005	< 0.001	0.0001	0.0053	< 0.001	0.34	< 0.01
X5	14-May-07	< 0.00025	0.008	< 0.001	0.05	< 0.001	< 0.001	< 0.05	90.6	< 0.0002		< 0.001	< 0.001	0.001	0.2	< 0.00002	1.6	< 0.005	9.55	0.86	< 0.0005	5.48	0.002	0.002	< 0.15	< 0.001	< 0.001	1.4	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	0.0002	0.0006	< 0.001	0.018	< 0.01
X5	22-May-07	< 0.00025	0.006	< 0.001	0.019	< 0.001	< 0.001	< 0.05	202	< 0.0002		0.005	< 0.001	< 0.001	0.14	< 0.00002	4.5	0.018	31	4.69	0.001	16.9	0.01	< 0.001	< 0.15	< 0.001	0.001	2.6	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	0.0002	0.0013	< 0.001	0.14	< 0.01
X5	29-May-07	< 0.00025	0.015	< 0.001	0.019	< 0.001	< 0.001	< 0.05	184	< 0.0002		0.004	< 0.001	0.001	0.12	< 0.00002	4	0.015	29.7	3.85	0.001	16.6	0.009	< 0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.55	< 0.001	< 0.0005	< 0.001	0.0002	0.0017	< 0.001	0.15	< 0.01
X5	05-Jun-07	< 0.00025	0.01	< 0.001	0.02	< 0.001	< 0.001	< 0.05	201	< 0.0002	< 0.005	0.005	< 0.001	0.001	0.14	< 0.00002	4.5	0.018	31.5	4.62	0.0009	17.7	0.011	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	0.0002	0.0019	< 0.001	0.15	< 0.01
X5	12-Jun-07	< 0.00025	0.039	< 0.001	0.023	< 0.001	< 0.001	< 0.05	234	0.0003	< 0.005	0.006	< 0.001	0.002	0.18	< 0.00002	5.2	0.023	36.9	5.39	0.0015	23.9	0.015	0.002	< 0.15	< 0.001	0.001	3.5	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0004	0.0023	< 0.001	0.16	< 0.01
X5	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.001	< 0.001	< 0.05	212	< 0.0002	< 0.005	0.005	< 0.001	< 0.001	0.2	< 0.00002	4.7	0.019	31.3	4.76	0.0009	18.4	0.01	< 0.001	< 0.15	< 0.001	0.001	2.7	< 0.001	0.61	< 0.001	< 0.0005	< 0.001	0.0003	0.0017	< 0.001	0.12	< 0.01
X5	19-Jun-07	< 0.00025	0.005	< 0.001	0.018	< 0.001	< 0.001	< 0.05	217	< 0.0002	< 0.005	0.006	< 0.001	0.001	0.2	< 0.00002	4.9	0.019	33.4	5.44	0.001	19.5	0.013	< 0.001	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	0.0003	0.0019	< 0.001	0.13	< 0.01
X5	26-Jun-07	< 0.00025	0.011	< 0.001	0.018	< 0.001	< 0.001	< 0.05	221	< 0.0002	0.0052	0.005	< 0.001	< 0.001	0.37	< 0.00002	5.2	0.022	32.8	4.76	0.0011	18.2	0.011	< 0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	0.0002	0.0017	< 0.001	0.11	< 0.01
X5	03-Jul-07	< 0.00025	0.009	< 0.001	0.019	< 0.001	< 0.001	< 0.05	207	< 0.0002	< 0.005	0.005	< 0.001	0.001	0.13	< 0.00002	5.2	0.023	31.8	4.35	0.0011	18.1	0.011	< 0.001	< 0.15	< 0.001	0.001	2.5	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	0.0003	0.0016	< 0.001	0.1	< 0.01
X5	10-Jul-07	< 0.00025	0.006	< 0.001	0.018	< 0.001	< 0.001	< 0.05	214	< 0.0002	< 0.005	0.006	< 0.001	< 0.001	0.13	< 0.00002	5.2	0.024	31.5	4.69	0.001	18.3	0.012	< 0.001	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	0.0003	0.0017	< 0.001	0.092	< 0.01
X5	16-Jul-07	< 0.00025	0.007	< 0.001	0.018	< 0.001	< 0.001	< 0.05	221	< 0.0002	0.0071	0.005	< 0.001	< 0.001	0.22	< 0.00002	6.3	0.032	38.8	4.24	0.0012	22.1	0.012	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0003	0.0015	0.001	0.11	< 0.01
X5	17-Jul-07	< 0.00025	0.009	< 0.001	0.018	< 0.001	< 0.001	< 0.05	215	< 0.0002	0.006	0.005	< 0.001	< 0.001	0.25	< 0.00002	5.9	0.029	35.5	4.43	0.0013	19.8	0.011	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	0.0003	0.0015	0.001	0.086	< 0.01
X5	24-Jul-07	< 0.00025	0.005	< 0.001	0.017	< 0.001	< 0.001	< 0.05	239	< 0.0002	< 0.005	0.006	< 0.001	< 0.001	0.22	< 0.00002	7	0.035	38.6	4.83	0.0013	21.8	0.013	0.002	< 0.15	< 0.001	0.002	2.8	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0003	0.0014	0.001	0.091	< 0.01
X5	31-Jul-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.001	< 0.001	< 0.05	213	< 0.0002	< 0.005	0.005	< 0.001	< 0.001	0.17	< 0.00002	6.7	0.034	38.1	4.19	0.0013	20.6	0.011	< 0.001	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.71	< 0.001	< 0.0005	< 0.001	0.0004	0.0015	0.001	0.071	< 0.01
X5	07-Aug-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.001	< 0.001	< 0.05	211	< 0.0002	< 0.005	0.007	< 0.001	0.001	0.21	< 0.00002	6	0.03	38.6	5.4	0.0015	20.2	0.015	< 0.001	< 0.15	< 0.001	0.001	3.2	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	0.0004	0.0018	0.001	0.095	< 0.01
X5	13-Aug-07	< 0.00025	0.008	< 0.001	0.016	< 0.001	< 0.001	< 0.05	223	< 0.0002	0.0058	0.006	< 0.001	0.001	0.3	< 0.00002	7	0.036	41.7	5.05	0.0013	21.6	0.013	< 0.001	< 0.15	< 0.001	< 0.001	2.6	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	0.0003	0.0015	0.002	0.098	< 0.01
X5	14-Aug-07	< 0.00025	0.016	< 0.001	0.018	< 0.001	< 0.001	< 0.05	225	< 0.0002	0.0084	0.009	< 0.001	0.001	0.26	< 0.00002	6.4	0.031	45	6.73	0.0016	22.6	0.017	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	0.0003	0.002	0.001	0.12	< 0.01
X5	21-Aug-07	< 0.00025	0.013	< 0.001	0.02	< 0.001	< 0.001	< 0.05	191	0.0002	< 0.005	0.007	< 0.001	0.001	0.27	< 0.00002	5.8	0.032	38.7	5.83	0.0014	20.8	0.013	< 0.001	< 0.15	< 0.001	< 0.001	2.4	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	0.0004	0.0021	0.001	0.1	< 0.01
X5	28-Aug-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.001	< 0.001	< 0.05	215	< 0.0002	< 0.005	0.007	< 0.001	0.003	0.23	< 0.00002	6.4	0.032	42.7	6.22	0.0015	21	0.016	0.001	< 0.15	< 0.001	0.001	2.8	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0003	0.0019	0.001	0.11	< 0.01
X5	04-Sep-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.001	< 0.001	< 0.05	210	< 0.0002	< 0.005	0.007	< 0.001	0.001	0.29	< 0.00002	6.5	< 1	44	6.39	0.0019	20.9	0.016	0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	0.0003	0.0017	0.002	0.13	< 0.01
X5	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.001	< 0.001	< 0.05	221	< 0.0002	0.0059	0.009	< 0.001	0.001	0.32	< 0.00002	6.6	0.032	49	7.75	0.0015	22.6	0.019	0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	0.0003	0.002	0.002	0.17	< 0.01
X5	11-Sep-07	< 0.00025	0.015	< 0.001	0.016	< 0.001	< 0.001	< 0.05	227	< 0.0002	0.0063	0.008	< 0.001	0.001	0.39	< 0.00002	7.3	0.033	52.8	7.27	0.0017	23.9	0.017	0.001	< 0.15	< 0.001	0.001	3.2	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	0.0003	0.0016	0.002	0.16	< 0.01
X5	17-Sep-07	< 0.00025	< 0.005	< 0.001	0.019	< 0.001	< 0.001	< 0.05	223	< 0.0002	< 0.005	0.01	< 0.001	0.001	0.36	< 0.00002	6.3	0.029	50.2	9.46	0.0016	23.4	0.023	0.002	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0003	0.0026	0.001	0.17	< 0.01
X5	23-Oct-07	< 0.00025	0.033	< 0.001	0.023	< 0.001	< 0.001	< 0.05	282	< 0.0002	0.0069	0.017	< 0.001	0.002	0.56	< 0.00002	6.2	0.024	65.3	15.4	0.0022	30.1	0.038	0.003	< 0.15	< 0.001	0.001	5.3	< 0.001	0.85	< 0.001	< 0.0005	< 0.001	0.0002	0.0036	< 0.001	0.22	< 0.01
X5	29-Oct-07	0.0007	0.017	< 0.001	0.021	< 0.001	< 0.001	< 0.05	257	< 0.0002	< 0.005	0.016	< 0.001	0.002	0.62	< 0.00002	5.9	0.022	62.1	15.4	0.0023	28.5	0.037	0.003	< 0.15	< 0.001	0.001	5.1	< 0.001	0.77	< 0.001	< 0.0005	< 0.001	0.0001	0.003	< 0.001	0.2	< 0.01
	average	0.00027	0.010	0.001	0.020	0.001	0.001	0.05	219	0.000204	0.00553	0.0076	0.001	0.001	0.26	0.00002	5.7	0.063	40.4	6.87	0.0014	21.0	0.016	0.001	0.15	0.001	0.001	3.2	0.001	0.68	0.001	0.0005	0.001	0.0003	0.0020	0.001	0.132	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.016	< 0.001	< 0.001	< 0.05	90.6	< 0.0002	0.0052	0.004	< 0.001	< 0.001	0.12	< 0.00002	1.6	< 1	9.55	0.86	0.0009	5.48	0.002	< 0.001	< 0.15	< 0.001	< 0.001	1.4	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	0.0001	0.0006	< 0.001	0.018	< 0.01
	maximum	0.0007	0.039	0.001	0.05	< 0.001	< 0.001	< 0.05	343	0.0003	0.0084	0.025	< 0.001	0.003	0.62	< 0.00002	7.3	0.036	69.6	26.5	0.0029	32.9	0.051	0.003	< 0.15	< 0.001	0.002	7.7	< 0.001	0.87	< 0.001	< 0.0005	< 0.001	0.0004	0.0053	0.002	0.34	< 0.01
	N > DL	1	18	1	26	0	0	0	26	2	8	25	0	18	26	0	26	24	26	26	25	26	26	10	0	0	14	26	0	26	0	0	0	26	26	13	26	0
	median	0.00025	0.0075	0.001	0.018	0.001	0.001	0.05	216	0.0002	0.005	0.006	0.001	0.001	0.225	0.00002	5.9	0.0265	38.6	5.22	0.0013	20.85	0.013	0.001	0.15	0.001	0.001	2.9	0.001	0.69	0.001	0.0005	0.001	0.0003	0.0017	0.001	0.12	0.01
X5P	16-Jan-07	< 0.00025	0.007	< 0.001	0.033	< 0.001	< 0.001	< 0.05	277	0.0003	< 0.005	0.012	< 0.001	0.003	0.47	< 0.00002	6.6	0.019	61.7	11.7	0.0018	30.6	0.027	0.002	< 0.15	< 0.001	0.001	6.9	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	0.0001	0.0053	< 0.001	0.39	< 0.01
X5P	15-Feb-07	< 0.00025	< 0.005	< 0.001	0.038	< 0.001	< 0.001	< 0.05	284	0.0003	< 0.005	0.01	< 0.001	0.002	0.4	< 0.00002	6.4	0.017	58.5	10.3	0.0016	29.7	0.022	0.001	< 0.15	< 0.001	< 0.001	7.3	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	0.0001	0.0057	< 0.001	0.3	< 0.01
X5P	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.036	< 0.001	< 0.001	< 0.05	269	0.0003	< 0.005	0.01	< 0.001	0.002	0.26	< 0.00002	6.4	0.017	55.8	9.77	0.0017	29.9	0.023	0.002	< 0.15	< 0.001	< 0.001	6.5	< 0.001	0.76	< 0.001	< 0.0005	< 0.001	0.0002	0.0057	< 0.001	0.29	< 0.01
X5P	19-Apr-07	< 0.00025	0.008	< 0.001	0.048	< 0.001	< 0.001	< 0.05	248	0.0004	< 0.005	0.007	< 0.001	0.003	0.12	< 0.00002	5.9	0.013	51.1	8.88	0.0021	24.5	0.019	0.003	< 0.15	< 0.001	0.001	7.3	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0059	< 0.001	0.24	< 0.01
X5P	15-May-07	< 0.00025	0.009	< 0.001	0.025	< 0.001	< 0.001	< 0.05	177	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.38	< 0.00002	2.8	0.01	19.9	0.66	< 0.0005	10	0.002	0.003	< 0.15	< 0.001	0.001	1.6	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0004	0.0006	< 0.001	0.032	< 0.01
X5P	14-Nov-07	< 0.00025	0.038	< 0.001	0.029	< 0.001	< 0.001	< 0.05	278	< 0.0002	< 0.005	0.013	< 0.001	0.002	0.29	< 0.00002	6.2	0.022	61	13.9	0.0025	27.3	0.03	0.003	< 0.15	< 0.001	0.001	5.7	< 0.001	0.8	< 0.001	< 0.0005	< 0.001	0.0002	0.0033	< 0.001	0.19	< 0.01
X5P	10-Dec-07	< 0.00025	0.015	< 0.001	0.028	< 0.001	< 0.001	< 0.05	257	< 0.0002	< 0.005	0.015	< 0.001	0.002	0.39	< 0.00002	6.1	0.02	55.7	14.3	0.0023	25.4	0.034	0.003	< 0.15	< 0.001	0.001	5.7	< 0.001	0.82	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0041	< 0.001	0.21	< 0.01
	average	0.00025	0.012	0.001	0.034	0.001	0.001	0.05	256	0.0003	0.005	0.0097	0.001	0.002	0.33	0.00002	5.8	0.017	52.0	9.93	0.0018	25.3	0.022	0.002	0.15	0.001	0.001	5.9	0.001	0.74	0.001	0.0005	0.001	0.0002	0.0044	0.001	0.236	0.01
	minimum	< 0.00025	0.007	< 0.001	0.025	< 0.001	< 0.001	< 0.05	177	0.0003	< 0.005	0.007	< 0.001	0.001	0.12	< 0.00002	2.8	0.01	19.9	0.66	< 0.0005	10	0.002	0.001	< 0.15	< 0.001	< 0.001	1.6	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.032	< 0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
	maximum	< 0.00025	0.038	< 0.001	0.048	< 0.001	< 0.001	< 0.05	284	0.0004	< 0.005	0.015	< 0.001	0.003	0.47	< 0.00002	6.6	0.022	61.7	14.3	0.0025	30.6	0.034	0.003	< 0.15	< 0.001	0.001	7.3	< 0.001	0.82	< 0.001	< 0.0005	< 0.001	0.0004	0.0059	< 0.001	0.39	< 0.01
	N > DL	0	5	0	7	0	0	0	7	4	0	6	0	7	7	0	7	7	7	7	6	7	7	7	2	0	5	7	0	7	0	2	0	5	7	0	7	0
	median	0.00025	0.008	0.001	0.033	0.001	0.001	0.05	269	0.0003	0.005	0.01	0.001	0.002	0.38	0.00002	6.2	0.017	55.8	10.3	0.0018	27.3	0.023	0.003	0.15	0.001	0.001	6.5	0.001	0.78	0.001	0.0005	0.001	0.0001	0.0053	0.001	0.24	0.01
X7	11-Jun-07	0.0006	0.75	0.01	0.031	< 0.001	< 0.001	< 0.05	368	0.0081		0.47	< 0.001	0.004	982	< 0.00002	9	0.092	645	69	0.0054	58.1	0.61	0.031	< 0.15	< 0.001	0.004	13	< 0.001	3.59	< 0.001	< 0.0005	0.006	0.0002	0.0033	0.001	335	< 0.01
X7	02-Oct-07	0.0008	0.87	0.01	0.012	< 0.001	< 0.001	< 0.05	381	0.011		0.64	< 0.001	0.005	1350	< 0.00002	10.4	0.11	584	70.1	0.0068	64.1	0.77	0.017	< 0.15	< 0.001	0.005	16.8	< 0.001	3.79	< 0.001	< 0.0005	0.001	0.0001	0.0036	0.001	398	< 0.01
X10	16-Jan-07	< 0.00025	0.019	< 0.001	0.074	< 0.001	< 0.001	< 0.05	48.8	< 0.0002		< 0.001	< 0.001	0.001	0.13	< 0.00002	1.2	0.007	12	0.037	0.0006	3.17	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.21	< 0.001	< 0.0005	0.001	< 0.0001	0.0022	< 0.001	0.071	< 0.01
X10	15-Feb-07	< 0.00025	< 0.005	< 0.001	0.073	< 0.001	< 0.001	< 0.05	50.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	1.2	0.006	12.2	0.011	0.0008	2.96	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	0.036	< 0.01
X10	12-Mar-07	< 0.00025	0.007	< 0.001	0.08	< 0.001	< 0.001	< 0.05	50.4	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	1.3	0.006	12.7	0.009	0.0008	2.99	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.03	< 0.01
X10	19-Apr-07	< 0.00025	0.006	< 0.001	0.076	< 0.001	< 0.001	< 0.05	49.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.18	< 0.00002	1.5	0.006	11.3	0.043	0.0007	3.3	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.083	< 0.01
X10	15-May-07	< 0.00025	0.15	< 0.001	0.037	< 0.001	< 0.001	< 0.05	18.7	< 0.0002		< 0.001	< 0.001	0.002	0.67	< 0.00002	1.4	< 0.005	4.36	0.088	< 0.0005	1.4	0.002	0.003	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.085	< 0.001	< 0.0005	0.005	< 0.0001	0.0008	< 0.001	0.04	< 0.01
X10	19-Jun-07	< 0.00025	0.043	< 0.001	0.035	< 0.001	< 0.001	< 0.05	19.5	< 0.0002		< 0.001	< 0.001	0.001	0.2	< 0.00002	0.7	< 0.005	5.05	0.019	< 0.0005	1.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.078	< 0.001	< 0.0005	0.001	< 0.0001	0.0008	< 0.001	0.016	< 0.01
X10	16-Jul-07	< 0.00025	0.083	< 0.001	0.041	< 0.001	< 0.001	< 0.05	19.3	< 0.0002		< 0.001	< 0.001	0.001	0.28	< 0.00002	0.6	< 0.005	5.03	0.027	< 0.0005	1.8	< 0.001	0.003	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.083	< 0.001	< 0.0005	0.004	< 0.0001	0.0006	< 0.001	0.018	< 0.01
X10	13-Aug-07	< 0.00025	0.011	< 0.001	0.049	< 0.001	< 0.001	< 0.05	31.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.29	< 0.00002	0.8	< 0.005	7.5	0.038	< 0.0005	2.22	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.023	< 0.01
X10	10-Sep-07	< 0.00025	0.008	< 0.001	0.048	< 0.001	< 0.001	< 0.05	25.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.24	< 0.00002	0.6	0.002	5.98	0.031	< 0.0005	1.94	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.097	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.024	< 0.01
X10	23-Oct-07	< 0.00025	0.009	< 0.001	0.055	< 0.001	< 0.001	< 0.05	34.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.3	< 0.00002	0.9	0.003	8.54	0.065	< 0.0005	2.48	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.036	< 0.01
X10	14-Nov-07	< 0.00025	0.03	< 0.001	0.057	< 0.001	< 0.001	< 0.05	35.8	< 0.0002		< 0.001	< 0.001	< 0.001	0.16	< 0.00002	0.9	0.004	8.65	0.057	< 0.0005	2.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.055	< 0.01
X10	10-Dec-07	< 0.00025	0.013	< 0.001	0.061	< 0.001	< 0.001	< 0.05	39.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.19	< 0.00002	1	0.004	8.79	0.054	< 0.0005	2.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.065	< 0.01
	average	0.00025	0.032	0.001	0.057	0.001	0.001	0.05	35.2	0.0002		0.001	0.001	0.0011	0.233	0.00002	1.01	0.005	8.51	0.040	0.0006	2.39	0.001	0.0013	0.15	0.001	0.001	4.5	0.001	0.142	0.001	0.0005	0.002	0.0001	0.0015	0.001	0.041	0.01
	minimum	< 0.00025	0.006	< 0.001	0.035	< 0.001	< 0.001	< 0.05	18.7	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.6	0.002	4.36	0.009	0.0006	1.4	0.001	0.003	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.078	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.016	< 0.01
	maximum	< 0.00025	0.15	< 0.001	0.08	< 0.001	< 0.001	< 0.05	50.4	< 0.0002		< 0.001	< 0.001	0.002	0.67	< 0.00002	1.5	0.007	12.7	0.088	0.0008	3.3	0.002	0.003	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.21	< 0.001	< 0.0005	0.005	< 0.0001	0.0024	< 0.001	0.083	< 0.01
	N > DL	0	11	0	12	0	0	0	12	0	0	0	0	4	11	0	12	8	12	12	4	12	3	2	0	0	0	12	0	12	0	0	4	0	12	0	12	0
	median	0.00025	0.012	0.001	0.056	0.001	0.001	0.05	35.1	0.0002		0.001	0.001	0.001	0.195	0.00002	0.95	0.005	8.595	0.0375	0.0005	2.425	0.001	0.001	0.15	0.001	0.001	4.75	0.001	0.145	0.001	0.0005	0.001	0.0001	0.0014	0.001	0.036	0.01
X11	20-Feb-07	< 0.00025	< 0.005	0.003	0.045	< 0.001	< 0.001	< 0.05	364	< 0.0002	< 0.005	0.015	< 0.001	0.001	2.49	< 0.00002	6	0.013	70.3	16.9	0.0012	34.2	0.02	< 0.001	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.88	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0042	< 0.001	0.007	< 0.01
X11	17-Aug-07	< 0.00025	< 0.005	0.002	0.049	< 0.001	< 0.001	< 0.05	303	< 0.0002		0.014	< 0.001	0.002	2.03	< 0.00002	5.9	0.015	68.9	15.1	0.0013	34.1	0.016	< 0.001	< 0.15	< 0.001	0.002	6.2	< 0.001	0.96	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0048	< 0.001	0.008	< 0.01
X12	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.045	< 0.001	< 0.001	< 0.05	160	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	5	0.007	37.2	0.007	< 0.0005	17.9	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.57	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
X13	16-Jan-07	< 0.00025	< 0.005	0.003	0.057	< 0.001	< 0.001	< 0.05	320	< 0.0002	< 0.005	0.012	< 0.001	0.001	2.91	< 0.00002	5.7	0.013	67.8	14.5	0.0015	35.3	0.019	< 0.001	< 0.15	< 0.001	0.001	7.7	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0047	< 0.001	0.007	< 0.01
X13	15-Feb-07	< 0.00025	0.005	0.002	0.065	< 0.001	< 0.001	< 0.05	298	< 0.0002	< 0.005	0.007	< 0.001	0.001	2.15	< 0.00002	5.1	0.01	57	11	0.0015	32.8	0.014	< 0.001	< 0.15	< 0.001	< 0.001	7.5	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0054	< 0.001	< 0.005	< 0.01
X13	12-Mar-07	< 0.00025	< 0.005	0.001	0.08	< 0.001	< 0.001	< 0.05	230	< 0.0002	< 0.005	0.003	< 0.001	0.001	1.12	< 0.00002	4.5	0.009	46	7.71	0.0019	28.7	0.013	< 0.001	< 0.15	< 0.001	< 0.001	6.5	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.006	< 0.001	< 0.005	< 0.01
X13	19-Apr-07	< 0.00025	< 0.005	0.002	0.072	< 0.001	< 0.001	< 0.05	269	< 0.0002	< 0.005	0.004	< 0.001	0.001	2.95	< 0.00002	4.6	0.008	48.6	11.5	0.0016	29.3	0.016	< 0.001	< 0.15	< 0.001	0.001	7.4	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	< 0.005	< 0.01
X13	15-May-07	< 0.00025	0.006	0.002	0.073	< 0.001	< 0.001	< 0.05	298	< 0.0002	< 0.005	0.008	< 0.001	0.002	2.6	< 0.00002	5.4	0.012	63.4	12.8	0.0014	34.2	0.017	< 0.001	< 0.15	< 0.001	0.002	8.1	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0062	< 0.001	0.008	< 0.01
X13	19-Jun-07	< 0.00025	< 0.005	0.001	0.067	< 0.001	< 0.001	< 0.05	271	< 0.0002	< 0.005	0.006	< 0.001	0.001	1.41	< 0.00002	4.9	0.01	55.6	10.7	0.0019	32.8	0.016	< 0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	0.01	< 0.01
X13	16-Jul-07	< 0.00025	0.01	0.002	0.069	< 0.001	< 0.001	< 0.05	231	0.0002	< 0.005	0.007	< 0.001	0.001	1.98	< 0.00002	5.1	0.012	58.8	10.9	0.002	33	0.017	< 0.001	< 0.15	< 0.001	< 0.001	7.6	< 0.001	0.81	< 0.001	< 0.0005	< 0.001	0.0001	0.0056	< 0.001	0.015	< 0.01
X13	13-Aug-07	< 0.00025	< 0.005	0.002	0.062	< 0.001	< 0.001	< 0.05	305	< 0.0002	< 0.005	0.009	< 0.001	0.001	1.97	< 0.00002	5.3	0.012	59.3	12.8	0.0021	32.7	0.016	< 0.001	< 0.15	< 0.001	0.001	6.4	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	0.007	< 0.01
X13	10-Sep-07	< 0.00025	0.024	0.002	0.065	< 0.001	< 0.001	< 0.05	253	< 0.0002	< 0.005	0.007	< 0.001	0.001	2.23	< 0.00002	5.2	0.011	58.4	12	0.0021	32.2	0.016	< 0.001	< 0.15	< 0.001	< 0.001	6.7	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	< 0.0001	0.006	< 0.001	0.008	< 0.01
X13	23-Oct-07	< 0.00025	0.006	0.002	0.062	< 0.001	< 0.001	< 0.05	328	< 0.0002	< 0.005	0.01	< 0.001	0.001	2.86	< 0.00002	5.6	0.013	72	14.1	0.0021	36.7	0.018	< 0.001	< 0.15	< 0.001	0.002	7.2	< 0.001	0.87	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	0.007	< 0.01
X13	14-Nov-07	< 0.00025	0.028	0.002	0.065	< 0.001	< 0.001	< 0.05	307	< 0.0002	< 0.005	0.008	< 0.001	< 0.001	2.13	< 0.00002	5.5	0.011	64.8	12.4	0.0024	33.9	0.016	< 0.001	< 0.15	< 0.001	0.002	8	< 0.001	0.81	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0053	< 0.001	0.007	< 0.01
X13	10-Dec-07	< 0.00025	0.005	0.002	0.063	< 0.001	< 0.001	< 0.05	277	< 0.0002	< 0.005	0.007	< 0.001	0.001	2.19	< 0.00002	4.8	0.008	52.1	11.9	0.0021	27.4	0.017	< 0.001	< 0.15	< 0.001	< 0.001	6.9	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0061	< 0.001	0.01	< 0.01
	average	0.00025	0.009	0.002	0.067	0.001	0.001	0.05	282	0.0002	0.005	0.007	0.001	0.001	2.21	0.00002	5.1	0.011	58.7	11.9	0.0019	32.4	0.016	0.001	0.15	0.001	0.0013	7.2	0.001	0.76	0.001	0.0005	0.001	0.0001	0.0056	0.001	0.008	0.01
	minimum	< 0.00025	< 0.005	0.001	0.057	< 0.001	< 0.001	< 0.05	230	< 0.0002	< 0.005	0.003	< 0.001	< 0.001	1.12	< 0.00002	4.5	0.008	46	7.71	0.0014	27.4	0.013	< 0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0047	< 0.001	<0.005	< 0.01
	maximum	< 0.00025	0.028	0.003	0.08	< 0.001	< 0.001	< 0.05	328	0.0002	< 0.005	0.012	< 0.001	0.002	2.95	< 0.00002	5.7	0.013	72	14.5	0.0024	36.7	0.019	< 0.001	< 0.15	< 0.001	0.002	8.1	< 0.001	0.87	< 0.001	< 0.0005	< 0.001	0.0001	0.0062	< 0.001	0.015	< 0.01
	N > DL	0	7	12	12	0	0	0	12	1	0	12	0	11	12	0	12	12	12	12	12	12	12	0	0	0	6	12	0	12	0	0	0	1	12	0	9	0
	median	0.00025	0.005	0.002	0.065	0.001	0.001	0.05	287.5	0.0002	0.005	0.007	0.001	0.001	2.17	0.00002	5.15	0.011	58.6	11.95	0.00195	32.8	0.016	0.001	0.15	0.001	0.001	7.3	0.001	0.765	0.001	0.0005	0.001	0.0001	0.0056	0.001	0.007	0.01
X14	16-Jan-07	< 0.00025	0.021	< 0.001	0.074	< 0.001	< 0.001	< 0.05	103	< 0.0002	0.0056	0.002	< 0.001	0.001	0.41	< 0.00002	2.1	0.008	23.4	2.38	0.0008	9.85	0.005	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.34	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.053	< 0.01
X14	15-Feb-07	0.0023	0.006	< 0.001	0.07	< 0.001	< 0.001	< 0.05	121	< 0.0002	< 0.005	0.002	< 0.001	0.001	0.36	< 0.00002	2.4	0.008	26	2.8	0.0008	11.7	0.005	< 0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	0.37	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0033	< 0.001	0.031	< 0.01
X14	12-Mar-07	< 0.00025	0.046	< 0.001	0.076	< 0.001	< 0.001	< 0.05	162	< 0.0002	< 0.005	0.003	< 0.001	0.001	0.73	< 0.00002	3.3	0.01	34.7	4.45	0.001	16.9	0.007	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.49	< 0.001	< 0.0005	0.002	< 0.0001	0.0039	< 0.001	0.024	< 0.01
X14	10-Apr-07	< 0.00025	0.58	0.002	0.052	< 0.001	< 0.001	< 0.05	243	< 0.0002		0.015	< 0.001	0.003	1.59	< 0.00002	4.5	0.014	49.8	16	0.002	22.9	0.03	0.008	< 0.15	< 0.001	0.001	7.3	< 0.001	0.63	< 0.001	< 0.0005	0.034	< 0.0001	0.0045	0.001	0.22	< 0.01
X14	19-Apr-07	< 0.00025	0.019	< 0.001	0.075	< 0.001	< 0.001	< 0.05	108	< 0.0002	< 0.005	0.001	< 0.001	< 0.001	0.37	< 0.00002	2.5	0.008	22.6	2.44	0.0009	9.69	0.005	< 0.001	< 0.15	< 0.001	< 0.001	5.8	< 0.001	0.35	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0031	< 0.001	0.07	< 0.01
X14	14-May-07	< 0.00025	0.14	< 0.001	0.039	< 0.001	< 0.001	< 0.05	27.9	< 0.0002		< 0.001	0.001	0.003	0.68	< 0.00002	1.6	< 0.005	6.65	0.38	< 0.0005	2.43	0.002	0.003	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.11	< 0.001	< 0.0005	0.005	< 0.0001	0.001	< 0.001	0.043	< 0.01
X14	15-May-07	< 0.00025	0.21	< 0.001	0.041	< 0.001	< 0.001	< 0.05	28.3	< 0.0002	0.0104	< 0.001	< 0.001	0.003	0.91	< 0.00002	1.6	< 0.005	6.52	0.42	0.0005	2.44	0.003	0.004	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.11	< 0.001	< 0.0005	0.008	< 0.0001	0.0009	< 0.001	0.045	< 0.01
X14	22-May-07	< 0.00025	0.4	< 0.001	0.034	< 0.001	< 0.001	< 0.05	26.4	< 0.0002		< 0.001	< 0.001	0.003	0.97	< 0.00002	1.6	< 0.005	5.29	0.45	< 0.0005	2.21	0.003	0.007	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.086	< 0.001	< 0.0005	0.013	< 0.0001	0.0005	0.001	0.034	< 0.01
X14	29-May-07	< 0.00025	0.39	< 0.001	0.032	< 0.001	< 0.001	< 0.05	24.5	< 0.0002		< 0.001	< 0.001	0.003	0.76	< 0.00002	1.4	< 0.005	5.59	0.47	< 0.0005	2.56	0.003	0.004	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.079	< 0.001	< 0.0005	0.012	< 0.0001	0.0007	< 0.001	0.016	< 0.01
X14	05-Jun-07	< 0.00025	0.53	< 0.001	0.027	< 0.001	< 0.001	< 0.05	16.1	< 0.0002	0.0061	< 0.001	< 0.001	0.002	0.93	< 0.00002	0.9	< 0.005	3.24	0.24	< 0.0005	1.64	0.002	0.003	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.055	< 0.001	< 0.0005	0.019	< 0.0001	0.0006	0.001	0.014	< 0.01
X14	12-Jun-07	< 0.00025	0.36	< 0.001	0.035	< 0.001	< 0.001	< 0.05	22.1	< 0.0002	0.0155	< 0.001	< 0.001	0.002	0.64	< 0.00002	0.9	< 0.005	4.78	0.25	< 0.0005	2.21	0.002	0.004	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.08	< 0.001	< 0.0005	0.014	< 0.0001	0.0006	< 0.001	0.016	< 0.01
X14	18-Jun-07	< 0.00025	0.055	< 0.001	0.028	< 0.001	< 0.001	< 0.05	29.2	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.21	< 0.00002	0.8	< 0.005	6.22	0.4	< 0.0005	2.66	0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.096	< 0.001	< 0.0005	0.001	< 0.0001	0.0008	< 0.001	0.019	< 0.01
X14	19-Jun-07	< 0.00025	0.061	< 0.001	0.033	< 0.001	< 0.001	< 0.05	41.5	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.27	< 0.00002	1.1	< 0.005	8.61	0.61	< 0.0005	3.71	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.13	< 0.001	< 0.0005	0.002	< 0.0001	0.001	< 0.001	0.019	< 0.01
X14	26-Jun-07	< 0.00025	0.16	< 0.001	0.034	< 0.001	< 0.001	< 0.05	30	< 0.0002	0.0103	< 0.001	< 0.001	0.002	0.31	< 0.00002	0.9	< 0.005	6.48	0.32	< 0.0005	2.69	0.002	0.002	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.1	< 0.001	< 0.0005	0.005	< 0.0001	0.0008	< 0.001	0.02	< 0.01
X14	03-Jul-07	< 0.00025	0.072	< 0.001	0.038	< 0.001	< 0.001	< 0.05	31.4	< 0.0002	0.0076	< 0.001	< 0.001	0.001	0.22	< 0.00002	0.9	< 0.005	7.12	0.36	< 0.0005	2.79	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.12	< 0.001	< 0.0005	0.002	< 0.0001	0.0008	< 0.001	0.019	< 0.01
X14	10-Jul-07	< 0.00025	0.15	< 0.001	0.044	< 0.001	< 0.001	< 0.05	49.8	0.0003	0.0069	< 0.001	0.001	0.012	0.41	< 0.00002	1.4	< 0.005	9.82	0.75	0.0008	4.19	0.005	0.002	< 0.15	< 0.001	< 0.001	3.8	0.002	0.18	< 0.001	< 0.0005	0.003	< 0.0001	0.0011	< 0.001	0.066	< 0.01
X14	16-Jul-07	< 0.00025	0.067	< 0.001	0.042	< 0.001	< 0.001	< 0.05	39.4	< 0.0002	0.0068	< 0.001	< 0.001	0.001	0.28	< 0.00002	1.1	< 0.005	8.55	0.55	0.0005	3.71	0.002	0.003	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.16	< 0.001	< 0.0005	0.002	< 0.0001	0.0009	< 0.001	0.025	< 0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
X14	17-Jul-07	< 0.00025	0.063	< 0.001	0.036	< 0.001	< 0.001	< 0.05	32.9	< 0.0002	0.0082	< 0.001	< 0.001	0.003	0.25	< 0.00002	1.1	< 0.005	7.31	0.43	< 0.0005	3.67	0.002	0.002	< 0.15	< 0.001	< 0.001	4	< 0.001	0.13	< 0.001	< 0.0005	0.002	< 0.0001	0.0007	< 0.001	0.023	< 0.01
X14	24-Jul-07	0.0007	0.039	< 0.001	0.047	< 0.001	< 0.001	< 0.05	64.6	< 0.0002	< 0.005	0.001	< 0.001	0.001	0.38	< 0.00002	1.6	0.007	12.9	1.01	0.0005	5.38	0.003	< 0.001	< 0.15	< 0.001	0.001	4.1	< 0.001	0.21	< 0.001	< 0.0005	0.002	< 0.0001	0.0012	< 0.001	0.031	< 0.01
X14	31-Jul-07	< 0.00025	0.028	< 0.001	0.043	< 0.001	< 0.001	< 0.05	56	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.26	< 0.00002	1.6	0.007	12.3	0.8	0.0007	5.08	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.2	< 0.001	< 0.0005	0.001	< 0.0001	0.0013	< 0.001	0.022	< 0.01
X14	07-Aug-07	< 0.00025	0.024	< 0.001	0.046	< 0.001	< 0.001	< 0.05	52	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.54	< 0.00002	1.3	0.005	11.5	0.97	0.0006	4.83	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.026	< 0.01
X14	13-Aug-07	< 0.00025	0.081	< 0.001	0.043	< 0.001	< 0.001	< 0.05	69.3	< 0.0002	0.0062	0.001	< 0.001	0.001	0.47	< 0.00002	1.9	0.009	15	1.21	0.0007	6.52	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.25	< 0.001	< 0.0005	0.003	< 0.0001	0.0014	< 0.001	0.033	< 0.01
X14	14-Aug-07	< 0.00025	0.024	< 0.001	0.047	< 0.001	< 0.001	< 0.05	55.7	< 0.0002	0.0074	< 0.001	< 0.001	< 0.001	0.19	< 0.00002	1.5	0.006	12.6	0.93	0.0006	5.15	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.032	< 0.01
X14	21-Aug-07	< 0.00025	0.042	< 0.001	0.052	< 0.001	< 0.001	< 0.05	63	< 0.0002	< 0.005	0.002	< 0.001	< 0.001	0.37	< 0.00002	1.8	0.008	14.3	1.37	0.0006	7.4	0.003	< 0.001	< 0.15	< 0.001	0.001	3.3	< 0.001	0.24	< 0.001	< 0.0005	0.001	< 0.0001	0.0013	< 0.001	0.037	< 0.01
X14	28-Aug-07	< 0.00025	0.005	< 0.001	0.046	< 0.001	< 0.001	< 0.05	58	< 0.0002	< 0.005	0.001	< 0.001	0.002	0.29	< 0.00002	1.6	0.006	12.6	1.08	0.0005	5.2	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.034	< 0.01
X14	04-Sep-07	< 0.00025	0.013	< 0.001	0.042	< 0.001	< 0.001	< 0.05	56.5	0.0002	< 0.005	0.001	< 0.001	0.001	0.3	< 0.00002	1.7	< 1	13.1	1.17	0.0009	6.26	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.23	< 0.001	< 0.0005	< 0.001	0.0002	0.0018	< 0.001	0.038	< 0.01
X14	10-Sep-07	< 0.00025	0.023	< 0.001	0.045	< 0.001	< 0.001	< 0.05	50.5	< 0.0002	< 0.005	0.001	< 0.001	< 0.001	0.26	< 0.00002	1.4	0.005	12	1.2	0.0007	4.79	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.038	< 0.01
X14	11-Sep-07	< 0.00025	0.066	< 0.001	0.045	< 0.001	< 0.001	< 0.05	43.7	< 0.0002	0.0071	< 0.001	< 0.001	0.002	0.41	< 0.00002	1.4	0.004	10.8	0.84	0.0006	4.55	0.003	0.002	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.17	< 0.001	< 0.0005	0.002	< 0.0001	0.0011	< 0.001	0.033	< 0.01
X14	17-Sep-07	< 0.00025	0.021	< 0.001	0.038	< 0.001	< 0.001	< 0.05	40.9	< 0.0002	0.0072	< 0.001	< 0.001	< 0.001	0.26	< 0.00002	1.1	0.004	9.55	0.91	< 0.0005	4.02	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	0.027	< 0.01
X14	23-Oct-07	< 0.00025	0.056	< 0.001	0.051	< 0.001	< 0.001	< 0.05	93.5	< 0.0002	0.0054	0.003	< 0.001	0.001	0.52	< 0.00002	2.1	0.007	21.5	3.26	0.0009	8.97	0.008	0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.3	< 0.001	< 0.0005	0.002	< 0.0001	0.002	< 0.001	0.07	< 0.01
X14	29-Oct-07	< 0.00025	0.017	< 0.001	0.047	< 0.001	< 0.001	< 0.05	75.9	< 0.0002	< 0.005	0.003	< 0.001	< 0.001	0.32	< 0.00002	1.8	0.006	17.8	2.71	0.0008	7.24	0.006	0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.069	< 0.01
X14	14-Nov-07	< 0.00025	0.04	< 0.001	0.058	< 0.001	< 0.001	< 0.05	59.5	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.23	< 0.00002	1.4	0.004	13.2	0.83	0.0007	4.87	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.051	< 0.01
X14	10-Dec-07	< 0.00025	0.017	< 0.001	0.062	< 0.001	< 0.001	< 0.05	72.8	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.31	< 0.00002	1.5	0.005	15.5	1.49	0.0007	5.92	0.003	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.25	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.052	< 0.01
	average	0.00033	0.116	0.001	0.046	0.001	0.001	0.05	62.1	0.000203	0.006	0.002	0.001	0.0018	0.467	0.00002	1.6	0.036	13.6	1.62	0.0007	5.88	0.004	0.002	0.15	0.001	0.001	4.3	0.001	0.208	0.001	0.0005	0.004	0.000103	0.0015	0.001	0.041	0.01
	minimum	< 0.00025	0.005	< 0.001	0.027	< 0.001	< 0.001	< 0.05	16.1	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.19	< 0.00002	0.8	< 0.005	3.24	0.24	< 0.0005	1.64	0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.055	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.014	< 0.01
	maximum	0.0023	0.58	0.002	0.076	< 0.001	< 0.001	< 0.05	243	0.0003	0.0155	0.015	0.001	0.012	1.59	< 0.00002	4.5	0.014	49.8	16	0.002	22.9	0.03	0.008	< 0.15	< 0.001	0.001	7.3	0.002	0.63	< 0.001	< 0.0005	0.034	0.0002	0.0045	0.001	0.22	< 0.01
	N > DL	2	33	1	33	0	0	0	33	2	14	13	2	23	33	0	33	19	33	33	22	33	33	14	0	0	3	33	1	33	0	0	21	1	33	3	33	0
	median	0.00025	0.055	0.001	0.044	0.001	0.001	0.05	52	0.0002	0.005	0.001	0.001	0.001	0.37	0.00002	1.5	0.005	12	0.91	0.0006	4.83	0.003	0.001	0.15	0.001	0.001	4	0.001	0.19	0.001	0.0005	0.002	0.0001	0.0013	0.001	0.033	0.01
X22B	14-Jan-07	< 0.00025	0.022	< 0.001	0.016	< 0.001	< 0.001	< 0.05	142	0.009		0.041	< 0.001	0.015	0.11	< 0.00002	8.3	0.049	65.9	2.57	0.0015	19.5	0.11	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0005	0.002	< 0.001	17.3	< 0.01
X22B	13-Feb-07	< 0.00025	0.018	< 0.001	0.015	< 0.001	< 0.001	< 0.05	141	0.0076		0.037	< 0.001	0.01	0.12	< 0.00002	8.5	0.049	64.7	2.31	0.0015	19.9	0.099	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0005	0.0021	< 0.001	13.8	< 0.01
X22B	11-Mar-07	< 0.00025	0.013	< 0.001	0.017	< 0.001	< 0.001	< 0.05	141	0.0052		0.036	< 0.001	0.004	0.05	< 0.00002	9.1	0.052	62.4	2.26	0.0018	19.9	0.095	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0006	0.0023	< 0.001	12.2	< 0.01
X22B	18-Apr-07	< 0.00025	0.073	< 0.001	0.018	< 0.001	< 0.001	< 0.05	145	0.0055		0.04	< 0.001	0.005	0.22	< 0.00002	8.7	0.049	60.7	2.56	0.0018	18.9	0.11	0.004	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.56	< 0.001	< 0.0005	0.002	0.0004	0.002	< 0.001	14.2	< 0.01
X22B	15-May-07	0.0004	0.023	< 0.001	0.016	< 0.001	< 0.001	< 0.05	142	0.0049		0.044	< 0.001	0.007	0.39	< 0.00002	8.9	0.053	63	2.58	0.0018	20.2	0.11	0.002	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.55	< 0.001	< 0.0005	< 0.001	0.0005	0.0022	< 0.001	13.9	< 0.01
X22B	18-Jun-07	< 0.00025	0.015	< 0.001	0.015	< 0.001	< 0.001	< 0.05	143	0.0051		0.04	< 0.001	0.009	0.19	< 0.00002	9.1	0.053	67.6	2.63	0.0018	21.8	0.11	0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	0.0005	0.0022	< 0.001	13.8	< 0.01
X22B	17-Jul-07	< 0.00025	0.027	< 0.001	0.017	< 0.001	< 0.001	< 0.05	136	0.0062		0.039	< 0.001	0.009	0.23	< 0.00002	8.2	0.052	63.6	2.36	0.0017	19.8	0.11	0.002	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.6	< 0.001	< 0.0005	0.002	0.0004	0.002	< 0.001	13.8	< 0.01
X22B	13-Aug-07	< 0.00025	0.006	< 0.001	0.015	< 0.001	< 0.001	< 0.05	132	0.0071		0.04	< 0.001	0.007	0.12	< 0.00002	7.8	0.049	62.6	2.27	0.0015	18.3	0.1	< 0.001	< 0.15	< 0.001	0.001	3	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0005	0.0017	< 0.001	13.4	< 0.01
X22B	10-Sep-07	< 0.00025	0.01	< 0.001	0.016	< 0.001	< 0.001	< 0.05	127	0.007		0.037	< 0.001	0.007	0.17	< 0.00002	7.9	0.046	61.3	2.26	0.0014	18.2	0.098	0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0005	0.0018	< 0.001	12.9	< 0.01
X22B	22-Oct-07	< 0.00025	0.01	< 0.001	0.015	< 0.001	< 0.001	< 0.05	137	0.0067		0.038	< 0.001	0.006	0.2	< 0.00002	8.2	0.052	66.4	2.31	0.0016	20.3	0.1	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.55	< 0.001	< 0.0005	< 0.001	0.0005	0.0019	< 0.001	13.8	< 0.01
X22B	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.001	< 0.001	< 0.05	140	0.0075		0.037	< 0.001	0.006	0.12	< 0.00002	8.6	0.054	66.2	2.23	0.0015	20	0.098	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.58	< 0.001	< 0.0005	< 0.001	0.0005	0.0017	< 0.001	14.2	< 0.01
X22B	10-Dec-07	< 0.00025	0.007	< 0.001	0.016	< 0.001	< 0.001	< 0.05	133	0.0072		0.037	< 0.001	0.007	0.13	< 0.00002	8	0.044	56.7	2.28	0.0013	16.9	0.1	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	0.0004	0.0018	< 0.001	13.3	< 0.01
	average	0.00026	0.019	0.001	0.016	0.001	0.001	0.05	138	0.0066		0.039	0.001	0.008	0.17	0.00002	8.4	0.050	63.4	2.39	0.0016	19.5	0.103	0.0014	0.15	0.001	0.001	3.6	0.001	0.55	0.001	0.0005	0.0012	0.0005	0.0020	0.001	13.9	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.015	< 0.001	< 0.001	< 0.05	127	0.0049		0.036	< 0.001	0.004	0.05	< 0.00002	7.8	0.044	56.7	2.23	0.0013	16.9	0.095	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0004	0.0017	< 0.001	12.2	< 0.01
	maximum	0.0004	0.073	< 0.001	0.018	< 0.001	< 0.001	< 0.05	145	0.009		0.044	< 0.001	0.015	0.39	< 0.00002	9.1	0.054	67.6	2.63	0.0018	21.8	0.11	0.004	< 0.15	< 0.001	0.001	4.5	< 0.001	0.6	< 0.001	< 0.0005	0.002	0.0006	0.0023	< 0.001	17.3	< 0.01
	N > DL	1	11	0	12	0	0	0	12	12	0	12	0	12	12	0	12	12	12	12	12	12	12	5	0	0	2	12	0	12	0	0	2	12	12	0	12	0
	median	0.00025	0.014	0.001	0.016	0.001	0.001	0.05	140.5	0.00685		0.0385	0.001	0.007	0.15	0.00002	8.4	0.0505	63.3	2.31	0.00155	19.85	0.1	0.001	0.15	0.001	0.001	3.6	0.001	0.55	0.001	0.0005	0.001	0.0005	0.002	0.001	13.8	0.01
X23	15-Jan-07	0.0004	0.008	0.001	0.014	< 0.001	< 0.001	< 0.05	518	0.026		0.71	< 0.001	0.014	43.7	<0.00002	15.5	0.14	864	77.3	0.0038	59.3	0.78	0.001	< 0.15	< 0.001	0.005	6.2	< 0.001	3.96	< 0.001	< 0.0005	0.001	0.0012	0.01	< 0.001	323	< 0.01
X23	15-Feb-07	0.0003	0.01	0.001	0.013	< 0.001	< 0.001	< 0.05	509	0.024		0.65	< 0.001	0.011	44.1	<0.00002	16	0.14	822	68.4	0.003	60.1	0.66	0.001	< 0.15	< 0.001	0.003	6	< 0.001	4.08	< 0.001	< 0.0005	< 0.001	0.0012	0.011	< 0.001	256	< 0.01
X23	12-Mar-07	0.0004	< 0.005	0.001	0.013	< 0.001	< 0.001	< 0.05	470	0.022		0.63	< 0.001	0.011	35	<0.00002	15.5	0.14	789	65.1	0.0038	60.4	0.67	< 0.001	< 0.15	< 0.001	0.004	5.7	< 0.001	3.9	< 0.001	< 0.0005	< 0.001	0.0012	0.01	< 0.001	250	< 0.01
X23	19-Apr-07	0.0005	0.02	0.002	0.014	< 0.001	< 0.001	< 0.05	503	0.024		0.65	< 0.001	0.025	51.9	0.02	14.6	0.11	731	72.5	0.0057	54	0.71	0.01	< 0.15	< 0.001	0.005	6.1	< 0.001	3.96	< 0.001	< 0.0005	< 0.001	0.0011	0.011	< 0.001	287	< 0.01
X23	15-May-07	< 0.00025	0.022	0.002	0.016	< 0.001	< 0.001	< 0.05	457	0.038		0.65	< 0.001	0.03	63.6	<0.00002	16.2	0.14	855	74.7	0.0005	56.6	0.75	0.013	< 0.15	< 0.001	0.006	7.8	< 0.001	3.66	< 0.001	< 0.0005	0.001	0.0014	0.011	< 0.001	301	< 0.01
X23	19-Jun-07	0.0006	< 0.005	0.001	0.015	< 0.001	< 0.001	< 0.05	457	0.066		0.75	< 0.001	0.023	58.9	<0.00002	16.5	0.14	776	68.2	0.0047	63.8	0.82	0.003	< 0.15	< 0.001	0.004	7.3	< 0.001	4.21	< 0.001	< 0.0005	< 0.001	0.0015	0.013	< 0.001	275	< 0.01
X23	17-Jul-07	0.0004	0.032	0.002	0.02	< 0.001	< 0.001	< 0.05	450	0.052		0.63	< 0.001	0.03	45.8	0.06	14.9	0.14	742	63	0.0041	56.9	0.72	0.1	< 0.15	< 0.001	0.004	7.3	< 0.001	4.16	< 0.001	< 0.0005	0.001	0.0013	0.013	< 0.001	251	< 0.01
X23	13-Aug-07	0.0005	0.022	0.001	0.013	< 0.001	< 0.001	< 0.05	514	0.042		0.67	< 0.001	0.021	47.2	<0.00002	17.1	0.13	912	69	0.0065	71.1	0.75	0.002	< 0.15	< 0.001	0.004	7.7	< 0.001	4.05	< 0.001	< 0.0005	< 0.001	0.0013	0.014	< 0.001	255	< 0.01
X23	10-Sep-07	0.0005	0.35	0.002	0.017	< 0.001	< 0.001	< 0.05	474	0.039		0.64	< 0.001	0.12	44.6	<0.00002	15.8	0.13	779	65.1	0.0067	60.1	0.68	0.081	< 0.15	< 0.001	0.004	7.4	< 0.001	3.81	< 0.001	< 0.0005	< 0.001	0.0014	0.015	< 0.001	214	< 0.01
X23	23-Oct-07	0.0006	0.008	0.001	0.015	< 0.001	< 0.001	< 0.05	495	0.04		0.68	< 0.001	0.016	39.6	<0.00002	15.5	0.15	890	65.3	0.0066	63.5	0.8	0.003	< 0.15	< 0.001	0.004	7.7	< 0.001	4.18	< 0.001	< 0.0005	< 0.001	0.0013	0.015	< 0.001	239	< 0.01
X23	14-Nov-07	0.0004	< 0.005	0.001	0.014	< 0.001	< 0.001	< 0.05	496	0.036		0.65	< 0.001	0.013	23.3	<0.00002	15.9	0.15	883	64.2	0.0066	58.8	0.75	0.001	< 0.15	< 0.001	0.005	7.9	< 0.001	3.83	< 0.001	< 0.0005	< 0.001	0.0012	0.013	< 0.001	228	< 0.01
X23	10-Dec-07	0.0004	< 0.005	0.001	0.014	< 0.001	< 0.001	< 0.05	490	0.027		0.63	< 0.001	0.011	7.33	<0.00002	14.5	0.12	746	70.6	0.0063	46.6	0.72	0.004	< 0.15	< 0.001	0.004	5.7	< 0.001	3.62	< 0.001	< 0.0005	< 0.001	0.0012	0.012	< 0.001	228	< 0.01
	average	0.00044	0.041	0.001	0.015	0.001	0.001	0.05	486	0.036		0.66	0.001	0.027	42.1	0.00668	15.7	0.136	816	68.6	0.0049	59.3	0.73	0.018	0.15	0.001	0.004	6.9	0.001	3.95	0.001	0.0005	0.001	0.0013	0.012	0.001	259	0.01
	minimum	< 0.00025	< 0.005	0.001	0.013	< 0.001	< 0.001	< 0.05	450	0.022		0.63	< 0.001	0.011	7.33	< 0.00002	14.5	0.11	731	63	0.0005	46.6	0.66	< 0.001	< 0.15	< 0.001	0.003	5.7	< 0.001	3.62	< 0.001	< 0.0005	< 0.001	0.0011	0.01	< 0.001	214	< 0.01
	maximum	0.0006	0.35	0.002	0.02	< 0.001	< 0.001	< 0.05	518	0.066		0.75	< 0.001	0.12	63.6	0.06	17.1	0.15	912	77.3	0.0067	71.1	0.82	0.1	< 0.15	< 0.001	0.006	7.9	< 0.001	4.21	< 0.001	< 0.0005	0.001	0.0015	0.015	< 0.001	323	< 0.01
	N > DL	11	8	12	12	0	0	0	12	12	0	12	0	12	12	2	12	12	12	12	12	12	12	11	0	0	12	12	0	12	0	0	3	12	12	0	12	0
	median	0.0004	0.009	0.001	0.014	0.001	0.001	0.05	492.5	0.037		0.65	0.001	0.0185	44.35	0.00002	15.65	0.14	805.5	68.3	0.0052	59.7	0.735	0.003	0.15	0.001	0.004	7.3	0.001	3.96	0.001	0.0005	0.001	0.00125	0.0125	0.001	253	0.01
X26	18-Jun-07	< 0.00025	0.005	0.002	0.007	< 0.001	< 0.001	< 0.05	533	0.019		0.41	< 0.001	0.003	32.6	< 0.00002	13.4	0.21	290	11.4	0.0007	53.6	1.26	0.038	< 0.15	< 0.001	0.003	5.7	< 0.001	3	< 0.001	< 0.0005	< 0.001	0.001	0.014	< 0.001	64.5	< 0.01
X26	16-Jul-07	< 0.00025	0.008	0.003	0.007	< 0.001	< 0.001	< 0.05	470	0.021		0.5	< 0.001	0.002	55.5	< 0.00002	14.6	0.24	273	11.8	0.0008	59.3	1.4	0.053	< 0.15	< 0.001	0.002	7	< 0.001	3.51	< 0.001	< 0.0005	< 0.001	0.0012	0.015	< 0.001	67.9	< 0.01
X26	13-Aug-07	< 0.00025	0.011	0.003	0.006	< 0.001	< 0.001	< 0.05	550	0.021		0.56	< 0.001	0.004	85.9	< 0.00002	15.7	0.22	387	17.3	0.0016	73.2	1.42	0.061	< 0.15	< 0.001	0.003	6.5	< 0.001	3.24	< 0.001	< 0.0005	< 0.001	0.0013	0.013	< 0.001	100	< 0.01
X26	10-Sep-07	< 0.00025	0.011	0.003	0.007	< 0.001	< 0.001	< 0.05	522	0.02		0.51	< 0.001	0.004	70.7	< 0.00002	14.2	0.22	334	15.4	0.0015	56.2	1.27	0.059	< 0.15	< 0.001	0.003	6.1	< 0.001	3.23	< 0.001	< 0.0005	< 0.001	0.0012	0.014	0.001	84.7	< 0.01
	average	0.00025	0.009	0.003	0.007	0.001	0.001	0.05	519	0.020		0.50	0.001	0.003	61.2	0.00002	14.5	0.22	321	14.0	0.0012	60.6	1.34	0.053	0.15	0.001	0.0028	6.3	0.001	3.25	0.001	0.0005	0.001	0.0012	0.014	0.001	79.3	0.01

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 2. Surface Water Total Metals

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
	minimum	< 0.00025	0.005	0.002	0.006	< 0.001	< 0.001	< 0.05	470	0.019		0.41	< 0.001	0.002	32.6	< 0.00002	13.4	0.21	273	11.4	0.0007	53.6	1.26	0.038	< 0.15	< 0.001	0.002	5.7	< 0.001	3	< 0.001	< 0.0005	< 0.001	0.001	0.013	< 0.001	64.5	< 0.01
	maximum	< 0.00025	0.011	0.003	0.007	< 0.001	< 0.001	< 0.05	550	0.021		0.56	< 0.001	0.004	85.9	< 0.00002	15.7	0.24	387	17.3	0.0016	73.2	1.42	0.061	< 0.15	< 0.001	0.003	7	< 0.001	3.51	< 0.001	< 0.0005	< 0.001	0.0013	0.015	0.001	100	< 0.01
	N > DL	0	4	4	4	0	0	0	4	4	0	4	2	4	4	0	4	4	4	4	4	4	4	4	0	0	4	4	0	4	0	3	0	4	4	1	4	2
	median	0.00025	0.0095	0.003	0.007	0.001	0.001	0.05	527.5	0.0205		0.505	0.001	0.0035	63.1	0.00002	14.4	0.22	312	13.6	0.00115	57.75	1.335	0.056	0.15	0.001	0.003	6.3	0.001	3.235	0.001	0.0005	0.001	0.0012	0.014	0.001	76.3	0.01

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
A25	11-Jun-07	< 0.00025	< 0.005	< 0.001	0.065	< 0.05	< 0.001	< 0.001	54.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.09	1.6	0.007	15.6	< 0.001	0.0006	3.25	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.6	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	< 0.005	< 0.01
A25	01-Oct-07	< 0.00025	0.007	< 0.001	0.075	< 0.05	< 0.001	< 0.001	54.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	1.8	0.009	13.4	< 0.001	< 0.0005	2.77	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.2	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
A30	12-Jun-07	< 0.00025	2.95	< 0.001	0.02	< 0.05	0.001	< 0.001	20.1	0.031	0.064	0.001	0.35	1.09	1	0.012	29.3	2.03	< 0.0005	1.93	0.062	0.33	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	0.0002	0.0027	< 0.001	22	< 0.01
A30	01-Oct-07	0.0004	3.99	< 0.001	0.016	< 0.05	0.002	< 0.001	33.4	0.046	0.088	< 0.001	0.46	0.29	1.1	0.02	38.4	2.56	< 0.0005	3.09	0.098	0.5	< 0.15	< 0.001	< 0.001	8.2	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	0.0002	0.0038	< 0.001	33.8	< 0.01
FAROCR	19-Jun-07	< 0.00025	0.04	< 0.001	0.015	< 0.05	< 0.001	< 0.001	5.3	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.4	< 0.005	1.08	< 0.001	< 0.0005	1.46	0.003	0.002	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.024	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
FAROCR	17-Jul-07	< 0.00025	0.065	< 0.001	0.016	< 0.05	< 0.001	< 0.001	4.16	< 0.0002	< 0.001	< 0.001	0.003	< 0.05	0.2	< 0.005	0.93	0.002	< 0.0005	1.51	0.001	0.003	< 0.15	< 0.001	< 0.001	5.8	< 0.001	0.025	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.024	< 0.01
FAROCR	14-Aug-07	< 0.00025	0.038	< 0.001	0.018	< 0.05	< 0.001	< 0.001	5.48	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	0.2	< 0.005	1.21	< 0.001	< 0.0005	1.75	< 0.001	0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	0.028	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
FAROCR	11-Sep-07	< 0.00025	0.039	< 0.001	0.016	< 0.05	< 0.001	< 0.001	3.58	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	0.2	< 0.001	0.76	0.002	< 0.0005	1.46	< 0.001	0.003	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.022	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.011	< 0.01
FAROCR	23-Oct-07	< 0.00025	0.019	< 0.001	0.023	0.07	< 0.001	< 0.001	9.01	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	0.3	0.002	2.21	< 0.001	0.0006	2.06	0.001	< 0.001	< 0.15	< 0.001	< 0.001	7.3	0.001	0.043	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.009	< 0.01
FAROCR	14-Nov-07	< 0.00025	0.039	< 0.001	0.02	< 0.05	< 0.001	< 0.001	7.96	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	0.002	1.97	0.002	< 0.0005	1.96	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	6.4	< 0.001	0.036	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.009	< 0.01
FAROCR	09-Dec-07	< 0.00025	0.014	< 0.001	0.021	< 0.05	< 0.001	< 0.001	8.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	1.94	< 0.001	0.0005	1.71	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.042	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
	average	0.00025	0.036	0.001	0.018	0.05	0.001	0.001	6.26	0.0002	0.001	0.001	0.002	0.05	0.3	0.003	1.44	0.0014	0.0005	1.70	0.0013	0.0017	0.15	0.001	0.001	6.0	0.001	0.031	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.010	0.01
	minimum	< 0.00025	0.014	< 0.001	0.015	< 0.05	< 0.001	< 0.001	3.58	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.2	< 0.001	0.76	< 0.001	< 0.0005	1.46	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.022	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
	maximum	< 0.00025	0.065	< 0.001	0.023	0.07	< 0.001	< 0.001	9.01	< 0.0002	< 0.001	< 0.001	0.003	< 0.05	0.4	0.002	2.21	0.002	0.0006	2.06	0.003	0.003	< 0.15	< 0.001	< 0.001	7.3	0.001	0.043	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.024	< 0.01
	N > DL	0	7	0	7	1	0	0	7	0	0	0	5	0	7	2	7	3	2	7	3	4	0	0	0	7	1	7	0	0	0	0	0	0	7	0
	median	0.00025	0.039	0.001	0.018	0.05	0.001	0.001	5.48	0.0002	0.001	0.001	0.002	0.05	0.3	0.002	1.21	0.001	0.0005	1.71	0.001	0.001	0.15	0.001	0.001	5.9	0.001	0.028	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.009	0.01
FCO	11-Jun-07	< 0.00025	0.038	< 0.001	0.03	< 0.05	< 0.001	< 0.001	4.85	0.001	0.004	< 0.001	0.016	0.16	0.5	< 0.005	1.89	0.19	< 0.0005	0.83	0.004	0.004	< 0.15	< 0.001	< 0.001	1.8	< 0.001	0.024	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.66	< 0.01
FCO	02-Oct-07	< 0.00025	0.007	< 0.001	0.047	< 0.05	< 0.001	< 0.001	17.9	0.0055	0.009	< 0.001	0.075	< 0.05	0.5	0.006	5.84	0.22	< 0.0005	2.48	0.019	< 0.001	< 0.15	< 0.001	< 0.001	6.6	< 0.001	0.075	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	3.67	< 0.01
FDL	11-Jun-07	< 0.00025	0.13	< 0.001	0.015	< 0.05	< 0.001	< 0.001	2.31	< 0.0002	< 0.001	< 0.001	0.002	0.11	0.2	< 0.005	0.44	0.004	< 0.0005	1.12	< 0.001	0.014	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.016	< 0.001	< 0.0005	0.001	< 0.0001	< 0.0005	< 0.001	0.018	< 0.01
FDL	02-Oct-07	< 0.00025	0.032	< 0.001	0.015	< 0.05	< 0.001	< 0.001	3.48	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	< 0.1	0.001	0.68	< 0.001	< 0.0005	1.67	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.02	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
FDU	11-Jun-07	< 0.00025	0.11	< 0.001	0.011	< 0.05	< 0.001	< 0.001	2.07	< 0.0002	< 0.001	< 0.001	0.001	0.09	0.2	< 0.005	0.36	0.001	< 0.0005	1.2	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.014	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
FDU	02-Oct-07	< 0.00025	0.029	< 0.001	0.012	< 0.05	< 0.001	< 0.001	3.03	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	< 0.1	0.001	0.63	< 0.001	< 0.0005	1.73	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	6	< 0.001	0.018	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
FWSD6	29-May-07	< 0.00025	0.009	< 0.001	0.056	< 0.05	< 0.001	< 0.001	44.8	< 0.0002	< 0.001	< 0.001	0.003	0.12	3	< 0.005	15.7	< 0.001	0.0011	1.06	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	0.8	< 0.001	0.57	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	< 0.005	< 0.01
GCULV	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	16.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	0.001	2.88	< 0.001	< 0.0005	2.24	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.083	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
GCULV	13-Feb-07	< 0.00025	0.009	< 0.001	0.039	< 0.05	< 0.001	< 0.001	16.1	< 0.0002	< 0.001	< 0.001	< 0.001	0.05	0.4	0.001	2.9	< 0.001	< 0.0005	2.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.077	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	< 0.005	< 0.01
GCULV	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	18.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.002	3.64	0.002	< 0.0005	2.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.097	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
GCULV	18-Apr-07	< 0.00025	0.008	< 0.001	0.046	< 0.05	< 0.001	< 0.001	16.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	< 0.001	2.89	0.001	0.0007	2.04	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.085	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0019	< 0.001	< 0.005	< 0.01
GCULV	14-May-07	< 0.00025	0.04	< 0.001	0.03	< 0.05	< 0.001	< 0.001	9.15	< 0.0002	< 0.001	0.001	< 0.001	0.24	1.2	< 0.005	1.68	0.004	0.0009	1.48	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.055	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
GCULV	18-Jun-07	< 0.00025	0.01	< 0.001	0.015	< 0.05	< 0.001	< 0.001	4.47	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	0.67	< 0.001	< 0.0005	1.1	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.2	< 0.001	0.027	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	16-Jul-07	< 0.00025	0.015	< 0.001	0.017	< 0.05	< 0.001	< 0.001	4.65	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.2	< 0.005	0.73	< 0.001	< 0.0005	1.14	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.032	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	13-Aug-07	< 0.00025	0.008	< 0.001	0.023	< 0.05	< 0.001	< 0.001	7.62	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.2	< 0.005	1.16	< 0.001	< 0.0005	1.46	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.045	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	10-Sep-07	< 0.00025	0.008	< 0.001	0.024	< 0.05	< 0.001	< 0.001	6.63	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.3	< 0.001	1.01	< 0.001	< 0.0005	1.46	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.044	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	22-Oct-07	< 0.00025	0.006	< 0.001	0.023	< 0.05	< 0.001	< 0.001	8.39	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.3	< 0.001	1.4	< 0.001	< 0.0005	1.75	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.048	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	13-Nov-07	< 0.00025	0.035	< 0.001	0.026	< 0.05	< 0.001	< 0.001	9.78	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.001	1.5	0.002	< 0.0005	1.84	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.051	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
GCULV	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.029	< 0.05	< 0.001	< 0.001	10.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	1.68	< 0.001	< 0.0005	1.68	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.06	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	average	0.00025	0.013	0.001	0.030	0.05	0.001	0.001	10.8	0.0002	0.001	0.001	0.001	0.07	0.45	0.002	1.85	0.001	0.0006	1.76	0.001	0.001	0.15	0.001	0.001	3.8	0.001	0.059	0.001	0.0005	0.001	0.0001	0.0009	0.001	0.005	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	4.47	< 0.0002	< 0.001	< 0.001	< 0.001	0.05	0.2	< 0.001	0.67	< 0.001	< 0.0005	1.1	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.2	< 0.001	0.027	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.04	< 0.001	0.049	< 0.05	< 0.001	< 0.001	18.7	< 0.0002	< 0.001	0.001	0.001	0.24	1.2	0.002	3.64	0.004	0.0009	2.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.097	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
	N > DL	0	9	0	12	0	0	0	12	0	0	1	2	2	12	3	12	4	2	12	0	0	0	0	0	12	0	12	0	0	0	0	5	0	0	0
	median	0.00025	0.008	0.001	0.0275	0.05	0.001	0.001	9.465	0.0002	0.001	0.001	0.001	0.05	0.4	0.001	1.59	0.001	0.0005	1.715	0.001	0.001	0.15	0.001	0.001	4.1	0.001	0.053	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.005	0.01
GHSCR1	11-Jun-07	< 0.00025	< 0.005	< 0.001	0.033	< 0.05	< 0.001	< 0.001	172	0.0013	< 0.001	< 0.001	0.002	0.11	3.6	0.007	53.2	0.012	< 0.0005	7.75	0.005	0.002	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	1.6	< 0.01
GHSCR1	02-Oct-07	< 0.00025	< 0.005	< 0.001	0.036	< 0.05	< 0.001	< 0.001	157	0.0012	< 0.001	< 0.001	0.001	< 0.05	3.4	0.007	41.9	0.059	< 0.0005	7.97	0.005	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	1.45	< 0.01
K8	13-Feb-07	< 0.00025	< 0.005	< 0.001	0.03	< 0.05	< 0.001	< 0.001	25.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.6	0.002	3.4	< 0.001	< 0.0005	2.34	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0042	< 0.001	< 0.005	< 0.01
K8	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.04	< 0.05	< 0.001	< 0.001	33.6	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.9	0.003	4.94	0.001	< 0.0005	2.86	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0077	< 0.001	< 0.005	< 0.01
K8	18-Apr-07	< 0.00025	0.008	< 0.001	0.029	< 0.05	< 0.001	< 0.001	24.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.6	< 0.001	3.13	< 0.001	< 0.0005	2.02	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0045	< 0.001	< 0.005	< 0.01
K8	14-May-07	< 0.00025	0.027	< 0.001	0.031	< 0.05	< 0.001	< 0.001	19.8	< 0.0002	< 0.001	0.001	0.001	0.11	1.2	< 0.005	2.95	< 0.001	0.0008	1.85	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0036	< 0.001	< 0.005	< 0.01
K8	18-Jun-07	< 0.00025	0.007	< 0.001	0.012	< 0.05	< 0.001	< 0.001	6.17	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.005	0.8	0.001	< 0.0005	1.14	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.038	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
K8	16-Jul-07	< 0.00025	0.017	< 0.001	0.017	< 0.05	< 0.001	< 0.001	7.85	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.005	1.03	< 0.001	< 0.0005	1.42	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
K8	13-Aug-07	< 0.00025	0.013	< 0.001	0.025	< 0.05	< 0.001	< 0.001	16.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	2.23	< 0.001	< 0.0005	1.9	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	< 0.005	< 0.01
K8	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.023	< 0.05	< 0.001	< 0.001	12	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.4	< 0.001	1.46	< 0.001	< 0.0005	1.75	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.08	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	< 0.005	< 0.01
K8	22-Oct-07	< 0.00025	0.01	< 0.001	0.023	< 0.05	< 0.001	< 0.001	15.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	0.001	1.94	< 0.001	< 0.0005	2.05	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.094	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
K8	13-Nov-07	< 0.00025	0.027	< 0.001	0.024	< 0.05	< 0.001	< 0.001	17.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	0.001	2.32	< 0.001	< 0.0005	1.96	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
K8	09-Dec-07	< 0.00025	0.007	< 0.001	0.024	< 0.05	< 0.001	< 0.001	17.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.001	2.17	< 0.001	< 0.0005	1.77	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	< 0.005	< 0.01
	average	0.00025	0.012	0.001	0.025	0.05	0.001	0.001	17.8	0.0002	0.001	0.001	0.001	0.06	0.55	0.003	2.40	0.001	0.0005	1.91	0.001	0.001	0.15	0.001	0.001	4.4	0.001	0.109	0.001	0.0005	0.001	0.0001	0.0025	0.001	0.005	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.012	< 0.05	< 0.001	< 0.001	6.17	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	0.8	< 0.001	< 0.0005	1.14	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.038	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.027	< 0.001	0.04	< 0.05	< 0.001	< 0.001	33.6	< 0.0002	< 0.001	0.001	0.001	0.11	1.2	0.003	4.94	0.001	0.0008	2.86	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0077	< 0.001	< 0.005	< 0.01
	N > DL	0	8	0	11	0	0	0	11	0	0	1	2	1	11	4	11	2	1	11	0	0	0	0	0	11	0	11	0	0	0	0	9	0	0	0
	median	0.00025	0.008	0.001	0.024	0.05	0.001	0.001	17.8	0.0002	0.001	0.001	0.001	0.05	0.4	0.002	2.23	0.001	0.0005	1.9	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.1	0.001	0.0005	0.001	0.0001	0.0015	0.001	0.005	0.01
NE1	12-Jun-07	< 0.00025	0.005	< 0.001	0.011	< 0.05	< 0.001	< 0.001	40.8	< 0.0002	< 0.001	< 0.001	0.003	0.07	1.8	0.006	14	0.002	0.0042	2.95	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
NE1	01-Oct-07	< 0.00025	< 0.005	< 0.001	0.014	< 0.05	< 0.001	< 0.001	65.3	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	2.3	0.01	21.2	< 0.001	0.006	4	< 0.001	< 0.001	< 0.15	< 0.001	0.001	3.6	< 0.001	0.33	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.012	< 0.01
NE2	12-Jun-07	< 0.00025	< 0.005	< 0.001	0.059	< 0.05	< 0.001	< 0.001	119	< 0.0002	< 0.001	< 0.001	0.001	0.12	3	0.014	118	0.001	< 0.0005	6.6	0.001	< 0.001	< 0.15	< 0.001	0.003	3.9	< 0.001	0.61	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0045	< 0.001	< 0.005	< 0.01
NE2	01-Oct-07	< 0.00025	0.005	< 0.001	0.033	< 0.05	< 0.001	< 0.001	102	< 0.0002	< 0.001	< 0.001	0.001	0.06	2.5	0.015	81.3	< 0.001	< 0.0005	5.71	0.004	< 0.001	< 0.15	< 0.001	0.001	4.6	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0048	< 0.001	0.064	< 0.01
NF1	12-Jun-07	< 0.00025	0.053	< 0.001	0.025	< 0.05	< 0.001	< 0.001	8.87	< 0.0002	< 0.001	< 0.001	0.002	0.13	0.5	< 0.005	1.81	0.009	< 0.0005	1.16	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.04	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
NF1	01-Oct-07	< 0.00025

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
R3	20-Feb-07	< 0.00025	< 0.005	< 0.001	0.069	< 0.05	< 0.001	< 0.001	90.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.8	0.006	19.1	1.04	0.0005	8.16	0.003	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.014	< 0.01
R3	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	53.5	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	1.5	0.006	12.3	0.76	0.0006	5.4	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	0.008	< 0.01
R4	20-Feb-07	< 0.00025	0.005	< 0.001	0.083	< 0.05	< 0.001	< 0.001	71.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.5	0.004	14.8	0.014	0.0005	5.31	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.23	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
R4	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.063	< 0.05	< 0.001	< 0.001	52	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	1.5	0.005	12	0.45	0.0005	4.89	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	< 0.005	< 0.01
R5	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.071	< 0.05	< 0.001	< 0.001	34.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.08	0.9	< 0.005	10.6	0.034	0.001	1.83	< 0.001	< 0.001	< 0.15	< 0.001	0.001	3.3	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	< 0.005	< 0.01
R6	20-Feb-07	< 0.00025	< 0.005	< 0.001	0.081	< 0.05	< 0.001	< 0.001	44.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.1	0.002	9.69	0.004	0.0011	1.91	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	< 0.005	< 0.01
R6	17-Aug-07	< 0.00025	0.005	< 0.001	0.073	< 0.05	< 0.001	< 0.001	33.7	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.9	< 0.005	10.1	0.006	0.0008	1.57	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	< 0.005	< 0.01
R7	14-Feb-07	< 0.00025	< 0.005	< 0.001	0.067	< 0.05	< 0.001	< 0.001	37.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.8	0.007	7.72	0.005	0.0008	2.96	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	< 0.005	< 0.01
R7	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.077	< 0.05	< 0.001	< 0.001	40.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.1	0.01	8.54	0.007	0.0008	3.49	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	< 0.005	< 0.01
R7	19-Apr-07	< 0.00025	< 0.005	< 0.001	0.072	< 0.05	< 0.001	< 0.001	40.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.1	0.006	7.47	0.005	0.0008	2.89	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	0.006	< 0.01
R7	15-May-07	< 0.00025	0.041	< 0.001	0.032	< 0.05	< 0.001	< 0.001	12.3	< 0.0002	< 0.001	< 0.001	0.002	0.22	1.3	< 0.005	2.5	0.002	0.0008	1.01	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R7	19-Jun-07	< 0.00025	0.013	< 0.001	0.033	< 0.05	< 0.001	< 0.001	16.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.4	< 0.005	3.83	0.001	< 0.0005	1.35	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.06	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R7	17-Jul-07	< 0.00025	0.012	< 0.001	0.032	< 0.05	< 0.001	< 0.001	14.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.005	3.27	0.006	< 0.0005	1.31	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.064	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R7	14-Aug-07	< 0.00025	0.007	< 0.001	0.043	< 0.05	< 0.001	< 0.001	22	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	4.94	0.007	< 0.0005	1.75	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.086	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	< 0.005	< 0.01
R7	11-Sep-07	< 0.00025	0.009	< 0.001	0.038	< 0.05	< 0.001	< 0.001	16.7	< 0.0002	< 0.001	< 0.001	0.002	0.08	0.4	< 0.001	3.66	0.005	< 0.0005	1.57	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.069	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R7	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	27	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.6	0.004	5.97	0.014	0.0006	2.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	< 0.005	< 0.01
R7	14-Nov-07	< 0.00025	0.026	< 0.001	0.052	< 0.05	< 0.001	< 0.001	31.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.004	6.37	0.009	0.0006	2.32	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R7	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.057	< 0.05	< 0.001	< 0.001	31.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	0.7	0.002	6.31	0.009	0.0005	2.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.006	< 0.01
	average	0.00025	0.012	0.001	0.050	0.05	0.001	0.001	26.4	0.0002	0.001	0.001	0.001	0.07	0.7	0.005	5.51	0.006	0.0006	2.11	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.108	0.001	0.0005	0.001	0.0001	0.0013	0.001	0.005	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.032	< 0.05	< 0.001	< 0.001	12.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	2.5	0.001	< 0.0005	1.01	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.041	< 0.001	0.077	< 0.05	< 0.001	< 0.001	40.8	< 0.0002	< 0.001	< 0.001	0.002	0.22	1.3	0.01	8.54	0.014	0.0008	3.49	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.006	< 0.01
	N > DL	0	6	0	11	0	0	0	11	0	0	0	2	5	11	6	11	11	7	11	1	0	0	0	0	11	0	11	0	0	0	0	8	0	2	0
	median	0.00025	0.007	0.001	0.049	0.05	0.001	0.001	27	0.0002	0.001	0.001	0.001	0.05	0.7	0.005	5.97	0.006	0.0006	2.27	0.001	0.001	0.15	0.001	0.001	4.8	0.001	0.11	0.001	0.0005	0.001	0.0001	0.0011	0.001	0.005	0.01
R8	15-May-07	< 0.00025	0.042	< 0.001	0.029	< 0.05	< 0.001	< 0.001	11.9	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	< 0.005	2.29	0.003	0.0007	0.96	< 0.001	0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.052	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R8	19-Jun-07	< 0.00025	0.014	< 0.001	0.031	< 0.05	< 0.001	< 0.001	15.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	3.52	< 0.001	< 0.0005	1.34	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.054	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R8	17-Jul-07	< 0.00025	0.017	< 0.001	0.032	< 0.05	< 0.001	< 0.001	13.8	< 0.0002	< 0.001	< 0.001	0.001	0.05	0.3	< 0.005	3.12	0.006	< 0.0005	1.34	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.061	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R8	14-Aug-07	< 0.00025	0.045	< 0.001	0.04	< 0.05	< 0.001	< 0.001	20.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	4.55	0.006	< 0.0005	1.77	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.08	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R8	11-Sep-07	< 0.00025	0.013	< 0.001	0.035	< 0.05	< 0.001	< 0.001	14.5	< 0.0002	< 0.001	< 0.001	0.002	0.07	0.4	< 0.001	3.16	0.004	< 0.0005	1.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.062	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
R8	23-Oct-07	< 0.00025	0.006	< 0.001	0.049	< 0.05	< 0.001	< 0.001	26.1	< 0.0002	< 0.001	< 0.001	< 0.001	0.08	0.6	0.004	5.87	0.015	0.0006	2.37	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	< 0.005	< 0.01
R8	14-Nov-07	< 0.00025	0.027	< 0.001	0.053	< 0.05	< 0.001	< 0.001	30.5	< 0.0002	< 0.001	< 0.001	< 0.001	0.05	0.7	0.004	6.33	0.011	0.0006	2.42	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R8	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.053	< 0.05	< 0.001	< 0.001	28.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.6	0.002	5.81	0.01	0.0006	2.09	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
	average	0.00025	0.021	0.001	0.040	0.05	0.001	0.001	20.2	0.0002	0.001	0.001	0.001	0.08	0.6	0.004	4.33	0.007	0.0006	1.73	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.081	0.001	0.0005	0.001	0.0001	0.0008	0.001	0.006	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.029	< 0.05	< 0.001	< 0.001	11.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	2.29	< 0.001	< 0.0005	0.96	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.052	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.045	< 0.001	0.053	< 0.05	< 0.001	< 0.001	30.5	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	0.004	6.33	0.015	0.0007	2.42	< 0.001	0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	0.009	< 0.01
	N > DL	0	7	0	8	0	0	0	8	0	0	0	3	5	8	3	8	7	4	8	0	1	0	0	0	8	0	8	0	0	0	0	5	0	1	0
	median	0.00025	0.0155	0.001	0.0375	0.05	0.001	0.001	17.85	0.0002	0.001	0.001	0.001	0.05	0.5	0.0045	4.035	0.006	0.00055	1.66	0.001	0.001	0.15	0.001	0.001	4.35	0.001	0.071	0.001	0.0005	0.001	0.0001	0.00055	0.001	0.005	0.01
R9	15-Jan-07	< 0.00025	0.012	< 0.001	0.076	< 0.05	< 0.001	< 0.001	43.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1	0.008	9.38	0.011	0.0007	3.09	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	< 0.005	< 0.01
R9	14-Feb-07	< 0.00025	0.006	< 0.001	0.068	< 0.05	< 0.001	< 0.001	41.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.9	0.008	8.9	0.008	0.0008	3.13	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.8	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	< 0.005	< 0.01
R9	15-May-07	< 0.00025	0.042	< 0.001	0.03	< 0.05	< 0.001	< 0.001	12.5	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	< 0.005	2.49	0.001	0.0007	0.98	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.056	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R9	19-Jun-07	< 0.00025	0.017	< 0.001	0.031	< 0.05	< 0.001	< 0.001	16.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	< 0.005	3.92	< 0.001	< 0.0005	1.38	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.06	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R9	17-Jul-07	< 0.00025	0.025	< 0.001	0.031	< 0.05	< 0.001	< 0.001	15	< 0.0002	< 0.001	< 0.001	0.001	0.05	0.3	< 0.005	3.45	0.005	< 0.0005	1.41	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.068	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R9	14-Aug-07	< 0.00025	0.009	< 0.001	0.039	< 0.05	< 0.001	< 0.001	21.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	4.76	0.006	< 0.0005	1.74	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.085	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	< 0.005	< 0.01
R9	11-Sep-07	< 0.00025	0.011	< 0.001	0.036	< 0.05	< 0.001	< 0.001	15.6	< 0.0002	< 0.001	< 0.001	0.002	0.08	0.5	< 0.001	3.49	0.004	< 0.0005	1.58	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.068	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R9	23-Oct-07	< 0.00025	0.022	< 0.001	0.046	< 0.05	< 0.001	< 0.001	27.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.6	0.003	6.24	0.015	0.0005	2.26	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	< 0.005	< 0.01
R9	14-Nov-07	< 0.00025	0.025	< 0.001	0.05	< 0.05	< 0.001	< 0.001	31.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.004	6.67	0.011	0.0006	2.29	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
R9	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.055	< 0.05	< 0.001	< 0.001	30.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.002	6.41	0.013	0.0006	2.13	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.006	< 0.01
	average	0.00025	0.017	0.001	0.046	0.05	0.001	0.001	25.5	0.0002	0.001	0.001	0.0012	0.07	0.7	0.005	5.57	0.008	0.0006	2.00	0.001	0.001	0.15	0.001	0.001	4.5	0.001	0.103	0.001	0.0005	0.001	0.0001	0.0012	0.001	0.005	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.03	< 0.05	< 0.001	< 0.001	12.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.3	< 0.001	2.49	< 0.001	< 0.0005	0.98	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.056	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.042	< 0.001	0.076	< 0.05	< 0.001	< 0.001	43.3	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	0.008	9.38	0.015	0.0008	3.13	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.8	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	0.006	< 0.01
	N > DL	0	9	0	10	0	0	0	10	0	0	0	3	4	10	5	10	9	6	10	0	0	0	0	0	10	0	10	0	0	0	0	7	0	1	0
	median	0.00025	0.0145	0.001	0.0425	0.05	0.001	0.001	24.3	0.0002	0.001	0.001	0.001	0.05	0.65	0.005	5.5	0.007	0.00055	1.935	0.001	0.001	0.15	0.001	0.001	4.6	0.001	0.0975	0.001	0.0005	0.001	0.0001	0.00095	0.001	0.005	0.01
R10	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.075	< 0.05	< 0.001	< 0.001	43.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1	0.008	9.27	0.012	0.0007	3.05	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.015	< 0.01
R10	14-Feb-07	< 0.00025	< 0.005	< 0.001	0.068	< 0.05	< 0.001	< 0.001	41.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.9	0.008	8.96	0.009	0.0008	3.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0026	< 0.001	< 0.005	< 0.01
R10	19-Apr-07	< 0.00025	0.006	< 0.001	0.067	< 0.05	< 0.001	< 0.001	38.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1	0.006	7.83	0.016	0.0008	2.81	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0021	< 0.001	0.044	< 0.01
R10	15-May-07	< 0.00025	0.046	< 0.001	0.035	< 0.05	< 0.001	< 0.001	14.8	< 0.0002	< 0.001	0.001	0.002	0.26	1.5	< 0.005	3.01	0.002	0.001	1.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.066	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R10	19-Jun-07	< 0.00025	0.015	< 0.001	0.032	< 0.05	< 0.001	< 0.001	16	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	< 0.005	3.87	< 0.001	< 0.0005	1.38	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.06	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
R10	17-Jul-07	< 0.00025	0.018	< 0.001	0.036	< 0.05	< 0.001	< 0.001	15.9	< 0.0002	< 0.001	< 0.001	0.001	0.05	0.4	< 0.005	3.73	0.006	< 0.0005	1.5	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.071	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	< 0.005	< 0.01
R10	14-Aug-07	< 0.00025	0.013	< 0.001	0.041	< 0.05	< 0.001	< 0.001	21.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	4.93	0.007	< 0.0005	1.79	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.086	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R10	11-Sep-07	< 0.00025	0.014	< 0.001	0.037	< 0.05	< 0.001	< 0.001	16	< 0.0002	< 0.001	< 0.001	0.001	0.08	0.5	< 0.001	3.49	0.002	< 0.0005	1.61	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.068	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	< 0.005	< 0.01
R10	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.048	< 0.05	< 0.001	< 0.001	27.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	0.6	0.004	6.31	0.015	0.0005	2.24	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	< 0.005	< 0.01
R10	14-Nov-07	< 0.00025	0.037	< 0.001	0.053	< 0.05	< 0.001	< 0.001	33.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.004	6.85	0.011	0.0006	2.4	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.008	< 0.01
R10	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.055	< 0.05	< 0.001	< 0.001	31.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.002	6.57	0.014	0.0005	2.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.011	< 0.01
	average	0.00025	0.015	0.001	0.050	0.05	0.001	0.001	27.2	0.0002	0.001	0.001	0.001	0.07	0.7	0.005	5.89	0.009	0.0006	2.12	0.001	0.001	0.15	0.001	0.001	4.6	0.001	0.112	0.001	0.0005	0.001	0.0001	0.0013	0.001	0.010	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.032	< 0.05	< 0.001	< 0.001	14.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.001

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
SP5-6	12-Jun-07	< 0.00025	0.017	< 0.001	0.018	< 0.05	< 0.001	< 0.001	77.5	0.0059	0.006	< 0.001	0.01	0.12	2.7	0.018	61.2	0.31	< 0.0005	4.87	0.022	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	4.23	< 0.01
SP5-6	02-Oct-07	< 0.00025	0.039	< 0.001	0.02	< 0.05	< 0.001	< 0.001	113	0.0028	0.012	< 0.001	0.006	0.06	3.3	0.023	86.1	0.55	< 0.0005	6.1	0.027	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	2.19	< 0.01
W5	12-Jun-07	< 0.00025	< 0.005	< 0.001	0.028	< 0.05	< 0.001	< 0.001	118	0.0041	0.001	< 0.001	0.003	0.1	3.4	0.025	137	0.089	< 0.0005	7.45	0.054	< 0.001	< 0.15	< 0.001	0.005	4.6	< 0.001	0.57	< 0.001	< 0.0005	< 0.001	0.0001	0.012	< 0.001	4.91	< 0.01
W5	01-Oct-07	< 0.00025	0.006	< 0.001	0.027	< 0.05	< 0.001	< 0.001	111	0.0006	< 0.001	< 0.001	0.002	0.06	2.7	0.017	64.7	0.001	< 0.0005	5.61	0.013	< 0.001	< 0.15	< 0.001	0.002	4.5	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0052	< 0.001	0.61	< 0.01
W8	11-Jun-07	< 0.00025	0.046	< 0.001	0.015	< 0.05	< 0.001	< 0.001	7.37	< 0.0002	< 0.001	< 0.001	0.003	0.06	0.4	< 0.005	1.14	0.001	< 0.0005	1.13	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.027	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.014	< 0.01
W8	02-Oct-07	< 0.00025	0.009	< 0.001	0.035	< 0.05	< 0.001	< 0.001	15.1	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.6	0.001	2.06	0.006	< 0.0005	1.65	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.051	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.014	< 0.01
W10	11-Jun-07	< 0.00025	0.068	< 0.001	0.01	< 0.05	< 0.001	< 0.001	7.73	< 0.0002	< 0.001	< 0.001	0.003	0.08	0.3	< 0.005	1.01	< 0.001	< 0.0005	1.24	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.027	< 0.001	< 0.0005	0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
W10	02-Oct-07	< 0.00025	0.01	< 0.001	0.012	< 0.05	< 0.001	< 0.001	13.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.001	1.68	< 0.001	< 0.0005	1.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.044	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
WEIR3	20-Feb-07	< 0.00025	< 0.005	< 0.001	0.06	< 0.05	< 0.001	< 0.001	225	< 0.0002	0.003	< 0.001	< 0.001	0.11	4.2	0.007	44.2	6.6	0.001	28.4	0.011	< 0.001	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0065	< 0.001	< 0.005	< 0.01
WEIR3	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.072	< 0.05	< 0.001	< 0.001	230	< 0.0002	0.003	< 0.001	0.001	0.06	4.3	0.008	48.2	8.46	0.0011	30.9	0.012	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0084	< 0.001	< 0.005	< 0.01
X2	18-Apr-07	< 0.00025	0.008	< 0.001	0.067	< 0.05	< 0.001	< 0.001	40.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.2	0.009	10.2	0.13	0.0007	3.38	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.14	< 0.01
X2	14-May-07	< 0.00025	0.03	< 0.001	0.03	< 0.05	< 0.001	< 0.001	15.8	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	< 0.005	3.52	0.033	< 0.0005	1.44	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.072	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.049	< 0.01
X2	18-Jun-07	< 0.00025	0.017	< 0.001	0.031	< 0.05	< 0.001	< 0.001	15.3	< 0.0002	< 0.001	< 0.001	0.001	0.1	0.5	< 0.005	3.69	0.012	< 0.0005	1.39	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.058	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.018	< 0.01
X2	16-Jul-07	< 0.00025	0.014	< 0.001	0.034	< 0.05	< 0.001	< 0.001	16	< 0.0002	< 0.001	< 0.001	0.001	0.07	0.4	< 0.005	3.92	0.013	< 0.0005	1.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.073	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.016	< 0.01
X2	13-Aug-07	< 0.00025	0.005	< 0.001	0.041	< 0.05	< 0.001	< 0.001	24.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.5	< 0.005	5.89	0.038	0.0006	2.07	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	0.0001	0.0011	< 0.001	0.021	< 0.01
X2	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	20.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.4	0.002	4.68	0.026	< 0.0005	1.73	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.079	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.015	< 0.01
X2	22-Oct-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	28.8	< 0.0002	< 0.001	< 0.001	< 0.001	0.13	0.7	0.004	6.85	0.1	0.0006	2.3	< 0.001	0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.024	< 0.01
X2	13-Nov-07	< 0.00025	0.03	< 0.001	0.054	< 0.05	< 0.001	< 0.001	34.3	< 0.0002	< 0.001	< 0.001	0.003	< 0.05	0.8	0.005	8.22	0.088	0.0006	2.65	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.4	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.057	< 0.01
X2	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.056	< 0.05	< 0.001	< 0.001	33.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	0.004	7.77	0.085	0.0005	2.3	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.06	< 0.01
	average	0.00025	0.013	0.001	0.045	0.05	0.001	0.001	25.4	0.0002	0.001	0.001	0.001	0.09	0.7	0.005	6.08	0.058	0.0006	2.09	0.001	0.001	0.15	0.001	0.001	4.4	0.001	0.105	0.001	0.0005	0.001	0.0001	0.0011	0.001	0.044	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.03	< 0.05	< 0.001	< 0.001	15.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	3.52	0.012	< 0.0005	1.39	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.058	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.015	< 0.01
	maximum	< 0.00025	0.03	< 0.001	0.067	< 0.05	< 0.001	< 0.001	40.1	< 0.0002	< 0.001	< 0.001	0.003	0.2	1.2	0.009	10.2	0.13	0.0007	3.38	0.002	0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	0.0001	0.0023	< 0.001	0.14	< 0.01
	N > DL	0	6	0	9	0	0	0	9	0	0	0	4	5	9	5	9	9	5	9	3	1	0	0	0	9	0	9	0	0	0	1	7	0	9	0
	median	0.00025	0.008	0.001	0.043	0.05	0.001	0.001	24.9	0.0002	0.001	0.001	0.001	0.07	0.7	0.005	5.89	0.038	0.0005	2.07	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.1	0.001	0.0005	0.001	0.0001	0.0011	0.001	0.024	0.01
X3	15-Jan-07	< 0.00025	0.007	< 0.001	0.07	< 0.05	< 0.001	< 0.001	47.2	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	1.1	0.008	12.1	0.11	0.0007	3.34	0.002	< 0.001	< 0.15	< 0.001	0.001	5.9	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.073	< 0.01
X3	13-Feb-07	< 0.00025	< 0.005	< 0.001	0.067	< 0.05	< 0.001	< 0.001	45.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1	0.007	11.1	0.081	0.0007	3.23	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0024	< 0.001	0.051	< 0.01
X3	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.077	< 0.05	< 0.001	< 0.001	49.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.3	0.01	13	0.13	0.0008	4.03	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.064	< 0.01
X3	18-Apr-07	< 0.00025	0.007	< 0.001	0.074	< 0.05	< 0.001	< 0.001	47.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	1.5	0.008	11.1	0.14	0.0007	3.69	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0025	< 0.001	0.11	< 0.01
X3	14-May-07	< 0.00025	0.02	< 0.001	0.031	< 0.05	< 0.001	< 0.001	17.5	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.2	< 0.005	3.74	0.037	< 0.0005	1.45	0.001	0.002	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.083	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	0.025	< 0.01
X3	18-Jun-07	< 0.00025	0.014	< 0.001	0.029	< 0.05	< 0.001	< 0.001	16.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.11	0.5	< 0.005	3.78	0.015	< 0.0005	1.51	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.068	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.011	< 0.01
X3	16-Jul-07	< 0.00025	0.011	< 0.001	0.033	< 0.05	< 0.001	< 0.001	15.7	< 0.0002	< 0.001	< 0.001	< 0.001	0.08	0.4	< 0.005	3.58	0.013	< 0.0005	1.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.08	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.007	< 0.01
X3	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.041	< 0.05	< 0.001	< 0.001	25.8	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.6	< 0.005	5.51	0.039	< 0.0005	2.07	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.011	< 0.01
X3	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.041	< 0.05	< 0.001	< 0.001	20.7	< 0.0002	< 0.001	< 0.001	< 0.001	0.09	0.5	0.002	4.48	0.024	< 0.0005	1.82	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.088	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.008	< 0.01
X3	22-Oct-07	< 0.00025	0.008	< 0.001	0.046	< 0.05	< 0.001	< 0.001	29.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.11	0.8	0.003	6.57	0.074	< 0.0005	2.31	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.013	< 0.01
X3	13-Nov-07	< 0.00025	0.027	< 0.001	0.052	< 0.05	< 0.001	< 0.001	32.9	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	0.8	0.004	7.46	0.066	< 0.0005	2.45	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.037	< 0.01
X3	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.055	< 0.05	< 0.001	< 0.001	33.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	0.8	0.004	7.35	0.069	< 0.0005	2.27	0.018	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.044	< 0.01
	average	0.00025	0.0099	0.001	0.051	0.05	0.001	0.001	31.8	0.0002	0.001	0.001	0.0012	0.08	0.9	0.006	7.48	0.067	0.0006	2.48	0.003	0.001	0.15	0.001	0.001	4.6	0.001	0.137	0.001	0.0005	0.001	0.0001	0.0015	0.001	0.038	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.029	< 0.05	< 0.001	< 0.001	15.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	3.58	0.013	< 0.0005	1.45	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.068	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.007	< 0.01
	maximum	< 0.00025	0.027	< 0.001	0.077	< 0.05	< 0.001	< 0.001	49.8	< 0.0002	< 0.001	< 0.001	0.002	0.2	1.5	0.01	13	0.14	0.0008	4.03	0.018	0.002	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.11	< 0.01
	N > DL	0	7	0	12	0	0	0	12	0	0	0	3	8	12	8	12	12	4	12	6	1	0	0	1	12	0	12	0	0	0	0	12	0	12	0
	median	0.00025	0.007	0.001	0.049	0.05	0.001	0.001	31.25	0.0002	0.001	0.001	0.001	0.07	0.8	0.005	6.96	0.0675	0.0005	2.29	0.001	0.001	0.15	0.001	0.001	4.75	0.001	0.13	0.001	0.0005	0.001	0.0001	0.00125	0.001	0.031	0.01
X4	16-Jan-07	< 0.00025	< 0.005	< 0.001	0.012	< 0.05	< 0.001	< 0.001	204	0.0053	0.04	< 0.001	0.001	13.5	4.2	0.015	51.5	13.9	0.0008	13.8	0.05	< 0.001	< 0.15	< 0.001	0.002	5	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0007	0.0007	< 0.001	13	< 0.01
X4	15-Feb-07	< 0.00025	< 0.005	< 0.001	0.009	< 0.05	< 0.001	< 0.001	201	0.0071	0.04	< 0.001	< 0.001	3.75	3.9	0.015	57.2	12.8	< 0.0005	14.6	0.052	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	0.0008	< 0.0005	< 0.001	13.9	< 0.01
X4	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.009	< 0.05	< 0.001	< 0.001	210	0.0077	0.043	< 0.001	0.001	3.34	4.4	0.017	59.4	13.4	0.0007	15.4	0.055	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.71	< 0.001	< 0.0005	< 0.001	0.0009	< 0.0005	< 0.001	14.7	< 0.01
X4	19-Apr-07	< 0.00025	< 0.005	< 0.001	0.009	< 0.05	< 0.001	< 0.001	189	0.0073	0.041	< 0.001	0.002	0.55	3.3	0.013	50	12.8	0.0009	12.1	0.054	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	0.0007	< 0.0005	< 0.001	15.5	< 0.01
X4	15-May-07	< 0.00025	< 0.005	< 0.001	0.012	< 0.05	< 0.001	< 0.001	158	0.0086	0.041	< 0.001	< 0.001	1.63	2.9	0.012	45.2	9.99	< 0.0005	10.7	0.048	< 0.001	< 0.15	< 0.001	0.001	3.3	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0008	< 0.0005	< 0.001	14.3	< 0.01
X4	19-Jun-07	< 0.00025	0.067	< 0.001	0.01	< 0.05	< 0.001	< 0.001	131	0.012	0.04	< 0.001	0.021	12.6	2.5	0.011	43.1	10.2	0.0006	8.55	0.059	0.2	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	0.001	< 0.0005	< 0.001	16.2	< 0.01
X4	16-Jul-07	< 0.00025	0.11	< 0.001	0.012	< 0.05	< 0.001	< 0.001	147	0.013	0.045	< 0.001	0.03	12	2.8	0.014	50.5	11.4	0.0006	10.1	0.058	0.26	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	0.0012	< 0.0005	< 0.001	18	< 0.01
X4	13-Aug-07	< 0.00025	0.11	< 0.001	0.012	< 0.05	< 0.001	< 0.001	163	0.011	0.049	< 0.001	0.03	9.4	3.2	0.014	51.8	12.4	0.0008	10.7	0.06	0.19	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	0.0013	0.0005	< 0.001	17.9	< 0.01
X4	10-Sep-07	< 0.00025	0.14	< 0.001	0.012	< 0.05	< 0.001	< 0.001	142	0.0096	0.04	< 0.001	0.028	7.63	2.8	0.012	47.9	11.2	0.0011	9.97	0.051	0.16	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0012	0.0008	< 0.001	16.2	< 0.01
X4	23-Oct-07	< 0.00025	0.33	< 0.001	0.01	< 0.05	< 0.001	< 0.001	168	0.012	0.051	< 0.001	0.054	10.1	3.3	0.015	60.5	12.9	0.001	11.9	0.066	0.2	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	0.0012	0.0008	< 0.001	21.8	< 0.01
X4	14-Nov-07	< 0.00025	0.03	< 0.001	0.013	< 0.05	< 0.001	< 0.001	192	0.0072	0.043	< 0.001	0.007	3.24	3.9	0.013	51.7	14.9	0.0014	12.5	0.049	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	0.0008	< 0.0005	< 0.001	13.4	< 0.01
X4	10-Dec-07	< 0.00025	0.21	< 0.001	0.01	< 0.05	< 0.001	< 0.001	168	0.01	0.048	< 0.001	0.044	7.16	3.2	0.012	50.7	13.3	0.0011	10.2	0.06	0.14	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.63	< 0.001	< 0.0005	< 0.001	0.001	0.0007	< 0.001	18.1	< 0.01
	average	0.00025	0.085	0.001	0.011	0.05	0.001	0.001	173	0.0092	0.043	0.001	0.018	7.08	3.4	0.014	51.6	12.4	0.0008	11.7	0.055	0.096	0.15	0.001	0.001	3.8	0.001	0.61	0.001	0.0005	0.001	0.0010	0.0006	0.001	16.1	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.009	< 0.05	< 0.001	< 0.001	131	0.0053	0.04	< 0.001	< 0.001	0.55	2.5	0.011	43.1	9.99	< 0.0005	8.55	0.048	< 0.001	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	0.0007	< 0.0005	< 0.001	13	< 0.01
	maximum	< 0.00025	0.33	< 0.001	0.013	< 0.05	< 0.001	< 0.001	210	0.013	0.051	< 0.001	0.054	13.5	4.4	0.017	60.5	14.9	0.0014	15.4	0.066	0.26	< 0.15	< 0.001	0.002	5	< 0.001	0.71	< 0.001	0	< 0.001	0.0013	0.0008	< 0.001	21.8	< 0.01
	N > DL	0	7	0	12	0	0	0	12	12	12	0	10	12	12	12	12	12	10	12	12	6	0	0	2	12	0	12	0	< 0.0005	0	12	5	0	12	0
	median	0.00025	0.0485	0.001	0.011	0.05	0.001	0.001	168	0.0091	0.042	0.001	0.014	7.395	3.25	0.0135	51.1	12.8	0.0008	11.3	0.0545	0.0705	0.15	0.001	0.001	3.8	0.001	0.635	0.001	0.0005	0.001	0.00095	0.0005	0.001	15.85	0.01
X5	10-Apr-07	< 0.00025	< 0.005	< 0.001	0.019	< 0.05	< 0.001	< 0.001	341	< 0.0002	0.025	< 0.001	< 0.001	< 0.05	5.6	0.017	68.8	25.6	0.0027	32.7	0.05	< 0.001	< 0.15	< 0.001	0.002	7.6	< 0.001	0.86	< 0.001	< 0.0005	< 0.001	0.0001	0.0052	< 0.001	0.33	< 0.01
X5	14-May-07	< 0.00025	< 0.005	< 0.001	0.047	< 0.05	< 0.001	< 0.001	86.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.16	1.5	< 0.005	9.17	0.81	< 0.0005	5.21	0.002	< 0.001	< 0.15	< 0.001	< 0.001	1.4	< 0.001	0.25	< 0.001	< 0.0005	< 0.001	0.0002	0.0006	< 0.001	0.014	< 0.01
X5	22-May-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.05	< 0.001	< 0.001	199	< 0.0002	0.005	< 0.001	< 0.001	< 0.05	4.4	0.018	31.3	4.52	0.0009	17	0.01	< 0.001	< 0.15	< 0.001	0.001	2.6	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	0.0002	0.0014	< 0.001	0.14	< 0.01
X5	29-May-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.05	< 0.001	< 0.001	179	< 0.0002	0.004	< 0.001	0.001	< 0.05	3.9	0.015	29.4	3.68	0.001	16.1	0.009	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.53	< 0.001	< 0.0005	< 0.001	0.0002	0.0017	< 0.001	0.14	< 0.01
X5	05-Jun-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.05	< 0.001	< 0.001	194	< 0.0002	0.004	< 0.001	0.001	0.07	4.1	0.017	30.8	4.47	0.001	17.2	0.01	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.58	< 0.001	< 0.0005	< 0.001	0.0002	0.0018	< 0.001	0.15	< 0.01
X5	12-Jun-07	< 0.00025	< 0.005	< 0.001	0.02	< 0.05	< 0.001	< 0.001	210	< 0.0002	0.005	< 0.001	< 0.001	< 0.05	4.3	0.02	32.7	4.8	0.0012	18.4	0.011	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	0.0002	0.0019	< 0.001	0.076	< 0.01
X5	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
X5	16-Jul-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	188	< 0.0002	0.004	< 0.001	< 0.001	0.1	5.1	0.028	32.5	3.63	0.0011	18.2	0.009	< 0.001	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	0.0002	0.0013	< 0.001	0.051	< 0.01
X5	17-Jul-07	< 0.00025	0.006	< 0.001	0.016	< 0.05	< 0.001	< 0.001	185	< 0.0002	0.004	< 0.001	< 0.001	0.12	5.1	0.025	31.1	3.66	0.001	17.7	0.01	< 0.001	< 0.15	< 0.001	< 0.001	2.6	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	0.0002	0.0013	< 0.001	0.029	< 0.01
X5	24-Jul-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	232	< 0.0002	0.006	< 0.001	< 0.001	0.06	6.7	0.034	37.4	4.5	0.0012	21	0.012	< 0.001	< 0.15	< 0.001	0.002	2.8	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	0.0003	0.0014	< 0.001	0.047	< 0.01
X5	31-Jul-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	209	< 0.0002	0.005	< 0.001	< 0.001	< 0.05	6.7	0.034	38.1	4.01	0.0013	20.3	0.01	< 0.001	< 0.15	< 0.001	< 0.001	2.6	< 0.001	0.71	< 0.001	< 0.0005	< 0.001	0.0004	0.0014	< 0.001	0.044	< 0.01
X5	07-Aug-07	< 0.00025	< 0.005	< 0.001	0.018	< 0.05	< 0.001	< 0.001	213	0.0004	0.007	< 0.001	0.001	< 0.05	6.1	0.031	39.2	5.39	0.0019	20.6	0.015	< 0.001	< 0.15	< 0.001	0.001	3.3	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	0.00037	0.0021	0.001	0.08	< 0.01
X5	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	207	< 0.0002	0.006	< 0.001	0.001	0.12	6.3	0.033	38.4	4.73	0.0012	19.9	0.012	< 0.001	< 0.15	< 0.001	< 0.001	2.3	< 0.001	0.63	< 0.001	< 0.0005	< 0.001	0.0003	0.0015	< 0.001	0.088	< 0.01
X5	14-Aug-07	< 0.00025	0.016	< 0.001	0.018	< 0.05	< 0.001	< 0.001	218	< 0.0002	0.008	< 0.001	0.001	< 0.05	6.3	0.03	44.1	6.63	0.0015	22	0.017	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0003	0.002	< 0.001	0.09	< 0.01
X5	21-Aug-07	< 0.00025	0.011	< 0.001	0.018	< 0.05	< 0.001	< 0.001	181	< 0.0002	0.006	< 0.001	0.001	0.11	5.4	0.03	36.2	5.5	0.0013	19.6	0.013	< 0.001	< 0.15	< 0.001	< 0.001	2.2	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	0.0004	0.002	< 0.001	0.06	< 0.01
X5	28-Aug-07	< 0.00025	< 0.005	< 0.001	0.017	< 0.05	< 0.001	< 0.001	210	< 0.0002	0.007	< 0.001	0.001	< 0.05	6.3	0.032	41.7	6.04	0.0014	20.9	0.014	< 0.001	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	0.0003	0.0018	< 0.001	0.099	< 0.01
X5	04-Sep-07	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	200	< 0.0002	0.007	< 0.001	0.001	0.07	6.1	< 1	42.1	6.03	0.0016	20	0.014	< 0.001	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	0.0003	0.0016	< 0.001	0.079	< 0.01
X5	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	206	< 0.0002	0.008	< 0.001	0.001	0.08	5.8	0.029	45.2	7.24	0.0016	20.8	0.018	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	0.0003	0.0019	< 0.001	0.13	< 0.01
X5	11-Sep-07	< 0.00025	0.007	< 0.001	0.016	< 0.05	< 0.001	< 0.001	206	< 0.0002	0.007	< 0.001	0.001	0.12	6.4	0.029	48	6.56	0.0017	21.5	0.015	< 0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0003	0.0016	< 0.001	0.11	< 0.01
X5	17-Sep-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	211	< 0.0002	0.01	< 0.001	0.001	< 0.05	5.7	0.028	47.9	8.91	0.0016	22.2	0.021	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	0.0002	0.0025	< 0.001	0.11	< 0.01
X5	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.02	< 0.05	< 0.001	< 0.001	243	< 0.0002	0.015	< 0.001	0.001	0.05	5.1	0.022	58.2	14.4	0.0019	27	0.032	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	0.0001	0.0031	< 0.001	0.15	< 0.01
X5	29-Oct-07	< 0.00025	< 0.005	< 0.001	0.02	< 0.05	< 0.001	< 0.001	255	< 0.0002	0.016	< 0.001	0.002	< 0.05	5.8	0.022	61.5	15	0.0022	28.3	0.036	< 0.001	< 0.15	< 0.001	0.001	5.2	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	0.0001	0.0031	< 0.001	0.2	< 0.01
	average	0.00025	0.006	0.001	0.018	0.05	0.001	0.001	206	0.0002	0.007	0.001	0.001	0.08	5.2	0.062	38.2	6.46	0.0013	19.7	0.015	0.001	0.15	0.001	0.001	3.1	0.001	0.65	0.001	0.0005	0.001	0.0002	0.0019	0.001	0.095	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	86.6	< 0.0002	0.004	< 0.001	< 0.001	< 0.05	1.5	< 0.005	9.17	0.81	0.0009	5.21	0.002	< 0.001	< 0.15	< 0.001	< 0.001	1.4	< 0.001	0.25	< 0.001	< 0.0005	< 0.001	0.0001	0.0006	< 0.001	0.014	< 0.01
	maximum	< 0.00025	0.016	< 0.001	0.047	< 0.05	< 0.001	< 0.001	341	0.0004	0.025	< 0.001	0.001	0.22	6.7	0.034	68.8	25.6	0.0027	32.7	0.05	< 0.001	< 0.15	< 0.001	0.002	7.6	< 0.001	0.86	< 0.001	< 0.0005	< 0.001	0.0004	0.0052	0.001	0.33	< 0.01
	N > DL	0	4	0	26	0	0	0	26	1	25	0	14	14	26	24	26	26	25	26	26	0	0	0	6	26	0	26	0	0	0	26	26	1	26	0
	median	0.00025	0.005	0.001	0.017	0.05	0.001	0.001	206	0.0002	0.0055	0.001	0.001	0.055	5.25	0.0245	36.8	4.765	0.0012	19.75	0.012	0.001	0.15	0.001	0.001	2.8	0.001	0.65	0.001	0.0005	0.001	0.0002	0.0017	0.001	0.0795	0.01
X5P	16-Jan-07	< 0.00025	< 0.005	< 0.001	0.026	< 0.05	< 0.001	< 0.001	224	0.0002	0.01	< 0.001	0.002	< 0.05	5.2	0.015	51.2	9.59	0.0015	25	0.022	< 0.001	< 0.15	< 0.001	0.001	5.6	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	0.0001	0.0044	< 0.001	0.31	< 0.01
X5P	15-Feb-07	< 0.00025	0.005	< 0.001	0.032	< 0.05	< 0.001	< 0.001	260	0.0002	0.01	< 0.001	0.001	0.07	5.6	0.016	53.2	9.6	0.0015	27.1	0.021	< 0.001	< 0.15	< 0.001	< 0.001	6.8	0.001	0.72	< 0.001	< 0.0005	< 0.001	0.0001	0.0051	< 0.001	0.26	< 0.01
X5P	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.035	< 0.05	< 0.001	< 0.001	255	0.0003	0.01	< 0.001	0.002	< 0.05	6	0.017	55.2	9.64	0.0017	28.9	0.021	< 0.001	< 0.15	< 0.001	< 0.001	6.5	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	0.0001	0.0054	< 0.001	0.28	< 0.01
X5P	19-Apr-07	< 0.00025	0.005	< 0.001	0.036	< 0.05	< 0.001	< 0.001	227	0.0003	0.007	< 0.001	0.002	< 0.05	5.2	0.012	47.8	8.26	0.0019	23.1	0.017	< 0.001	< 0.15	< 0.001	< 0.001	7.2	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0056	< 0.001	0.21	< 0.01
X5P	15-May-07	< 0.00025	< 0.005	< 0.001	0.027	< 0.05	< 0.001	< 0.001	122	< 0.0002	< 0.001	< 0.001	< 0.001	0.23	1.9	0.007	13.9	0.32	< 0.0005	7.01	0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.3	< 0.001	0.38	< 0.001	< 0.0005	< 0.001	0.0003	< 0.0005	< 0.001	0.013	< 0.01
X5P	14-Nov-07	< 0.00025	0.026	< 0.001	0.028	< 0.05	< 0.001	< 0.001	268	< 0.0002	0.013	< 0.001	0.001	0.05	6	0.022	58.9	12.5	0.0023	26.6	0.03	< 0.001	< 0.15	< 0.001	0.001	5.5	< 0.001	0.77	< 0.001	< 0.0005	< 0.001	0.0001	0.0032	< 0.001	0.15	< 0.01
X5P	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.025	< 0.05	< 0.001	< 0.001	246	< 0.0002	0.013	< 0.001	0.001	0.05	5.4	0.018	51.1	13.2	0.0021	23.4	0.03	< 0.001	< 0.15	< 0.001	0.001	5.4	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0037	< 0.001	0.19	< 0.01
	average	0.00025	0.008	0.001	0.030	0.05	0.001	0.001	229	0.0002	0.009	0.001	0.001	0.08	5.0	0.015	47.3	9.02	0.0016	23.0	0.020	0.001	0.15	0.001	0.001	5.5	0.001	0.67	0.001	0.0005	0.001	0.0001	0.0040	0.001	0.202	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.025	< 0.05	< 0.001	< 0.001	122	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.9	0.007	13.9	0.32	< 0.0005	7.01	0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.3	< 0.001	0.38	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.013	< 0.01
	maximum	< 0.00025	0.026	< 0.001	0.036	< 0.05	< 0.001	< 0.001	268	0.0003	0.013	< 0.001	0.002	0.23	6	0.022	58.9	13.2	0.0023	28.9	0.03	< 0.001	< 0.15	< 0.001	0.001	7.2	0.001	0.77	< 0.001	< 0.0005	< 0.001	0.0003	0.0056	< 0.001	0.31	< 0.01
	N > DL	0	3	0	7	0	0	0	7	4	6	0	6	4	7	7	7	7	6	7	7	0	0	0	3	7	1	7	0	0	0	5	6	0	7	0
	median	0.00025	0.005	0.001	0.028	0.05	0.001	0.001	246	0.0002	0.01	0.001	0.001	0.05	5.4	0.016	51.2	9.6	0.0017	25	0.021	0.001	0.15	0.001	0.001	5.6	0.001	0.72	0.001	0.0005	0.001	0.0001	0.0044	0.001	0.21	0.01
X7	11-Jun-07	0.0005	0.2	0.002	0.009	< 0.05	< 0.001	< 0.001	318	0.0072	0.42	< 0.001	0.003	844	7.8	0.082	573	62.8	0.0046	50.5	0.56	< 0.001	< 0.15	< 0.001	0.004	11.9	< 0.001	3.23	< 0.001	< 0.0005	< 0.001	0.0002	0.0015	< 0.001	301	< 0.01
X7	02-Oct-07	0.0007	0.43	0.002	0.01	< 0.05	< 0.001	< 0.001	379	0.011	0.51	< 0.001	0.005	1230	9.1	0.099	573	68.5	0.0063	55.6	0.69	< 0.001	< 0.15	< 0.001	0.005	13.7	< 0.001	3.47	< 0.001	< 0.0005	< 0.001	0.0001	0.0027	< 0.001	387	< 0.01
X10	16-Jan-07	< 0.00025	< 0.005	< 0.001	0.072	< 0.05	< 0.001	< 0.001	47	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.2	0.007	11.9	0.037	0.0006	3.26	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	0.065	< 0.01
X10	15-Feb-07	< 0.00025	< 0.005	< 0.001	0.064	< 0.05	< 0.001	< 0.001	45.1	< 0.0002	< 0.001	< 0.001	< 0.001	0.05	1	0.005	11	0.012	0.0008	2.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	0.027	< 0.01
X10	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.077	< 0.05	< 0.001	< 0.001	49.8	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.2	0.006	12.5	0.009	0.0008	2.92	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.021	< 0.01
X10	19-Apr-07	< 0.00025	< 0.005	< 0.001	0.067	< 0.05	< 0.001	< 0.001	44	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.2	0.006	10.4	0.044	0.0007	2.99	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.2	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	0.054	< 0.01
X10	15-May-07	< 0.00025	0.022	< 0.001	0.03	< 0.05	< 0.001	< 0.001	17.1	< 0.0002	< 0.001	< 0.001	0.002	0.21	1.2	< 0.005	4.06	0.029	< 0.0005	1.29	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.078	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.02	< 0.01
X10	19-Jun-07	< 0.00025	0.008	< 0.001	0.031	< 0.05	< 0.001	< 0.001	17.5	< 0.0002	< 0.001	< 0.001	< 0.001	0.11	0.5	< 0.005	4.51	0.02	< 0.0005	1.39	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.07	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	0.013	< 0.01
X10	16-Jul-07	< 0.00025	0.012	< 0.001	0.029	< 0.05	< 0.001	< 0.001	16.3	< 0.0002	< 0.001	< 0.001	0.001	0.07	0.4	< 0.005	4.19	0.022	< 0.0005	1.52	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.072	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.012	< 0.01
X10	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	28	< 0.0002	< 0.001	< 0.001	< 0.001	0.12	0.6	< 0.005	6.79	0.035	< 0.0005	1.97	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.012	< 0.01
X10	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.046	< 0.05	< 0.001	< 0.001	23.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.14	0.5	0.002	5.7	0.031	< 0.0005	1.84	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.09	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.017	< 0.01
X10	23-Oct-07	< 0.00025	0.006	< 0.001	0.05	< 0.05	< 0.001	< 0.001	31.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.11	0.7	0.003	7.85	0.062	< 0.0005	2.26	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.017	< 0.01
X10	14-Nov-07	< 0.00025	0.025	< 0.001	0.055	< 0.05	< 0.001	< 0.001	37	< 0.0002	< 0.001	< 0.001	< 0.001	0.07	0.9	0.003	8.64	0.064	< 0.0005	2.55	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.046	< 0.01
X10	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.056	< 0.05	< 0.001	< 0.001	34.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.8	0.003	7.85	0.065	0.0005	2.15	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.064	< 0.01
	average	0.00025	0.009	0.001	0.052	0.05	0.001	0.001	32.6	0.0002	0.001	0.001	0.001	0.09	0.9	0.005	7.95	0.036	0.0006	2.23	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.13	0.001	0.0005	0.001	0.0001	0.0014	0.001	0.031	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.029	< 0.05	< 0.001	< 0.001	16.3	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.4	< 0.005	4.06	0.009	< 0.0005	1.29	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.1	< 0.001	0.07	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.012	< 0.01
	maximum	< 0.00025	0.025	< 0.001	0.077	< 0.05	< 0.001	< 0.001	49.8	< 0.0002	< 0.001	< 0.001	0.002	0.21	1.2	0.007	12.5	0.065	0.0008	3.26	0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0023	< 0.001	0.065	< 0.01
	N > DL	0	5	0	12	0	0	0	12	0	0	0	2	8	12	8	12	12	5	12	3	0	0	0	0	12	0	12	0	0	0	0	11	0	12	0
	median	0.00025	0.005	0.001	0.0525	0.05	0.001	0.001	33.05	0.0002	0.001	0.001	0.001	0.07	0.85	0.005	7.85	0.033	0.0005	2.205	0.001	0.001	0.15	0.001	0.001	4.65	0.001	0.14	0.001	0.0005	0.001	0.0001	0.0013	0.001	0.0205	0.01
X11	20-Feb-07	< 0.00025	< 0.005	0.002	0.04	< 0.05	< 0.001	< 0.001	346	< 0.0002	0.015	< 0.001	< 0.001	0.26	5.4	0.013	66.9	15.7	0.0012	32.8	0.018	< 0.001	< 0.15	< 0.001	0.001	7.4	< 0.001	0.86	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0041	< 0.001	< 0.005	< 0.01
X11	17-Aug-07	< 0.00025	< 0.005	0.001	0.042	< 0.05	< 0.001	< 0.001	268	< 0.0002	0.013	< 0.001	0.001	0.08	5.5	0.015	63.6	14	0.0012	32	0.016	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.91	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0043	< 0.001	0.008	< 0.01
X12	17-Aug-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	150	< 0.0002	< 0.001	< 0.001	< 0.001	0.06	4.5	0.006	34.8	0.008	< 0.0005	16.6	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
X13	16-Jan-07	< 0.00025	< 0.005	< 0.001	0.057	< 0.05	< 0.001	< 0.001	232	< 0.0002	0.004	< 0.001	< 0.001	0.05	4.3	0.009	48.5	9.09	0.0018	29.6	0.014	< 0.001	< 0.15	< 0.001	< 0.001	6.8	< 0.001	0.62	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0047	< 0.001	0.006	< 0.01
X13	15-Feb-07	< 0.00025	< 0.005	0.001	0.06	< 0.05	< 0.001	< 0.001	271	< 0.0002	0.007	< 0.001	< 0.001	0.08	4.4	0.009	51.2	9.95	0.0013	29.7	0.013	< 0.001	< 0.15	< 0.001	< 0.001	7.1	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	< 0.0001	0.005	< 0.001	< 0.005	< 0.01
X13	12-Mar-07	< 0.00025	< 0.005	0.001	0.065	< 0.05	< 0.001	< 0.001	230	< 0.0002	0.003	< 0.001	< 0.001	0.06	4.7	0.01	46	7.71	0.0017	29.6	0.014	< 0.001	< 0.15	< 0.001	< 0.001	6.7	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0052	< 0.001	< 0.005	< 0.01
X13	19-Apr-07	< 0.00025	< 0.005	0.001	0.07	< 0.05	< 0.001	< 0.001	265	< 0.0002	0.005	< 0.001	< 0.001	< 0.05	4.2	0.008	49	11.2	0.0017	28.5	0.016	< 0.001	< 0.15	< 0.001	0.001	7.6	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0053	< 0.001	< 0.005	< 0.01
X13	15-May-07	< 0.00025	< 0.005	< 0.001	0.063	< 0.05	< 0.001	< 0.001	249	< 0.0002	0.006	< 0.001	0.001	0.45	4.2	0.01	52.9	10.7	0.0012	30.4	0.015	< 0.001	< 0.15	< 0.001	0.002	7.5	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0058	< 0.001	0.006	< 0.01
X13	19-Jun-07	< 0.00025	< 0.005	< 0.001	0.06	< 0.05	< 0.001	< 0.001	245	< 0.0002	0.006	< 0.001	< 0.001	0.06	4.2	0.01	51.9	9.96	0.0017	29.8	0.013	< 0.001	< 0.15	< 0.001	< 0.001	6.2	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0053	< 0.001	0.009	< 0.01
X13	16-Jul-07	< 0.00025	< 0.005	0.001	0.055	< 0.05	< 0.001	< 0.001	229	< 0.0002	0.006	< 0.001	< 0.001	0.05	4.1	0.011	50.6	9.57	0.0014	27.1	0.013	< 0.001	< 0.15	< 0.001	< 0.001	6.6	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0045	< 0.001	< 0.005	< 0.01
X13	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.053	< 0.05	< 0.001	< 0.001	279	< 0.0002	0.008	< 0.001	0.001	0.1	5.2	0.012	59.1	12.5	0.0018	31.6	0.016	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	< 0.0001	0.005	< 0.001	0.005	< 0.01
X13	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.062	< 0.05	< 0.001	< 0.001	239	< 0.0002	0.005	< 0.001	< 0.001	< 0.05	4.2	0.009	47.4	9.47	0.0021	26.6	0.013	< 0.001	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.66	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0054	< 0.001	0.006	< 0.01
X13	23-Oct-07	< 0.00025	< 0.005	0.001	0.053	< 0.05	< 0.001	< 0.001	269	< 0.0002	0.009	< 0.001	0.001	0.17	4.9	0.013	65.2	11.9	0.002	34	0.017	< 0.001	< 0.15	< 0.001	< 0.001	7.4	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0052	< 0.001	0.005	< 0.01
X13	14-Nov-07	< 0.00025	0.023	< 0.001	0.067	< 0.05	< 0.001	< 0.001	263	< 0.0002	0.004	< 0.001	0.001	0.05	4.6	0.009	52	9.42	0.0022	29.9	0.014	< 0.001	< 0.15	< 0.001

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
	N > DL	0	1	5	12	0	0	0	12	0	12	0	4	10	12	12	12	12	12	12	12	0	0	0	3	12	0	12	0	0	0	0	12	0	8	0
	median	0.00025	0.005	0.001	0.06	0.05	0.001	0.001	247	0.0002	0.0055	0.001	0.001	0.06	4.25	0.0095	50.9	9.955	0.00175	29.65	0.014	0.001	0.15	0.001	0.001	6.75	0.001	0.655	0.001	0.0005	0.001	0.0001	0.00525	0.001	0.0055	0.01
X14	16-Jan-07	< 0.00025	< 0.005	< 0.001	0.074	< 0.05	< 0.001	< 0.001	101	< 0.0002	0.002	< 0.001	< 0.001	< 0.05	2	0.008	22.9	2.34	0.0008	9.64	0.004	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.34	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0029	< 0.001	0.042	< 0.01
X14	15-Feb-07	< 0.00025	< 0.005	< 0.001	0.065	< 0.05	< 0.001	< 0.001	110	< 0.0002	0.002	< 0.001	< 0.001	0.06	2.1	0.008	24.2	2.57	0.0007	10.7	0.004	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.35	< 0.001	< 0.0005	< 0.001	< 0.0001	0.003	< 0.001	0.024	< 0.01
X14	12-Mar-07	< 0.00025	< 0.005	< 0.001	0.073	< 0.05	< 0.001	< 0.001	158	< 0.0002	0.003	< 0.001	< 0.001	< 0.05	3.1	0.01	34.6	4.33	0.001	16.5	0.007	< 0.001	< 0.15	< 0.001	0.001	5.6	< 0.001	0.47	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0037	< 0.001	0.012	< 0.01
X14	10-Apr-07	< 0.00025	0.007	< 0.001	0.042	< 0.05	< 0.001	< 0.001	238	< 0.0002	0.014	< 0.001	0.001	0.06	4.5	0.013	48.6	15.9	0.0019	22.2	0.029	< 0.001	< 0.15	< 0.001	0.001	6.3	< 0.001	0.62	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0045	< 0.001	0.19	< 0.01
X14	19-Apr-07	< 0.00025	< 0.005	< 0.001	0.068	< 0.05	< 0.001	< 0.001	97.5	< 0.0002	0.001	< 0.001	< 0.001	< 0.05	2	0.008	20.3	2.25	0.0008	8.71	0.004	< 0.001	< 0.15	< 0.001	< 0.001	5.6	< 0.001	0.32	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.049	< 0.01
X14	14-May-07	< 0.00025	0.025	< 0.001	0.033	< 0.05	< 0.001	< 0.001	25.5	< 0.0002	< 0.001	< 0.001	0.002	0.28	1.4	< 0.005	6.1	0.32	< 0.0005	2.21	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.031	< 0.01
X14	15-May-07	< 0.00025	0.022	< 0.001	0.03	< 0.05	< 0.001	< 0.001	24.4	< 0.0002	< 0.001	< 0.001	0.002	0.21	1.2	< 0.005	5.61	0.27	0.0006	2.11	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.096	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.021	< 0.01
X14	22-May-07	< 0.00025	0.051	< 0.001	0.026	< 0.05	< 0.001	< 0.001	26.8	< 0.0002	< 0.001	< 0.001	0.002	0.23	1.5	< 0.005	5.27	0.38	< 0.0005	2.23	0.002	0.001	< 0.15	< 0.001	< 0.001	2.3	< 0.001	0.087	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.022	< 0.01
X14	29-May-07	< 0.00024	0.038	< 0.001	0.024	< 0.05	< 0.001	< 0.001	22.3	< 0.0002	< 0.001	< 0.001	0.002	0.16	1.2	< 0.005	5.15	0.4	< 0.0005	2.43	0.002	0.001	< 0.15	< 0.001	< 0.001	2.6	< 0.001	0.071	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.01	< 0.01
X14	05-Jun-07	< 0.00025	0.024	< 0.001	0.019	< 0.05	< 0.001	< 0.001	15	< 0.0002	< 0.001	< 0.001	< 0.001	0.14	0.8	< 0.005	2.96	0.15	< 0.0005	1.56	0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.1	< 0.001	0.051	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.01	< 0.01
X14	12-Jun-07	< 0.00025	0.04	< 0.001	0.027	< 0.05	< 0.001	< 0.001	21.3	< 0.0002	< 0.001	< 0.001	0.002	0.12	0.7	< 0.005	4.52	0.22	< 0.0005	2.18	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.077	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.012	< 0.01
X14	18-Jun-07	< 0.00025	0.009	< 0.001	0.029	< 0.05	< 0.001	< 0.001	34.5	< 0.0002	< 0.001	< 0.001	< 0.001	0.13	0.9	< 0.005	7.4	0.4	< 0.0005	3.07	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.01	< 0.01
X14	19-Jun-07	< 0.00025	0.009	< 0.001	0.033	< 0.05	< 0.001	< 0.001	39	< 0.0002	< 0.001	< 0.001	0.001	0.12	1	< 0.005	8.13	0.56	< 0.0005	3.5	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.009	< 0.01
X14	26-Jun-07	< 0.00025	0.011	< 0.001	0.029	< 0.05	< 0.001	< 0.001	27.5	< 0.0002	< 0.001	< 0.001	0.001	0.09	0.8	< 0.005	5.94	0.29	< 0.0005	2.35	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.093	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.013	< 0.01
X14	03-Jul-07	< 0.00025	0.014	< 0.001	0.031	< 0.05	< 0.001	< 0.001	28.8	< 0.0002	< 0.001	< 0.001	0.001	< 0.05	0.7	< 0.005	6.29	0.31	< 0.0005	2.61	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.017	< 0.01
X14	10-Jul-07	< 0.00025	< 0.005	< 0.001	0.036	< 0.05	< 0.001	< 0.001	43.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1	< 0.005	8.69	0.67	< 0.0005	3.52	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.014	< 0.01
X14	16-Jul-07	< 0.00025	0.012	< 0.001	0.035	< 0.05	< 0.001	< 0.001	34.3	< 0.0002	< 0.001	< 0.001	< 0.001	0.09	0.9	< 0.005	7.56	0.47	< 0.0005	3.2	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	0.011	< 0.01
X14	17-Jul-07	< 0.00025	0.021	< 0.001	0.035	< 0.05	< 0.001	< 0.001	32.9	< 0.0002	< 0.001	< 0.001	0.002	0.08	1	< 0.005	7.15	0.41	< 0.0005	3.63	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0007	< 0.001	0.012	< 0.01
X14	24-Jul-07	< 0.00025	< 0.005	< 0.001	0.046	< 0.05	< 0.001	< 0.001	60	< 0.0002	< 0.001	< 0.001	< 0.001	0.1	1.5	0.006	12	0.93	< 0.0005	4.94	0.002	< 0.001	< 0.15	< 0.001	0.001	3.8	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.022	< 0.01
X14	31-Jul-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	52.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.09	1.5	0.006	11.6	0.77	0.0006	4.84	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.017	< 0.01
X14	07-Aug-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	53.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.13	1.4	0.005	11.8	0.99	0.0007	4.95	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.021	< 0.01
X14	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.038	< 0.05	< 0.001	< 0.001	63.7	< 0.0002	0.001	< 0.001	< 0.001	< 0.05	1.7	0.008	14	1.11	0.0006	6	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.23	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.017	< 0.01
X14	14-Aug-07	< 0.00025	0.01	< 0.001	0.041	< 0.05	< 0.001	< 0.001	54.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.4	0.006	12.2	0.89	0.0005	5.04	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.017	< 0.01
X14	21-Aug-07	< 0.00025	0.035	< 0.001	0.046	< 0.05	< 0.001	< 0.001	57.7	< 0.0002	0.001	< 0.001	< 0.001	0.27	1.6	0.007	13	1.2	0.0006	6.81	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.02	< 0.01
X14	28-Aug-07	< 0.00025	< 0.005	< 0.001	0.045	< 0.05	< 0.001	< 0.001	56	< 0.0002	0.001	< 0.001	< 0.001	0.13	1.5	0.006	12.2	1.06	0.0005	5.07	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.03	< 0.01
X14	04-Sep-07	< 0.00025	< 0.005	< 0.001	0.041	< 0.05	< 0.001	< 0.001	50.7	< 0.0002	0.001	< 0.001	0.001	0.07	1.4	< 1	11.6	1.04	0.0008	5.17	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	0.0001	0.0012	< 0.001	0.021	< 0.01
X14	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	48.7	< 0.0002	0.001	< 0.001	< 0.001	0.07	1.2	0.005	11.5	1.16	0.0006	4.63	0.003	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	0.018	< 0.01
X14	11-Sep-07	< 0.00025	0.009	< 0.001	0.034	< 0.05	< 0.001	< 0.001	37.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.13	1.1	0.003	9.15	0.69	0.0005	3.81	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.021	< 0.01
X14	17-Sep-07	< 0.00025	< 0.005	< 0.001	0.035	< 0.05	< 0.001	< 0.001	39.3	< 0.0002	< 0.001	< 0.001	< 0.001	0.13	1	0.004	9.24	0.87	< 0.0005	3.76	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.13	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.013	< 0.01
X14	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	83.2	< 0.0002	0.003	< 0.001	< 0.001	< 0.05	1.8	0.007	19.7	2.91	0.0008	8.23	0.007	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.036	< 0.01
X14	29-Oct-07	< 0.00025	< 0.005	< 0.001	0.046	< 0.05	< 0.001	< 0.001	76.9	< 0.0002	0.003	< 0.001	0.001	0.07	1.7	0.007	18.1	2.73	0.0007	7.37	0.007	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.064	< 0.01
X14	14-Nov-07	< 0.00025	0.027	< 0.001	0.055	< 0.05	< 0.001	< 0.001	54.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.2	0.004	12.4	0.76	0.0006	4.51	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.034	< 0.01
X14	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.057	< 0.05	< 0.001	< 0.001	67	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	1.3	0.004	14	1.39	0.0006	5.26	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0021	< 0.001	0.036	< 0.01
	average	0.00025	0.013	0.001	0.041	0.05	0.001	0.001	58.7	0.0002	0.002	0.001	0.0012	0.105	1.5	0.036	12.8	1.54	0.0006	5.54	0.004	0.001	0.15	0.001	0.001	4.0	0.001	0.197	0.001	0.0005	0.001	0.0001	0.0014	0.001	0.027	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.019	< 0.05	< 0.001	< 0.001	15	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	0.7	< 0.005	2.96	0.15	< 0.0005	1.56	0.001	< 0.001	< 0.15	< 0.001	0.001	2.1	< 0.001	0.051	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0006	< 0.001	0.009	< 0.01
	maximum	< 0.00025	0.051	< 0.001	0.074	< 0.05	< 0.001	< 0.001	238	< 0.0002	0.014	< 0.001	0.002	0.28	4.5	0.013	48.6	15.9	0.0019	22.2	0.029	0.001	< 0.15	< 0.001	0.001	6.3	< 0.001	0.62	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0045	< 0.001	0.19	< 0.01
	N > DL	0	17	0	33	0	0	0	33	0	12	0	12	23	33	19	33	33	19	33	33	2	0	0	3	33	0	33	0	0	0	1	30	0	33	0
	median	0.00025	0.007	0.001	0.041	0.05	0.001	0.001	50.7	0.0002	0.001	0.001	0.001	0.09	1.4	0.005	11.6	0.87	0.0005	4.63	0.002	0.001	0.15	0.001	0.001	3.8	0.001	0.19	0.001	0.0005	0.001	0.0001	0.0012	0.001	0.02	0.01
X22B	14-Jan-07	< 0.00025	0.007	< 0.001	0.016	< 0.05	< 0.001	< 0.001	140	0.0093	0.042	< 0.001	0.014	< 0.05	8	0.05	67	2.57	0.0016	19.4	0.12	< 0.001	< 0.15	< 0.001	0.001	4.6	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0005	0.002	< 0.001	17.3	< 0.01
X22B	13-Feb-07	< 0.00025	0.01	< 0.001	0.014	< 0.05	< 0.001	< 0.001	132	0.0072	0.034	< 0.001	0.007	0.06	7.5	0.047	59.4	2.17	0.0013	18.1	0.094	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.5	< 0.001	< 0.0005	< 0.001	0.0004	0.0019	< 0.001	13.3	< 0.01
X22B	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	135	0.0046	0.035	< 0.001	< 0.001	< 0.05	8.5	0.051	59.9	2.22	0.0017	19.2	0.092	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.52	< 0.001	< 0.0005	< 0.001	0.0005	0.0021	< 0.001	12.3	< 0.01
X22B	18-Apr-07	< 0.00025	0.006	< 0.001	0.014	< 0.05	< 0.001	< 0.001	131	0.005	0.036	< 0.001	0.002	< 0.05	7.6	0.045	55.2	2.33	0.0016	17.2	0.097	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0004	0.0018	< 0.001	13	< 0.01
X22B	15-May-07	< 0.00025	0.009	< 0.001	0.014	< 0.05	< 0.001	< 0.001	128	0.0044	0.039	< 0.001	0.004	0.24	7.6	0.05	58.9	2.37	0.0017	18.6	0.096	< 0.001	< 0.15	< 0.001	0.001	3.7	< 0.001	0.5	< 0.001	< 0.0005	< 0.001	0.0005	0.002	< 0.001	12.6	< 0.01
X22B	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	123	0.0049	0.035	< 0.001	0.006	0.05	7.5	0.046	57.6	2.3	0.0015	18.7	0.094	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.5	< 0.001	< 0.0005	< 0.001	0.0004	0.0018	< 0.001	12	< 0.01
X22B	17-Jul-07	< 0.00025	0.006	< 0.001	0.016	< 0.05	< 0.001	< 0.001	124	0.006	0.036	< 0.001	0.006	< 0.05	7.2	0.049	58.3	2.2	0.0015	18.1	0.099	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.57	< 0.001	< 0.0005	< 0.001	0.0004	0.0018	< 0.001	12.9	< 0.01
X22B	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	124	0.007	0.038	< 0.001	0.005	< 0.05	7.2	0.047	58.8	2.17	0.0014	17.6	0.097	< 0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0004	0.0016	< 0.001	12.8	< 0.01
X22B	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.016	< 0.05	< 0.001	< 0.001	112	0.0064	0.032	< 0.001	0.004	0.05	6.7	0.043	53.7	2.02	0.0013	16	0.087	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.49	< 0.001	< 0.0005	< 0.001	0.0005	0.0017	< 0.001	11.3	< 0.01
X22B	22-Oct-07	< 0.00025	< 0.005	< 0.001	0.015	< 0.05	< 0.001	< 0.001	133	0.0067	0.037	< 0.001	0.005	0.06	7.7	0.051	64.8	2.26	0.0014	19.9	0.1	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.54	< 0.001	< 0.0005	< 0.001	0.0005	0.0018	< 0.001	13.8	< 0.01
X22B	13-Nov-07	< 0.00025	0.032	< 0.001	0.017	< 0.05	< 0.001	< 0.001	150	0.0079	0.039	< 0.001	0.006	< 0.05	9.1	0.053	68.2	2.39	0.0016	20.6	0.1	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	0.0005	0.0018	< 0.001	14.7	< 0.01
X22B	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.014	< 0.05	< 0.001	< 0.001	120	0.0067	0.034	< 0.001	0.005	< 0.05	6.8	0.04	50.7	2.08	0.0013	15.1	0.093	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.51	< 0.001	< 0.0005	< 0.001	0.0003	0.0017	< 0.001	12.1	< 0.01
	average	0.00025	0.008	0.001	0.015	0.05	0.001	0.001	129	0.0063	0.036	0.001	0.005	0.07	7.6	0.048	59.4	2.26	0.0015	18.2	0.097	0.001	0.15	0.001	0.001	3.5	0.001	0.52	0.001	0.0005	0.001	0.0004	0.0018	0.001	13.2	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.014	< 0.05	< 0.001	< 0.001	112	0.0044	0.032	< 0.001	< 0.001	< 0.05	6.7	0.04	50.7	2.02	0.0013	15.1	0.087	< 0.001	< 0.15	< 0.001	0.001	2.9	< 0.001	0.49	< 0.001	< 0.0005	< 0.001	0.0003	0.0016	< 0.001	11.3	< 0.01
	maximum	0	0.032	< 0.001	0.017	< 0.05	< 0.001	< 0.001	150	0.0093	0.042	< 0.001	0.014	0.24	9.1	0.053	68.2	2.57	0.0017	20.6	0.12	< 0.001	< 0.15	< 0.001	0.001	4.6	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	0.0005	0.0021	< 0.001	17.3	< 0.01
	N > DL	< 0.00025	6	0	12	0	0	0	12	12	12	0	11	5	12	12	12	12	12	12	12	0	0	0	3	12	0	12	0	0	0	0	12	12	12	0
	median	0.00025	0.0055	0.001	0.015	0.05	0.001	0.001	129.5	0.00655	0.036	0.001	0.005	0.05	7.55	0.048	58.85	2.24	0.0015	18.35	0.0965	0.001	0.15	0.001	0.001	3.4	0.001	0.51	0.001	0.0005	0.001	0.00045	0.0018	0.001	12.85	0.01
X23	15-Jan-07	0.0004	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	490	0.024	0.7	< 0.001	0.004	10.5	14.5	0.13	831	72.5	0.004	58.1	0.75	< 0.001	< 0.15	< 0.001	0.004	5.2	< 0.001	3.87	< 0.001	< 0.0005	< 0.001	0.0011	0.0077	< 0.001	303	< 0.01
X23	15-Feb-07	0.0003	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	463	0.02	0.6	< 0.001	0.003	5.96	13.3	0.12	740	62.7	0.0027	53.9	0.61	< 0.001	< 0.15	< 0.001	0.003	5	< 0.001	3.71	< 0.001	< 0.0005	< 0.001	0.001	0.0081	< 0.001	226	< 0.01
X23	12-Mar-07	0.0004	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	459	0.021	0.64	< 0.001	0.004	8.8	14.6	0.14	786	65.1	0.0038	58.7	0.67	< 0.001	< 0.15	< 0.001	0.003	4.8	< 0.001	3.88	< 0.001	< 0.0005	< 0.001	0.0011	0.0085	< 0.001	250	< 0.01
X23	19-Apr-07	0.0004	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	418	0.022	0.63	< 0.001	0.005	5.08	13.5	0.12	613	62.1	0.0054	52.6	0.69	< 0.001	< 0.15	< 0.001	0.004	5.3	< 0.001	3.86	< 0.001	< 0.0005	< 0.001	0.001	0.0083	< 0.001	232	< 0.01
X23	15-May-07	< 0.00025	< 0.005	0.001	0.013	< 0.05	< 0.001	< 0.001	412	0.031	0.59	< 0.001	0.006	1.05	15.7	0.13	772	67.1	< 0.0005	50.3	0.69	< 0.001	< 0.15	< 0.001	0.006	5.4	< 0.001	3.26	< 0.001	< 0.0005	0.001	0.0011	0.0051	< 0.001	264	< 0.01
X23	19-Jun-07	0.0004	< 0.005	< 0.001	0.012	< 0.05	< 0.001	< 0.001	439	0.051	0.64	< 0.001	0.004	5.5	13.4	0.12	748	66.8	0.0036	54.2	0.68	< 0.001	< 0.15	< 0.001	0.004	5.2	< 0.001	3.54	< 0.001	< 0.0005	< 0.001	0.0011	0.0088	< 0.001	258	< 0.01
X23	17-Jul-07	0.0003	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	421	0.045	0.59	< 0.001	0.004	5.4	13.5	0.13	697	59.6	0.0038	52.1	0.67	< 0.001	< 0.15	< 0.001	0.004	6	< 0.001	3.8	< 0.001	< 0.0005	< 0.001	0.0011	0.0095	< 0.001	229	< 0.01
X23	13-Aug-07	0.0005	< 0.005	0.001	0.012	< 0.05	< 0.001	< 0.001	512	0.038	0.66	< 0.001	0.006	4.23	16.9	0.13	871	68.1	0.0065	67.5	0.73	< 0.001	< 0.

Appendix 3
2007 Surface Water Quality Data
Rose Creek Drainage

Table 3. Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
	average	0.00038	0.005	0.001	0.012	0.05	0.001	0.001	454	0.031	0.62	0.001	0.005	4.43	14.2	0.13	762	64.3	0.0045	54.6	0.68	0.001	0.15	0.001	0.004	5.5	0.001	3.67	0.001	0.0005	0.001	0.0011	0.0094	0.001	235	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.011	< 0.05	< 0.001	< 0.001	412	0.02	0.58	< 0.001	0.003	0.09	12.5	0.11	613	59.6	< 0.0005	42.2	0.6	< 0.001	< 0.15	< 0.001	0.003	4.8	< 0.001	3.26	< 0.001	< 0.0005	< 0.001	0.0009	0.0051	< 0.001	191	< 0.01
	maximum	0.0005	< 0.005	0.001	0.013	< 0.05	< 0.001	< 0.001	512	0.051	0.7	< 0.001	0.01	10.5	16.9	0.14	871	72.5	0.0065	67.5	0.75	< 0.001	< 0.15	< 0.001	0.006	6.4	< 0.001	3.9	< 0.001	< 0.0005	0.001	0.0012	0.013	< 0.001	303	< 0.01
	N > DL	11	0	10	12	0	0	0	12	12	12	0	12	12	12	12	12	12	11	12	12	0	0	0	12	12	0	12	0	0	1	12	12	0	12	0
	median	0.0004	0.005	0.001	0.012	0.05	0.001	0.001	458	0.031	0.615	0.001	0.005	5.24	14.05	0.13	769	63.3	0.0047	53.9	0.685	0.001	0.15	0.001	0.004	5.35	0.001	3.69	0.001	0.0005	0.001	0.0011	0.00915	0.001	230.5	0.01
X26	18-Jun-07	< 0.00025	< 0.005	0.002	0.006	< 0.05	< 0.001	< 0.001	442	0.019	0.41	< 0.001	0.002	27	13.1	0.22	240	11.9	0.0008	55.1	1.31	< 0.001	< 0.15	< 0.001	0.003	6.1	< 0.001	3.08	< 0.001	< 0.0005	< 0.001	0.001	0.014	< 0.001	53.9	< 0.01
X26	16-Jul-07	< 0.00025	0.005	0.001	0.006	< 0.05	< 0.001	< 0.001	455	0.019	0.43	< 0.001	0.002	37.9	12.2	0.2	263	11.8	0.0008	50.4	1.21	< 0.001	< 0.15	< 0.001	0.002	6.2	< 0.001	3.12	< 0.001	< 0.0005	< 0.001	0.001	0.013	< 0.001	65.6	< 0.01
X26	13-Aug-07	< 0.00025	0.007	0.002	0.006	< 0.05	< 0.001	< 0.001	528	0.019	0.53	< 0.001	0.004	65.3	14.8	0.21	373	16	0.0014	69.3	1.36	< 0.001	< 0.15	< 0.001	0.003	6.1	< 0.001	3.07	< 0.001	< 0.0005	< 0.001	0.0011	0.011	< 0.001	93.8	< 0.01
X26	10-Sep-07	< 0.00025	< 0.005	0.001	0.006	< 0.05	< 0.001	< 0.001	476	0.018	0.51	< 0.001	0.004	55.4	13.7	0.2	302	14.5	0.0015	55.5	1.25	< 0.001	< 0.15	< 0.001	0.003	6.3	< 0.001	2.99	< 0.001	< 0.0005	< 0.001	0.0011	0.012	0.001	75.4	< 0.01
	average	0.00025	0.006	0.002	0.006	0.05	0.001	0.001	475	0.019	0.47	0.001	0.003	46.4	13.5	0.21	295	13.6	0.0011	57.6	1.28	0.001	0.15	0.001	0.003	6.2	0.001	3.07	0.001	0.0005	0.001	0.001	0.0125	0.001	72.2	0.01
	minimum	< 0.00025	< 0.005	0.001	0.006	< 0.05	< 0.001	< 0.001	442	0.018	0.41	< 0.001	0.002	27	12.2	0.2	240	11.8	0.0008	50.4	1.21	< 0.001	< 0.15	< 0.001	0.002	6.1	< 0.001	2.99	< 0.001	< 0.0005	< 0.001	0.001	0.011	< 0.001	53.9	< 0.01
	maximum	< 0.00025	0.007	0.002	0.006	< 0.05	< 0.001	< 0.001	528	0.019	0.53	< 0.001	0.004	65.3	14.8	0.22	373	16	0.0015	69.3	1.36	< 0.001	< 0.15	< 0.001	0.003	6.3	< 0.001	3.12	< 0.001	< 0.0005	< 0.001	0.0011	0.014	0.001	93.8	< 0.01
	N > DL	0	2	4	4	0	0	0	4	4	4	0	4	4	4	4	4	4	4	4	4	0	0	0	4	4	0	4	0	0	0	4	4	1	4	0
	median	0.00025	0.005	0.0015	0.006	0.05	0.001	0.001	465.5	0.019	0.47	0.001	0.003	46.65	13.4	0.205	282.5	13.2	0.0011	55.3	1.28	0.001	0.15	0.001	0.003	6.15	0.001	3.075	0.001	0.0005	0.001	0.00105	0.0125	0.001	70.5	0.01

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:
Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 4

2007 Groundwater Quality Data

-Rose Creek Drainage

Gartner Lee

Appendix 4
2007 Ground Water Quality Data

Table 1. Ground Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND-L µS/cm	HARD mg/L	SO4-D mg/L	TEMP °C	PH-F	PH-L	WL (m below casing)
BH1	28-May-07	165	338	192	41.4	3.6	6.13	7.13	3.35
BH1	02-Oct-07	126	427	211	94.1	4.7	6.15	6.47	3.42
BH12A	02-Oct-07	186	1020	583	304	2.6	7.64	7.57	2.333
BH12B	02-Oct-07	195	1190	659	379	2.6	7.61	7.8	2.811
BH13A	02-Oct-07	129	528	176	142	1.6	7.74	7.86	2.634
BH13B	02-Oct-07	92	1460	826	623	1.6	7.4	7.32	3.22
BH14A	28-May-07	356	2920	2280	1840	1	7.04	7.78	3.948
BH14A	02-Oct-07	424	3790	2460	2030	4.4	7.09	7.4	3.515
BH14B	28-May-07	352	2870	2320	1660	4.6	7.22	7.89	4.545
BH14B	02-Oct-07	407	3400	2190	1710	4.1	7.06	7.43	4.15
BH2	28-May-07	116	365	195	95.5	4	6.47	7.43	4.72
BH2	02-Oct-07	116	417	208	97	3.4	6.38	6.54	4.835
BH4	02-Oct-07	99.2	432	227	129	2.8	6.12	6.33	2.495
P01-01A	30-May-07	285	1400	908	692	2.5	7.15	8.17	3.72
P01-01A	03-Oct-07	267	1560	957	673	1.5	7.68	7.49	3.775
P01-01B	30-May-07	264	1060	669	417	2.6	7.36	8.05	3.786
P01-01B	03-Oct-07	259	1140	660	364	1.6	7.86	7.64	3.81
P01-02A	04-Oct-07	254	645	365	123			7.92	2.133
P01-02B	30-May-07	205	495	285	107	3.8	7.75	8.27	0.634
P01-03	04-Oct-07	385	2900	1880	1620	1.9	6.82	6.9	3.59
P01-11	30-May-07	303	1980	1350	1090	3.8	7.08	7.83	0.89
P01-11	04-Oct-07	337	2250	1390	1110	4.8	7.37	7.24	0.988
P2001-02A	29-May-07	442	1210	816	308	3.1	7.42	8.14	5.11
P2001-02A	11-Oct-07	476	1260	799	332	2.5	7.59	7.87	4.94
P2001-02B	29-May-07	361	1120	737	249	3.2	7.42	8.12	5.14
P2001-02B	11-Oct-07	464	1250	777	317	1.2	7.87	7.95	4.985
P2001-03	29-May-07	440	929	514	124	3	7.53	8.15	38.36
P96-6	28-May-07	374	1070	706	264	4.1	6.22	6.9	9.594
P96-6	02-Oct-07	271	924	527	268	2	6.68	6.85	12.549
P96-7	29-May-07	276	2560	1810	1620	2.5	7.21	7.87	8.922
P96-7	03-Oct-07	204	2830	1920	1810			7.61	4.5
P96-8A	05-Oct-07	268	5800	4310	4290	5.1	6.44	6.52	2.81
P96-8B	05-Oct-07	168	5260	3930	3840	5.4	6.63	6.6	2.899
P96-9A	29-May-07	411	2710	2070	1500	0.8	6.82	7.79	5.411
P96-9A	12-Oct-07	520	3270	2370	1760	4.3	7.11	7.46	5.87
S1A	28-May-07	216	5930	4810	5200	3.6	6.93	6.91	3.938
S1A	03-Oct-07	219	6420	4840	4800			6.63	3.544
S1B	28-May-07	224	1580	1050	818	2	6.42	7.24	4.174
S1B	03-Oct-07	139	1600	905	767	1.8	6.51	6.81	4.277
S2A	28-May-07	228	5280	4210	4450	3.2	6.49	6.87	4.543
S2A	03-Oct-07	229	6400	4810	4790	2.3	6.31	6.67	4.666
S2B	28-May-07	15.9	3370	4190	3010	3	6.59	6.17	4.71

Appendix 4
2007 Ground Water Quality Data

Table 1. Ground Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND-L µS/cm	HARD mg/L	SO4-D mg/L	TEMP °C	PH-F	PH-L	WL (m below casing)
S2B	03-Oct-07	163	4640	3600	2960	2.3	6.77	6.44	4.901
S3	29-May-07	211	4340	4530	4560	1.2	6.01	6.85	2.024
S3	03-Oct-07	192	6800	5110	526	3.1	6.11	6.63	2
TH86-17	01-Jun-07	73.6	188	91.6	< 1	1.9	7.4	8.02	8.17
TH86-17	02-Oct-07	73.9	176	80.1	14.3	5.1	7.82	7.42	8.211
V34	29-May-07	506	968	626	107	3.2	7.51	8.21	6.52
V34	11-Oct-07	473	1070	666	131	0.7	7.68	8.01	6.21
V35	29-May-07	677	3050	2510	1680	3	7.13	8.05	9.16
V35	11-Oct-07	528	2060	1440	870	2.5	7.48	7.83	6.2
V36	29-May-07	487	1760	1280	693	2.6	7.26	8.1	9.989
V36	11-Oct-07	416	1560	1020	544	1.6	7.55	7.82	9.06
V37	03-Jun-07	407	769	434	63.5	3.1	7.8	8.31	9.275
V37	11-Oct-07	430	794	433	63.9	1.8	7.81	7.96	8.82
X16A	31-May-07	136	276	175	26.8	2.3	7.6	8.22	3.422
X16A	04-Oct-07	166	335	182	23.8	3.2	8.11	8.04	3.68
X16B	31-May-07	198	360	243	27.8	3	7.68	8.31	3.543
X16B	04-Oct-07	206	401	218	25	2.9	8.23	8.13	3.72
X17A	30-May-07	276	572	359	63.3	2.2	7.58	8.32	2.28
X17A	10-Oct-07	225	459	264	34.6	2.7	7.24	8.05	2.214
X17B	30-May-07	390	957	535	176	3	7.21	8.25	2.823
X17B	10-Oct-07	259	548	311	48.6	3.1	7.73	7.98	2.775
X18A	30-May-07	252	1460	951	626	3.4	7.17	8.1	4.501
X18A	05-Oct-07	256	1480	837	549	1.8	7.61	7.78	4.657
X18B	30-May-07	257	1450	976	645	3.2	7.05	8.11	
X18B	05-Oct-07	230	1420	788	548	2	7	7.62	4.421
X21A-96	01-Jun-07	15.5	9750	4480	18500	2.1	5.89	3.51	5.293
X21A-96	10-Oct-07	21.1	13800	4440	16500	3.4	6.07	4.08	4.604
X21B-96	01-Jun-07	120	1470	858	851	3	6.87	7.12	5.265
X21B-96	10-Oct-07	165	1780	911	947	3.1	6.97	6.73	4.742
X21C-96	01-Jun-07	180	335	203	12	3.1	7.17	8.11	5.3
X21C-96	10-Oct-07	188	351	195	11.8	2.6	7.97	8.13	4.786
X24A-96	01-Aug-07	353	2680		1430	8.2	6.58	7.46	4.16
X24A-96	04-Oct-07	387	2900	1770	1620	2.5	6.95	7	4.714
X24A-96	06-Nov-07	368	2710		1510	2.9	6.88	7.52	4.55
	average	369	2763	1770	1520	4.5	6.80	7.3	4.47
	minimum	353	2680	1770	1430	2.5	6.58	7	4.16
	maximum	387	2900	1770	1620	8.2	6.95	7.52	4.714
	N > DL	3	3	1	3	3	3	3	3
	median	368	2710	1770	1510	2.9	6.88	7.46	4.55
X24D-96	01-Aug-07	395	3230		1840	10.9	6.52	7.48	3.93
X24D-96	04-Oct-07	404	3240	1990	1890	1.6	7	7.06	4.505
X24D-96	06-Nov-07	406	3220		1930	1.4	6.87	7.38	4.33

Appendix 4
2007 Ground Water Quality Data

Table 1. Ground Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND-L µS/cm	HARD mg/L	SO4-D mg/L	TEMP °C	PH-F	PH-L	WL (m below casing)
	average	402	3230	1990	1887	4.6	6.8	7.3	4.3
	minimum	395	3220	1990	1840	1.4	6.52	7.06	3.93
	maximum	406	3240	1990	1930	10.9	7	7.48	4.505
	N > DL	3	3	1	3	3	3	3	3
	median	404	3230	1990	1890	1.6	6.87	7.38	4.33
X25A-96	31-May-07	254	927	552	285	3.4	7.13	8.1	3.47
X25A-96	01-Aug-07	263	1020		301	9.3	7.21	7.98	3.28
X25A-96	04-Oct-07	269	1000	538	293	2	7.6	7.59	3.845
X25A-96	06-Nov-07	269	1040		334	0.5	7.76	7.93	3.67
	average	264	997	545	303	3.8	7.4	7.9	3.6
	minimum	254	927	538	285	0.5	7.13	7.59	3.28
	maximum	269	1040	552	334	9.3	7.76	8.1	3.845
	N > DL	4	4	2	4	4	4	4	4
	median	266	1010	545	297	2.7	7.405	7.955	3.57
X25B-96	31-May-07	270	1030	582	356	3.3	7.27	8.22	2.957
X25B-96	01-Aug-07	274	1140		348	7.2	7.52	8.1	3.18
X25B-96	04-Oct-07	280	1120	573	311	1.9	7.97	7.82	3.744
X25B-96	06-Nov-07	274	1140		378	1.4	8.48	8.04	3.565
	average	275	1108	578	348	3.5	7.8	8.0	3.4
	minimum	270	1030	573	311	1.4	7.27	7.82	2.957
	maximum	280	1140	582	378	7.2	8.48	8.22	3.744
	N > DL	4	4	2	4	4	4	4	4
	median	274	1130	577.5	352	2.6	7.745	8.07	3.3725

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 4
2007 Ground Water Quality Data

Table 2. Ground Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	HG-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	SB-D mg/L	SE-D mg/L	SN-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L
BH1	28-May-07	< 0.00002	0.056	< 0.0005	0.046	< 0.1	< 0.001	55.7	0.00302	0.00148	< 0.001	0.0045	< 0.03	< 0.00002	< 2	0.0128	12.9	0.225	< 0.001	4.2	0.0059	0.00179	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00111	< 0.03	0.971
BH1	02-Oct-07	< 0.00002	0.102	< 0.0005	0.046	< 0.1	< 0.001	62	0.00624	0.00354	< 0.001	0.0086	< 0.03	< 0.00002	< 2	0.0148	13.7	0.307	< 0.001	4.8	0.0132	0.00401	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00059	< 0.001	2.43
BH12A	02-Oct-07	< 0.00004	< 0.01	< 0.001	0.039	< 0.1	< 0.002	117	0.000289	< 0.0006	< 0.002	0.0021	< 0.03	< 0.00002	3	0.018	70.8	0.00565	< 0.002	5.9	0.0097	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00509	< 0.002	0.224
BH12B	02-Oct-07	< 0.00004	0.018	< 0.001	0.028	< 0.1	< 0.002	138	0.000422	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	3	0.02	76.4	0.00281	< 0.002	6.4	0.0095	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00549	< 0.002	0.305
BH13A	02-Oct-07	< 0.00002	0.0274	0.00055	0.032	< 0.1	< 0.001	45.3	0.000067	0.00071	< 0.001	0.0019	0.511	< 0.00002	2.7	0.008	15.3	0.107	0.0032	9.9	0.0011	0.0013	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00051	< 0.001	0.0265
BH13B	02-Oct-07	< 0.0001	< 0.025	< 0.0025	0.037	< 0.1	< 0.005	215	0.000123	< 0.0015	< 0.005	0.0059	< 0.03	< 0.00002	3.3	< 0.025	70.3	0.0018	< 0.005	7.2	0.0113	< 0.0025	< 0.0025	0.013	< 0.0025	< 0.01	< 0.001	0.0018	< 0.005	0.0091
BH14A	28-May-07	< 0.0001	< 0.025	< 0.0025	< 0.02	< 0.1	< 0.005	565	0.000105	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	3.1	0.051	211	< 0.0015	< 0.005	19.7	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.123	< 0.03	0.121
BH14A	02-Oct-07	0.00029	0.27	< 0.005	< 0.02	< 0.1	< 0.01	591	0.00029	< 0.003	< 0.01	< 0.01	< 0.03	< 0.00002	3.6	0.06	240	< 0.003	< 0.01	15.1	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.135	< 0.01	0.59
BH14B	28-May-07	< 0.0001	< 0.025	< 0.0025	< 0.02	< 0.1	< 0.005	568	0.000136	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	3.2	0.05	218	< 0.0015	< 0.005	15.3	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.14	< 0.03	0.224
BH14B	02-Oct-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	525	< 0.00017	< 0.003	< 0.01	< 0.01	< 0.03	< 0.00002	4	0.051	214	< 0.003	< 0.01	14.7	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.141	< 0.01	0.239
BH2	28-May-07	< 0.00004	0.112	< 0.001	0.045	< 0.1	< 0.002	54.7	0.014	0.00076	< 0.002	< 0.002	0.082	< 0.00002	< 2	0.011	14.1	0.02	< 0.002	3.7	0.0302	0.0025	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	< 0.0004	< 0.03	7.02
BH2	02-Oct-07	< 0.0001	0.102	< 0.0025	0.051	< 0.1	< 0.005	58.3	0.021	< 0.0015	< 0.005	< 0.005	0.043	< 0.00002	< 2	< 0.025	15.3	0.0121	< 0.005	4.2	0.0412	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	< 0.001	< 0.005	10.8
BH4	02-Oct-07	< 0.00002	1.38	< 0.0005	< 0.02	< 0.1	< 0.001	67.5	0.00567	0.0167	< 0.001	0.019	0.073	< 0.00002	< 2	0.0292	14.1	0.182	< 0.001	4.6	0.0254	0.001	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	< 0.0002	< 0.001	1.94
BH5	02-Oct-07	< 0.00002	0.0676	< 0.0005	0.037	< 0.1	< 0.001	70.9	0.000674	0.0135	< 0.001	< 0.001	16.4	< 0.00002	3.2	0.0345	23.4	1.1	< 0.001	10.9	0.021	0.0007	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.0002	< 0.001	2.64
P01-01A	30-May-07	< 0.0001	< 0.025	< 0.0025	0.059	< 0.1	< 0.005	267	0.00066	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	5.6	< 0.025	58.7	4.56	< 0.005	26.9	0.0056	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0084	< 0.03	0.007
P01-01A	03-Oct-07	< 0.0001	< 0.025	< 0.0025	0.063	< 0.1	< 0.005	289	0.000598	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	6.4	< 0.025	56.9	4.17	< 0.005	25.3	0.0059	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0077	< 0.005	0.009
P01-01B	30-May-07	< 0.00004	< 0.01	0.0031	0.061	< 0.1	< 0.002	203	< 0.000034	< 0.0006	< 0.002	< 0.002	0.76	< 0.00002	3.6	0.011	39.4	0.113	< 0.002	26.1	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00701	< 0.03	0.0055
P01-01B	03-Oct-07	< 0.0001	< 0.025	0.0029	0.07	< 0.1	< 0.005	203	< 0.000085	< 0.0015	< 0.005	< 0.005	0.595	< 0.00002	4.2	< 0.025	37.1	0.112	< 0.005	24.6	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0063	< 0.005	0.006
P01-02A	04-Oct-07	< 0.00004	< 0.01	< 0.001	0.06	< 0.1	< 0.002	105	0.000081	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	2.8	< 0.01	24.9	0.943	< 0.002	9.7	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0025	< 0.002	0.0053
P01-02B	30-May-07	< 0.00002	0.0196	0.00419	0.025	< 0.1	< 0.001	71.5	< 0.000017	< 0.0003	< 0.001	< 0.001	0.659	< 0.00002	< 2	0.0058	26	0.141	< 0.001	9.8	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00247	< 0.03	0.0058
P01-03	04-Oct-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	558	0.00146	0.0793	< 0.01	< 0.01	0.202	< 0.00002	6.8	< 0.05	117	53.6	< 0.01	41.2	0.143	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0075	< 0.01	0.0308
P01-11	30-May-07	< 0.0001	< 0.025	0.0308	0.034	< 0.1	< 0.005	409	< 0.000085	0.003	< 0.005	< 0.005	27.3	< 0.00002	6.3	< 0.025	78.9	17.4	< 0.005	45.7	0.006	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0053	< 0.03	<0.0050
P01-11	04-Oct-07	< 0.0001	< 0.025	0.0306	0.037	< 0.1	< 0.005	434	< 0.000085	0.0029	< 0.005	< 0.005	24.7	< 0.00002	6.7	< 0.025	74.9	15.8	< 0.005	42.8	0.0053	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0052	< 0.005	0.0092
P2001-02A	29-May-07	< 0.00002	0.0026	0.0149	0.0161	< 0.02	< 0.001	183	< 0.000034	< 0.0002	< 0.001	< 0.0002	1.36		3.8	0.026	87.4	0.117	0.00164	6.7	< 0.001	< 0.0001	< 0.0002	< 0.002	< 0.0002	< 0.01	< 0.0002	0.0207	< 0.002	0.004
P2001-02A	11-Oct-07	< 0.00004	0.247	0.0111	< 0.02	< 0.1	< 0.002	178	< 0.000034	< 0.0006	< 0.002	< 0.002	0.909	< 0.00002	3.8	0.03	86.1	0.102	< 0.002	6.5	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0209	< 0.002	0.011
P2001-02B	29-May-07	< 0.00002	0.0048	0.0173	0.0255	< 0.02	< 0.001	155	< 0.000034	0.00024	< 0.001	< 0.0002	1.95		4.8	0.033	85.3	0.181	0.00606	11.1	< 0.001	0.00016	< 0.0002	< 0.002	< 0.0002	< 0.01	< 0.0002	0.0174	< 0.002	0.0047
P2001-02B	11-Oct-07	< 0.00004	0.043	0.0154	< 0.02	< 0.1	< 0.002	174	< 0.000034	< 0.0006	< 0.002	< 0.002	1.63	< 0.00002	3.8	0.029	83.2	0.179	0.0021	7.3	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0195	< 0.002	0.022
P2001-03	29-May-07	< 0.00002	0.0048	0.00372	0.0309	0.023	< 0.001	99.8	0.000888	0.00077	< 0.001	0.00233	< 0.03		3.2	0.011	64.4	0.593	0.0165	42.1	0.0018	< 0.0001	< 0.0002	< 0.002	< 0.0002	< 0.01	< 0.0002	0.0128	< 0.002	0.0089
P96-6	28-May-07	< 0.00004	< 0.01	< 0.001	< 0.02	< 0.1	< 0.002	185	0.000327	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	3.7	0.04	59.3	0.0326	< 0.002	6.9	0.0225	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0173	< 0.03	0.808
P96-6	02-Oct-07	< 0.00004	< 0.01	< 0.001	< 0.02	< 0.1	< 0.002	138	0.000096	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	3.4	0.03	44.4	0.0022	< 0.002	5.1	0.0078	< 0.001	< 0.001	0.0033	< 0.001	< 0.01	< 0.0004	0.0162	< 0.002	0.239
P96-7	29-May-07	< 0.0001	< 0.025	< 0.0025	< 0.02	< 0.1	< 0.005	504	< 0.000085	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	4.7	0.035	133	0.0043	< 0.005	15.7	0.0052	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0255	< 0.03	0.0081
P96-7	03-Oct-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	533	< 0.00017	< 0.003	< 0.01	< 0.01	< 0.03	< 0.00002	5.4	< 0.05	142	0.0035	< 0.01	17	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0228	< 0.01	0.017
P96-8A	05-Oct-07	< 0.001	< 0.25	< 0.025	< 0.04	< 0.2	< 0.05	422	0.039	0.473	< 0.05	< 0.05	1.05	< 0.00002	16.4	< 0.25	790	57	< 0.05	57.4	0.597	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.05	170
P96-8B	05-Oct-07	< 0.001	< 0.25	< 0.025	< 0.04	< 0.2	< 0.05	390	0.0608	0.315	< 0.05	< 0.05	< 0.06	< 0.00002	16.3	< 0.25	719	53.3	< 0.05	54.7	0.684	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.05	208
P96-9A	29-May-07	< 0.0001	< 0.025	< 0.0025	0.041	< 0.1	< 0.005	357	0.00031	< 0.0015	< 0.005	< 0.005	< 0.03	< 0.00002	3.8	< 0.025	286	0.0874	< 0.005	12	0.0055	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0353	< 0.03	0.0141
P96-9A	12-Oct-07	< 0.0002	0.848	< 0.005	0.058	< 0.1	< 0.01	401	0.00042	< 0.003	< 0.01	< 0.01	< 0.03	< 0.00002	5.1	< 0.05	332	0.0078	< 0.01	13.5	< 0.01	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0468	< 0.01	< 0.05
S1A	28-May-07	< 0.001	< 0.25	< 0.025	< 0.04	< 0.2	< 0.05	557	0.0177	0.027	< 0.05	< 0.05	< 0.06	< 0.00002	10.3	< 0.25	832	76.9	< 0.05	39.4	1.78	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.06	208
S1A	03-Oct-07	< 0.001	< 0.25	< 0.025	< 0.04	< 0.2	< 0.05	522	0.0194	0.028	< 0.05	< 0.05	< 0.06	< 0.00002	12.4	< 0.25	858	73.4	< 0.05	36.7	1.73	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.05	215
S1B	28-May-07	< 0.0001	0.054	< 0.0025	0.024	< 0.1	< 0.005	292	0.00078	< 0.0015	< 0.005	0.0053	0.324	< 0.00002	2.9	< 0.025	78.5	1.15	< 0.005	35.7	0.0115	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0025	< 0.03	0.124
S1B	03-Oct-07	< 0.0001	< 0.025	< 0.0025	0.029	< 0.1	< 0.005	227	0.000784	< 0.0015	< 0.005	< 0.005	0.032	< 0.00002	3.1	< 0.025	82.2	1.48	< 0.005	35.6	0.0354	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	< 0.001	< 0.005	3.5
S2A	28-May-07	< 0.001	< 0.25	< 0.025	< 0.04	< 0.2	< 0.05	504	0.0243	0.024	< 0.05	< 0.05	0.236	< 0.00002	10.6	< 0.25	718	78.8	< 0.05	27.5	1.69	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.06	207
S2A	03-Oct-07	< 0.002	< 0.5	< 0.05	< 0.04	< 0.2	< 0.1	504	0.0247	< 0.03	< 0.1	< 0.1	1.21	< 0.00002	12.1	< 0.5	862	85.2	< 0.1	27.9	1.89	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.02	< 0.02	< 0.1	241
S2B	28-May-07	< 0.0004	0.26	< 0.01	0.053	< 0.2	< 0.02	816	0.00932	0.0273	< 0.02	< 0.02	156	< 0.00002	7.2	< 0.1	522	55.2	< 0.02	27.8	0.754	< 0.01	< 0.01	< 0.02	< 0.01	< 0.02	< 0.004	< 0.004	< 0.06	89.9
S2B	03-Oct-07	< 0.0002	< 0.05	< 0.005	0.056	< 0.2	< 0.01	927	0.00133	0.0119	< 0.01	< 0.01	193	< 0.00002	5.5	< 0.05	311	23.2	< 0.01	25.8	0.164	< 0.005	< 0.005	< 0.01	< 0.005	< 0.02	< 0.002	< 0.002	< 0.01	20.5
S3	29-May-07	< 0.001	0.53	< 0.025	< 0.04	< 0.2	< 0.05	451	0.0101	0.037	< 0.05	< 0.05	1.12	< 0.00002	10.5	< 0.25	825	115	< 0.05	22.1	2.11	< 0.025	< 0.025	< 0.05	< 0.025	< 0.02	< 0.01	< 0.01	< 0.06	310
S3	03-Oct-07	< 0.002	< 0.5	< 0.05	< 0.04	< 0.2	< 0.1	468	0.0128	0.041	< 0.1	< 0.1	1.05	< 0.00002	13.7	< 0.5	957	118	< 0.1	25.3	2.42	< 0.05	< 0.05	< 0.1	< 0.05	< 0.02	< 0.02	< 0.02	< 0.1	365
TH86-17	01-Jun-07	< 0.00002	< 0.005	0.00109	0.04	< 0.1	< 0.001	26.4	0.000018	0.00153	< 0.001	< 0.001	0.916	< 0.00002	< 2	< 0.005	6.24	0.0225	0.0039	2.2	0.0167	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00193	< 0.03	0.0099
TH86-17	02-Oct-07	< 0.00002	0.0069	< 0.0005	0.05	< 0.1	< 0.001	23.4	0.000018	< 0.0003	< 0.001	< 0.001	0.272	< 0.00002	< 2	< 0.005	5.28	0.00436	< 0.001	2.1	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00045	< 0.001	0.0138
V34	29-May-07	< 0.00002	0.0048	0.00163	0.112	< 0.02	< 0.001	90.2	< 0.000034	0.00048	< 0.001	0.00023	0.854		3.9	0.014	97.3	0.0832	0.00318	6.6	< 0.001	0.00028	< 0.0002	< 0.002	< 0.0002	< 0.01	< 0.0002	0.0103	< 0.002	0.0073
V34	11-Oct-07	< 0.00004	0.682	0.0013	0.128	< 0.1	< 0.002	99.1	< 0.000034	< 0.0006	< 0.002	< 0.002	0.95	< 0.00002	3.3	0.017	102	0.0739	0.0027	6.1	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0117	< 0.002	0.038
V35	29-May-07	< 0.0001	< 0.01	0.0011	0.0126	< 0.1	< 0.005	521	0.0002	< 0.001	< 0.005	0.0012	< 0.03		5.5	< 0.05	293	0.186	0.00212	11.5	0.0118	0.0006	< 0.001	< 0.01	< 0.001	< 0.01	< 0.001	0.139	< 0.01	<0.005
V35	11-Oct-07	< 0.0001	0.27	< 0.0025	< 0.02	< 0.1	< 0.005	308	0.000147	< 0.0015	< 0.005	< 0.005	0.08	< 0.00002	4	0.026	164	0.815	< 0.005	7.3	0.0071	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0679	< 0.005	0.029
V36	29-May-07	< 0.00005	< 0.005	0.0597	0.0142	< 0.05	< 0.0025	251	0.000146	0.00167	< 0.0025	< 0.0005	0.609		5.6	0.036	158	0.186	0.00328	9	0.0066	0.00127	< 0.0005	< 0.005	< 0.0005	< 0.01	< 0.0005	0.0407	< 0.005	0.0142
V36	11-Oct-07	< 0.0001	< 0.025	0.0068	< 0.02	< 0.1	< 0.005	214	0.000224	< 0.0015	< 0.005	< 0.005	0.036	< 0.00002	3.8	0.035	118	0.1	< 0.005	5.8	0.0082	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0233	< 0.005	0.03
V37	03-Jun-07	< 0.00002	< 0.002	0.00139	0.163	0.035	< 0.001	56.1	0.000062	0.00022	< 0.001	0.0003	1.16		6.2	0.025	71.5	0.084	0.0168	24.2	< 0.001	< 0.0001	< 0.0002	< 0.002	< 0.0002	< 0.01	< 0.0002	0.000327	< 0.002	0.0044
V37	11-Oct-07	< 0.00004	< 0.01	< 0.001	0.146	< 0.1	< 0.002	57.7	0.000044	< 0.0006	< 0.002	0.0025	0.317	< 0.00002	5.8	0.025	70.2	0.0355	0.0173	21.5	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00076	< 0.002	0.011
X16A	31-May-07	< 0.00002	< 0.005	< 0.0005	0.08	< 0.1	< 0.001	51.5	0.000076	< 0.0003	< 0.001	< 0.001	< 0.03	< 0.00002	< 2	< 0.005	11.3	0.00055	0.0022	2.2	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00141	< 0.03	0.0312
X16A	04-Oct-07	< 0.00002	0.0072	< 0.0005	0.084	< 0.1	< 0.001	53.5	0.000058	< 0.0003	< 0.001	< 0.001	< 0.03	< 0.00002	< 2	< 0.005	11.6	0.00153	0.0022	2	< 0.001	< 0.0005	< 0.0005	0.001	< 0.0005	< 0.01	< 0.0002	0.00158	< 0.001	0.0104
X16B	31-May-07	< 0.00002	< 0.005	< 0.0005	0.136	< 0.1	< 0.001	69.5	< 0.000017	< 0.0003	< 0.001	< 0.001	< 0.03	< 0.00002	< 2	< 0.005	16.8	< 0.0003	0.0016	2.1	< 0.001	< 0.0005	< 0.0005	0.0018	< 0.0005	< 0.01	< 0.0002	0.00196	< 0.03	0.006
X16B	04-Oct-07	< 0.00002	0.0185	< 0.0005	0.125	< 0.1	< 0.001	62	< 0.000017	< 0.0003	< 0.001	< 0.001	< 0.03	< 0.00002	< 2	< 0.005	15.5	< 0.0004	0.0017	< 2	< 0.001	< 0.0005	< 0.0005	0.0017	< 0.0005	< 0.01	< 0.0002	0.00194	< 0.001	0.0065

Appendix 4
2007 Ground Water Quality Data

Table 2. Ground Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	HG-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	SB-D mg/L	SE-D mg/L	SN-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L
X17A	30-May-07	< 0.00004	< 0.01	< 0.001	0.207	< 0.1	< 0.002	103	0.000039	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	< 2	< 0.01	25	0.0202	< 0.002	3.3	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00288	< 0.03	0.0092
X17A	10-Oct-07	< 0.00002	0.0137	< 0.0005	0.159	< 0.1	< 0.001	74.8	0.00004	< 0.0003	< 0.001	< 0.001	< 0.03	< 0.00002	< 2	< 0.005	18.7	0.0095	< 0.001	2.8	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00225	< 0.001	0.0069
X17B	30-May-07	< 0.00004	0.143	< 0.001	0.177	< 0.1	< 0.002	146	< 0.000034	< 0.0006	< 0.002	< 0.002	< 0.03	< 0.00002	3.4	0.028	41.4	0.302	< 0.002	31.9	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00187	< 0.03	<0.005
X17B	10-Oct-07	< 0.00002	0.0073	< 0.0005	0.208	< 0.1	< 0.001	86.7	< 0.000017	< 0.0003	< 0.001	< 0.001	0.794	< 0.00002	2.4	0.0155	22.8	0.226	< 0.001	6.9	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00238	< 0.001	0.0086
X18A	30-May-07	< 0.0001	< 0.025	0.0108	0.18	< 0.1	< 0.005	274	< 0.000085	< 0.0015	< 0.005	< 0.005	2.47	< 0.00002	6	< 0.025	64.9	2.15	< 0.005	25.3	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0071	< 0.03	0.0095
X18A	05-Oct-07	< 0.0001	< 0.025	0.0059	0.196	< 0.1	< 0.005	240	< 0.000085	< 0.0015	< 0.005	< 0.005	2.24	< 0.00002	6	< 0.025	57.7	1.24	< 0.005	22.6	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0079	< 0.005	0.0102
X18B	30-May-07	< 0.0001	< 0.025	< 0.0025	0.129	< 0.1	< 0.005	282	0.000347	< 0.0015	< 0.005	< 0.005	0.131	< 0.00002	6.7	< 0.025	65.6	2.09	< 0.005	22	0.0144	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0101	< 0.03	0.0069
X18B	05-Oct-07	< 0.0001	< 0.025	< 0.0025	0.114	< 0.1	< 0.005	222	0.000372	< 0.0015	< 0.005	< 0.005	0.112	< 0.00002	6.6	< 0.025	57	1.99	< 0.005	21.3	0.0137	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0091	< 0.005	0.0083
X21A-96	01-Jun-07	< 0.002	< 0.5	< 0.05	< 0.2	< 1	< 0.1	367	< 0.0017	< 0.03	< 0.1	< 0.1	7110	0.000032	< 20	< 0.5	865	474	< 0.1	32	< 0.1	0.057	< 0.05	< 0.1	< 0.05	< 0.1	< 0.02	< 0.02	0.61	79.2
X21A-96	10-Oct-07	< 0.002	< 0.5	< 0.05	< 0.2	< 1	< 0.1	389	< 0.0017	< 0.03	< 0.1	< 0.1	6600	< 0.00002	< 20	< 0.5	842	481	< 0.1	45	< 0.1	0.073	< 0.05	< 0.1	< 0.05	< 0.1	< 0.02	< 0.02	< 0.1	36.9
X21B-96	01-Jun-07	< 0.0001	< 0.025	0.0116	0.022	< 0.1	< 0.005	260	< 0.000085	0.0101	< 0.005	< 0.005	59.3	< 0.00002	4.6	< 0.025	50.9	21.8	< 0.005	69.4	0.0134	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0033	< 0.03	0.224
X21B-96	10-Oct-07	< 0.0001	< 0.025	0.0065	0.021	< 0.1	< 0.005	274	0.000111	0.0117	< 0.005	< 0.005	79.6	< 0.00002	4.5	< 0.025	55.2	27.6	< 0.005	63.4	0.0163	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0036	< 0.005	0.321
X21C-96	01-Jun-07	< 0.00002	0.0114	0.02	0.174	< 0.1	< 0.001	65.1	0.000038	< 0.0003	< 0.001	0.001	< 0.03	< 0.00002	2	< 0.005	9.71	0.206	0.0041	2.9	< 0.001	0.0019	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00028	< 0.03	< 0.005
X21C-96	10-Oct-07	< 0.00002	0.0124	0.027	0.184	< 0.1	< 0.001	62.8	0.000018	< 0.0003	< 0.001	< 0.001	0.48	< 0.00002	< 2	< 0.005	9.35	0.235	0.0042	2.8	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.0002	< 0.001	0.0081
X24A-96	01-Aug-07	< 0.0002	0.267	< 0.005	< 0.02	< 0.1	< 0.01	540	0.00063	0.055	< 0.01	< 0.01	1.25	< 0.00002	6.7	< 0.05	127	39.2	< 0.01	36.5	0.051	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0091	< 0.03	0.0165
X24A-96	04-Oct-07	< 0.0004	< 0.1	< 0.01	< 0.02	< 0.1	< 0.02	506	0.00107	0.0621	< 0.02	< 0.02	1.6	< 0.00002	7.3	< 0.1	123	45	< 0.02	38.5	0.068	< 0.01	< 0.01	< 0.02	< 0.01	< 0.01	< 0.004	0.0102	< 0.02	0.0198
X24A-96	06-Nov-07	< 0.0001	< 0.025	< 0.0025	0.04	< 0.1	< 0.005	152	0.000172	0.0036	< 0.005	< 0.005	< 0.03	< 0.00005	4.3	< 0.025	39.1	5.49	< 0.005	27.4	0.0053	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0088	< 0.005	0.0199
	average	0.00023	0.1307	0.0058	0.027	0.1	0.012	399	0.000624	0.0402	0.012	0.012	0.96	0.00003	6.1	0.058	96.4	29.9	0.012	34.1	0.0414	0.0058	0.0058	0.012	0.0058	0.01	0.002	0.0094	0.018	0.0255
	minimum	< 0.0001	0.267	< 0.0025	< 0.02	< 0.1	< 0.005	152	0.000172	0.0036	< 0.005	< 0.005	< 0.03	< 0.00002	4.3	< 0.025	39.1	5.49	< 0.005	27.4	0.0053	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0088	< 0.005	< 0.05
	maximum	< 0.0004	0.267	< 0.01	0.04	< 0.1	< 0.01	540	0.00107	0.0621	< 0.01	< 0.01	1.6	< 0.00005	7.3	< 0.1	127	45	< 0.01	38.5	0.068	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.004	0.0102	< 0.02	0.0199
	N > DL	0	1	0	1	0	0	3	3	3	0	0	2	0	3	0	3	3	0	3	3	0	0	0	0	0	0	3	0	3
	median	0.0002	0.1	0.005	0.02	0.1	0.01	506	0.00063	0.055	0.01	0.01	1.25	0.00002	6.7	0.05	123	39.2	0.01	36.5	0.051	0.005	0.005	0.01	0.005	0.01	0.002	0.0091	0.02	0.0198
X24D-96	01-Aug-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	583	0.00291	0.0562	< 0.01	< 0.01	< 0.03	< 0.00002	6.4	< 0.05	131	52.6	< 0.01	43.5	0.221	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0057	< 0.03	0.0697
X24D-96	04-Oct-07	< 0.0004	< 0.1	< 0.01	< 0.02	< 0.1	< 0.02	576	0.00292	0.0645	< 0.02	< 0.02	< 0.03	< 0.00002	7.7	< 0.1	134	51.6	< 0.02	47.1	0.243	< 0.01	< 0.01	< 0.02	< 0.01	< 0.01	< 0.004	0.0058	< 0.02	0.0824
X24D-96	06-Nov-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	593	0.00284	0.057	< 0.01	< 0.01	< 0.03	< 0.00005	7.7	< 0.05	140	53.2	< 0.01	47.9	0.213	< 0.005	< 0.005	< 0.01	< 0.005	0.011	< 0.002	0.0053	< 0.01	0.076
	average	0.00027	0.067	0.007	0.02	0.1	0.013	584	0.00289	0.0592	0.013	0.013	0.03	0.00003	7.3	0.07	135	52.5	0.013	46.2	0.226	0.0067	0.0067	0.0133	0.0067	0.0103	0.0027	0.0056	0.02	0.0781
	minimum	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	576	0.00284	0.0562	< 0.01	< 0.01	< 0.03	< 0.00002	6.4	< 0.05	131	51.6	< 0.01	43.5	0.213	< 0.005	< 0.005	< 0.01	< 0.005	0.011	< 0.002	0.005	< 0.01	0.0697
	maximum	< 0.0004	< 0.1	< 0.01	< 0.02	< 0.1	< 0.02	593	0.00292	0.0645	< 0.02	< 0.02	< 0.03	< 0.00005	7.7	< 0.1	140	53.2	< 0.02	47.9	0.243	< 0.01	< 0.01	< 0.02	< 0.01	0.011	< 0.004	0.006	< 0.03	0.0824
	N > DL	0	0	0	0	0	0	3	3	3	0	0	0	0	3	0	3	3	0	3	3	0	0	0	0	1	0	3	0	3
	median	0.0002	0.05	0.005	0.02	0.1	0.01	583	0.00291	0.057	0.01	0.01	0.03	0.00002	7.7	0.05	134	52.6	0.01	47.1	0.221	0.005	0.005	0.01	0.005	0.01	0.002	0.0057	0.02	0.076
X25A-96	31-May-07	< 0.00004	< 0.01	0.0025	0.035	< 0.1	< 0.002	160	0.000176	0.00265	< 0.002	< 0.002	< 0.03	< 0.00002	4.3	< 0.01	36.7	6.09	0.0021	26.2	0.0055	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00883	< 0.03	0.0071
X25A-96	01-Aug-07	< 0.00004	< 0.01	< 0.001	0.026	< 0.1	< 0.002	149	0.000148	0.00294	< 0.002	< 0.002	< 0.03	< 0.00002	3.5	< 0.01	34.2	5.46	< 0.002	23.9	0.0043	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00876	< 0.03	0.0064
X25A-96	04-Oct-07	< 0.00004	< 0.01	< 0.001	0.037	< 0.1	< 0.002	159	0.00019	0.00373	< 0.002	0.003	< 0.03	< 0.00002	4.1	< 0.01	34	5.25	< 0.002	25.6	0.0052	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00918	< 0.002	0.0067
X25A-96	06-Nov-07	< 0.0002	< 0.05	< 0.005	< 0.02	< 0.1	< 0.01	512	0.00087	0.0612	< 0.01	< 0.01	1.94	< 0.00005	6.6	< 0.05	120	43.7	< 0.01	35.7	0.06	< 0.005	< 0.005	< 0.01	< 0.005	0.011	< 0.002	0.0084	< 0.01	0.008
	average	0.00008	0.02	0.0024	0.030	0.1	0.004	245	0.000346	0.01763	0.004	0.0043	0.51	0.000028	4.6	0.02	56.2	15.13	0.0040	27.9	0.0188	0.002	0.002	0.004	0.002	0.010	0.0008	0.00879	0.018	0.0138
	minimum	< 0.00004	< 0.01	< 0.005	< 0.02	< 0.1	< 0.002	149	0.000148	0.00294	< 0.002	0.003	1.94	< 0.00002	3.5	< 0.01	34	5.25	< 0.002	23.9	0.0043	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0084	< 0.002	< 0.015
	maximum	< 0.0002	< 0.05	< 0.001	0.037	< 0.1	< 0.01	512	0.00087	0.0612	< 0.01	0.003	1.94	< 0.00005	6.6	< 0.05	120	43.7	0.0021	35.7	0.06	< 0.005	< 0.005	< 0.01	< 0.005	0.011	< 0.002	0.00918	< 0.01	0.008
	N > DL	0	0	1	3	0	0	4	4	4	0	1	1	0	4	0	4	4	1	4	4	0	0	0	0	1	0	4	0	4
	median	0.00004	0.01	0.00175	0.0305	0.1	0.002	159.5	0.000183	0.003335	0.002	0.0025	0.03	0.00002	4.2	0.01	35.45	5.775	0.00205	25.9	0.00535	0.001	0.001	0.002	0.001	0.01	0.0004	0.008795	0.02	0.0125
X25B-96	31-May-07	< 0.0001	< 0.025	< 0.0025	0.025	< 0.1	< 0.005	183	< 0.000085	< 0.0015	< 0.005	< 0.005	0.616	< 0.00002	3.4	< 0.025	30.4	0.201	< 0.005	46.4	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0056	< 0.03	0.0056
X25B-96	01-Aug-07	< 0.00004	< 0.01	< 0.001	< 0.02	< 0.1	< 0.002	172	< 0.000034	< 0.0006	< 0.002	< 0.002	0.643	< 0.00002	2.7	< 0.01	28.8	0.162	< 0.002	45	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00536	< 0.03	<0.0050
X25B-96	04-Oct-07	< 0.00004	< 0.01	< 0.001	0.024	< 0.1	< 0.002	184	0.000045	< 0.0006	< 0.002	< 0.002	0.57	< 0.00002	3.2	< 0.01	27.8	0.167	< 0.002	44.9	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00531	< 0.002	0.0064
X25B-96	06-Nov-07	< 0.00004	< 0.01	0.001	0.024	< 0.1	< 0.002	177	< 0.000034	< 0.0006	< 0.002	< 0.002	0.685	< 0.00005	3.1	0.01	30	0.191	< 0.002	43.6	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00545	< 0.002	< 0.005
	average	0.00006	0.014	0.0014	0.023	0.1	0.0028	179	0.000050	0.00083	0.0028	0.0028	0.629	0.00003	3.1	0.014	29.3	0.180	0.0028	45.0	0.0028	0.0014	0.0014	0.0028	0.0014	0.01	0.0006	0.00543	0.016	0.0125
	minimum	< 0.00004	< 0.01	< 0.0025	< 0.02	< 0.1	< 0.002	172	< 0.000034	< 0.0015	< 0.002	< 0.002	0.57	< 0.00002	2.7	< 0.025	27.8	0.162	< 0.002	43.6	< 0.002	< 0.0025	< 0.0025	< 0.002	< 0.0025	< 0.01	0	0.00531	< 0.002	< 0.005
	maximum	< 0.0001	< 0.025	0.001	0.025	< 0.1	< 0.005	184	0.000045	< 0.0006	< 0.005	< 0.005	0.685	< 0.00005	3.4	< 0.01	30.4	0.201	< 0.005	46.4	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.01	0	0.0056	< 0.03	< 0.01
	N > DL	0	0	1	3	0	0	4	1	0	0	0	4	0	4	1	4	4	0	4	0	0	0	0	0	0	0	4	0	2
	median	0.00004	0.01	0.001	0.024	0.1	0.002	180	0.0000395	0.0006	0.002	0.002	0.6295	0.00002	3.15	0.01	29.4	0.179	0.002	44.95	0.002	0.001	0.001	0.002	0.001	0.01	0.0004	0.005405	0.016	0.01

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 5

2007 Bioassay Results

-Rose Creek Drainage

Cantest Ltd.
Burnaby
703080418-Grab

X 13

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070309F-02 Report # : 2-11-200-040-07-017

Sample Taken:	Mar. 6, 2007	Sample pH:	7.3
Sample Collected By:		Sample Dissolved Oxygen:	11.3 mg/L
Sample Received:	Mar. 9, 2007	Sample Temperature:	9.7 °C
Start Date/Time:	Mar. 9, 2007 6:40 PM	Sample Conductance:	1682 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	60	14.5	15.1	7.4	7.6	9.9	9.6	0	0	0	0	0
10	276	14.5	14.8	7.7	7.6	10.2	9.9	0	0	0	0	0
18	410	14.5	14.8	7.4	7.6	10.1	9.8	0	0	0	0	0
32	609	14.2	15.0	7.3	7.7	10.1	9.0	0	0	0	0	0
56	1042	14.3	15.0	7.2	7.8	10.1	9.8	0	0	0	0	0
100	1650	14.4	15.0	7.3	7.8	10.2	9.9	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. PO# 256.

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	110 min.
Test Volume:	15 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.36 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	0.54 ± 0.12 g	Length (Mean + SD):	4 ± 0.3 cm
Weight (Range):	0.27– 0.88 g	Length (Range):	3.2– 4.7 cm

Reference Toxicant: Phenol
Test was conducted on: 02/27/2007
Test gave a 96-h LC50 of 10.62 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 21 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Cantest Ltd.
Burnaby
706210390 - X13

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070622B-07 Report # : 2-11-200-040-07-061

Sample Taken:	Jun. 19, 2007	Sample pH:	7.2
Sample Collected By:	C. McNinnow, R. Meers	Sample Dissolved Oxygen:	8.5 mg/L
Sample Received:	Jun. 22, 2007	Sample Temperature:	13.4 °C
Start Date/Time:	Jun. 22, 2007 5:35 PM	Sample Conductance:	1759 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	54	14.1	14.4	7.9	7.5	10.2	9.5	0	0	0	0	0
0	54	14.1	14.5	7.9	7.5	10.2	9.7	0	0	0	0	0
100	1793	14.2	14.1	7.3	8.3	8.9	9.9	0	0	0	0	0
100	1793	14.2	14.6	7.3	8.3	8.9	9.8	0	0	0	0	0

Comments:
At 96hr in 100% concentration fish appeared sluggish compared to control fish. All other fish appeared and behaved normally during the test. PO# 479. Amended Report.

Test Conditions:

Organisms per Replicate:	5	Preaeration Time:	30 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.44 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.57 ± 0.42 g	Length (Mean + SD):	5.6 ± 0.5 cm
Weight (Range):	0.91– 2.47 g	Length (Range):	4.7– 6.6 cm

Reference Toxicant: Phenol
Test was conducted on: 05/25/2007
Test gave a 96-h LC50 of 9.22 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Cantest Ltd.
Burnaby
709270582 X13-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070928C-02 Report # : 2-11-200-040-07-096

Sample Taken:	Sep. 25, 2007 12:45 PM	Sample pH:	7.1
Sample Collected By:	C. McKinon, R. Mecrs	Sample Dissolved Oxygen:	10.4 mg/L
Sample Received:	Sep. 28, 2007	Sample Temperature:	11.1 °C
Start Date/Time:	Sep. 28, 2007 4:30 PM	Sample Conductance:	1601 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	74	14.3	15.1	7.4	8.1	10.1	9.9	0	0	0	0	0
100	1615	14.9	15.0	7.3	8.2	10.0	9.9	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. P.O. # 703

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	80 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.47 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.64 ± 0.45 g	Length (Mean + SD):	5.5 ± 0.6 cm
Weight (Range):	0.48– 2.51 g	Length (Range):	3.6– 6.2 cm

Reference Toxicant: Phenol
Test was conducted on: 09/11/2007
Test gave a 96-h LC50 of 10.21 (8.8, 11.51) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 26 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Anvil Range Mining Corporation
X13-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 712130460 Report # : 2-11-200-196-07-003

Sample Taken:	Dec. 11, 2007 12:45 PM	Sample pH:	7.2
Sample Collected By:	R. Meers, C. McKinnon	Sample Dissolved Oxygen:	9.9 mg/L
Sample Received:	Dec. 13, 2007	Sample Temperature:	13.4 °C
Start Date/Time:	Dec. 14, 2007 4:09 PM	Sample Conductance:	1500 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	63	15.7	15.2	8.3	7.7	9.8	10.0	0	0	0	0	0
100	1503	15.5	15.2	7.7	8.5	10.1	10.0	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test.

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	35 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.19 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	0.34 ± 0.1 g	Length (Mean + SD):	3.4 ± 0.3 cm
Weight (Range):	0.15– 0.59 g	Length (Range):	2.8– 4.2 cm

Reference Toxicant: Phenol
Test was conducted on: 12/05/2007
Test gave a 96-h LC50 of 13.18 (11.26, 16.31) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Cantest Ltd.
Burnaby
703080417-Grab

X 5 P

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070309F-01 Report # : 2-11-200-040-07-019

Sample Taken:	Mar. 6, 2007	Sample pH:	7.5
Sample Collected By:		Sample Dissolved Oxygen:	9.9 mg/L
Sample Received:	Mar. 9, 2007	Sample Temperature:	13.1 °C
Start Date/Time:	Mar. 10, 2007 10:40 AM	Sample Conductance:	1692 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	62	14.0	14.5	7.7	7.4	10.2	9.2	0	0	0	0	0
10	271	14.1	14.3	7.7	7.7	10.3	9.8	0	0	0	0	0
18	423	14.0	14.7	7.6	7.7	10.3	9.5	0	0	0	0	0
32	668	14.0	14.8	7.6	8.1	10.2	9.8	0	0	0	0	0
56	1062	14.0	15.0	7.6	8.1	10.2	9.0	0	0	0	0	0
100	1691	14.0	15.2	7.6	8.4	10.1	9.6	0	0	0	0	0

Comments:
At 24 hours, all fish except in control, were very active, swimming very fast. All fish appeared and behaved normally during the remainder of the test. PO #256

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	30 min.
Test Volume:	15 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.35 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	0.53 ± 0.09 g	Length (Mean + SD):	4 ± 0.2 cm
Weight (Range):	0.32– 0.67 g	Length (Range):	3.4– 4.3 cm

Reference Toxicant: Phenol
Test was conducted on: 02/27/2007
Test gave a 96-h LC50 of 10.62 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 21 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Cantest Ltd.
Burnaby
706210389 -X5

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070622B-06 Report # : 2-11-200-040-07-060

Sample Taken:	Jun. 19, 2007	Sample pH:	7.9
Sample Collected By:	C. McNinnow, R. Meers	Sample Dissolved Oxygen:	10.0 mg/L
Sample Received:	Jun. 22, 2007	Sample Temperature:	13.3 °C
Start Date/Time:	Jun. 22, 2007 5:30 PM	Sample Conductance:	1286 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	54	14.1	14.5	7.9	7.5	10.2	9.5	0	0	0	0	0
0	54	14.1	14.0	7.9	7.5	10.2	9.7	0	0	0	0	0
100	1288	14.2	14.4	8.0	8.3	9.9	9.8	0	0	0	0	0
100	1286	14.2	14.2	8.0	8.2	9.9	9.9	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. PO# 479. Amended Report.

Test Conditions:

Organisms per Replicate:	5	Preaeration Time:	30 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.44 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.57 ± 0.42 g	Length (Mean + SD):	5.6 ± 0.5 cm
Weight (Range):	0.91– 2.47 g	Length (Range):	4.7– 6.6 cm

Reference Toxicant: Phenol
Test was conducted on: 05/25/2007
Test gave a 96-h LC50 of 9.22 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST

Digitally signed by Janet Pickard
Toxicology Group

Cantest Ltd.
Burnaby
709270581 X5P-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070928C-01 Report # : 2-11-200-040-07-095

Sample Taken:	Sep. 25, 2007 1:00 PM	Sample pH:	6.9
Sample Collected By:	C. McKinon, R. Mecrs	Sample Dissolved Oxygen:	11.0 mg/L
Sample Received:	Sep. 28, 2007	Sample Temperature:	11.7 °C
Start Date/Time:	Sep. 28, 2007 4:42 PM	Sample Conductance:	1446 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	70	14.3	15.1	8.0	7.8	10.4	9.8	0	0	0	0	0
100	1470	15.1	15.1	7.5	7.7	10.1	7.5	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. P.O. # 703

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	84 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.47 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.64 ± 0.45 g	Length (Mean + SD):	5.5 ± 0.6 cm
Weight (Range):	0.48– 2.51 g	Length (Range):	3.6– 6.2 cm

Reference Toxicant: Phenol
Test was conducted on: 09/11/2007
Test gave a 96-h LC50 of 10.21 (8.8, 11.51) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 26 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Anvil Range Mining Corporation
X5P-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 712130459 Report # : 2-11-200-196-07-004

Sample Taken:	Dec. 11, 2007 12:30 PM	Sample pH:	7.5
Sample Collected By:	R. Meers, C. McKinnon	Sample Dissolved Oxygen:	10.2 mg/L
Sample Received:	Dec. 13, 2007	Sample Temperature:	14.0 °C
Start Date/Time:	Dec. 14, 2007 4:33 PM	Sample Conductance:	1379 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	63	15.7	15.3	8.3	7.8	9.8	10.1	0	0	0	0	0
100	1391	14.2	15.3	7.6	8.1	10.5	10.1	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test.

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	30 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.34 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.18 ± 0.33 g	Length (Mean + SD):	5 ± 0.5 cm
Weight (Range):	0.76– 1.95 g	Length (Range):	4.2– 5.8 cm

Reference Toxicant: Phenol
Test was conducted on: 11/29/2007
Test gave a 96-h LC50 of 11.97 (10, 22) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Appendix 6

2007 Water Quality Data

-Vangorda Creek Drainage

Gartner Lee

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
LCD	11-Jun-07		1070		0.04	608	2	11.4	6.6
LCD	01-Oct-07		2320	1090	0.31	1590	3	0.5	6.3
MOOSESP	15-May-07	277	1510	903		578		2.1	7.6
MOOSESP	07-Jun-07	257	1240	737		560		1.8	7.5
MOOSESP	18-Jun-07	258	1290			515		4.9	7.7
MOOSESP	03-Jul-07	264	1330	716		543		4.4	7.5
MOOSESP	16-Jul-07	269	1280	724		570		5.5	7.5
MOOSESP	02-Aug-07	284	1370	820		626		5.4	7.5
MOOSESP	14-Aug-07	289	1350	898		571		6.6	7.6
MOOSESP	11-Sep-07	293	1510	867		610		4.3	8.1
MOOSESP	25-Sep-07	295	1410	860		634		2.4	7.4
MOOSESP	10-Oct-07	288	1630	900		677		2.8	7.6
MOOSESP	22-Oct-07	276	1890	995		753		1.9	7.6
MOOSESP	13-Nov-07	289	2050	1100		802		1.4	7.5
MOOSESP	26-Nov-07	283	1810	1010		798		0.1	7.6
MOOSESP	10-Dec-07	287	1830	990		800		0.9	7.3
MOOSESP	17-Dec-07	280	1850	1030		807		1.8	7.1
	average	279	1560	896		662		3.2	7.5
	minimum	257	1240	716		515		0.1	7.1
	maximum	295	2050	1100		807		6.6	8.1
	N > DL	14	14	13	0	14	0	14	14
	median	283.5	1460	898		630		2.6	7.5
V1	18-Jun-07	21.4	48	21	< 0.01	5.31	< 1	4.2	7.5
V1	24-Sep-07	25.8	71	26	< 0.01	9.75	< 1	0.9	7.2
V1	10-Dec-07	40.3	106	42	< 0.01	11.3	< 1		
	average	29	75	30	0.01	9	1	2.6	7.4
	minimum	21.4	48	21	< 0.01	5.31	< 1	0.9	7.2
	maximum	40.3	106	42	< 0.01	11.3	< 1	4.2	7.5
	N > DL	3	3	3	0	3	0	2	2
	median	25.8	71	26	0.01	9.75	1	2.55	7.35
V2	08-Jan-07	364	2280	1260		1040	1	-0.3	8.3
V2	01-May-07	344	2310	1280		1000	3	0.7	8.1
V2	14-May-07	318	2120	1270	0.02	850	3	2.2	8
V2	07-Jun-07	293	1710	921		732	< 1	2	8
V2	18-Jun-07	277	1690	874	0.01	647	< 1	3.2	8.1
V2	03-Jul-07	302	1800	933		766	< 1	3.3	8
V2	16-Jul-07	316	2020	1070	0.02	880	< 1	4.1	7.8
V2	02-Aug-07	333	2120	1210		996	< 1	4.3	8
V2	14-Aug-07	352	1920	1250	0.02	944	< 1	5.4	8.1
V2	11-Sep-07	311	1660	914	0.03	699	< 1	3.4	8.2

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
V2	25-Sep-07	297	1400	838		637	3	1.9	7.9
V2	10-Oct-07	285	1570	922		643	< 1	1.8	8
V2	22-Oct-07	269	1770	907	< 0.01	668	< 1	1.1	7.9
V2	13-Nov-07	284	1770	937	< 0.01	712	2	1.1	7.9
V2	26-Nov-07	279	1660	928		696	< 1	0.2	7.8
V2	10-Dec-07	294	1750	925	< 0.01	761	5	0.4	7.5
V2	17-Dec-07	288	1720	1020		751	1	0.8	7.7
	average	306	1839	1027	0.02	790	1.6	2.1	8.0
	minimum	269	1400	838	< 0.01	637	< 1	-0.3	7.5
	maximum	364	2310	1280	0.03	1040	5	5.4	8.3
	N > DL	17	17	17	5	17	7	17	17
	median	297	1770	933	0.015	751	1	1.9	8
V2A	07-Jun-07	350	2010	1130		864	< 1	0.8	8.2
V2A	18-Jun-07	360	2140	1160	0.02	860	< 1	3	8.3
V2A	03-Jul-07	370	2170	1100		751	< 1	3.7	8.1
V2A	16-Jul-07	374	2090	1180	0.01	927	< 1	4.1	8
V2A	02-Aug-07	388	2140	1280		972	< 1	4.5	8.1
V2A	14-Aug-07	395	1940	1300	0.02	926	< 1	5.5	8.2
V2A	11-Sep-07	396	2180	1260	0.02	975	< 1	4.3	8.4
V2A	25-Sep-07	393	2130	1260		1000	< 1	1.9	8.1
V2A	10-Oct-07	378	2300	1220		954	< 1	0.9	8.3
V2A	22-Oct-07	359	2430	1320	< 0.01	982	< 1	0.2	8
V2A	13-Nov-07	354	2090	1250	0.02	937	< 1	1	7.8
V2A	26-Nov-07	351	2120	1230		944	< 1	0.4	7.8
	average	372	2145	1224	0.02	924	1	2.5	8.1
	minimum	350	1940	1100	< 0.01	751	0	0.2	7.8
	maximum	396	2430	1320	0.02	1000	< 1	5.5	8.4
	N > DL	12	12	12	5	12	< 1	12	12
	median	372	2135	1240	0.02	940.5	1	2.45	8.1
V4	04-Jun-07		428	259	0.02	43.2	12	5.5	8
V4	25-Jul-07		493	287	0.01	41.2	12	9.3	8.04
V4	10-Oct-07		518	285	0.02	50.8	< 1	1.1	8.2
	average		480	277	0.02	45.1	8.3	5.3	8.1
	minimum		428	259	0.01	41.2	< 1	1.1	8
	maximum		518	287	0.02	50.8	12	9.3	8.2
	N > DL	0	3	3	3	3	2	3	3
	median		493	285	0.02	43.2	12	5.5	8.04

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
V5	15-Jan-07	< 0.5	793	436	0.01	167	3	0	7.8
V5	14-May-07	139	348	178	0.01	47.3	18	0.6	8.1
V5	18-Jun-07	125	305	167	0.01	39.1	46	4.4	8.2
V5	16-Jul-07	160	388	196	0.01	55.7	208	7	8
V5	13-Aug-07	204	484	259	0.03	77.5	13	4.8	8.3
V5	10-Sep-07	215	494	246	0.03	84	6	5.9	8
V5	23-Oct-07	197	533	287	< 0.01	93.6	8	0.2	8.1
V5	13-Nov-07	177	539	320	0.02	103	17	0.2	7.6
V5	09-Dec-07	232	640	321	0.03	120	23	0.5	7.4
	average	181	503	268	0.02	87.5	38	2.6	7.9
	minimum	< 0.5	305	167	< 0.01	39.1	3	0	7.4
	maximum	232	793	436	0.03	167	208	7	8.3
	N > DL	8	9	9	8	9	9	9	9
	median	187	494	259	0.01	84	17	0.6	8
V6A	18-Jun-07	45.4	114	54	0.01	13.6	11	5.2	8
V6A	24-Sep-07	67.5	183	81.6	0.32	28	< 1	0.8	7.7
V6A	09-Dec-07	98.2	294	134	0.04	49.1	4		
	average	70	197	90	0.12	30.2	5.3	3.0	7.9
	minimum	45.4	114	54	0.01	13.6	< 1	0.8	7.7
	maximum	98.2	294	134	0.32	49.1	11	5.2	8
	N > DL	3	3	3	3	3	2	2	2
	median	67.5	183	81.6	0.04	28	4	3	7.85
V8	15-Jan-07	238	673	362	0.01	165	< 1	-0.3	8
V8	13-Feb-07	237	695	369	0.02	163	< 1	-0.1	8.1
V8	11-Mar-07	255	715	410	0.02	201	< 1	-0.3	7.8
V8	18-Apr-07	242	729	371	0.01	185	< 1	0.2	8
V8	14-May-07	129	361	197	0.02	61.2	7	1	8.1
V8	18-Jun-07	84.7	232	112	< 0.01	35.8	13	5.3	8
V8	16-Jul-07	107	288	133	< 0.01	48.4	52	8.4	7.9
V8	13-Aug-07	148	363	202	0.02	73	2	5.8	8.2
V8	10-Sep-07	150	361	180	0.02	74	< 1	6.9	7.9
V8	23-Oct-07	183	476	260	< 0.01	99.8	< 1	0.5	8.1
V8	13-Nov-07	177	514	282	0.02	111	2	1.5	7.8
V8	09-Dec-07	193	588	293	< 0.01	129	2	0.3	7.4
	average	184	526	278	0.01	113	7.0	0.8	7.8
	minimum	177	476	260	< 0.01	99.8	< 1	0.3	7.4
	maximum	193	588	293	0.02	129	52	1.5	8.1
	N > DL	3	3	3	1	3	2	3	3
	median	183	514	282	0.01	111	2	0.5	7.8

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
V15	08-Jan-07	519	3600	1680		1760	< 1	-0.3	7.5
V15	14-Jan-07	521	3850	2090	0.03	1720	< 1	0	7.4
V15	06-Feb-07	487	3150	2090		1690	< 1	1	7.1
V15	13-Feb-07	503	3670	2050	0.02	1600	6	0.7	7.1
V15	05-Mar-07	447	2600	1760		1580	1	-0.4	7.1
V15	11-Mar-07	481	2960	2000	0.04	1690	10	-0.2	7
V15	04-Apr-07	517	3470	2060		1600	13	1	7
V15	18-Apr-07	520	3300	2100	0.02	1710	< 1	1.4	7
V15	01-May-07	434	3100	1820		1510	18	2.1	6.9
V15	14-May-07	406	3200	1780	0.02	1330	43	5.7	7.2
V15	07-Jun-07	446	2880	1680		1390	8	5	6.9
V15	18-Jun-07	466	3510	1830	< 0.01	1430	3	10.7	7.2
V15	03-Jul-07	488	3400	1730		1480	< 1	8.2	6.9
V15	16-Jul-07	488	3690	2060	0.01	1690	2	7.1	6.7
V15	02-Aug-07	558	3990	2230		1870	< 1	6.6	6.7
V15	14-Aug-07	533	3340	2290	0.02	1630	< 1	9.3	6.9
V15	11-Sep-07	613	4270	2550	0.02	1790	< 1	4.2	7.2
V15	25-Sep-07	591	3900	2250		1800	< 1	2.9	6.3
V15	10-Oct-07	576	4090	2070		1710	< 1	3	6.7
V15	22-Oct-07	503	4180	2230	< 0.01	1630	< 1	2.7	6.9
V15	13-Nov-07	535	3700	2310	0.02	1660	< 1	3	6.4
V15	26-Nov-07	532	3890	2120		1670	1	3.8	6.8
V15	10-Dec-07	523	4330	2220	0.06	1670	< 1	1.1	6.4
V15	17-Dec-07	496	3630	2110		1580	< 1	3.8	6.6
	average	508	3571	2046	0.02	1633	5.0	3.4	6.9
	minimum	406	2600	1680	< 0.01	1330	< 1	-0.4	6.3
	maximum	613	4330	2550	0.06	1870	43	10.7	7.5
	N > DL	24	24	24	10	24	10	24	24
	median	510	3615	2080	0.02	1665	1	2.95	6.9
V16	11-Jun-07		3600	2330	0.01	1880	9	6.4	7
V16	01-Oct-07		4200	2350	0.02	2100	15	1.1	7.6
V17A	11-Jun-07	30.1	76	30	0.02	8.59	4	4.8	7
V17A	01-Oct-07	42	131	60	0.03	21.8	< 1	0.9	7.8
V19	11-Jun-07		118	59	< 0.01	1.96	1	5.2	7.4
V19	01-Oct-07		238	91	< 0.01	2.56	< 1	0.6	7.6
V20	11-Jun-07		145	70	< 0.01	5.79	1	9.8	7.5
V20	01-Oct-07		233	108	< 0.01	9.31	< 1	0.3	7.5

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
V22	13-Feb-07							0	7.3
V22	05-Mar-07		987	498	0.12	522	< 1	-0.2	7
V22	11-Mar-07							-0.1	7.2
V22	18-Apr-07							0.9	7.1
V22	14-May-07							4.9	6.4
V22	18-Jun-07		1320	550	0.16	776	2	13.4	4.1
V22	16-Jul-07							15.8	3.6
V22	13-Aug-07							13.4	3.3
V22	11-Sep-07							9.6	3
V22	24-Sep-07		1750	620	0.17	1020	8	5.2	2.9
V22	22-Oct-07							0.8	2.7
V22	13-Nov-07							0.5	3
V22	10-Dec-07		1800	647	0.16	1030	11	1.6	2.7
	average		1464	579	0.15	837	5.5	5.1	4.6
	minimum		987	498	0.12	522	< 1	-0.2	2.7
	maximum		1800	647	0.17	1030	11	15.8	7.3
	N > DL	0	4	4	4	4	3	13	13
	median		1535	585	0.16	898	5.5	1.6	3.6
V23	13-Feb-07							-0.2	8.1
V23	05-Mar-07		979	554	0.07	462	< 1	-0.1	8.1
V23	11-Mar-07							-1.4	7.8
V23	18-Apr-07							0.3	8.4
V23	14-May-07							3.7	8.4
V23	18-Jun-07		883	469	0.02	377	4	14.2	8.1
V23	16-Jul-07							15.8	9
V23	13-Aug-07							12.8	8.4
V23	11-Sep-07							10.6	8.3
V23	24-Sep-07		965	522	0.03	421	5	5.3	7.6
V23	22-Oct-07							0.6	7.8
V23	13-Nov-07							0.5	7.6
V23	10-Dec-07		1030	528	0.07	443	3	0.1	7.3
	average		964	518	0.05	426	3.3	4.8	8.1
	minimum		883	469	0.02	377	< 1	-1.4	7.3
	maximum		1030	554	0.07	462	5	15.8	9
	N > DL	0	4	4	4	4	3	13	13
	median		972	525	0.05	432	3.5	0.6	8.1

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
V25BSP	14-May-07	47.6	296	142	< 0.01	87.3	1	1.7	7.6
V25BSP	18-Jun-07	60.7	241	109	0.02	56.7	1	14.6	7.5
V25BSP	16-Jul-07	70.5	298	114	0.01	71.8	1	15.7	7.4
V25BSP	14-Aug-07	79.8	382	202	< 0.01	139	< 1	12.9	7.2
V25BSP	11-Sep-07	68.8	506	234	0.02	207	< 1	7.8	7.9
V25BSP	23-Oct-07	79.9	489	242	< 0.01	177	< 1	0.4	7.7
V25BSP	13-Nov-07	63.1	533	288	< 0.01	235	< 1	1.7	7.6
V25BSP	10-Dec-07	75.6	548	250	< 0.01	209	< 1	0.6	7.1
	average		412	198	0.01	148	1	6.9	7.5
	minimum		241	109	< 0.01	56.7	< 1	0.4	7.1
	maximum		548	288	0.02	235	1	15.7	7.9
	N > DL	0	8	8	3	8	3	8	8
	median		435.5	218	0.01	158	1	4.75	7.55
V27	04-Jun-07		47	17	0.03	8.46	6	4.5	7.5
V27	25-Jul-07		204	100	< 0.01	47.5	< 1	10.1	7.8
V27	10-Oct-07		239	108	< 0.01	64.1	< 1	1.3	7.7
	average		163	75	0.02	40.0	2.7	5.3	7.7
	minimum		47	17	< 0.01	8.46	< 1	1.3	7.5
	maximum		239	108	0.03	64.1	6	10.1	7.8
	N > DL	0	3	3	1	3	1	3	3
	median		204	100	0.01	47.5	1	4.5	7.7
V31	11-Jun-07		7350		5.35	5410	117	8	5
V32	11-Jun-07		97000		4.86	54500	11	12.1	2.9
V32	01-Oct-07		98100		6.61	67400	26	0.4	3.1
V33	01-Oct-07		67300		9.45	54800	195	0.8	5.9
VGMAIN	15-Jan-07	188	601	315	< 0.01	161	< 1	-0.1	8
VGMAIN	13-Feb-07	191	622	333	0.02	162	< 1	0	8.1
VGMAIN	11-Mar-07	204	617	350	0.02	186	< 1	0	7.8
VGMAIN	18-Apr-07	197	672	342	0.02	190	< 1	0.1	8
VGMAIN	14-May-07	115	355	193	< 0.01	67.9	< 1	0.7	8.1
VGMAIN	18-Jun-07	65.7	191	86	< 0.01	33.2	2	5.4	8
VGMAIN	16-Jul-07	86.3	250	105	< 0.01	44.3	< 1	8.4	7.8
VGMAIN	13-Aug-07	113	310	165	0.03	68.1	< 1	5.9	8
VGMAIN	10-Sep-07	113	304	143	0.01	66.6	< 1	6.8	7.9

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 1. Surface Water Routine Parameters

STATION	DATE	ALK-T mg/L	COND µS/cm	HARD mg/L	NH3 mg/L	SO4-D mg/L	TSS mg/L	TEMP °C	PH-F
VGMAIN	23-Oct-07	132	433	218	< 0.01	97.7	< 1	0.3	8
VGMAIN	13-Nov-07	146	438	241	0.02	108	< 1	0.9	7.7
VGMAIN	10-Dec-07	154	522	253	0.02	126	< 1	0.2	7.5
	average	142	443	229	0.02	109	1.1	2.4	7.9
	minimum	65.7	191	86	< 0.01	33.2	< 1	-0.1	7.5
	maximum	204	672	350	0.03	190	2	8.4	8.1
	N > DL	12	12	12	7	12	1	12	12
	median	139	435.5	229.5	0.02	102.85	2	0.5	8

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 2. Surface Water Total Metal Parameters

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
LCD	11-Jun-07	< 0.00025	0.069	< 0.001	0.029	< 0.001	< 0.001	< 0.05	76.2	0.054		0.18	< 0.001	0.002	0.7	< 0.00002	1.6	0.009	66.5	32.5	0.002	1.37	0.17	0.001	< 0.15	< 0.001	0.002	1.8	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	94.8	< 0.01
LCD	01-Oct-07	0.0004	0.093	< 0.001	0.02	< 0.001	< 0.001	< 0.05	154	0.114		0.66	< 0.001	0.005	0.22	< 0.00002	2.9	0.023	171	75.2	0.0069	3.13	0.49	0.002	< 0.15	< 0.001	0.003	3.7	< 0.001	0.54	< 0.001	< 0.0005	0.001	0.0003	0.0005	< 0.001	179	< 0.01
MOOSESP	15-May-07	< 0.00025	0.009	0.001	0.047	< 0.001	< 0.001	< 0.05	199	< 0.0002		< 0.001	< 0.001	0.002	0.38	< 0.00002	2.4	< 0.005	98.6	0.004	0.0021	7.3	< 0.001	0.001	< 0.15	< 0.001	0.002	5.2	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.013	< 0.01
MOOSESP	07-Jun-07	< 0.00025	0.006	0.001	0.036	< 0.001	< 0.001	< 0.05	165	< 0.0002		< 0.001	0.001	< 0.001	0.37	< 0.00002	1.9	< 0.005	78.6	< 0.001	0.0019	6.51	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.45	< 0.001	< 0.0005	< 0.001	< 0.0001	0.012	< 0.001	0.006	< 0.01
MOOSESP	18-Jun-07	< 0.00025	0.02	0.001	0.037	< 0.001	< 0.001	< 0.05	159	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	2.1	< 0.005	81.2	0.006	0.0024	7.1	< 0.001	0.002	< 0.15	< 0.001	0.001	3.8	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	< 0.0001	0.014	< 0.001	0.015	< 0.01
MOOSESP	03-Jul-07	< 0.00025	0.026	< 0.001	0.041	< 0.001	< 0.001	< 0.05	161	< 0.0002		< 0.001	< 0.001	0.001	0.15	< 0.00002	1.9	< 0.005	76	0.032	0.0018	6.35	0.001	0.002	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.48	< 0.001	< 0.0005	< 0.001	< 0.0001	0.013	< 0.001	0.007	< 0.01
MOOSESP	16-Jul-07	< 0.00025	0.016	< 0.001	0.039	< 0.001	< 0.001	< 0.05	158	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	1.9	< 0.005	79.9	0.002	0.0021	6.6	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.52	< 0.001	< 0.0005	< 0.001	< 0.0001	0.013	< 0.001	0.005	< 0.01
MOOSESP	02-Aug-07	< 0.00025	0.008	0.001	0.042	< 0.001	< 0.001	< 0.05	181	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	2.2	< 0.005	89.1	0.004	0.0019	7.18	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.3	< 0.001	0.55	< 0.001	< 0.0005	< 0.001	< 0.0001	0.014	< 0.001	0.005	< 0.01
MOOSESP	14-Aug-07	< 0.00025	0.075	0.001	0.049	< 0.001	< 0.001	< 0.05	199	< 0.0002		< 0.001	< 0.001	0.001	0.09	< 0.00002	2.4	< 0.005	97.4	0.027	0.0021	8	< 0.001	0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.007	< 0.01
MOOSESP	11-Sep-07	< 0.00025	0.015	< 0.001	0.042	< 0.001	< 0.001	< 0.05	193	< 0.0002		< 0.001	< 0.001	0.001	0.12	< 0.00002	2.5	0.003	93.4	0.001	0.0021	7.45	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.006	< 0.01
MOOSESP	25-Sep-07	< 0.00005	0.005	0.0009	0.044	< 0.0002	< 0.0002	< 0.01	194	0.00009		< 0.0002	0.0003	0.0008	0.07	< 0.00002	2.25	0.0049	91.3	0.0062	0.002	7.05	0.0006	< 0.0002	< 0.03	< 0.0002	0.0009	5.03	< 0.0002	0.563	< 0.0002	< 0.0001	0.0004	< 0.00002	0.013	< 0.0002	0.003	< 0.002
MOOSESP	10-Oct-07	< 0.00025	0.024	< 0.001	0.043	< 0.001	< 0.001	< 0.05	208	< 0.0002		< 0.001	< 0.001	0.003	0.08	< 0.00002	2.4	0.004	92.2	< 0.001	0.0017	7.17	< 0.001	< 0.001	< 0.15	< 0.001	0.002	4.7	< 0.001	0.62	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	< 0.005	< 0.01
MOOSESP	22-Oct-07	< 0.00025	0.006	0.001	0.045	< 0.001	< 0.001	< 0.05	215	< 0.0002		< 0.001	< 0.001	0.001	0.09	< 0.00002	2.3	0.005	111	0.003	0.0018	8.75	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.007	< 0.01
MOOSESP	13-Nov-07	< 0.00025	0.027	0.001	0.046	< 0.001	< 0.001	< 0.05	248	< 0.0002		< 0.001	< 0.001	< 0.001	0.07	< 0.00002	2.6	0.005	117	0.001	0.002	8.76	< 0.001	< 0.001	< 0.15	< 0.001	0.001	5.5	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	0.006	< 0.01
MOOSESP	26-Nov-07	< 0.00025	< 0.005	0.001	0.046	< 0.001	< 0.001	< 0.05	228	< 0.0002		< 0.001	< 0.001	0.001	0.07	< 0.00002	2.5	0.004	106	0.001	0.002	7.78	< 0.001	< 0.001	< 0.15	0.004	0.001	4.6	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	0.008	< 0.01
MOOSESP	10-Dec-07	< 0.00025	0.007	0.001	0.045	< 0.001	< 0.001	< 0.05	223	< 0.0002		< 0.001	< 0.001	0.001	0.15	< 0.00002	2.3	0.002	105	0.018	0.0018	7.48	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	< 0.0001	0.022	< 0.001	0.009	< 0.01
MOOSESP	17-Dec-07	< 0.00025	< 0.005	0.001	0.052	< 0.001	< 0.001	< 0.05	227	0.0003		< 0.001	< 0.001	0.001	0.06	< 0.00002	2.4	0.005	113	0.029	0.0022	8.72	0.001	0.002	< 0.15	< 0.001	0.002	4.6	< 0.001	0.71	< 0.001	< 0.0005	< 0.001	0.0001	0.021	< 0.001	0.008	< 0.01
	average	0.00024	0.017	0.001	0.044	0.00095	0.00095	0.05	197	0.0002		0.00095	0.001	0.001	0.13	0.00002	2.27	0.005	95.3	0.009	0.0020	7.48	0.001	0.00115	0.142	0.00115	0.0012	4.6	0.00095	0.59	0.00095	0.00047	0.00096	0.0001	0.016	0.00095	0.007	0.009
	minimum	< 0.00025	< 0.005	< 0.001	0.036	< 0.0002	< 0.0002	< 0.05	158	< 0.0002		< 0.0002	< 0.001	< 0.001	0.06	< 0.00002	1.9	< 0.005	76	< 0.001	0.0017	6.35	< 0.001	< 0.0002	< 0.15	< 0.0002	< 0.001	3.7	< 0.0002	0.45	< 0.0002	< 0.0005	< 0.001	< 0.00002	0.012	< 0.0002	< 0.005	< 0.002
	maximum	< 0.00025	0.075	0.001	0.052	< 0.001	< 0.001	< 0.01	248	0.0003		< 0.001	0.001	0.003	0.38	< 0.00002	2.6	0.005	117	0.032	0.0024	8.76	0.001	0.002	< 0.15	0.004	0.002	5.5	< 0.001	0.71	< 0.001	< 0.0001	0.0004	< 0.00001	0.022	< 0.001	0.015	< 0.01
	N > DL	0	13	11	15	0	0	0	15	2	0	0	2	10	15	0	15	8	15	13	15	15	3	5	0	1	12	15	0	15	0	0	1	1	15	0	14	0
	median	0.00025	0.009	0.001	0.044	0.001	0.001	0.05	199	0.0002		0.001	0.001	0.001	0.09	0.00002	2.3	0.005	93.4	0.004	0.002	7.3	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.59	0.001	0.0005	0.001	0.0001	0.015	0.001	0.007	0.01
V1	18-Jun-07	< 0.00025	0.033	< 0.001	0.014	< 0.001	< 0.001	< 0.05	6.62	< 0.0002		< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.4	< 0.005	0.97	0.014	< 0.0005	1.89	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.03	< 0.001	< 0.0005	0.002	0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
V1	24-Sep-07	< 0.00025	0.012	< 0.001	0.022	< 0.001	< 0.001	< 0.05	7.73	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05		0.3	< 0.001	1.11	0.002	< 0.0005	1.64	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.5	< 0.001	0.042	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.006	< 0.01
V1	10-Dec-07	< 0.00025	0.006	< 0.001	0.032	< 0.001	< 0.001	< 0.05	13.3	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.6	0.001	2.22	0.002	0.0005	2.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.065	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	< 0.005	< 0.01
	average	0.00025	0.0170	0.001	0.0227	0.001	0.001	0.05	9.2	0.0002		0.001	0.001	0.001	0.07	0.00002	0.4	0.0010	1.43	0.006	0.0005	1.93	0.001	0.001	0.15	0.001	0.001	3.6	0.001	0.046	0.001	0.0005	0.002	0.0001	0.0008	0.001	0.0060	0.01
	minimum	< 0.00025	0.006	< 0.001	0.014	< 0.001	< 0.001	< 0.05	6.62	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.3	< 0.001	0.97	0.002	< 0.0005	1.64	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.0001	0.03	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.033	< 0.001	0.032	< 0.001	< 0.001	< 0.01	13.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.6	0.001	2.22	0.014	0.0005	2.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	0	0.065	< 0.001	< 0.0001	0.002	0.0001	0.0008	< 0.001	0.006	< 0.01
	N > DL	0	3	0	3	0	0	0	3	0	0	0	0	0	1	0	3	3	3	1	3	3	0	0	0	0	0	3	0	3	0	0	1	1	1	0	1	0
	median	0.00025	0.012	0.001	0.022	0.001	0.001	0.05	7.73	0.0002		0.001	0.001	0.001	0.07	0.00002	0.4	0.001	1.11	0.002	0.0005	1.89	0.001	0.001	0.15	0.001	0.001	3.5	0.001	0.042	0.001	0.0005	0.002	0.0001	0.0008	0.001	0.006	0.01
V2	08-Jan-07	< 0.01	< 0.05	< 0.03	0.098	< 0.003		< 0.01	266	< 0.01		< 0.02	< 0.01	< 0.02	0.04		2.7		142	< 0.003	< 0.02	9.7	< 0.02	< 0.03	< 0.15	< 0.05		4.58	< 0.03	0.86			< 0.005			< 0.01	0.017	< 0.02
V2	01-May-07	< 0.00025	0.044	0.002	0.064	< 0.001	< 0.001	< 0.05	240	0.0003		< 0.001	< 0.001	0.002	0.11	< 0.00002	3.4	0.007	165	0.006	0.0019	11.4	< 0.001	0.001	< 0.15	< 0.001	0.002	5.3	< 0.001	0.83	< 0.001	< 0.0005	0.002	0.0001	0.021	< 0.001	0.031	< 0.01
V2	14-May-07	< 0.00025	0.037	0.001	0.062	< 0.001	< 0.001	< 0.05	247	< 0.0002	0.0066	< 0.001	< 0.001	0.002	0.55	< 0.00002	3.2	0.006	158	0.034	0.0022	9.14	0.006	0.001	< 0.15	< 0.001	0.002	5.8	< 0.001	0.79	< 0.001	< 0.0005	0.001	< 0.0001	0.02	< 0.001	0.028	< 0.01
V2	07-Jun-07	< 0.00025	0.015	0.001	0.062	< 0.001	< 0.001	< 0.05	199	< 0.0002		< 0.001	< 0.001	0.002	0.46	< 0.00002	2.2	< 0.005	103	0.001	0.0015	7.6	0.003	< 0.001	< 0.15	< 0.001	0.002	5.1	< 0.001	0.62	< 0.001	< 0.0005	0.001	< 0.0001	0.016	< 0.001	0.018	< 0.01
V2	18-Jun-07	< 0.00025	0.011	< 0.001	0.061	< 0.001	< 0.001	< 0.05	190	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.1	< 0.00002	2.1	< 0.005	97	0.012	0.0015	8.21	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.61	< 0.001	< 0.0005	< 0.001	< 0.0001	0.014	< 0.001	0.053	< 0.01
V2	03-Jul-07	< 0.00025	0.012	0.001	0.069	< 0.001	< 0.001	< 0.05	194	< 0.0002		< 0.001	< 0.001	0.001	< 0.05	< 0.00002	2.1	< 0.005	109	0.002	0.0014	8.15	0.003	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.026	< 0.01
V2	16-Jul-07	< 0.00025	0.012	< 0.001	0.069	< 0.001	< 0.001	< 0.05	223	< 0.0002	0.0051	< 0.001	< 0.001	0.001	0.15	< 0.00002	2.4	0.005	124	0.004	0.0016	8.66	0.004	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.034	< 0.01
V2	02-Aug-07	< 0.00025	0.006	0.001	0.07	< 0.001	< 0.001	< 0.05	245	0.0003		< 0.001	< 0.001	0.001	0.08	< 0.00002	2.6	< 0.005	144	0.002	0.0016	9.61	0.005	< 0.001	< 0.15	< 0.001	0.002	5.2	< 0.001	0.86	< 0.001	< 0.0005	< 0.001	< 0.0001	0.02	< 0.001	0.028	< 0.01
V2	14-Aug-07	< 0.00025	0.031	< 0.001	0.072	< 0.001	< 0.001	< 0.05	254	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	< 0.05	< 0.00002	2.7	0.005	150	0.002	0.0015	10	0.005	< 0.001	< 0.15	< 0.001	< 0.001	5.5	< 0.001	0.85	< 0.001	< 0.0005	< 0.001	< 0.0001	0.024	< 0.001	0.024	< 0.01
V2	11-Sep-07	< 0.00025	0.014	< 0.001	0.075	< 0.001	< 0.001	< 0.05	205	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.62	< 0.00002	2	0.004	97.7	0.001	0.0016	8.37	0.002	< 0.001	< 0.15	< 0.001	0.001	5.8	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.016	< 0.01
V2	25-Sep-07	< 0.00005	0.004	0.0008	0.09	< 0.0002	< 0.0002	< 0.01	196	0.00008		< 0.0002	0.0002	0.0013	0.07	< 0.00002	1.97	0.0031	84.8	0.0006	0.0015	8.26	0.0015	0.0003	< 0.03	< 0.0002	0.001	5.55	< 0.0002	0.637	< 0.0002	< 0.0001	0.0004	< 0.00002	0.012	< 0.0002	0.005	< 0.002
V2	10-Oct-07	< 0.00025	0.013	< 0.001	0.092	< 0.001	< 0.001	< 0.05	219	< 0.0002		< 0.001	< 0.001	0.002	0.12	< 0.00002	2.1	0.003	91.1	< 0.001	0.0015	9.18	0.001	< 0.001	< 0.15	< 0.001	0.002	5.3	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	< 0.0001	0.017	< 0.001	0.008	< 0.01
V2	22-Oct-07	< 0.00025	0.013	< 0.001	0.084	< 0.001	< 0.001	< 0.05	207	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.09	< 0.00002	2	0.003	94.7	0.003	0.0015	9.57	0.002	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	0.013	< 0.01
V2	13-Nov-07	< 0.00025	0.019	0.001	0.084	< 0.001	< 0.001	< 0.05	212	< 0.0002	0.0063	< 0.001	< 0.001	0.001	0.11	< 0.00002	2	0.003	98.7	0.005	0.0016	9.53	0.001	< 0.001	< 0.15	< 0.001	0.002	5.4	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	0.017	< 0.01
V2	26-Nov-07	< 0.00025	0.011	< 0.001	0.085	< 0.001	< 0.001	< 0.05	219	< 0.0002		< 0.001	< 0.001	0.001	0.08	< 0.00002	2	0.003	92.7	< 0.001	0.0013	8.88	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	< 0.0001	0.017	< 0.001	0.007	< 0.01
V2	10-Dec-07	< 0.00025	0.048	0.001	0.077	< 0.001	< 0.001	< 0.05	221	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.2	< 0.00002	2	< 0.001	90.3	0.007	0.0014	7.83	0.002	0.002	< 0.15	< 0.001	0.001	4.9	< 0.001	0.74	< 0.001	< 0.0005	0.001	< 0.0001	0.02	< 0.001	0.016	< 0.01
V2	17-Dec-07	< 0.00025	< 0.005	0.001	0.076	< 0.001	< 0.001	< 0.05	230	< 0.0002		< 0.001	< 0.001	0.001	0.05	< 0.00002	2.1	0.004	107	0.001	0.0018	10.8	0.002	< 0.001	< 0.15	< 0.001	0.002	5.1	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	0.009	< 0.01
	average	0.00081	0.020	0.003	0.076	0.00107	0.00095	0.045	222	0.0008	0.0054	0.00207	0.0015	0.0025	0.17	0.00002	2.3	0.004	114.6	0.005	0.0027	9.1	0.004	0.003	0.143	0.00384	0.0014	5.2	0.00266	0.73	0.00095	0.00048	0.0013	0.00010	0.018	0.00148	0.021	0.010
	minimum	< 0.00025	0.004	0.0008	0.061	< 0.0002	< 0.0002	< 0.05	190	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	< 0.05	< 0.00002	1.97	< 0.001	84.8	< 0.001	0.0013	7.6	0.001	< 0.001	< 0.15	< 0.0002	0.001	4.5	< 0.0002	0.61	< 0.0002	< 0.0005	< 0.001	< 0.00002	0.012	< 0.0002	0.005	< 0.002
	maximum	< 0.01	0.048	0.002	0.098	< 0.001	< 0.001	< 0.01	266	0.0003	0.0066	< 0.001	0.0002	0.002	0.62	< 0.00002	3.4	0.007	165	0.034	0.0022	11.4	0.006	0.002	< 0.03	< 0.001	0.002	5.8	< 0.001	0.86	< 0.001	< 0.0001	0.002	< 0.0001	0.024	< 0.001	0.053	< 0.01
	N > DL	0	15	9	17	0	0	0	17	3	3	0	1	16	15	0	17	11	17	14	16	17	15	4	0	0	11	17	0	17	0	0	5	1	16	0	17	0
	median	0.00025	0.013	0.001	0.075	0.001	0.001	0.05	219	0.0002	0.005	0.001	0.001	0.0013	0.1	0.00002	2.1	0.0045	103	0.002	0.0015	9.14	0.002	0.001	0.15	0.001	0.001	5.2	0.001	0.72	0.001	0.0005	0.001	0.0001	0.018	0.001	0.017	0.01
V2A	07-Jun-07	< 0.00025	0.012	0.002	0.044	< 0.001	< 0.001	< 0.05	227	< 0.0002		0.001	< 0.001	0.002	0.52	< 0.00002	3.8	0.01	137	0.031	0.003	7.44	0.047	< 0.001	< 0.15	< 0.001	0.002	4.5	< 0.001	0.73	< 0.001	< 0.0005	< 0.001	< 0.0001	0.027	< 0.001	0.25	< 0.01
V2A	18-Jun-07	< 0.00025	0.006	0.001	0.042	< 0.001	< 0.001	< 0.05	225	< 0.0002		< 0.001	< 0.001	0.001	0.1	< 0.00002	3.6	0.009	147	0.011	0.003	8.34	0.038	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	< 0.0001	0.028	< 0.001	0.26	< 0.01
V2A	03-Jul-07	< 0.00025	0.012	0.001	0.043	< 0.001	< 0.001	< 0.05	213	< 0.0002		< 0.001	< 0.001	0.001	< 0.05	< 0.00002	3.4	0.009	138	0.001	0.0028	7.73	0.036	< 0.001	< 0.15	< 0.001	0.002	3.7	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.2	< 0.01
V2A	16-Jul-07	< 0.00025	< 0.005	0.001	0.049	< 0.001	< 0.001	< 0.05	248	< 0.0002		< 0.001	< 0.001	0.001	0.19	< 0.00002	3.7	0.01	158	0.003	0.0033	8.56	0.045	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.92	< 0.001	< 0.0005	< 0.001	< 0.0001	0.032	< 0.001	0.2	< 0.01
V2A	02-Aug-07	< 0.00025	< 0.005	0.002	0.05	< 0.001	< 0.001	< 0.05	243	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	3.9	0.009	163	< 0.001	0.0027	8.71	0.04	< 0.001	< 0.15	< 0.001	0.001	4.3	< 0.001	0.88	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.18	< 0.01
V2A	14-Aug-07	< 0.00025	0.039	0.002	0.048	< 0.001	< 0.001	< 0.05	244	0.0003		< 0.001	< 0.001	0.002	< 0.05	< 0.00002	4	0.011	167	0.001	0.003	9.06	0.044	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.86	< 0.001	< 0.0005	< 0.001	0.0002	0.033	< 0.001	0.17	< 0.01
V2A	11-Sep-07	< 0.00025	0.007	0.002	0.049	< 0.001	< 0.001	< 0.05	237	< 0.0002		< 0.001	< 0.001	0.002	0.77	< 0.00002	4.2	0.013	161	< 0.001	0.0028	8.73	0.044	< 0.001	< 0.15	< 0.001	0.003	5.3	< 0.001	0.87	< 0.001	< 0.0005	< 0.001	< 0.0001	0.035	< 0.001	0.16	< 0.01
V2A	25-Sep-07	< 0.00005	0.002	0.0011	0.049	< 0.0002	< 0.0002	< 0.01	240	0.00005		< 0.0002	< 0.0002	0.001	0.11	< 0.00002	3.71	0.011	159	0.0004	0.0026	7.88	0.034	< 0.0002	< 0.03	0.0006	0.0013	4.49	< 0.0002	0.829	< 0.0002	< 0.0001	0.0003	0.00003	0.023	0.0002	0.086	< 0.002
V2A	10-Oct-07	< 0.00025	0.017	0.001	0.045	< 0.001	< 0.001	< 0.05	242	< 0.0002		< 0.001	< 0.001	0.001	0.07	< 0.00002	3.8	0.009	148	< 0.001	0.0024	7.96	0.038	< 0.001	< 0.15	< 0.001	0.002	4	< 0.001	0.83	< 0.001	< 0.0005	< 0.001	< 0.0001	0.031	< 0.001	0.13	< 0.01
V2A	22-Oct-07	< 0.00025	0.007	0.001	0.046	< 0.001	< 0.001	< 0.05	239	< 0.0002		< 0.001	< 0.001	0.001	0.06	< 0.00002	3.5	0.011	176	< 0.001	0.0027	9.71	0.039	< 0.001	< 0.15	< 0.001	0.002	4.3	< 0.001	0.92	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.15	< 0.01
V2A	13-Nov-07	< 0.00025	< 0.005	0.002	0.048	< 0.001	< 0.001	< 0.05	240	< 0.0002		< 0.001	< 0.001	0.001	0.08

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 2. Surface Water Total Metal Parameters

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
	average	0.00023	0.011	0.001	0.047	0.00093	0.00093	0.05	237	0.00020		0.00093	0.00093	0.001	0.179	0.00002	3.7	0.010	155	0.005	0.0029	8.46	0.039	0.00093	0.14	0.00097	0.002	4.4	0.00093	0.84	0.00093	0.00047	0.00094	0.0001	0.030	0.00093	0.176	0.009
	minimum	< 0.00025	< 0.005	0.001	0.042	< 0.0002	< 0.0002	< 0.05	213	< 0.0002		0.001	< 0.0002	< 0.001	< 0.05	< 0.00002	3.3	0.007	137	< 0.001	0.0024	7.44	0.027	< 0.0002	< 0.15	< 0.001	< 0.001	3.7	< 0.0002	0.73	< 0.0002	< 0.0005	< 0.001	< 0.0001	0.023	< 0.001	0.086	< 0.002
	maximum	< 0.00025	0.039	0.002	0.05	< 0.001	< 0.001	< 0.01	250	0.0003		0.001	< 0.001	0.002	0.77	< 0.00002	4.2	0.013	176	0.031	0.0033	9.71	0.047	< 0.001	< 0.03	0.0006	0.003	5.3	< 0.001	0.92	< 0.001	< 0.0001	0.0003	0.0002	0.035	0.0002	0.26	< 0.01
	N > DL	0	9	12	12	0	0	0	12	2	0	1	0	11	10	0	12	12	12	7	12	12	12	0	3	1	9	12	0	12	0	0	1	2	12	1	12	0
	median	0.00025	0.007	0.00105	0.048	0.001	0.001	0.05	240	0.0002		0.001	0.001	0.001	0.08	0.00002	3.705	0.0095	158	0.001	0.0029	8.45	0.0385	0.001	0.15	0.001	0.00165	4.395	0.001	0.85	0.001	0.0005	0.001	0.0001	0.03	0.001	0.175	0.01
V4	04-Jun-07	< 0.00025	0.18	< 0.001	0.073	< 0.001	< 0.001	< 0.05	63.5	< 0.0002		< 0.001	< 0.001	0.002	0.47	< 0.00002	1.1	< 0.005	24.3	0.025	0.0012	2.48	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.27	< 0.001	< 0.0005	0.005	< 0.0001	0.0073	< 0.001	< 0.005	< 0.01
V4	25-Jul-07	< 0.00025	0.062	0.001	0.076	< 0.001	< 0.001	< 0.05	72.9	< 0.0002		< 0.001	< 0.001	0.001	0.41	< 0.00002	0.9	< 0.005	25.6	0.037	0.0011	2.79	0.001	< 0.001	< 0.15	< 0.001	0.002	4.9	< 0.001	0.29	< 0.001	< 0.0005	0.002	< 0.0001	0.0065	< 0.001	0.009	< 0.01
V4	10-Oct-07	< 0.00025	0.013	< 0.001	0.069	< 0.001	< 0.001	< 0.05	71.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.27	< 0.00002	0.9	0.003	25.9	0.042	0.0008	2.7	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0089	< 0.001	< 0.005	< 0.01
	average	0.00025	0.085	0.001	0.073	0.001	0.001	0.05	69.3	0.0002		0.001	0.001	0.00133	0.38	0.00002	1.0	0.00433	25.3	0.035	0.0010	2.66	0.001	0.001	0.15	0.001	0.00133	4.4	0.001	0.29	0.001	0.0005	0.00267	0.0001	0.0076	0.001	0.006	0.01
	minimum	< 0.00025	0.013	< 0.001	0.069	< 0.001	< 0.001	< 0.05	63.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.27	< 0.00002	0.9	0.003	24.3	0.025	0.0008	2.48	< 0.001	< 0.001	< 0.15	< 0.001	0.002	4.1	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0065	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.18	0.001	0.076	< 0.001	< 0.001	< 0.05	72.9	< 0.0002		0	0	0.002	0.47	< 0.00002	1.1	0.003	25.9	0.042	0.0012	2.79	0.002	< 0.001	< 0.15	< 0.001	0.002	4.9	< 0.001	0.3	0	< 0.0001	0.005	< 0.0001	0.0089	< 0.001	0.009	< 0.01
	N > DL	0	3	1	3	0	0	0	3	0	0	0	0	2	3	0	3	1	3	3	3	3	2	0	0	0	1	3	0	3	0	0	2	0	3	0	1	0
	median	0.00025	0.062	0.001	0.073	0.001	0.001	0.05	71.4	0.0002		0.001	0.001	0.001	0.41	0.00002	0.9	0.005	25.6	0.037	0.0011	2.7	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.29	0.001	0.0005	0.002	0.0001	0.0073	0.001	0.005	0.01
V5	15-Jan-07	< 0.00025	0.057	< 0.001	0.089	< 0.001	< 0.001	< 0.05	101	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	1.4	0.006	44.5	0.011	0.0021	4.86	0.002	< 0.001	< 0.15	< 0.001	0.003	5.1	< 0.001	0.4	< 0.001	< 0.0005	0.001	< 0.0001	0.0062	< 0.001	0.009	< 0.01
V5	14-May-07	< 0.00025	0.37	0.001	0.058	< 0.001	< 0.001	< 0.05	43.1	< 0.0002		< 0.001	0.002	0.004	0.76	< 0.00002	1.5	< 0.005	17	0.042	0.0014	2.42	0.003	0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.18	< 0.001	< 0.0005	0.01	< 0.0001	0.0023	0.001	0.02	< 0.01
V5	18-Jun-07	< 0.00025	0.89	0.001	0.064	< 0.001	< 0.001	< 0.05	39.7	< 0.0002		< 0.001	0.002	0.004	1.46	< 0.00002	0.9	< 0.005	16.5	0.041	0.0009	2.69	0.004	0.002	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.15	< 0.001	< 0.0005	0.022	< 0.0001	0.002	0.002	0.035	< 0.01
V5	16-Jul-07	< 0.00025	4.58	0.005	0.18	< 0.001	< 0.001	< 0.05	46	0.0002		0.004	0.01	0.014	7.35	< 0.00002	1.6	0.011	19.8	0.14	0.0009	2.73	0.016	0.009	0.2	< 0.001	< 0.001	11.6	< 0.001	0.21	< 0.001	0.002	0.12	< 0.0001	0.0026	0.01	0.035	< 0.01
V5	13-Aug-07	< 0.00025	0.18	< 0.001	0.072	< 0.001	< 0.001	< 0.05	61.6	< 0.0002		< 0.001	< 0.001	0.001	0.36	< 0.00002	1	< 0.005	25.4	0.026	0.0012	3.39	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.25	< 0.001	< 0.0005	0.004	< 0.0001	0.0036	< 0.001	0.009	< 0.01
V5	10-Sep-07	< 0.00025	0.08	< 0.001	0.073	< 0.001	< 0.001	< 0.05	58.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.2	< 0.00002	1	0.003	24.4	0.012	0.0015	3.37	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.28	< 0.001	< 0.0005	0.003	< 0.0001	0.0039	< 0.001	< 0.005	< 0.01
V5	23-Oct-07	< 0.00025	0.22	< 0.001	0.068	< 0.001	< 0.001	< 0.05	66.9	< 0.0002		< 0.001	< 0.001	0.001	0.42	< 0.00002	1.1	0.004	29.1	0.015	0.0014	3.99	0.002	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.28	< 0.001	< 0.0005	0.005	< 0.0001	0.0035	< 0.001	0.007	< 0.01
V5	13-Nov-07	< 0.00025	0.33	< 0.001	0.077	< 0.001	< 0.001	< 0.05	77.6	< 0.0002		< 0.001	< 0.001	0.001	0.63	< 0.00002	1.2	0.004	30.6	0.027	0.0014	3.91	0.002	< 0.001	< 0.15	< 0.001	0.001	5.3	< 0.001	0.29	< 0.001	< 0.0005	0.008	< 0.0001	0.0037	0.001	0.009	< 0.01
V5	09-Dec-07	< 0.00025	0.16	< 0.001	0.072	< 0.001	< 0.001	< 0.05	75.6	< 0.0002		< 0.001	< 0.001	0.001	0.41	< 0.00002	1.2	0.002	32.1	0.024	0.0015	3.86	0.002	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.29	< 0.001	< 0.0005	0.005	< 0.0001	0.0048	< 0.001	0.007	< 0.01
	average	0.00025	0.763	0.001	0.084	0.001	0.001	0.05	63.3	0.0002		0.00133	0.002	0.003	1.30	0.00002	1.2	0.005	26.6	0.038	0.0014	3.47	0.004	0.002	0.156	0.001	0.00122	5.5	0.001	0.26	0.001	0.00067	0.020	0.0001	0.0036	0.002	0.015	0.01
	minimum	< 0.00025	0.057	< 0.001	0.058	< 0.001	< 0.001	< 0.05	39.7	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	0.9	< 0.005	16.5	0.011	0.0009	2.42	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.15	< 0.001	< 0.0005	0.001	< 0.0001	0.002	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	4.58	0.005	0.18	< 0.001	< 0.001	< 0.05	101	0.0002		0.004	0.01	0.014	7.35	< 0.00002	1.6	0.011	44.5	0.14	0.0021	4.86	0.016	0.009	0.2	0	0.003	11.6	< 0.001	0.4	0	0.002	0.12	< 0.0001	0.0062	0.01	0.035	< 0.01
	N > DL	0	9	3	9	0	0	0	9	1	0	1	3	7	9	0	9	6	9	9	9	9	9	3	1	0	4	9	0	9	0	1	9	0	9	4	8	0
	median	0.00025	0.22	0.001	0.072	0.001	0.001	0.05	61.6	0.0002		0.001	0.001	0.001	0.42	0.00002	1.2	0.005	25.4	0.026	0.0014	3.39	0.002	0.001	0.15	0.001	0.001	4.7	0.001	0.28	0.001	0.0005	0.005	0.0001	0.0036	0.001	0.009	0.01
V6A	18-Jun-07	< 0.00025	0.76	0.002	0.03	< 0.001	< 0.001	< 0.05	16.1	< 0.0002		< 0.001	< 0.001	0.003	0.61	< 0.00002	0.4	< 0.005	3.34	0.016	< 0.0005	1.44	0.001	0.002	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.066	< 0.001	< 0.0005	0.017	< 0.0001	0.0024	< 0.001	0.029	< 0.01
V6A	24-Sep-07	< 0.00025	0.028	< 0.001	0.025	< 0.001	< 0.001	< 0.05	24.2	< 0.0002		< 0.001	< 0.001	< 0.001	0.11		0.4	< 0.001	5.34	0.006	< 0.0005	1.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.098	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.014	< 0.01
V6A	09-Dec-07	< 0.00025	0.058	0.001	0.04	< 0.001	< 0.001	< 0.05	40.3	< 0.0002		< 0.001	< 0.001	< 0.001	0.25	< 0.00002	0.5	< 0.001	8.14	0.02	< 0.0005	1.71	< 0.001	0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.17	< 0.001	< 0.0005	0.002	< 0.0001	0.0032	< 0.001	0.025	< 0.01
	average	0.00025	0.282	0.001	0.032	0.001	0.001	0.05	26.9	0.0002		0.001	0.001	0.00167	0.32	0.00002	0.43	0.00233	5.61	0.014	0.0005	1.60	0.001	0.00133	0.15	0.001	0.001	4.5	0.001	0.111	0.001	0.0005	0.007	0.0001	0.0024	0.001	0.023	0.01
	minimum	< 0.00025	0.028	< 0.001	0.025	< 0.001	< 0.001	< 0.05	16.1	< 0.0002		< 0.001	< 0.001	< 0.001	0.11	< 0.00002	0.4	< 0.001	3.34	0.006	< 0.0005	1.44	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.066	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.014	< 0.01
	maximum	< 0.00025	0.76	0.002	0.04	< 0.001	< 0.001	< 0.05	40.3	< 0.0002		< 0.001	< 0.001	0.003	0.61	< 0.00002	0.5	< 0.005	8.14	0.02	< 0.0005	1.71	0.001	0.002	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.17	0	< 0.0001	0.017	< 0.0001	0.0032	< 0.001	0.029	< 0.01
	N > DL	0	3	2	3	0	0	0	3	0	0	0	0	1	3	0	3	0	3	3	0	3	1	2	0	0	0	3	0	3	0	0	2	0	3	0	3	0
	median	0.00025	0.058	0.001	0.03	0.001	0.001	0.05	24.2	0.0002		0.001	0.001	0.001	0.25	0.00002	0.4	0.001	5.34	0.016	0.0005	1.66	0.001	0.001	0.15	0.001	0.001	4.4	0.001	0.098	0.001	0.0005	0.002	0.0001	0.0024	0.001	0.025	0.01
V8	15-Jan-07	< 0.00025	0.016	< 0.001	0.077	< 0.001	< 0.001	< 0.05	83.8	< 0.0002	0.0055	< 0.001	< 0.001	< 0.001	0.06	< 0.00002	1.2	0.005	37	0.034	0.0012	4.61	0.003	< 0.001	< 0.15	< 0.001	0.002	4.6	< 0.001	0.36	< 0.001	< 0.0005	< 0.001	0.0001	0.0072	< 0.001	0.064	< 0.01
V8	13-Feb-07	< 0.00025	0.015	< 0.001	0.072	< 0.001	< 0.001	< 0.05	84.9	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.14	< 0.00002	1.3	0.005	38.2	0.018	0.0012	4.66	0.002	< 0.001	< 0.15	< 0.001	0.001	4.6	< 0.001	0.36	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0074	< 0.001	0.011	< 0.01
V8	11-Mar-07	< 0.00025	0.008	< 0.001	0.085	< 0.001	< 0.001	< 0.05	90.9	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.12	< 0.00002	1.5	0.007	44.3	0.028	0.001	5.38	0.003	< 0.001	< 0.15	< 0.001	0.002	4.9	< 0.001	0.41	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0089	< 0.001	0.028	< 0.01
V8	18-Apr-07	< 0.00025	0.026	< 0.001	0.075	< 0.001	< 0.001	< 0.05	85.5	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.2	< 0.00002	1.5	0.004	38.1	0.028	0.0013	4.59	0.006	< 0.001	< 0.15	< 0.001	0.002	4.3	< 0.001	0.37	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0063	< 0.001	0.045	< 0.01
V8	14-May-07	< 0.00025	0.19	< 0.001	0.051	< 0.001	< 0.001	< 0.05	47.1	< 0.0002	0.0098	< 0.001	0.002	0.004	0.49	< 0.00002	1.5	< 0.005	19.3	0.026	0.0014	2.48	0.004	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.19	< 0.001	< 0.0005	0.008	< 0.0001	0.0037	< 0.001	0.018	< 0.01
V8	18-Jun-07	< 0.00025	0.3	< 0.001	0.036	< 0.001	< 0.001	< 0.05	26.9	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.5	< 0.00002	0.7	< 0.005	11	0.019	< 0.0005	2.01	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.1	< 0.001	< 0.0005	0.008	< 0.0001	0.0016	< 0.001	0.03	< 0.01
V8	16-Jul-07	< 0.00025	1.37	0.002	0.074	< 0.001	< 0.001	< 0.05	32.3	< 0.0002	0.0074	< 0.001	0.003	0.005	2.13	< 0.00002	0.9	< 0.005	12.8	0.038	0.0006	2.14	0.005	0.002	< 0.15	< 0.001	< 0.001	5.9	< 0.001	0.15	< 0.001	0.0005	0.036	< 0.0001	0.002	0.003	0.017	< 0.01
V8	13-Aug-07	< 0.00025	0.054	< 0.001	0.055	< 0.001	< 0.001	< 0.05	48.4	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.1	< 0.00002	0.8	< 0.005	19.7	0.011	0.0007	3.08	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0032	< 0.001	0.019	< 0.01
V8	10-Sep-07	< 0.00025	0.014	< 0.001	0.053	< 0.001	< 0.001	< 0.05	42.3	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.8	0.002	18.1	0.006	0.0008	2.77	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0033	< 0.001	0.007	< 0.01
V8	23-Oct-07	< 0.00025	0.04	< 0.001	0.057	< 0.001	< 0.001	< 0.05	60.6	< 0.0002	< 0.005	< 0.001	< 0.001	0.001	0.13	< 0.00002	1	0.003	26.4	0.009	0.001	3.84	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0044	< 0.001	0.01	< 0.01
V8	13-Nov-07	< 0.00025	0.051	< 0.001	0.061	< 0.001	< 0.001	< 0.05	66.5	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.15	< 0.00002	1.1	0.004	28.1	0.011	0.0009	3.82	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0046	< 0.001	0.01	< 0.01
V8	09-Dec-07	< 0.00025	0.045	< 0.001	0.063	< 0.001	< 0.001	< 0.05	68.3	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.18	< 0.00002	1.1	0.002	29.7	0.016	0.0009	3.81	0.002	< 0.001	< 0.15	< 0.001	0.002	4.4	< 0.001	0.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.006	< 0.001	0.013	< 0.01
	average	0.00025	0.1774	0.001	0.063	0.001	0.001	0.05	61.5	0.0002	0.0056	0.001	0.00125	0.002	0.36	0.00002	1.1	0.004	26.9	0.020	0.00096	3.60	0.003	0.001	0.15	0.001	0.001	4.5	0.001	0.26	0.001	0.0005	0.005	0.0001	0.0049	0.001	0.023	0.01
	minimum	< 0.00025	0.008	< 0.001	0.036	< 0.001	< 0.001	< 0.05	26.9	< 0.0002	< 0.005	< 0.001	< 0.001	< 0.001	0.06	< 0.00002	0.7	< 0.005	11	0.006	< 0.0005	2.01	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.007	< 0.01
	maximum	< 0.00025	1.37	0.002	0.085	< 0.001	< 0.001	< 0.05	90.9	< 0.0002	0.0098	< 0.001	0.003	0.005	2.13	< 0.00002	1.5	0.007	44.3	0.038	0.0014	5.38	0.006	0.002	< 0.15	< 0.001	0.002	5.9	< 0.001	0.41	0	0.0005	0.036	0.0001	0.0089	0.003	0.064	< 0.01
	N > DL	0	12	1	12	0	0	0	12	0	3	0	2	7	12	0	12	8	12	12	11	12	12	1	0	0	5	12	0	12	0	1	3	1	12	1	12	0
	median	0.00025	0.0425	0.001	0.062	0.001	0.001	0.05	63.55	0.0002	0.005	0.001	0.001	0.001	0.145	0.00002	1.1	0.005	27.25	0.0185	0.00095	3.815	0.002	0.001	0.15	0.001	0.001	4.5	0.001	0.27	0.001	0.0005	0.001	0.0001	0.0045	0.001	0.0175	0.01
V15	08-Jan-07	< 0.01	< 0.05	< 0.03	0.048	< 0.003		< 0.01	346	< 0.01		< 0.02	< 0.01	< 0.02	< 0.01		5.9		261	< 0.003	< 0.02	11.7	0.05	< 0.03	< 0.15	< 0.05		5.25	< 0.03	1.17			< 0.005				< 0.01	0.69	< 0.02
V15	14-Jan-07	< 0.00025	0.007	< 0.001	0.047	< 0.001	< 0.001	< 0.05	347	0.0009		< 0.001	< 0.001	0.002	0.07	< 0.00002	5	0.019	296	0.005	0.0006	12.7	0.059	< 0.001	< 0.15	< 0.001	< 0.001	6.6	< 0.001	1.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.037	< 0.001	0.67	< 0.01
V15	06-Feb-07	< 0.00025	0.036	< 0.001	0.047	< 0.001	< 0.001	< 0.05	353	0.001		< 0.001	< 0.001	0.003	0.09	< 0.00002	5	0.019	294	0.004	0.0007	12.3	0.062	0.001	< 0.15	< 0.001	0.002	6.3	< 0.001	1.38	< 0.001	< 0.0005	< 0.001	< 0.0001	0.035	< 0.001	0.65	< 0.01
V15	13-Feb-07	< 0.00025	0.056	< 0.001	0.049	< 0.001	< 0.001	< 0.05	363	0.0008		< 0.001	< 0.001	0.002	0.19	< 0.00002	5	0.015	276	0.002	0.0006	12.1	0.045	0.001	< 0.15	< 0.001	0.001	6.4	< 0.001	1.25	< 0.001	< 0.0005	0.002	< 0.0001	0.037	< 0.001	0.52	< 0.01
V15	05-Mar-07	< 0.01	< 0.05	< 0.03	0.042	< 0.003		< 0.01	333	< 0.01		< 0.02	< 0.01	< 0.02	0.03	< 0.00002	7.2		226	< 0.003	< 0.02	11.8	0.05	< 0.03	< 0.15	< 0.05		4.91	< 0.03	1.02			< 0.005				< 0.01	0.64	< 0.02
V15	11-Mar-07	< 0.00025	0.17	0.001	0.051	< 0.001	< 0.001	< 0.05	333	0.0009		< 0.001	0.001	0.003	0.38	< 0.00002	5	0.019	283	0.007	0.0009	12.4	0.055	0.004	< 0.15	< 0.001	0.001	6.2	< 0.001	1.19	< 0.001	< 0.0005	0.005	< 0.0001	0.039	< 0.001	0.67	< 0.01
V15	04-Apr-07	< 0.00025	0.089	< 0.001	0.05	< 0.001	< 0.001	< 0.05	362	0.0008		< 0.001	< 0.001	0.002	0.09	< 0.00002	4.7	0.016	280	0.002	0.0009	11.9	0.052	< 0.001	< 0.15	< 0.001	0.002	5.6	< 0.001	1.21	< 0.001	< 0.0005	0.002	< 0.0001	0.038	< 0.001	0.65	< 0.01
V15	18-Apr-07	< 0.00025	0.026	0.001	0.048	< 0.001	< 0.001	< 0.05	369	0.001		< 0.001	< 0.001	0.003	0.16	< 0.00002	4.7	0.015	286	0.006	0.0006	11.1	0.064	< 0.001	< 0.15	< 0.001	0.002	5.8	< 0.001	1.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.85	< 0.01
V15	01-May-07	< 0.00025	0.14	0.001	0.05	< 0.001	< 0.001	< 0.05	309	0.0008		< 0.001	< 0.001	0.003	0.27	< 0.00002	4.8	0.016	254	0.016	0.0009	11.1	0.042	0.004	< 0.15	< 0.001	0.003	5.7	< 0.001	1.13	< 0.001	< 0.0005	0.004	< 0.0001	0.029	< 0.001	0.69	< 0.01
V15	14-May-07	< 0.00025	0.74	0.003	0.084	< 0.001	< 0.001	< 0.05	306	0.0007		0.001	0.002	0.007	2.05	< 0.00002	4.4	0.014	247	0.075	0.0013	10.2	0.044	0.03	< 0.15	< 0.001	0.003	6.8	< 0.001	1.03	< 0.001	< 0.0005	0.021	< 0.0001	0.026	0.002	0.66	< 0.01
V15	07-Jun-07	< 0.00025	0.012	< 0.001	0.044	< 0.001	< 0.001	< 0.05	306	0.0006		< 0.001	< 0.001	0.002	0.59	< 0.00002	4	0.014	222	0.002	0.0011	10.1	0.031	< 0.001	< 0.15	< 0.001	0.003	5.8	< 0.001	0.99	< 0.001	< 0.0005	< 0.001	< 0.0001	0.026	< 0.001	0.44	< 0.01
V15	18-Jun-07	< 0.00025	0.028	< 0.001	0.048	< 0.001	< 0.001	< 0.05	319	0.0007		< 0.001	< 0.001	0.003	0.1	< 0.00002	4.9	0.015	252	0.01	0.0011	12.2	0.038	< 0.001	< 0.15	< 0.001	0.002	5.9	< 0.001	1.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.032	< 0.001

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 2. Surface Water Total Metal Parameters

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
V15	03-Jul-07	< 0.00025	0.011	< 0.001	0.049	< 0.001	< 0.001	< 0.05	300	0.0006		< 0.001	0.001	0.002	< 0.05	< 0.00002	4.4	0.012	239	< 0.001	0.0009	11.4	0.031	< 0.001	< 0.15	< 0.001	0.002	5.9	< 0.001	1.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.035	< 0.001	0.36	< 0.01
V15	16-Jul-07	< 0.00025	0.024	< 0.001	0.047	< 0.001	< 0.001	< 0.05	365	0.0007		< 0.001	< 0.001	0.002	0.23	< 0.00002	4.5	0.015	280	0.002	0.0011	11.2	0.043	< 0.001	< 0.15	< 0.001	0.001	6.4	< 0.001	1.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.031	< 0.001	0.54	< 0.01
V15	02-Aug-07	< 0.00025	0.014	< 0.001	0.056	< 0.001	< 0.001	< 0.05	373	0.0009		< 0.001	< 0.001	0.002	0.14	< 0.00002	5.2	0.014	315	0.001	0.0007	12.9	0.052	< 0.001	< 0.15	< 0.001	0.002	6.1	< 0.001	1.42	< 0.001	< 0.0005	< 0.001	< 0.0001	0.039	< 0.001	0.72	< 0.01
V15	14-Aug-07	< 0.00025	0.008	< 0.001	0.052	< 0.001	< 0.001	< 0.05	383	0.0007		< 0.001	< 0.001	0.002	0.06	< 0.00002	4.8	0.015	324	0.001	0.0009	12.8	0.048	< 0.001	< 0.15	< 0.001	0.001	6.4	< 0.001	1.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.041	< 0.001	0.64	< 0.01
V15	11-Sep-07	< 0.00025	0.011	< 0.001	0.048	< 0.001	< 0.001	< 0.05	421	0.0011		< 0.001	< 0.001	0.003	0.21	< 0.00002	5.8	0.016	364	0.005	0.0007	13.8	0.064	< 0.001	< 0.15	< 0.001	0.002	6.8	< 0.001	1.43	< 0.001	< 0.0005	< 0.001	< 0.0001	0.04	0.001	0.96	< 0.01
V15	25-Sep-07	< 0.00005	0.005	0.0008	0.057	< 0.0002	< 0.0002	< 0.01	382	0.00094		< 0.0002	0.0004	0.0022	0.07	< 0.00002	5.21	0.02	315	0.0014	0.0007	12.1	0.056	0.0003	< 0.03	< 0.0002	0.0021	6.63	< 0.0002	1.38	< 0.0002	< 0.0001	0.0004	< 0.00002	0.05	0.0002	0.62	< 0.002
V15	10-Oct-07	< 0.00025	0.036	< 0.001	0.052	< 0.001	< 0.001	< 0.05	357	0.0012		< 0.001	< 0.001	0.003	0.14	< 0.00002	5.4	0.017	286	0.002	0.0005	11.9	0.068	< 0.001	< 0.15	< 0.001	0.002	6	< 0.001	1.32	< 0.001	< 0.0005	0.001	< 0.0001	0.041	< 0.001	1.14	< 0.01
V15	22-Oct-07	< 0.00025	0.052	< 0.001	0.049	< 0.001	< 0.001	< 0.05	360	0.0012		< 0.001	< 0.001	0.003	0.17	< 0.00002	5	0.02	324	0.003	0.0007	13.5	0.077	< 0.001	< 0.15	< 0.001	0.002	6.4	< 0.001	1.29	< 0.001	< 0.0005	0.003	< 0.0001	0.04	< 0.001	1.29	< 0.01
V15	13-Nov-07	< 0.00025	0.016	< 0.001	0.051	< 0.001	< 0.001	< 0.05	378	0.0012		< 0.001	< 0.001	0.003	0.08	< 0.00002	5.2	0.019	331	0.002	0.0006	13.3	0.068	< 0.001	< 0.15	< 0.001	0.002	6.5	< 0.001	1.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.037	< 0.001	1.21	< 0.01
V15	26-Nov-07	< 0.00025	0.025	< 0.001	0.049	< 0.001	< 0.001	< 0.05	360	0.0012		< 0.001	< 0.001	0.003	0.09	< 0.00002	5.3	0.018	296	< 0.001	0.0005	11.6	0.082	< 0.001	< 0.15	< 0.001	0.002	6.1	< 0.001	1.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.038	< 0.001	1.4	< 0.01
V15	10-Dec-07	< 0.00025	0.007	< 0.001	0.047	< 0.001	< 0.001	< 0.05	360	0.0012		< 0.001	< 0.001	0.003	0.15	< 0.00002	5.1	0.013	320	0.002	< 0.0005	12.3	0.07	< 0.001	< 0.15	< 0.001	0.002	6.4	< 0.001	1.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.044	< 0.001	1.32	< 0.01
V15	17-Dec-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.001	< 0.001	< 0.05	366	0.001		< 0.001	< 0.001	0.002	0.07	< 0.00002	5.3	0.016	291	< 0.001	0.0007	13.4	0.056	< 0.001	< 0.15	< 0.001	0.002	5.7	< 0.001	1.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.04	< 0.001	0.92	< 0.01
	average	0.00105	0.067	0.003	0.051	0.00113	0.00096	0.05	352	0.0017		0.00255	0.00177	0.004	0.23	0.00002	5.1	0.016	286	0.007	0.0024	12.1	0.054	0.005	0.15	0.00505	0.0019	6.11	0.00338	1.24	0.00096	0.00048	0.0026	0.0001	0.037	0.0018	0.78	0.011
	minimum	< 0.00025	< 0.05	< 0.001	0.042	< 0.0002	< 0.0002	< 0.05	300	0.0006		< 0.0002	< 0.001	0.002	< 0.05	< 0.00002	4	0.012	222	< 0.001	< 0.0005	10.1	0.031	< 0.001	< 0.15	< 0.0002	0.001	4.91	< 0.0002	0.99	< 0.0002	< 0.0005	< 0.001	< 0.00002	0.026	< 0.001	0.36	< 0.002
	maximum	< 0.01	0.74	0.003	0.084	< 0.001	< 0.001	< 0.01	421	0.0012		0.001	0.002	0.007	2.05	< 0.00002	7.2	0.02	364	0.075	0.0013	13.8	0.082	0.03	< 0.15	< 0.05	0.003	6.8	< 0.001	1.43	< 0.001	< 0.0001	0.021	< 0.0001	0.05	0.002	1.4	< 0.01
	N > DL	0	21	5	24	0	0	0	24	22	0	1	4	22	22	0	24	22	24	19	21	24	24	6	0	0	21	24	0	24	0	0	8	0	22	3	24	0
	median	0.00025	0.0255	0.001	0.049	0.001	0.001	0.05	360	0.00092		0.001	0.001	0.003	0.12	0.00002	5	0.016	286	0.002	0.0007	12.1	0.0535	0.001	0.15	0.001	0.002	6.15	0.001	1.26	0.001	0.0005	0.001	0.0001	0.0375	0.001	0.67	0.01
V16	11-Jun-07	< 0.00025	0.093	0.002	0.044	< 0.001	< 0.001	< 0.05	310	0.0002		< 0.001	< 0.001	0.002	0.41	< 0.00002	5.6	0.008	378	0.009	0.0005	14.7	0.004	0.007	< 0.15	< 0.001	0.003	4.2	< 0.001	1.28	< 0.001	< 0.0005	0.003	< 0.0001	0.028	< 0.001	0.019	< 0.01
V16	01-Oct-07	< 0.00025	0.3	0.002	0.046	< 0.001	< 0.001	< 0.05	351	< 0.0002		< 0.001	0.002	0.004	0.66	< 0.00002	5.5	0.011	357	0.059	0.0006	14.1	0.004	0.016	< 0.15	< 0.001	0.002	4.7	< 0.001	1.21	< 0.001	< 0.0005	0.008	< 0.0001	0.04	< 0.001	0.01	< 0.01
V17A	11-Jun-07	< 0.00025	0.14	0.002	0.02	< 0.001	< 0.001	< 0.05	9.39	< 0.0002		< 0.001	< 0.001	0.001	0.28	< 0.00002	0.3	< 0.005	1.65	0.019	< 0.0005	1.32	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.3	< 0.001	0.043	< 0.001	< 0.0005	0.002	< 0.0001	0.0008	< 0.001	0.009	< 0.01
V17A	01-Oct-07	< 0.00025	0.04	0.001	0.02	< 0.001	< 0.001	< 0.05	17.2	< 0.0002		< 0.001	< 0.001	0.002	0.37	< 0.00002	0.3	< 0.001	4.07	0.024	< 0.0005	1.89	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5	< 0.001	0.07	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.056	< 0.01
V19	11-Jun-07	< 0.00025	0.022	< 0.001	0.038	< 0.001	< 0.001	< 0.05	14.5	< 0.0002		< 0.001	< 0.001	< 0.001	0.06	< 0.00002	0.3	< 0.005	5.48	< 0.001	< 0.0005	1.63	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.077	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
V19	01-Oct-07	< 0.00025	0.008	< 0.001	0.047	< 0.001	< 0.001	< 0.05	23.2	< 0.0002		< 0.001	< 0.001	0.001	0.16	< 0.00002	0.3	0.001	8.1	0.006	< 0.0005	2.19	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.7	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.034	< 0.01
V20	11-Jun-07	< 0.00025	0.1	< 0.001	0.036	< 0.001	< 0.001	< 0.05	18.5	< 0.0002		< 0.001	< 0.001	0.003	0.21	< 0.00002	0.5	< 0.005	5.88	0.014	< 0.0005	1.69	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.09	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.009	< 0.01
V20	01-Oct-07	< 0.00025	0.062	< 0.001	0.036	< 0.001	< 0.001	< 0.05	29.1	< 0.0002		< 0.001	< 0.001	0.005	0.12	< 0.00002	0.5	0.003	8.43	0.016	< 0.0005	2.14	0.002	0.004	< 0.15	< 0.001	< 0.001	5	< 0.001	0.12	< 0.001	< 0.0005	0.002	< 0.0001	< 0.0005	< 0.001	0.017	< 0.01
V22	5-Mar-07	< 0.00025	0.005	< 0.001	0.045	< 0.001	< 0.001	< 0.05	126	0.042		0.13	< 0.001	0.008	< 0.05	< 0.00002	2.6	0.028	44.3	9.94	0.0013	5.4	0.18	0.015	< 0.15	< 0.001	0.001	6.3	< 0.001	1.0	< 0.001	< 0.0005	0.002	0.002	0.0019	< 0.001	36.9	< 0.01
V22	18-Jun-07	< 0.00025	0.98	< 0.001	0.019	< 0.001	< 0.001	< 0.05	125	0.097		0.31	< 0.001	0.63	10.3	< 0.00002	1.8	0.025	57.9	21.8	0.0011	3.46	0.32	0.13	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0017	0.0024	< 0.001	82.4	< 0.01
V22	24-Sep-07	< 0.00025	1.31	0.003	0.021	< 0.001	< 0.001	< 0.05	149	0.115		0.45	< 0.001	0.56	12.7		2.1	0.03	71.7	28.7	0.0023	3.6	0.39	0.23	< 0.15	< 0.001	0.002	3.4	< 0.001	0.82	< 0.001	< 0.0005	< 0.001	0.0018	0.0029	< 0.001	105	< 0.01
V22	10-Dec-07	< 0.00025	1.35	0.002	0.022	< 0.001	< 0.001	< 0.05	150	0.109		0.44	< 0.001	0.5	8.44	< 0.00002	2.3	0.03	66.1	28.5	0.0025	3.7	0.4	0.26	< 0.15	< 0.001	0.002	4.2	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	0.0015	0.0034	< 0.001	101	< 0.01
	average	0.00025	0.91	0.002	0.027	0.001	0.001	0.05	138	0.091		0.33	0.001	0.42	7.9	0.00002	2.2	0.028	60.0	22.2	0.0018	4.04	0.32	0.16	0.15	0.001	0.0015	4.2	0.001	0.84	0.001	0.0005	0.00125	0.0018	0.00265	0.001	81.3	0.01
	minimum	< 0.00025	0.005	< 0.001	0.019	< 0.001	< 0.001	< 0.05	125	0.042		0.13	< 0.001	0.008	0.05	< 0.00002	1.8	0.025	44.3	9.94	0.0011	3.46	0.18	0.015	< 0.15	< 0.001	< 0.001	2.8	< 0.001	0.7	< 0.001	< 0.0005	< 0.001	0.0015	0.0019	< 0.001	36.9	< 0.01
	maximum	< 0.00025	1.35	0.003	0.045	< 0.001	0.001	< 0.05	150	0.115		0.45	< 0.001	0.63	12.7	< 0.00002	2.6	0.03	71.7	28.7	0.0025	5.4	0.4	0.26	< 0.15	< 0.001	0.002	6.3	< 0.001	1	< 0.001	< 0.0005	0.002	0.002	0.0034	< 0.001	105	< 0.01
	N > DL	0	4	2	4	0	0	0	4	4	0	4	0	4	3	0	4	4	4	4	4	4	4	4	0	0	3	4	0	4	0	0	1	4	4	0	4	0
	median	0.00025	1.15	0.0015	0.0215	0.001	0.001	0.05	138	0.103		0.38	0.001	0.53	9.37	0.00002	2.2	0.029	62	25.15	0.0018	3.65	0.36	0.18	0.15	0.001	0.0015	3.8	0.001	0.83	0.001	0.0005	0.001	0.00175	0.00265	0.001	91.7	0.01
V23	5-Mar-07	< 0.00025	0.038	0.001	0.044	< 0.001	< 0.001	< 0.05	109	0.001		0.007	< 0.001	0.002	0.06	< 0.00002	3.2	0.025	68.3	0.14	0.0026	11.2	0.15	0.001	< 0.15	< 0.001	0.002	3.5	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	0.0009	0.0069	< 0.001	5.1	< 0.01
V23	18-Jun-07	< 0.00025	0.038	< 0.001	0.038	< 0.001	< 0.001	< 0.05	94.1	0.0021		0.003	< 0.001	0.001	0.14	< 0.00002	2.6	0.018	56.8	0.075	0.002	8.79	0.13	0.001	< 0.15	0.003	0.001	2.4	< 0.001	0.65	< 0.001	< 0.0005	0.002	0.0007	0.0039	< 0.001	3.5	< 0.01
V23	24-Sep-07	< 0.00025	0.085	0.002	0.044	< 0.001	< 0.001	< 0.05	98.9	0.0013		0.004	< 0.001	0.014	0.26		2.7	0.02	59.1	0.083	0.0024	8.95	0.12	0.01	< 0.15	0.003	0.001	2.6	< 0.001	0.69	< 0.001	< 0.0005	0.003	0.0009	0.0054	< 0.001	3.66	< 0.01
V23	10-Dec-07	< 0.00025	0.021	< 0.001	0.043	< 0.001	< 0.001	< 0.05	112	0.0016		0.004	< 0.001	0.003	0.12	< 0.00002	3.1	0.02	60.5	0.12	0.0024	9.3	0.15	0.002	< 0.15	0.004	0.001	3.1	< 0.001	0.76	< 0.001	< 0.0005	< 0.001	0.0008	0.0078	< 0.001	5.26	< 0.01
	average	0.00025	0.046	0.001	0.04	0.001	0.001	0.05	104	0.0015		0.005	0.001	0.005	0.15	0.00002	2.90	0.02	61.2	0.10	0.002	9.56	0.14	0.004	0.15	0.003	0.001	2.9	0.001	0.71	0.001	0.0005	0.002	0.001	0.006	0.001	4.38	0.01
	minimum	< 0.00025	0.021	< 0.001	0.038	< 0.001	< 0.001	< 0.05	94.1	0.001		0.003	< 0.001	0.001	0.06	< 0.00002	2.6	0.018	56.8	0.075	0.002	8.79	0.12	0.001	0.15	< 0.001	0.001	2.4	< 0.001	0.65	< 0.001	0.0005	< 0.001	0.0007	0.0039	< 0.001	3.5	< 0.01
	maximum	< 0.00025	0.085	0.002	0.044	< 0.001	< 0.001	< 0.05	112	0.0021		0.007	< 0.001	0.014	0.26	< 0.00002	3.2	0.025	68.3	0.14	0.0026	11.2	0.15	0.01	0.15	0.004	0.002	3.5	< 0.001	0.76	< 0.001	0.0005	0.003	0.0009	0.0078	< 0.001	5.26	< 0.01
	N > DL	0	4	2	4	0	0	0	4	4	0	4	0	4	4	1	4	4	4	4	4	4	4	4	0	3	4	4	0	4	0	0	2	4	4	0	4	0
	median	0.00025	0.038	0.001	0.044	0.001	0.001	0.05	104	0.0015		0.004	0.001	0.0025	0.13	0.00002	2.9	0.02	59.8	0.10	0.0024	9.125	0.14	0.0015	0.15	0.003	0.001	2.85	0.001	0.715	0.001	0.0005	0.0015	0.00085	0.00615	0.001	4.38	0.01
V25BSP	14-May-07	< 0.00025	0.12	< 0.001	0.013	< 0.001	< 0.001	< 0.05	42.6	0.0002	0.005	0.004	0.001	0.01	0.21	< 0.00002	1.5	< 0.005	8.68	0.068	0.0009	2.14	0.002	0.002	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.15	< 0.001	< 0.0005	0.002	< 0.0001	0.0011	< 0.001	0.095	< 0.01
V25BSP	18-Jun-07	< 0.00025	0.084	< 0.001	0.015	< 0.001	< 0.001	< 0.05	33.1	< 0.0002	< 0.005	0.001	< 0.001	0.005	0.17	< 0.00002	1.1	< 0.005	6.48	0.026	< 0.0005	2.17	0.002	0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.11	< 0.001	< 0.0005	0.002	< 0.0001	0.0006	< 0.001	0.042	< 0.01
V25BSP	16-Jul-07	< 0.00025	0.05	< 0.001	0.02	< 0.001	< 0.001	< 0.05	35.5	< 0.0002	0.0069	0.001	< 0.001	0.004	0.08	< 0.00002	0.8	< 0.005	7.26	0.026	< 0.0005	2.3	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.15	< 0.001	< 0.0005	0.001	< 0.0001	< 0.0005	< 0.001	0.026	< 0.01
V25BSP	14-Aug-07	< 0.00025	0.026	< 0.001	0.022	< 0.001	< 0.001	< 0.05	60.2	< 0.0002	< 0.005	0.002	< 0.001	0.006	< 0.05	< 0.00002	1.1	< 0.005	12.4	0.031	0.0007	3.72	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.054	< 0.01
V25BSP	11-Sep-07	< 0.00025	< 0.005	< 0.001	0.023	< 0.001	< 0.001	< 0.05	69.5	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.07	< 0.00002	1.1	0.002	14.6	0.013	< 0.0005	3.93	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0009	< 0.001	0.05	< 0.01
V25BSP	23-Oct-07	< 0.00025	0.027	< 0.001	0.019	< 0.001	< 0.001	< 0.05	71.7	0.0002	< 0.005	0.004	< 0.001	0.005	0.08	< 0.00002	1.1	0.003	15.2	0.029	0.0008	4.62	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.077	< 0.01
V25BSP	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.023	< 0.001	< 0.001	< 0.05	86.7	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.06	< 0.00002	1.2	0.003	17.2	0.015	< 0.0005	4.59	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.049	< 0.01
V25BSP	10-Dec-07	< 0.00025	0.025	< 0.001	0.02	< 0.001	< 0.001	< 0.05	76.1	< 0.0002	< 0.005	< 0.001	< 0.001	0.002	0.09	< 0.00002	1.1	< 0.001	14.6	0.007	< 0.0005	4.16	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.002	< 0.001	0.078	< 0.01
	average	0.00025	0.043	0.001	0.019	0.001	0.001	0.05	59.4	0.0002	0.005	0.002	0.001	0.005	0.10	0.00002	1.1	0.004	12.1	0.027	0.0006	3.45	0.001	0.001	0.15	0.001	0.001	4.4	0.001	0.22	0.001	0.0005	0.001	0.0001	0.001	0.001	0.059	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.013	< 0.001	< 0.001	< 0.05	33.1	< 0.0002	< 0.005	0.001	< 0.001	0.002	< 0.05	< 0.00002	0.8	< 0.001	6.48	0.007	< 0.0005	2.14	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.026	< 0.01
	maximum	< 0.00025	0.12	< 0.001	0.023	< 0.001	< 0.001	< 0.01	86.7	0.0002	0.0069	0.004	0.001	0.01	0.21	< 0.00002	1.5	0.003	17.2	0.068	0.0009	4.62	0.002	0.002	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.31	< 0.001	< 0.0005	0.002	< 0.0001	0.002	< 0.001	0.095	< 0.01
	N > DL	0	6	0	8	0	0	0	8	2	2	5	1	8	7	0	8	3	8	8	3	8	4	2	0	0	0	8	0	8	0	0	3	0	7	0	8	0
	median	0.00025	0.0265	0.001	0.02	0.001	0.001	0.05	64.85	0.0002	0.005	0.001	0.001	0.0045	0.08	0.00002	1.1	0.004	13.5	0.026	0.0005	3.825	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.25	0.001	0.0005	0.001	0.0001	0.001	0.001	0.052	0.01
V27	04-Jun-07	< 0.00025	0.16	< 0.001	0.012	< 0.001	< 0.001	< 0.05	4.68	< 0.0002		< 0.001	< 0.001	0.001	0.36	< 0.00002	0.5	< 0.005	1.35	0.039	< 0.0005	0.69	< 0.001	0.002	< 0.15	< 0.001	< 0.001	1.6	< 0.001	0.02	< 0.001	< 0.0005	0.005	< 0.0001	< 0.0005	< 0.001	0.016	< 0.01
V27	25-Jul-07	< 0.00025	0.021	< 0.001	0.03	< 0.001	< 0.001	< 0.05	26.5	< 0.0002		< 0.001	< 0.001	0.001	0.09	< 0.00002	0.6	< 0.005	8.22	0.004	< 0.0005	2.12	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.095	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.031	< 0.01
V27	10-Oct-07	< 0.00025	0.018	< 0.001	0.035	< 0.001	< 0.001	< 0.05	28.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.5	< 0.001	8.86	0.003	< 0.0005	2.01	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.026	< 0.01
	average	0.00025	0.066	0.001	0.026	0.001	0.001	0.05	19.9	0.0002		0.001	0.001	0.001	0.173	0.00002	0.5	0.004	6.14	0.015	0.0005	1.61	0.001	0.001	0.15	0.001	0.001	3.2	0.001	0.072	0.001	0.0005	0.00233	0.0001	0.0011	0.001	0.024333	0.01
	minimum	< 0.00025	0.018	< 0.001	0.012	< 0.001	< 0.001	< 0.05	4.68	< 0.0002		< 0.001	< 0.001	< 0.001	0.07	< 0.00002	0.5	< 0.005	1.35	0.003	< 0.0005	0.69	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.6	< 0.001	0.02	< 0.001	< 0.0005	< 0.001	< 0.01	< 0.0005	< 0.01	0.016	< 0.01
	maximum	< 0.00025	0.16	< 0.001	0.035	< 0.001	< 0.001	< 0.01	28.6	< 0.0002		< 0.001	< 0.001	0.001	0.36	< 0.00002	0.6	< 0.001	8.86	0.039	< 0.0005	2.12	0.001	0.002	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.1	< 0.001	< 0.0005	0.005	< 0.01	0.0018	< 0.01	0.031	< 0.01
	N > DL	0	3	0	3	0	0	0	3	0	0	0	0	2	3	0	3	0	3	3	0	3	1	1	0	0	0	3	0	3	0	0	1	0	2	0	3	0
	median	0.00025	0.021	0.001	0.03	0.001	0.001	0.05	26.5	0.0002		0.001	0.001	0.001	0.09	0.00002	0.5	0.005	8.22	0.004	0.0005	2.01	0.001	0.001	0.15	0.001	0.001	3.8

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 2. Surface Water Total Metal Parameters

STATION	DATE	AG-T mg/L	AL-T mg/L	AS-T mg/L	BA-T mg/L	BE-T mg/L	BI-T mg/L	B-T mg/L	CA-T mg/L	CD-T mg/L	CN-T mg/L	CO-T mg/L	CR-T mg/L	CU-T mg/L	FE-T mg/L	HG-T mg/L	K-T mg/L	LI-T mg/L	MG-T mg/L	MN-T mg/L	MO-T mg/L	NA-T mg/L	NI-T mg/L	PB-T mg/L	P-T mg/L	SB-T mg/L	SE-T mg/L	SI-T mg/L	SN-T mg/L	SR-T mg/L	TE-T mg/L	TH-T mg/L	TI-T mg/L	TL-T mg/L	U-T mg/L	V-T mg/L	ZN-T mg/L	ZR-T mg/L
VGMAIN	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.071	< 0.001	< 0.001	< 0.05	74.8	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	1	0.004	31	0.007	0.0007	3.92	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0073	< 0.001	0.024	< 0.01
VGMAIN	13-Feb-07	< 0.00025	0.007	< 0.001	0.07	< 0.001	< 0.001	< 0.05	78.6	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	1.1	0.004	33	0.006	0.0007	4.24	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0084	< 0.001	0.015	< 0.01
VGMAIN	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.08	< 0.001	< 0.001	< 0.05	81.4	< 0.0002		< 0.001	< 0.001	< 0.001	0.09	< 0.00002	1.2	0.005	35.7	0.008	0.0008	4.56	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.35	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0089	< 0.001	0.022	< 0.01
VGMAIN	18-Apr-07	< 0.00025	0.007	< 0.001	0.075	< 0.001	< 0.001	< 0.05	82.1	0.0003		< 0.001	< 0.001	0.001	0.22	< 0.00002	1.2	0.003	33.2	0.035	0.0008	3.8	0.011	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.34	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0069	< 0.001	0.086	< 0.01
VGMAIN	14-May-07	< 0.00025	0.031	< 0.001	0.045	< 0.001	< 0.001	< 0.05	46.1	< 0.0002		< 0.001	0.001	0.004	0.24	< 0.00002	1.4	< 0.005	18.8	0.017	0.0012	2.33	0.004	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.18	< 0.001	< 0.0005	0.001	< 0.0001	0.0039	< 0.001	0.027	< 0.01
VGMAIN	18-Jun-07	< 0.00025	0.03	< 0.001	0.026	< 0.001	< 0.001	< 0.05	21.2	< 0.0002		< 0.001	< 0.001	0.001	0.09	< 0.00002	0.6	< 0.005	7.97	0.008	< 0.0005	1.64	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.081	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0014	< 0.001	0.023	< 0.01
VGMAIN	16-Jul-07	< 0.00025	0.021	< 0.001	0.035	< 0.001	< 0.001	< 0.05	26.1	< 0.0002		< 0.001	< 0.001	0.001	< 0.05	< 0.00002	0.5	< 0.005	9.61	0.004	< 0.0005	1.86	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.12	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.01	< 0.01
VGMAIN	13-Aug-07	< 0.00025	0.046	< 0.001	0.044	< 0.001	< 0.001	< 0.05	40.1	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.7	< 0.005	15.7	0.004	< 0.0005	2.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	0.002	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.003	< 0.001	0.011	< 0.01
VGMAIN	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.001	< 0.001	< 0.05	34.4	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.7	0.002	13.9	0.002	0.0005	2.46	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0029	< 0.001	0.01	< 0.01
VGMAIN	23-Oct-07	< 0.00025	0.007	< 0.001	0.049	< 0.001	< 0.001	< 0.05	52	< 0.0002		< 0.001	< 0.001	< 0.001	0.08	< 0.00002	0.8	0.002	21.3	0.003	0.0005	3.25	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.21	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0043	< 0.001	0.013	< 0.01
VGMAIN	13-Nov-07	< 0.00025	0.032	< 0.001	0.053	< 0.001	< 0.001	< 0.05	58	< 0.0002		< 0.001	< 0.001	< 0.001	0.05	< 0.00002	0.9	0.003	23.2	0.005	0.0007	3.29	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0046	< 0.001	0.014	< 0.01
VGMAIN	10-Dec-07	< 0.00025	0.006	< 0.001	0.057	< 0.001	< 0.001	< 0.05	60	< 0.0002		< 0.001	< 0.001	< 0.001	0.1	< 0.00002	1	< 0.001	25.1	0.006	0.0006	3.45	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0062	< 0.001	0.02	< 0.01
	average	0.00025	0.017	0.001	0.054	0.001	0.001	0.05	54.6	0.0002		0.001	0.001	0.001	0.10	0.00002	0.9	0.004	22.4	0.009	0.0007	3.12	0.003	0.001	0.15	0.001	0.001	4.2	0.001	0.224	0.001	0.0005	0.001	0.000	0.005	0.001	0.023	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.026	< 0.001	< 0.001	< 0.05	21.2	< 0.0002		< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.001	7.97	0.002	< 0.0005	1.64	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3	< 0.001	0.081	< 0.001	< 0.0005	< 0.001	< 0.01	0.001	< 0.01	0.010	< 0.01
	maximum	< 0.00025	0.046	< 0.001	0.08	< 0.001	< 0.001	< 0.01	82.1	0.0003		< 0.001	0.001	0.004	0.24	< 0.00002	1.4	0.005	35.7	0.035	0.0012	4.56	0.011	< 0.001	< 0.15	< 0.001	< 0.001	4.6	0.002	0.35	< 0.001	< 0.0005	0.001	< 0.01	0.0089	< 0.01	0.086	< 0.01
	N > DL	0	9	0	12	0	0	0	12	1	0	0	1	4	8	0	12	7	12	12	9	12	10	0	0	0	0	12	1	12	0	0	1	0	12	0	12	0
	median	0.00025	0.007	0.001	0.051	0.001	0.001	0.05	55	0.0002		0.001	0.001	0.001	0.08	< 0.00002	0.95	0.004	22.25	0.006	0.00065	3.27	0.0015	0.001	0.15	0.001	0.001	4.3	0.001	0.225	0.001	0.0005	0.001	0.0001	0.00445	0.001	0.0175	0.01

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:
Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 3 Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	HG-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
LCD	11-Jun-07	< 0.00025	0.069	< 0.001	0.025	< 0.05	< 0.001	< 0.001	69.9	0.058	0.18	< 0.001	0.001	0.7		1.4	0.009	66	30.8	0.0024	1.26	0.17	0.001	< 0.15	< 0.001	0.001	1.8	< 0.001	0.23	< 0.001	< 0.0005	< 0.001	0.0001	< 0.0005	< 0.001	89.8	< 0.01
LCD	01-Oct-07	0.0004	< 0.005	< 0.001	0.018	< 0.05	< 0.001	< 0.001	156	0.115	0.67	< 0.001	0.005	0.07		2.9	0.023	172	77.9	0.0067	3.12	0.49	0.001	< 0.15	< 0.001	0.003	3.6	< 0.001	0.56	< 0.001	< 0.0005	< 0.001	0.0003	< 0.0005	< 0.001	184	< 0.01
MOOSESP	15-May-07	< 0.00025	0.009	0.001	0.042	< 0.05	< 0.001	< 0.001	184	< 0.0002	< 0.001	< 0.001	0.001	0.34		2.1	< 0.005	90.4	< 0.001	0.0021	6.75	< 0.001	< 0.001	< 0.15	< 0.001	0.002	5	< 0.001	0.52	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.007	< 0.01
MOOSESP	07-Jun-07	< 0.00025	< 0.005	0.001	0.036	< 0.05	< 0.001	< 0.001	160	< 0.0002	< 0.001	< 0.001	< 0.001	0.31		1.8	< 0.005	77.1	< 0.001	0.0021	6.33	< 0.001	< 0.001	< 0.15	< 0.001	0.002	4.6	< 0.001	0.45	< 0.001	< 0.0005	< 0.001	< 0.0001	0.013	< 0.001	0.006	< 0.01
MOOSESP	18-Jun-07	< 0.00025	0.016	< 0.001	0.032	< 0.05	< 0.001	< 0.001	144	< 0.0002	< 0.001	< 0.001	< 0.001	0.08		1.8	< 0.005	72.9	0.004	0.002	6.23	< 0.001	0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.44	< 0.001	< 0.0005	< 0.001	< 0.0001	0.012	< 0.001	0.007	< 0.01
MOOSESP	03-Jul-07	< 0.00025	0.026	0.001	0.039	< 0.05	< 0.001	< 0.001	145	< 0.0002	< 0.001	< 0.001	0.001	0.09		1.6	< 0.005	73.3	0.011	0.0018	5.97	< 0.001	0.002	< 0.15	< 0.001	0.001	3.9	< 0.001	0.45	< 0.001	< 0.0005	< 0.001	< 0.0001	0.013	< 0.001	< 0.005	< 0.01
MOOSESP	16-Jul-07	< 0.00025	0.011	< 0.001	0.039	< 0.05	< 0.001	< 0.001	158	< 0.0002	< 0.001	< 0.001	< 0.001	0.08		1.8	< 0.005	79.7	0.001	0.002	6.6	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.49	< 0.001	< 0.0005	< 0.001	< 0.0001	0.013	< 0.001	< 0.005	< 0.01
MOOSESP	02-Aug-07	< 0.00025	0.01	0.001	0.041	< 0.05	< 0.001	< 0.001	182	< 0.0002	< 0.001	< 0.001	< 0.001	0.11		2.2	< 0.005	90.2	0.006	0.0018	7.25	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.4	< 0.001	0.55	< 0.001	< 0.0005	< 0.001	< 0.0001	0.014	< 0.001	0.006	< 0.01
MOOSESP	14-Aug-07	< 0.00025	0.028	< 0.001	0.044	< 0.05	< 0.001	< 0.001	173	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		2.1	< 0.005	86.4	0.016	0.002	7.05	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.52	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	< 0.005	< 0.01
MOOSESP	11-Sep-07	< 0.00025	0.011	< 0.001	0.044	< 0.05	< 0.001	< 0.001	195	< 0.0002	< 0.001	< 0.001	0.002	0.11		2.4	0.004	93	0.001	0.002	7.61	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.9	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	0.006	< 0.01
MOOSESP	25-Sep-07	< 0.00005	0.002	0.001	0.043	< 0.01	< 0.0002	< 0.0002	188	0.00008	< 0.0002	0.0003	0.0009	0.05		2.19	0.005	91.3	0.0009	0.002	7.1	0.0007	< 0.0002	< 0.03	< 0.0002	0.0011	5.28	< 0.0002	0.554	< 0.0002	< 0.0001	0.0002	0.00002	0.012	< 0.0002	0.005	< 0.002
MOOSESP	10-Oct-07	< 0.00025	0.014	< 0.001	0.043	< 0.05	< 0.001	< 0.001	205	< 0.0002	< 0.001	< 0.001	0.002	0.07		2.3	0.004	88.8	< 0.001	0.002	6.93	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	< 0.005	< 0.01
MOOSESP	22-Oct-07	< 0.00025	< 0.005	0.001	0.042	< 0.05	< 0.001	< 0.001	200	< 0.0002	< 0.001	< 0.001	0.001	0.08		2	0.004	103	0.002	0.002	8.05	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.6	< 0.001	0.63	< 0.001	< 0.0005	< 0.001	< 0.0001	0.017	< 0.001	< 0.005	< 0.01
MOOSESP	13-Nov-07	< 0.00025	0.034	0.001	0.044	< 0.05	< 0.001	< 0.001	227	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		2.4	0.005	109	0.001	0.002	8.17	< 0.001	< 0.001	< 0.15	< 0.001	0.001	5	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	< 0.005	< 0.01
MOOSESP	26-Nov-07	< 0.00025	< 0.005	0.001	0.045	< 0.05	< 0.001	< 0.001	229	< 0.0002	< 0.001	< 0.001	0.003	0.05		2.5	0.004	105	< 0.001	0.0019	7.76	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	< 0.0001	0.02	< 0.001	0.006	< 0.01
MOOSESP	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.039	< 0.05	< 0.001	< 0.001	204	< 0.0002	< 0.001	< 0.001	< 0.001	0.1		2	0.002	95.3	< 0.001	0.0018	6.8	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.021	< 0.001	< 0.005	< 0.01
MOOSESP	17-Dec-07	< 0.00025	< 0.005	< 0.001	0.047	< 0.05	< 0.001	< 0.001	226	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		2.4	0.005	112	0.001	0.002	8.7	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	< 0.0001	0.021	< 0.001	0.006	< 0.01
	average	0.00024	0.012	0.001	0.041	0.047	0.0009	0.0009	188	0.00019	0.0009	0.0010	0.001	0.108		2.1	0.005	91.2	0.003	0.0020	7.15	0.001	0.0010	0.14	0.0009	0.001	4.6	0.0009	0.566	0.0009	0.0005	0.0009	0.0001	0.0158	0.0009	0.0056	0.009
	minimum	< 0.00005	< 0.005	< 0.001	0.032	< 0.01	< 0.0002	< 0.0002	144	< 0.0002	< 0.0002	< 0.001	< 0.001	< 0.05		1.6	< 0.005	72.9	< 0.001	0.0018	5.97	< 0.001	< 0.0002	< 0.03	< 0.0002	< 0.001	3.6	< 0.0002	0.44	< 0.0002	< 0.0001	< 0.001	< 0.0001	0.012	< 0.0002	< 0.005	< 0.002
	maximum	< 0.00025	0.034	0.001	0.047	< 0.05	< 0.001	< 0.001	229	0.00008	< 0.001	0.0003	0.003	0.34		2.5	0.005	112	0.016	0.0021	8.7	0.0007	< 0.001	< 0.15	< 0.001	0.002	5.28	< 0.001	0.69	< 0.001	< 0.0005	0.0002	0.00002	0.021	< 0.001	0.007	< 0.01
	N > DL	0	10	8	15	0	0	0	15	1	0	1	7	12	0	15	8	15	10	15	15	1	2	0	0	11	15	0	15	0	0	1	1	15	0	8	0
	median	0.00025	0.01	0.001	0.042	0.05	0.001	0.001	188	0.0002	0.001	0.001	0.001	0.08		2.1	0.005	90.4	0.001	0.002	7.05	0.001	0.001	0.15	0.001	0.001	4.6	0.001	0.554	0.001	0.0005	0.001	0.0001	0.016	0.001	0.005	0.01
V1	18-Jun-07	< 0.00025	0.017	< 0.001	0.013	< 0.05	< 0.001	< 0.001	5.41	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.3	< 0.005	0.77	0.003	< 0.0005	1.19	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.026	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
V1	24-Sep-07	< 0.00025	0.061	< 0.001	0.023	< 0.05	< 0.001	< 0.001	9.41	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.3	< 0.001	1.13	0.004	< 0.0005	1.71	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.044	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.011	< 0.01
V1	10-Dec-07	< 0.00025	0.006	< 0.001	0.031	< 0.05	< 0.001	< 0.001	13.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.5	< 0.001	2.09	< 0.001	< 0.0005	1.84	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.063	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.006	< 0.01
	average	0.00025	0.028	0.001	0.022	0.05	0.001	0.001	9.34	0.0002	0.001	0.001	0.001	0.05		0.4	0.002	1.33	0.003	0.0005	1.58	0.001	0.001	0.15	0.001	0.001	3.7	0.001	0.044	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.007	0.01
	minimum	< 0.00025	0.006	0	0.013	< 0.05	< 0.001	< 0.001	5.41	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.3	< 0.001	0.77	< 0.001	< 0.0005	1.19	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.9	< 0.001	0.026	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.061	0	0.031	< 0.05	< 0.001	< 0.001	13.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.5	< 0.005	2.09	0.004	< 0.0005	1.84	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.063	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0005	< 0.001	0.011	< 0.01
	N > DL	0	3	0	3	0	0	0	3	0	0	0	0	0	0	3	0	3	2	0	3	0	0	0	0	0	3	0	3	0	0	0	1	0	2	0
	median	0.00025	0.017	0.001	0.023	0.05	0.001	0.001	9.41	0.0002	0.001	0.001	0.001	0.05		0.3	0.001	1.13	0.003	0.0005	1.71	0.001	0.001	0.15	0.001	0.001	3.6	0.001	0.044	0.001	0.0005	0.001	0.0001	0.0005	0.001	0.006	0.01
V2	08-Jan-07	< 0.01	< 0.05	< 0.03	0.095	< 0.01	< 0.003		272	< 0.01	< 0.02	< 0.01	< 0.02	< 0.01		2.6		140	< 0.003	< 0.02	9.3	< 0.02	< 0.03	< 0.15	< 0.05		4.51	< 0.03	0.85			< 0.005			< 0.01	0.01	< 0.02
V2	01-May-07	< 0.00025	0.005	0.001	0.058	< 0.05	< 0.001	< 0.001	239	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		3.1	0.006	160	0.003	0.0018	9.1	< 0.001	< 0.001	< 0.15	< 0.001	0.002	5.3	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	< 0.0001	0.022	< 0.001	0.029	< 0.01
V2	14-May-07	< 0.00025	< 0.005	0.001	0.052	< 0.05	< 0.001	< 0.001	209	< 0.0002	0.001	< 0.001	0.002	0.43		2.5	0.006	139	0.034	0.0019	7.95	0.006	< 0.001	< 0.15	< 0.001	0.002	5.4	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.027	< 0.01
V2	07-Jun-07	< 0.00025	< 0.005	< 0.001	0.06	< 0.05	< 0.001	< 0.001	191	< 0.0002	< 0.001	< 0.001	0.001	0.41		2.1	< 0.005	104	< 0.001	0.0015	7.46	0.003	< 0.001	< 0.15	< 0.001	0.002	5.1	< 0.001	0.6	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.018	< 0.01
V2	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.065	< 0.05	< 0.001	< 0.001	197	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		2	< 0.005	99.5	0.001	0.0015	8.25	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.008	< 0.01
V2	03-Jul-07	< 0.00025	< 0.005	< 0.001	0.065	< 0.05	< 0.001	< 0.001	195	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		1.8	< 0.005	103	0.002	0.0013	7.52	0.003	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.009	< 0.01
V2	16-Jul-07	< 0.00025	0.006	< 0.001	0.068	< 0.05	< 0.001	< 0.001	209	< 0.0002	< 0.001	< 0.001	0.001	0.14		2.1	0.005	119	< 0.001	0.0015	8.19	0.004	< 0.001	< 0.15	< 0.001	< 0.001	5.3	< 0.001	0.74	< 0.001	< 0.0005	< 0.001	< 0.0001	0.018	< 0.001	0.023	< 0.01
V2	02-Aug-07	< 0.00025	< 0.005	0.001	0.07	< 0.05	< 0.001	< 0.001	242	< 0.0002	< 0.001	< 0.001	< 0.001	0.07		2.6	< 0.005	143	< 0.001	0.0015	9.51	0.004	< 0.001	< 0.15	< 0.001	0.001	5.2	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	< 0.0001	0.02	< 0.001	0.022	< 0.01
V2	14-Aug-07	< 0.00025	0.025	< 0.001	0.068	< 0.05	< 0.001	< 0.001	233	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		2.4	< 0.005	134	< 0.001	0.0015	8.99	0.005	< 0.001	< 0.15	< 0.001	< 0.001	5.1	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	< 0.0001	0.022	< 0.001	0.011	< 0.01
V2	11-Sep-07	< 0.00025	0.006	0.001	0.069	< 0.05	< 0.001	< 0.001	192	< 0.0002	< 0.001	< 0.001	0.001	0.62		1.8	0.004	91.4	0.003	0.0016	8.23	0.002	< 0.001	< 0.15	< 0.001	0.002	6	< 0.001	0.61	< 0.001	< 0.0005	< 0.001	< 0.0001	0.017	< 0.001	0.021	< 0.01
V2	25-Sep-07	< 0.00005	0.003	0.0008	0.088	< 0.01	< 0.0002	< 0.0002	192	0.00008	< 0.0002	0.0002	0.0011	0.05		1.92	0.0032	83.4	0.0004	0.0016	8.25	0.0015	< 0.0002	< 0.03	< 0.0002	0.0011	5.67	< 0.0002	0.632	< 0.0002	< 0.0001	0.0002	0.00002	0.012	< 0.0002	0.005	< 0.002
V2	10-Oct-07	< 0.00025	0.008	< 0.001	0.084	< 0.05	< 0.001	< 0.001	205	< 0.0002	< 0.001	< 0.001	0.002	< 0.05		1.9	0.003	83.7	< 0.001	0.0015	8.32	0.001	< 0.001	< 0.15	< 0.001	0.001	5	< 0.001	0.65	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	0.008	< 0.01
V2	22-Oct-07	< 0.00025	0.005	< 0.001	0.078	< 0.05	< 0.001	< 0.001	189	< 0.0002	< 0.001	< 0.001	0.001	0.07		1.7	0.003	89.2	0.013	0.0015	9.05	0.002	< 0.001	< 0.15	< 0.001	0.001	5.1	< 0.001	0.64	< 0.001	< 0.0005	< 0.001	< 0.0001	0.015	< 0.001	0.04	< 0.01
V2	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.077	< 0.05	< 0.001	< 0.001	204	< 0.0002	< 0.001	< 0.001	0.001	0.06		1.8	0.003	93.5	< 0.001	0.0017	9.12	0.001	< 0.001	< 0.15	< 0.001	0.001	5	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	< 0.0001	0.016	< 0.001	0.011	< 0.01
V2	26-Nov-07	< 0.00025	< 0.005	< 0.001	0.089	< 0.05	< 0.001	< 0.001	235	< 0.0002	< 0.001	< 0.001	0.003	0.05		2.2	0.003	101	< 0.001	0.0016	9.61	0.001	< 0.001	< 0.15	< 0.001	0.001	5.4	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	0.007	< 0.01
V2	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.069	< 0.05	< 0.001	< 0.001	202	< 0.0002	< 0.001	< 0.001	0.001	0.08		1.7	0.001	82.9	0.037	0.0017	7.14	0.002	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	0.11	< 0.01
V2	17-Dec-07	< 0.00025	< 0.005	< 0.001	0.078	< 0.05	< 0.001	< 0.001	231	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		2.1	0.003	108	< 0.001	0.0017	11.1	0.002	< 0.001	< 0.15	< 0.001	0.002	5	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	< 0.0001	0.019	< 0.001	< 0.005	< 0.01
	average	0.00081	0.009	0.0027	0.073	0.045	0.0011	0.0010	214	0.00077	0.0021	0.0015	0.002	0.135		2.1	0.004	110	0.006	0.0027	8.65	0.004	0.0027	0.143	0.0038	0.001	5.1	0.0027	0.71	0.0010	0.0005	0.0012	0.00010	0.018	0.0015	0.0214	0.010
	minimum	< 0.00005	< 0.005	< 0.001	0.052	< 0.01	< 0.0002	< 0.0002	189	< 0.0002	< 0.0002	< 0.001	< 0.001	< 0.05		1.7	< 0.005	82.9	< 0.001	0.0013	7.14	< 0.001	< 0.0002	< 0.03	< 0.0002	< 0.001	4.5	< 0.0002	0.6	< 0.0002	< 0.0001	< 0.001	0.00002	0.012	< 0.0002	< 0.005	< 0.002
	maximum	< 0.00025	0.025	0.001	0.095	< 0.05	< 0.001	< 0.001	272	0.00008	< 0.001	0.0002	0.003	0.62		3.1	0.006	160	0.037	0.0019	11.1	0.006	< 0.001	< 0.15	< 0.001	0.002	6	< 0.001	0.85	< 0.001	< 0.0005	0.0002	< 0.0001	0.022	< 0.001	0.11	< 0.01
	N > DL	0	7	5	17	0	0	0	17	1	1	1	14	10	0	17	11	17	8	16	17	15	0	0	0	13	17	0	17	0	0	1	0	16	0	16	0
	median	0.00025	0.005	0.001	0.069	0.05	0.001	0.001	205	0.0002	0.001	0.001	0.001	0.05		2.1	0.0045	103	0.001	0.0016	8.32	0.002	0.001	0.15	0.001	0.001	5.1	0.001	0.68	0.001	0.0005	0.001	0.0001	0.018	0.001	0.011	0.01
V2A	07-Jun-07	< 0.00025	< 0.005	0.002	0.04	< 0.05	< 0.001	< 0.001	206	< 0.0002	< 0.001	< 0.001	0.002	0.44		3.3	0.009	129	0.013	0.0028	7.01	0.043	< 0.001	< 0.15	< 0.001	0.003	4.2	< 0.001	0.67	< 0.001	< 0.0005	< 0.001	< 0.0001	0.025	< 0.001	0.23	< 0.01
V2A	18-Jun-07	< 0.00025	< 0.005	0.002	0.045	< 0.05	< 0.001	< 0.001	236	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		3.6	0.009	148	0.002	0.0029	8.51	0.04	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.8	< 0.001	< 0.0005	< 0.001	< 0.0001	0.028	< 0.001	0.16	< 0.01
V2A	03-Jul-07	< 0.00025	0.008	0.001	0.041	< 0.05	< 0.001	< 0.001	206	< 0.0002	< 0.001	0.001	0.001	< 0.05		2.9	0.009	134	0.002	0.0026	7.32	0.036	< 0.001	< 0.15	< 0.001	0.001	3.8	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	< 0.0001	0.029	< 0.001	0.032	< 0.01
V2A	16-Jul-07	< 0.00025	< 0.005	0.001	0.044	< 0.05	< 0.001	< 0.001	231	< 0.0002	< 0.001	< 0.001	0.001	0.18		3.6	0.009	146	< 0.001	0.003	7.93	0.041	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.85	< 0.001	< 0.0005	< 0.001	< 0.0001	0.028	< 0.001	0.14	< 0.01
V2A	02-Aug-07	< 0.00025	< 0.005	0.002	0.048	< 0.05	< 0.001	< 0.001	238	< 0.0002	< 0.001	< 0.001	0.001	0.08		3.9	0.009	160	< 0.001	0.0027	8.65	0.04	< 0.001	< 0.15	< 0.001	0.001	4.3	0.001	0.88	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.18	< 0.01
V2A	14-Aug-07	< 0.00025	0.016	0.001	0.046	< 0.05	< 0.001	< 0.001	218	< 0.0002	< 0.001	< 0.001	0.002	< 0.05		3.3	0.01	147	< 0.001	0.0029	7.93	0.04	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.031	< 0.001	0.094	< 0.01
V2A	11-Sep-07	< 0.00025	0.009	0.001	0.044	< 0.05	< 0.001	< 0.001	225	< 0.0002	< 0.001	< 0.001	0.001	0.68		3.5	0.011	153	0.002	0.0025	7.76	0.04	< 0.001	< 0.15	< 0.001	0.002	4.6	< 0.001	0.77	< 0.001	< 0.0005	< 0.001	< 0.0001	0.031	< 0.001	0.084	< 0.01
V2A	25-Sep-07	< 0.00005	0.002	0.0012	0.048	< 0.01	< 0.0002	< 0.0002	236	0.00006	< 0.0002	< 0.0002	0.0011	0.05		3.63	0.011	158	0.0003	0.0027	7.83	0.036	< 0.0002	< 0.03	0.0006	0.0013	4.72	< 0.0002	0.839	< 0.0002	< 0.0001	0.0003	0.00003	0.023	0.0002	0.098	< 0.002
V2A	10-Oct-07	< 0.00025	0.01	0.001	0.046	< 0.05	< 0.001	< 0.001	248	< 0.0002	< 0.001	< 0.001	0.002	< 0.05		3.8	0.01	153	< 0.001	0.0025	8.18	0.039	< 0.001	< 0.15	< 0.001	0.002	4.2	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	< 0.0001	0.032	< 0.001	0.14	< 0.01
V2A	22-Oct-07	< 0.00025	< 0.005	0.001	0.041	< 0.05	< 0.001	< 0.001	221	< 0.0002	< 0.001	< 0.001	0.001	0.08		3	0.009	157	0.001	0.0027	8.46	0.034	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.78	< 0.001	< 0.0005	< 0.001	< 0.0001	0.029	< 0.001	0.07	< 0.01
V2A	13-Nov-07	< 0.00025	< 0.005	0.001	0.044	< 0.05	< 0.001	< 0.001	227	< 0.0002	< 0.001	< 0.001	0.001	0.06		3	0.008	144	0.004	0.003	8.59	0.028	< 0.001	< 0.15	< 0.001	0.002	4.2	< 0.001	0.79	< 0.001	< 0.0005	< 0.001	< 0.0001	0.025	< 0.001	0.11	< 0.01
V2A	26-Nov-07	< 0.00025	< 0.005	0.001	0.049	< 0.05	< 0.001	< 0.001	246	< 0.0002	< 0.001	< 0.001	0.002	0.06		3.3	0.008	145	< 0.001	0.0031	8.16	0.027	< 0.001	< 0.15	< 0.001	0.001	4.2	< 0.001	0.84	< 0.001	< 0.0005	< 0.001	< 0.0001	0.029	< 0.001	0.15	< 0.01
	average	0.00023	0.007	0.001	0.045	0.047	0.0009	0.0009	228	0.00019	0.0009	0.0009	0.001

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 3 Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	HG-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
V5	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.082	< 0.05	< 0.001	< 0.001	100	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		1.3	0.005	46.1	0.009	0.002	4.96	0.002	< 0.001	< 0.15	< 0.001	0.003	5.3	< 0.001	0.39	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0058	< 0.001	0.009	< 0.01
V5	14-May-07	< 0.00025	0.012	< 0.001	0.047	< 0.05	< 0.001	< 0.001	40.5	< 0.0002	< 0.001	0.001	0.002	0.16		1.3	< 0.005	16.3	0.011	0.0014	2.33	0.002	< 0.001	< 0.15	< 0.001	< 0.001	3.9	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	0.019	< 0.01
V5	18-Jun-07	< 0.00025	0.02	< 0.001	0.043	< 0.05	< 0.001	< 0.001	36.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.6	< 0.005	14.4	0.001	0.0006	2.46	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
V5	16-Jul-07	< 0.00025	0.051	< 0.001	0.054	< 0.05	< 0.001	< 0.001	42.8	< 0.0002	< 0.001	< 0.001	0.002	< 0.05		0.7	< 0.005	16.8	0.006	0.0009	2.64	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0022	< 0.001	< 0.005	< 0.01
V5	13-Aug-07	< 0.00025	< 0.005	< 0.001	0.063	< 0.05	< 0.001	< 0.001	58.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.8	< 0.005	24.5	0.007	0.0012	3.27	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0034	< 0.001	< 0.005	< 0.01
V5	10-Sep-07	< 0.00025	0.006	< 0.001	0.066	< 0.05	< 0.001	< 0.001	61.7	< 0.0002	< 0.001	< 0.001	< 0.001	0.2		1	0.004	25.1	0.006	0.0014	3.41	0.002	< 0.001	< 0.15	< 0.001	0.002	5.1	< 0.001	0.25	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0036	< 0.001	< 0.005	< 0.01
V5	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.058	< 0.05	< 0.001	< 0.001	63	< 0.0002	< 0.001	< 0.001	< 0.001	0.08		0.8	0.003	26.9	0.004	0.0014	3.62	0.001	< 0.001	< 0.15	< 0.001	0.001	4.2	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0032	< 0.001	< 0.005	< 0.01
V5	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.068	< 0.05	< 0.001	< 0.001	75.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.06		1	0.004	30.1	0.004	0.0015	3.81	< 0.001	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0036	< 0.001	0.006	< 0.01
V5	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.062	< 0.05	< 0.001	< 0.001	71.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.09		1	0.001	30.4	0.014	0.0017	3.53	0.001	< 0.001	< 0.15	< 0.001	0.002	4.3	< 0.001	0.28	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0046	< 0.001	0.033	< 0.01
	average	0.00025	0.013	0.001	0.060	0.05	0.001	0.001	61.2	0.0002	0.001	0.001	0.001	0.09		0.9	0.004	25.6	0.007	0.0013	3.34	0.001	0.001	0.15	0.001	0.001	4.4	0.001	0.24	0.001	0.0005	0.001	0.0001	0.0033	0.001	0.010	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	36.9	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.6	0.001	14.4	0.001	0.0006	2.33	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.051	< 0.001	0.082	< 0.05	0	< 0.001	100	< 0.0002	< 0.001	0.001	0.002	0.2		1.3	0.005	46.1	0.014	0.002	4.96	0.002	< 0.001	< 0.15	< 0.001	0.003	5.3	< 0.001	0.39	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0058	< 0.001	0.033	< 0.01
	N > DL	0	4	0	9	0	< 0.001	0	9	0	0	1	2	5	0	9	5	9	9	9	9	8	0	0	0	5	9	0	9	0	0	0	0	9	0	4	0
	median	0.00025	0.005	0.001	0.062	0.05	0.001	0.001	61.7	0.0002	0.001	0.001	0.001	0.06		1	0.005	25.1	0.006	0.0014	3.41	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.25	0.001	0.0005	0.001	0.0001	0.0034	0.001	0.005	0.01
V6A	18-Jun-07	< 0.00025	0.033	0.001	0.019	< 0.05	< 0.001	< 0.001	13.9	< 0.0002	< 0.001	< 0.001	0.001	0.11		0.3	< 0.005	2.5	0.007	< 0.0005	1.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.057	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	0.029	< 0.01
V6A	24-Sep-07	< 0.00025	0.013	< 0.001	0.025	< 0.05	< 0.001	< 0.001	23.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.06		0.3	< 0.001	5.32	< 0.001	< 0.0005	1.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.3	< 0.001	0.097	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.011	< 0.01
V6A	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.036	< 0.05	< 0.001	< 0.001	37.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.06		0.4	< 0.001	7.79	0.004	< 0.0005	1.59	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.003	< 0.001	0.029	< 0.01
	average	0.00025	0.017	0.001	0.027	0.05	0.001	0.001	25.1	0.0002	0.001	0.001	0.001	0.08		0.3	0.002	5.20	0.004	0.0005	1.51	0.001	0.001	0.15	0.001	0.001	4.2	0.001	0.105	0.001	0.0005	0.001	0.0001	0.0019	0.001	0.023	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.019	< 0.05	< 0.001	< 0.001	13.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.06		0.3	< 0.001	2.5	< 0.001	< 0.0005	1.27	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.057	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	0.011	< 0.01
	maximum	< 0.00025	0.033	0.001	0.036	< 0.05	< 0.001	< 0.001	37.9	< 0.0002	< 0.001	< 0.001	0.001	0.11		0.4	< 0.005	7.79	0.007	< 0.0005	1.66	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.7	< 0.001	0.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.003	< 0.001	0.029	< 0.01
	N > DL	0	2	1	3	0	0	0	3	0	0	0	1	3	0	3	0	3	2	0	3	0	0	0	0	0	3	0	3	0	0	0	0	3	0	3	0
	median	0.00025	0.013	0.001	0.025	0.05	0.001	0.001	23.6	0.0002	0.001	0.001	0.001	0.06		0.3	0.001	5.32	0.004	0.0005	1.59	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.097	0.001	0.0005	0.001	0.0001	0.0016	0.001	0.029	0.01
V8	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.074	< 0.05	< 0.001	< 0.001	82.7	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		1.2	0.005	37	0.018	0.0011	4.48	0.002	< 0.001	< 0.15	< 0.001	0.001	4.7	< 0.001	0.35	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0069	< 0.001	0.01	< 0.01
V8	13-Feb-07	< 0.00025	< 0.005	< 0.001	0.065	< 0.05	< 0.001	< 0.001	79.5	< 0.0002	< 0.001	< 0.001	< 0.001	0.07		1.1	0.005	35.8	0.017	0.001	4.37	0.002	< 0.001	< 0.15	< 0.001	0.001	4.5	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0071	< 0.001	0.01	< 0.01
V8	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.084	< 0.05	< 0.001	< 0.001	90.9	< 0.0002	< 0.001	< 0.001	< 0.001	0.05		1.4	0.007	44.3	0.029	0.001	5.4	0.002	< 0.001	< 0.15	< 0.001	0.002	5	< 0.001	0.41	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0089	< 0.001	0.014	< 0.01
V8	18-Apr-07	< 0.00025	< 0.005	< 0.001	0.067	< 0.05	< 0.001	< 0.001	75	< 0.0002	< 0.001	< 0.001	< 0.001	0.05		1.2	0.003	34	0.024	0.0012	3.96	0.005	< 0.001	< 0.15	< 0.001	0.002	4	< 0.001	0.34	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0055	< 0.001	0.029	< 0.01
V8	14-May-07	< 0.00025	0.01	< 0.001	0.042	< 0.05	< 0.001	< 0.001	41.6	< 0.0002	< 0.001	0.001	0.003	0.15		1.2	< 0.005	17.1	0.013	0.0011	2.2	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0031	< 0.001	0.018	< 0.01
V8	18-Jun-07	< 0.00025	0.013	< 0.001	0.03	< 0.05	< 0.001	< 0.001	26.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.6	< 0.005	10.2	< 0.001	< 0.0005	1.88	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
V8	16-Jul-07	< 0.00025	0.051	< 0.001	0.04	< 0.05	< 0.001	< 0.001	30.5	< 0.0002	< 0.001	< 0.001	0.001	0.07		0.6	< 0.005	11.8	0.004	< 0.0005	2.05	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.14	< 0.001	< 0.0005	0.002	< 0.0001	0.0018	< 0.001	< 0.005	< 0.01
V8	13-Aug-07	< 0.00025	0.011	< 0.001	0.05	< 0.05	< 0.001	< 0.001	45.6	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.7	< 0.005	18.8	0.005	0.0007	2.81	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.19	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0031	< 0.001	< 0.005	< 0.01
V8	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	39.6	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.7	0.002	16.6	0.004	0.0008	2.58	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.6	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	< 0.005	< 0.01
V8	23-Oct-07	< 0.00025	0.01	< 0.001	0.05	< 0.05	< 0.001	< 0.001	54.2	< 0.0002	< 0.001	< 0.001	0.001	0.06		0.8	0.003	23.9	0.006	0.0009	3.43	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0039	< 0.001	< 0.005	< 0.01
V8	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.056	< 0.05	< 0.001	< 0.001	65.4	< 0.0002	< 0.001	< 0.001	< 0.001	0.06		1	0.004	26.9	0.007	0.0009	3.59	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.5	< 0.001	0.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0043	< 0.001	0.007	< 0.01
V8	09-Dec-07	< 0.00025	< 0.005	< 0.001	0.053	< 0.05	< 0.001	< 0.001	58.7	< 0.0002	< 0.001	< 0.001	< 0.001	0.07		0.9	0.001	26	0.01	0.0008	3.32	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.24	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0053	< 0.001	0.008	< 0.01
	average	0.00025	0.011	0.001	0.055	0.05	0.001	0.001	57.5	0.0002	0.001	0.001	0.001	0.065		1.0	0.004	25.2	0.012	0.0009	3.34	0.002	0.001	0.15	0.001	0.001	4.2	0.001	0.24	0.001	0.0005	0.0011	0.0001	0.0045	0.001	0.010	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.03	< 0.05	< 0.001	< 0.001	26.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.6	< 0.005	10.2	< 0.001	< 0.0005	1.88	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.4	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0013	< 0.001	< 0.005	< 0.01
	maximum	< 0.00025	0.051	< 0.001	0.084	< 0.05	< 0.001	< 0.001	90.9	< 0.0002	< 0.001	0.001	0.003	0.15		1.4	0.007	44.3	0.029	0.0012	5.4	0.005	< 0.001	< 0.15	< 0.001	0.002	5	< 0.001	0.41	< 0.001	< 0.0005	0.002	< 0.0001	0.0089	< 0.001	0.029	< 0.01
	N > DL	0	5	0	12	0	0	0	12	0	0	1	3	8	0	12	8	12	11	10	12	8	0	0	0	4	12	0	12	0	0	1	0	12	0	7	0
	median	0.00025	0.005	0.001	0.0515	0.05	0.001	0.001	56.45	0.0002	0.001	0.001	0.001	0.055		0.95	0.005	24.95	0.0085	0.0009	3.375	0.001	0.001	0.15	0.001	0.001	4.15	0.001	0.23	0.001	0.0005	0.001	0.0001	0.0041	0.001	0.0075	0.01
V15	08-Jan-07	< 0.01	< 0.05	< 0.03	0.041	< 0.01	< 0.003		292	< 0.01	< 0.02	< 0.01	< 0.02	< 0.01		5		230	< 0.003	< 0.02	9.7	0.04	< 0.03	< 0.15	< 0.05		4.56	< 0.03	1.01			< 0.005			< 0.01	0.54	< 0.02
V15	14-Jan-07	< 0.00025	< 0.005	< 0.001	0.045	< 0.05	< 0.001	< 0.001	345	0.0012	0.001	< 0.001	0.003	0.09		4.7	0.018	296	0.12	0.0009	12	0.06	< 0.001	< 0.15	< 0.001	0.002	6.4	< 0.001	1.24	< 0.001	< 0.0005	0.001	0.0002	0.036	< 0.001	0.67	< 0.01
V15	06-Feb-07	< 0.00025	0.006	< 0.001	0.045	< 0.05	< 0.001	< 0.001	354	0.001	< 0.001	< 0.001	0.002	< 0.05		4.7	0.02	302	0.003	0.0006	11.9	0.059	< 0.001	< 0.15	< 0.001	0.002	6.4	< 0.001	1.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.037	< 0.001	0.66	< 0.01
V15	13-Feb-07	< 0.00025	0.009	< 0.001	0.044	< 0.05	< 0.001	< 0.001	349	0.0008	< 0.001	< 0.001	0.001	0.08		4.5	0.015	266	< 0.001	0.0006	11.3	0.044	< 0.001	< 0.15	< 0.001	< 0.001	6.1	< 0.001	1.17	< 0.001	< 0.0005	0.001	< 0.0001	0.036	< 0.001	0.51	< 0.01
V15	05-Mar-07	< 0.01	< 0.05	< 0.03	0.042	< 0.01	< 0.003		303	< 0.01	< 0.02	< 0.01	< 0.02	< 0.01		4.5		230	< 0.003	< 0.02	11.4	0.04	< 0.03	< 0.15	< 0.05		4.92	< 0.03	1.02			< 0.005			< 0.01	0.63	< 0.02
V15	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	298	0.0008	< 0.001	< 0.001	0.002	< 0.05		4.5	0.018	244	0.007	0.0008	11.9	0.05	< 0.001	< 0.15	< 0.001	0.001	5.2	< 0.001	1.05	< 0.001	< 0.0005	< 0.001	< 0.0001	0.036	< 0.001	0.59	< 0.01
V15	04-Apr-07	< 0.00025	0.007	< 0.001	0.051	< 0.05	< 0.001	< 0.001	373	0.0008	< 0.001	< 0.001	0.002	< 0.05		4.9	0.017	284	< 0.001	0.0011	12.3	0.053	< 0.001	< 0.15	< 0.001	0.001	5.9	< 0.001	1.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.04	0.001	0.67	< 0.01
V15	18-Apr-07	< 0.00025	< 0.005	< 0.001	0.043	< 0.05	< 0.001	< 0.001	331	0.0009	< 0.001	< 0.001	0.002	0.08		4	0.014	253	0.006	0.0007	9.82	0.06	< 0.001	< 0.15	< 0.001	0.002	5.6	< 0.001	1.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.85	< 0.01
V15	01-May-07	< 0.00025	0.01	< 0.001	0.043	< 0.05	< 0.001	< 0.001	290	0.0009	< 0.001	< 0.001	0.001	< 0.05		4.6	0.016	238	0.012	0.0009	11.4	0.041	< 0.001	< 0.15	< 0.001	0.003	5.7	< 0.001	1.09	< 0.001	< 0.0005	< 0.001	< 0.0001	0.029	< 0.001	0.69	< 0.01
V15	14-May-07	< 0.00025	0.006	< 0.001	0.039	< 0.05	< 0.001	< 0.001	287	0.0006	< 0.001	< 0.001	0.002	0.54		4.3	0.013	227	0.026	0.0011	9.44	0.038	< 0.001	< 0.15	< 0.001	0.003	5.9	< 0.001	0.97	< 0.001	< 0.0005	< 0.001	< 0.0001	0.028	< 0.001	0.52	< 0.01
V15	07-Jun-07	< 0.00025	< 0.005	< 0.001	0.042	< 0.05	< 0.001	< 0.001	289	0.0006	< 0.001	0.001	0.002	0.61		3.6	0.013	205	0.001	0.0011	9.07	0.028	< 0.001	< 0.15	< 0.001	0.003	6	< 0.001	0.95	< 0.001	< 0.0005	< 0.001	< 0.0001	0.026	< 0.001	0.42	< 0.01
V15	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	303	0.0005	< 0.001	< 0.001	< 0.001	0.06	< 0.00002	4.6	0.013	237	0.003	0.0009	11.9	0.035	< 0.001	< 0.15	< 0.001	0.001	6	< 0.001	1.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.03	< 0.001	0.43	< 0.01
V15	03-Jul-07	< 0.00025	< 0.005	< 0.001	0.046	< 0.05	< 0.001	< 0.001	281	0.0005	< 0.001	< 0.001	0.002	< 0.05		3.8	0.012	222	< 0.001	0.0009	10.1	0.03	< 0.001	< 0.15	< 0.001	0.002	5.7	< 0.001	1.09	< 0.001	< 0.0005	< 0.001	< 0.0001	0.033	< 0.001	0.3	< 0.01
V15	16-Jul-07	< 0.00025	0.006	< 0.001	0.043	< 0.05	< 0.001	< 0.001	335	0.0007	< 0.001	< 0.001	0.002	0.2		4	0.014	237	< 0.001	0.0011	10.3	0.04	< 0.001	< 0.15	< 0.001	0.001	6.2	< 0.001	1.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.029	< 0.001	0.54	< 0.01
V15	02-Aug-07	< 0.00025	< 0.005	< 0.001	0.054	< 0.05	< 0.001	< 0.001	363	0.0009	< 0.001	< 0.001	0.002	0.1		5	0.014	307	< 0.001	0.0007	12.6	0.051	< 0.001	< 0.15	< 0.001	0.002	6.2	< 0.001	1.4	< 0.001	< 0.0005	< 0.001	< 0.0001	0.039	< 0.001	0.69	< 0.01
V15	14-Aug-07	< 0.00025	< 0.005	< 0.001	0.048	< 0.05	< 0.001	< 0.001	352	0.0007	< 0.001	< 0.001	0.002	0.05		4.3	0.015	292	< 0.001	0.0009	12.2	0.045	< 0.001	< 0.15	< 0.001	0.001	6.4	< 0.001	1.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.039	< 0.001	0.61	< 0.01
V15	11-Sep-07	< 0.00025	< 0.005	< 0.001	0.046	< 0.05	< 0.001	< 0.001	393	0.0009	< 0.001	< 0.001	0.003	0.14		5.3	0.015	342	0.003	0.0006	12.9	0.062	< 0.001	< 0.15	< 0.001	0.002	6.6	< 0.001	1.16	< 0.001	< 0.0005	< 0.001	< 0.0001	0.037	< 0.001	0.89	< 0.01
V15	25-Sep-07	< 0.00005	0.004	0.0008	0.054	< 0.01	< 0.0002	< 0.0002	359	0.00095	< 0.0002	0.0004	0.0021	0.05		4.8	0.019	305	0.0014	0.0008	11.7	0.055	0.0003	< 0.03	< 0.0002	0.002	6.82	< 0.0002	1.35	< 0.0002	< 0.0001	0.0004	0.00002	0.05	0.0003	0.63	< 0.002
V15	10-Oct-07	< 0.00025	0.012	< 0.001	0.052	< 0.05	< 0.001	< 0.001	348	0.0012	< 0.001	< 0.001	0.003	0.06		5.3	0.017	283	0.001	0.0006	11.9	0.068	< 0.001	< 0.15	< 0.001	0.002	6.6	< 0.001	1.3	< 0.001	< 0.0005	< 0.001	< 0.0001	0.041	0.001	1.18	< 0.01
V15	22-Oct-07	< 0.00025	0.013	< 0.001	0.044	< 0.05	< 0.001	< 0.001	308	0.0011	< 0.001	< 0.001	0.002	0.08		4.2	0.019	286	0.002	0.0007	12.3	0.069	< 0.001	< 0.15	< 0.001	0.002	6.3	< 0.001	1.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.036	< 0.001	1.17	< 0.01
V15	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.047	< 0.05	< 0.001	< 0.001	362	0.0013	< 0.001	< 0.001	0.002	< 0.05		4.9	0.018	311	0.003	0.0007	12.3	0.064	< 0.001	< 0.15	< 0.001	0.002	5.9	< 0.001	1.26	< 0.001	< 0.0005	< 0.001	< 0.0001	0.036	< 0.001	1.13	< 0.01
V15	26-Nov-07	< 0.00025	< 0.005	< 0.001	0.053	< 0.05	< 0.001	< 0.001	358	0.0012	< 0.001	< 0.001	0.003	0.06		5.5	0.019	295	< 0.001	0.0005	12.4	0.085	< 0.001	< 0.15	< 0.001	0.002	6.7	< 0.001	1.38	< 0.001	< 0.0005	< 0.001	< 0.0001	0.041	< 0.001	1.44	< 0.01
V15	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.045	< 0.05	< 0.001	< 0.001	324	0.001	< 0.001	< 0.001	0.002	0.08		4.4	0.012	274	0.003	< 0.0005	9.84	0.067	< 0.001	< 0.15	< 0.001	0.002	5.9	< 0.001	1.18	< 0.001	< 0.0005	< 0.001	< 0.0001	0.041	< 0.001	1.14	< 0.01
V15	17-Dec-07	< 0.00025	< 0.005	< 0.001	0.049	< 0.05	< 0.001	< 0.001	363	0.0011	< 0.001	< 0.001	0.002	< 0.05		5	0.016	294	< 0.001	0.0007	13.3	0.06	< 0.001	< 0.15	< 0.001	0.002	5.7	< 0.001	1.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.04	< 0.001	1.02	< 0.01
	average	0.00105	0.010	0.0034	0.046	0.045	0.0011	0.0010	332	0.0017	0.00255	0.002	0.004	0.110	0.00002	4.6	0.016	269	0.0086	0.0024	11.4	0.052	0.0034	0.15	0.0051	0.002	6.0	0.0034	1.17	0.0010	0.0005	0.001	0.0001	0.036	0.002	0.75	0.011
	minimum	< 0.00005	< 0.005	< 0.001	0.039	< 0.05	< 0.0002	< 0.0002	281	0.0005	< 0.0002	< 0.001	< 0.001	< 0.05	< 0.00002	3.6	0.012	205	< 0.001	< 0.0005	9.07	0.028	< 0.001

Appendix 6
2007 Surface Water Quality Data
Vangorda Creek Drainage

Table 3 Surface Water Dissolved Metals

STATION	DATE	AG-D mg/L	AL-D mg/L	AS-D mg/L	BA-D mg/L	B-D mg/L	BE-D mg/L	BI-D mg/L	CA-D mg/L	CD-D mg/L	CO-D mg/L	CR-D mg/L	CU-D mg/L	FE-D mg/L	HG-D mg/L	K-D mg/L	LI-D mg/L	MG-D mg/L	MN-D mg/L	MO-D mg/L	NA-D mg/L	NI-D mg/L	PB-D mg/L	P-D mg/L	SB-D mg/L	SE-D mg/L	SI-D mg/L	SN-D mg/L	SR-D mg/L	TE-D mg/L	TH-D mg/L	TI-D mg/L	TL-D mg/L	U-D mg/L	V-D mg/L	ZN-D mg/L	ZR-D mg/L
V22	18-Jun-07	< 0.00025	0.92	< 0.001	0.019	< 0.05	< 0.001	< 0.001	118	0.097	0.29	< 0.001	0.6	9.51		1.7	0.024	55.3	20.8	0.0011	3.32	0.3	0.12	< 0.15	< 0.001	< 0.001	2.7	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0016	0.0023	< 0.001	79.1	< 0.01
V22	24-Sep-07	< 0.00025	1.32	< 0.001	0.019	< 0.05	< 0.001	< 0.001	154	0.117	0.46	< 0.001	0.58	1.33		2.2	0.031	72.8	30.4	0.0022	3.63	0.41	0.23	< 0.15	< 0.001	0.002	3.5	< 0.001	0.83	< 0.001	< 0.0005	< 0.001	0.0018	0.0029	< 0.001	116	< 0.01
V22	10-Dec-07	< 0.00025	1.25	0.001	0.021	< 0.05	< 0.001	< 0.001	137	0.1	0.4	< 0.001	0.45	6.5		2	0.028	62.6	26.3	0.0022	3.58	0.36	0.23	< 0.15	< 0.001	0.001	4.1	< 0.001	0.77	< 0.001	< 0.0005	< 0.001	0.0013	0.0031	< 0.001	97.7	< 0.01
	average	0.00025	0.87	0.001	0.025	0.05	0.001	0.001	132	0.089	0.32	0.001	0.41	4.35		2.0	0.028	58.5	21.8	0.0017	3.94	0.31	0.15	0.15	0.0015	0.001	4.2	0.001	0.81	0.001	0.0005	0.001	0.0017	0.0026	0.001	82.4	0.01
	minimum	< 0.00025	0.005	< 0.001	0.019	< 0.05	< 0.001	< 0.001	118	0.04	0.13	< 0.001	0.007	0.05		1.7	0.024	43.4	9.77	0.0011	3.32	0.18	0.005	< 0.15	< 0.001	0.001	2.7	< 0.001	0.69	< 0.001	< 0.0005	< 0.001	0.0013	0.0019	< 0.001	36.9	< 0.01
	maximum	< 0.00025	1.32	< 0.001	0.041	< 0.05	< 0.001	< 0.001	154	0.117	0.46	< 0.001	0.6	9.51		2.2	0.031	72.8	30.4	0.0022	5.23	0.41	0.23	< 0.15	0.003	0.002	6.5	< 0.001	0.95	< 0.001	< 0.0005	< 0.001	0.002	0.0031	< 0.001	116	< 0.01
	N > DL	3	4	1	4	0	0	0	4	4	4	0	4	3	0	4	4	4	4	4	4	4	4	0	1	3	4	0	4	0	0	0	4	4	0	4	0
	median	0.00025	1.09	0.001	0.02	0.05	0.001	0.001	128	0.099	0.35	0.001	0.52	3.92		2.1	0.0275	59.0	23.6	0.0018	3.61	0.33	0.18	0.15	0.001	0.001	3.8	0.001	0.8	0.001	0.0005	0.001	0.0017	0.0026	0.001	88.4	0.01
V23	5-Mar-07	< 0.00025	< 0.005	< 0.001	0.044	< 0.05	< 0.001	< 0.001	106	0.0009	0.006	< 0.001	0.001	< 0.05		3.1	0.025	65.9	0.13	0.0026	10.8	0.15	< 0.001	< 0.15	0.004	0.002	3.4	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	0.0009	0.0069	< 0.001	5.1	< 0.01
V23	18-Jun-07	< 0.00025	< 0.005	< 0.001	0.034	< 0.05	< 0.001	< 0.001	85.8	0.0019	0.003	< 0.001	0.001	0.07		2.2	0.017	51.6	0.079	0.0019	7.88	0.12	< 0.001	< 0.15	0.003	< 0.001	2.3	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	0.0005	0.0026	< 0.001	1.86	< 0.01
V23	24-Sep-07	< 0.00025	0.006	0.001	0.043	< 0.05	< 0.001	< 0.001	109	0.0019	0.004	< 0.001	0.11	0.12		2.9	0.02	61.2	0.09	0.0032	9.23	0.12	0.034	< 0.15	0.004	0.002	2.7	< 0.001	0.72	< 0.001	< 0.0005	< 0.001	0.0012	0.0037	< 0.001	2.44	< 0.01
V23	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.038	< 0.05	< 0.001	< 0.001	99.3	0.0014	0.004	< 0.001	0.002	< 0.05		2.6	0.018	54.4	0.11	0.0023	8.19	0.14	< 0.001	< 0.15	0.003	0.001	2.9	< 0.001	0.68	< 0.001	< 0.0005	< 0.001	0.0005	0.0071	< 0.001	4.56	< 0.01
	average	0.00025	0.005	0.001	0.040	0.05	0.001	0.001	100	0.0015	0.004	0.001	0.029	0.07		2.7	0.02	58.3	0.10	0.0025	9.03	0.13	0.0093	0.15	0.004	0.002	2.8	0.001	0.69	0.001	0.0005	0.001	0.0008	0.0051	0.001	3.49	0.01
	minimum	< 0.00025	0.005	< 0.001	0.034	< 0.05	< 0.001	< 0.001	85.8	0.0009	0.003	< 0.001	0.001	< 0.05		2.2	0.017	51.6	0.079	0.0019	7.88	0.12	< 0.001	< 0.15	0.003	0.001	2.3	< 0.001	0.59	< 0.001	< 0.0005	< 0.001	0.0005	0.0026	0.001	1.86	< 0.01
	maximum	< 0.00025	0.006	< 0.001	0.044	< 0.05	< 0.001	< 0.001	109	0.0019	0.006	< 0.001	0.11	0.12		3.1	0.025	65.9	0.13	0.0032	10.8	0.15	0.034	< 0.15	0.004	0.002	3.4	< 0.001	0.75	< 0.001	< 0.0005	< 0.001	0.0012	0.0071	0.001	5.1	< 0.01
	N > DL	3	3	1	4	0	0	0	4	4	4	0	4	2	0	4	4	4	4	4	4	4	2	3	4	3	4	0	4	0	0	0	4	4	3	4	0
	median	0.00025	0.005	0.001	0.0405	0.05	0.001	0.001	103	0.0017	0.004	0.001	0.0015	0.06		2.8	0.019	57.8	0.1	0.0025	8.71	0.13	0.001	0.15	0.0035	0.0015	2.8	0.001	0.7	0.001	0.0005	0.001	0.0007	0.0053	0.001	3.5	0.01
V25BSP	14-May-07	< 0.00025	0.01	< 0.001	0.01	< 0.05	< 0.001	< 0.001	37.3	< 0.0002	< 0.001	< 0.001	0.004	0.09		1.3	< 0.005	8	0.008	0.0007	1.74	0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.5	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.079	< 0.01
V25BSP	18-Jun-07	< 0.00025	0.011	< 0.001	0.014	< 0.05	< 0.001	< 0.001	31.6	< 0.0002	< 0.001	< 0.001	0.003	< 0.05	< 0.00002	1	< 0.005	6.27	0.008	< 0.0005	2.09	0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.7	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.019	< 0.01
V25BSP	16-Jul-07	< 0.00025	0.011	< 0.001	0.019	< 0.05	< 0.001	< 0.001	34.3	< 0.0002	< 0.001	< 0.001	0.003	0.07		0.8	< 0.005	6.85	0.009	< 0.0005	2.29	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.14	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.017	< 0.01
V25BSP	14-Aug-07	< 0.00025	0.009	< 0.001	0.02	< 0.05	< 0.001	< 0.001	56.7	< 0.0002	0.002	< 0.001	0.005	< 0.05		1	< 0.005	11.9	0.022	0.0006	3.44	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.043	< 0.01
V25BSP	11-Sep-07	< 0.00025	< 0.005	< 0.001	0.021	< 0.05	< 0.001	< 0.001	68.4	< 0.0002	< 0.001	< 0.001	0.002	0.08		1.1	0.002	14.7	0.011	< 0.0005	3.76	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.27	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0008	< 0.001	0.045	< 0.01
V25BSP	23-Oct-07	< 0.00025	0.007	< 0.001	0.016	< 0.05	< 0.001	< 0.001	66.8	< 0.0002	0.003	< 0.001	0.003	0.06		1	0.002	13.9	0.021	0.0007	4.12	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.23	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0015	< 0.001	0.044	< 0.01
V25BSP	13-Nov-07	< 0.00025	< 0.005	< 0.001	0.021	< 0.05	< 0.001	< 0.001	83	< 0.0002	< 0.001	< 0.001	0.002	0.05		1.1	0.003	16.8	0.013	< 0.0005	4.39	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.29	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0012	< 0.001	0.05	< 0.01
V25BSP	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.019	< 0.05	< 0.001	< 0.001	72.3	< 0.0002	< 0.001	< 0.001	0.002	0.08		1	< 0.001	14.1	0.007	< 0.0005	3.92	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.8	< 0.001	0.25	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.071	< 0.01
	average	0.00025	0.008	0.001	0.018	0.05	0.001	0.001	56.3	0.0002	0.001	0.001	0.003	0.07	0.00002	1.04	0.0035	11.6	0.012	0.0006	3.22	0.001	0.001	0.15	0.001	0.001	4.3	0.001	0.21	0.001	0.0005	0.001	0.0001	0.0010	0.001	0.046	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.01	< 0.05	< 0.001	< 0.001	31.6	< 0.0002	< 0.001	< 0.001	0.002	< 0.05	< 0.00002	0.8	< 0.005	6.27	0.007	< 0.0005	1.74	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	2.5	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.017	< 0.01
	maximum	< 0.00025	0.011	< 0.001	0.021	< 0.05	< 0.001	< 0.001	83	< 0.0002	0.003	< 0.001	0.005	0.09	< 0.00002	1.3	0.003	16.8	0.022	0.0007	4.39	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.9	< 0.001	0.29	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0018	< 0.001	0.079	< 0.01
	N > DL	0	5	0	8	0	0	0	8	0	2	0	8	6	0	8	3	8	8	3	8	5	0	0	0	0	8	0	8	0	0	0	0	6	0	8	0
	median	0.00025	0.008	0.001	0.019	0.05	0.001	0.001	61.75	0.0002	0.001	0.001	0.003	0.065	0.00002	1	0.004	12.9	0.01	0.0005	3.6	0.001	0.001	0.15	0.001	0.001	4.7	0.001	0.225	0.001	0.0005	0.001	0.0001	0.0008	0.001	0.0445	0.01
V27	04-Jun-07	< 0.00025	0.038	< 0.001	0.009	< 0.05	< 0.001	< 0.001	4.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.005	1.32	0.002	< 0.0005	0.69	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.5	< 0.001	0.02	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
V27	25-Jul-07	< 0.00025	0.055	< 0.001	0.033	< 0.05	< 0.001	< 0.001	28.7	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		0.6	< 0.005	8.28	0.004	< 0.0005	2.22	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.099	< 0.001	< 0.0005	< 0.001	< 0.0001	0.001	< 0.001	0.029	< 0.01
V27	10-Oct-07	< 0.00025	0.016	< 0.001	0.034	< 0.05	< 0.001	< 0.001	28.6	< 0.0002	< 0.001	< 0.001	0.001	0.06		0.5	< 0.001	8.76	0.003	< 0.0005	2.01	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.025	< 0.01
	average	0.00025	0.036	0.001	0.025	0.05	0.001	0.001	20.5	0.0002	0.001	0.001	0.001	0.053	0.00002	0.5	0.004	6.12	0.003	0.0005	1.64	0.001	0.001	0.15	0.001	0.001	3.2	0.001	0.073	0.001	0.0005	0.001	0.0001	0.0011	0.001	0.021	0.01
	minimum	< 0.00025	0.016	< 0.001	0.009	< 0.05	< 0.001	< 0.001	4.2	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05	< 0.00002	0.5	< 0.001	1.32	0.002	< 0.0005	0.69	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	1.5	< 0.001	0.02	< 0.001	< 0.0005	< 0.001	< 0.0001	< 0.0005	< 0.001	0.008	< 0.01
	maximum	< 0.00025	0.055	< 0.001	0.034	< 0.05	< 0.001	< 0.001	28.7	< 0.0002	< 0.001	< 0.001	0.001	0.06	< 0.00002	0.6	< 0.005	8.76	0.004	< 0.0005	2.22	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.1	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0017	< 0.001	0.029	< 0.01
	N > DL	0	3	0	3	0	0	0	3	0	0	0	2	1	0	3	0	3	3	0	3	0	0	0	0	0	3	0	3	0	0	0	0	2	0	3	0
	median	0.00025	0.038	0.001	0.033	0.05	0.001	0.001	28.6	0.0002	0.001	0.001	0.001	0.05	0.00002	0.5	0.005	8.28	0.003	0.0005	2.01	0.001	0.001	0.15	0.001	0.001	4	0.001	0.099	0.001	0.0005	0.001	0.0001	0.001	0.001	0.025	0.01
V31	11-Jun-07	0.0015	0.23	0.003	0.011	< 0.05	< 0.001	< 0.001	319	0.21	2.54	< 0.001	0.008	122		9.1	0.054	574	208	0.015	12.1	2.71	< 0.001	< 0.15	< 0.001	0.007	8.3	< 0.001	1.4	< 0.001	< 0.0005	< 0.001	0.0016	0.0009	< 0.001	743	< 0.01
V32	11-Jun-07	0.017	221	0.011	0.004	< 0.05	0.017	< 0.001	366	5.03	23.8	0.017	0.044	3650		2	0.54	4710	3690	0.298	11.3	12.8	1.2	< 0.15	0.001	0.072	16.9	< 0.001	1	< 0.001	0.023	0.005	0.021	0.946	0.007	10300	< 0.01
V32	01-Oct-07	< 1	353	< 3	< 0.1	< 1	< 0.3		425	10	26	< 1	< 2	3870		34		5530	3860	< 2	18	19	< 3	< 15	< 5		22	< 3	0.4			< 0.5			< 1	11300	< 2
V33	01-Oct-07	< 1	< 5	< 3	< 0.1	< 1	< 0.3		432	1	16	< 1	< 2	2810		36		6810	2580	< 2	18	15	< 3	< 15	< 5		10	< 3	4			< 0.5			< 1	5620	< 2
VGMAIN	15-Jan-07	< 0.00025	< 0.005	< 0.001	0.068	< 0.05	< 0.001	< 0.001	72.5	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		1	0.004	31.3	0.007	0.0007	3.97	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0069	< 0.001	0.025	< 0.01
VGMAIN	13-Feb-07	< 0.00025	0.005	< 0.001	0.069	< 0.05	< 0.001	< 0.001	75.6	< 0.0002	< 0.001	< 0.001	< 0.001	0.1		1	0.004	31.2	0.006	0.0008	3.96	0.002	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0075	< 0.001	0.01	< 0.01
VGMAIN	11-Mar-07	< 0.00025	< 0.005	< 0.001	0.074	< 0.05	< 0.001	< 0.001	75.1	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		1.1	0.005	33.6	0.007	0.0007	4.2	0.003	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.31	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0079	< 0.001	0.013	< 0.01
VGMAIN	18-Apr-07	< 0.00025	< 0.005	< 0.001	0.073	< 0.05	< 0.001	< 0.001	78.2	< 0.0002	< 0.001	< 0.001	< 0.001	0.08		1.1	0.002	31.8	0.032	0.0007	3.6	0.011	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.32	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0064	< 0.001	0.039	< 0.01
VGMAIN	14-May-07	< 0.00025	0.01	< 0.001	0.042	< 0.05	< 0.001	< 0.001	43.2	< 0.0002	< 0.001	0.001	0.003	0.16		1.2	< 0.005	17.9	0.008	0.0012	2.17	0.005	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.17	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0038	< 0.001	0.016	< 0.01
VGMAIN	18-Jun-07	< 0.00025	0.008	< 0.001	0.025	< 0.05	< 0.001	< 0.001	21.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.5	< 0.005	7.97	< 0.001	< 0.0005	1.57	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.08	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	0.007	< 0.01
VGMAIN	16-Jul-07	< 0.00025	0.013	< 0.001	0.031	< 0.05	< 0.001	< 0.001	25.1	< 0.0002	< 0.001	< 0.001	0.001	< 0.05		0.5	< 0.005	9.6	0.001	< 0.0005	1.83	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.11	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0016	< 0.001	0.007	< 0.01
VGMAIN	13-Aug-07	< 0.00025	0.02	< 0.001	0.041	< 0.05	< 0.001	< 0.001	37.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.6	< 0.005	14.7	0.002	< 0.0005	2.46	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0028	< 0.001	0.007	< 0.01
VGMAIN	10-Sep-07	< 0.00025	< 0.005	< 0.001	0.045	< 0.05	< 0.001	< 0.001	34.1	< 0.0002	< 0.001	< 0.001	0.002	< 0.05		0.6	0.002	13.8	0.002	0.0006	2.42	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.8	< 0.001	0.15	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0029	< 0.001	0.01	< 0.01
VGMAIN	23-Oct-07	< 0.00025	< 0.005	< 0.001	0.048	< 0.05	< 0.001	< 0.001	49	< 0.0002	< 0.001	< 0.001	0.001	0.06		0.7	0.002	20.5	0.003	0.0006	3.11	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.1	< 0.001	0.2	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0041	< 0.001	0.006	< 0.01
VGMAIN	13-Nov-07	< 0.00025	0.027	< 0.001	0.052	< 0.05	< 0.001	< 0.001	57	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.8	0.003	22.5	0.004	0.0006	3.18	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.4	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0043	< 0.001	0.009	< 0.01
VGMAIN	10-Dec-07	< 0.00025	< 0.005	< 0.001	0.053	< 0.05	< 0.001	< 0.001	56	< 0.0002	< 0.001	< 0.001	< 0.001	0.07		0.8	< 0.001	22.9	0.004	0.0006	3.15	0.001	< 0.001	< 0.15	< 0.001	< 0.001	4.2	< 0.001	0.22	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0058	< 0.001	0.012	< 0.01
	average	0.00025	0.009	0.001	0.052	0.05	0.001	0.001	52.1	0.0002	0.001	0.001	0.001	0.07		0.8	0.004	21.5	0.006	0.0007	2.97	0.003	0.001	0.15	0.001	0.001	4.1	0.001	0.21	0.001	0.0005	0.001	0.0001	0.0046	0.001	0.013	0.01
	minimum	< 0.00025	< 0.005	< 0.001	0.025	< 0.05	< 0.001	< 0.001	21.4	< 0.0002	< 0.001	< 0.001	< 0.001	< 0.05		0.5	< 0.005	7.97	< 0.001	< 0.0005	1.57	< 0.001	< 0.001	< 0.15	< 0.001	< 0.001	3.2	< 0.001	0.08	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0011	< 0.001	0.006	< 0.01
	maximum	< 0.00025	0.027	< 0.001	0.074	< 0.05	< 0.001	< 0.001	78.2	< 0.0002	< 0.001	0.001	0.003	0.16		1.2	0.005	33.6	0.032	0.0012	4.2	0.011	< 0.001	< 0.15	< 0.001	< 0.001	4.6	< 0.001	0.32	< 0.001	< 0.0005	< 0.001	< 0.0001	0.0079	< 0.001	0.039	< 0.01
	N > DL	0	6	0	12	0	0	0	12	0	0	1	4	5	0	12	7	12	11	9	12	6	0	0	0	0	12	0	12	0	0	0	0	12	0	12	0
	median	0.00025	0.005	0.001	0.05	0.05	0.001	0.001	52.5	0.0002	0.001	0.001	0.001	0.05		0.8	0.004	21.5	0.004	0.0006	3.13	0.001	0.001	0.15	0.001	0.001	4.15	0.001	0.21	0.001	0.0005	0.001	0.0001	0.0042	0.001	0.01	0.01

Statistics only generated where there are more than 2 values in a data set

average	average of values, including values less than detection limit as set to DL value
	if it is the DL value will be shown without the < symbol
minimum	lowest value and will be least DL value if these are present in the data set
maximum	highest vale
N > DL	number of values measured that are above detection limits
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts	
median	the median value of the data set - if it is a DL value will be shown without the < symbol

NOTE:

Detection Limit values used as the DL value in statistics contrasts with conversion to 0 for charts

Appendix 7

2007 Bioassay Results

-Vangorda Creek Drainage

Gartner Lee

Cantest Ltd.
Burnaby
706210387 - V2

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070622B-04 Report # : 2-11-200-040-07-058

Sample Taken:	Jun. 19, 2007	Sample pH:	8.0
Sample Collected By:	C. McNinnow, R. Meers	Sample Dissolved Oxygen:	10.6 mg/L
Sample Received:	Jun. 22, 2007	Sample Temperature:	12.1 °C
Start Date/Time:	Jun. 22, 2007 4:30 PM	Sample Conductance:	1464 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	54	14.1	14.7	7.9	7.6	10.2	9.6	0	0	0	0	0
0	54	14.1	14.7	7.9	7.6	10.2	9.6	0	0	0	0	0
100	1486	14.3	14.5	8.3	8.5	10.2	9.8	0	0	0	0	0
100	1486	14.3	14.6	8.3	8.5	10.2	9.8	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. PO# 479. Amended Report.

Test Conditions:

Organisms per Replicate:	5	Preaeration Time:	30 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.44 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.57 ± 0.42 g	Length (Mean + SD):	5.6 ± 0.5 cm
Weight (Range):	0.91– 2.47 g	Length (Range):	4.7– 6.6 cm

Reference Toxicant: Phenol
Test was conducted on: 05/25/2007
Test gave a 96-h LC50 of 9.22 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Cantest Ltd.
Burnaby
709270583 V2-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070928C-03 Report # : 2-11-200-040-07-097

Sample Taken:	Sep. 25, 2007 10:05 AM	Sample pH:	8.0
Sample Collected By:	C. McKinon, R. Mecrs	Sample Dissolved Oxygen:	11.5 mg/L
Sample Received:	Sep. 28, 2007	Sample Temperature:	11.5 °C
Start Date/Time:	Sep. 28, 2007 5:22 PM	Sample Conductance:	1365 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	57	14.0	14.7	7.8	8.0	10.2	9.9	0	0	0	0	0
100	1360	14.4	14.7	8.0	8.4	10.3	10.0	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. P.O. # 703

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	120 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.47 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.64 ± 0.45 g	Length (Mean + SD):	5.5 ± 0.6 cm
Weight (Range):	0.48– 2.51 g	Length (Range):	3.6– 6.2 cm

Reference Toxicant: Phenol
Test was conducted on: 09/11/2007
Test gave a 96-h LC50 of 10.21 (8.8, 11.51) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 26 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Anvil Range Mining Corporation
V2-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 712130457 Report # : 2-11-200-196-07-001

Sample Taken:	Dec. 11, 2007 11:00 AM	Sample pH:	7.8
Sample Collected By:	R. Meers, C. McKinnon	Sample Dissolved Oxygen:	10.0 mg/L
Sample Received:	Dec. 13, 2007	Sample Temperature:	14.7 °C
Start Date/Time:	Dec. 14, 2007 4:07 PM	Sample Conductance:	1374 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	63	14.9	15.1	8.3	8.1	9.8	9.9	0	0	0	0	0
100	1389	15.8	15.1	7.9	8.3	9.3	9.9	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test.

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	30 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.19 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	0.34 ± 0.1 g	Length (Mean + SD):	3.4 ± 0.3 cm
Weight (Range):	0.15– 0.59 g	Length (Range):	2.8– 4.2 cm

Reference Toxicant: Phenol
Test was conducted on: 12/05/2007
Test gave a 96-h LC50 of 13.18 (11.26, 16.31) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Cantest Ltd.
Burnaby
706210388 - V25 BSP

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070622B-05 Report # : 2-11-200-040-07-059

Sample Taken:	Jun. 19, 2007	Sample pH:	8.0
Sample Collected By:	C. McNinnow, R. Meers	Sample Dissolved Oxygen:	10.4 mg/L
Sample Received:	Jun. 22, 2007	Sample Temperature:	12.2 °C
Start Date/Time:	Jun. 22, 2007 5:15 PM	Sample Conductance:	234 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	55	14.1	14.6	7.9	7.5	10.2	9.7	0	0	0	0	0
0	54	14.1	14.7	7.9	7.5	10.2	9.6	0	0	0	0	0
100	233	14.2	14.8	8.0	8.1	10.0	9.8	0	0	0	0	0
100	236	14.2	14.6	8.0	7.6	10.0	8.1	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. PO# 479. Amended Report.

Test Conditions:

Organisms per Replicate:	5	Preaeration Time:	30 min.
Test Volume:	18 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.44 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.57 ± 0.42 g	Length (Mean + SD):	5.6 ± 0.5 cm
Weight (Range):	0.91– 2.47 g	Length (Range):	4.7– 6.6 cm

Reference Toxicant: Phenol
Test was conducted on: 05/25/2007
Test gave a 96-h LC50 of 9.22 (7, 13) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:

Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Cantest Ltd.
Burnaby
709270584 V25 BSP-Grab

Rainbow Trout Bioassay
96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 070928-04 Report # : 2-11-200-040-07-098

Sample Taken:	Sep. 25, 2007 9:55 AM	Sample pH:	7.9
Sample Collected By:	C. McKinon, R. Mecrs	Sample Dissolved Oxygen:	11.0 mg/L
Sample Received:	Sep. 28, 2007	Sample Temperature:	12.0 °C
Start Date/Time:	Sep. 28, 2007 4:35 PM	Sample Conductance:	448 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	57	13.9	14.9	7.5	7.9	10.3	9.7	0	0	0	0	0
100	422	14.3	15.1	7.7	7.9	10.1	9.8	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test. P.O. # 703

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	65 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.47 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.64 ± 0.45 g	Length (Mean + SD):	5.5 ± 0.6 cm
Weight (Range):	0.48– 2.51 g	Length (Range):	3.6– 6.2 cm

Reference Toxicant: Phenol
Test was conducted on: 09/11/2007
Test gave a 96-h LC50 of 10.21 (8.8, 11.51) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 26 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

CANTEST
Digitally signed by Janet Pickard
Toxicology Group

Anvil Range Mining Corporation

V25-Grab (V25 BSP)

Rainbow Trout Bioassay

96-h LC50 %v/v: >100%

CANTEST Ltd.
3650 Wesbrook Mall
Vancouver, BC
Canada V6S 2L2
tel: 604 224 4331
fax: 604 224 0540
web: http://cantest.com

Cantest Sample # : 712130458 Report # : 2-11-200-196-07-002

Sample Taken:	Dec. 11, 2007 10:30 AM	Sample pH:	7.2
Sample Collected By:	R. Meers, C. McKinnon	Sample Dissolved Oxygen:	10.4 mg/L
Sample Received:	Dec. 13, 2007	Sample Temperature:	14.0 °C
Start Date/Time:	Dec. 14, 2007 4:20 PM	Sample Conductance:	435 µmho/cm

Conc. (%v/v)	Cond. (µmho/cm)	Temp. Initial (°C)	Temp. Final (°C)	pH Initial	pH Final	D.O. Initial (mg/L)	D.O. Final (mg/L)	Percent Mortality 24 hr	48 hr	72 hr	96 hr	Number of Mortalities
0	63	14.5	15.0	8.3	8.3	9.7	10.0	0	0	0	0	0
100	441	14.0	15.3	7.5	8.0	9.9	9.9	0	0	0	0	0

Comments:
All fish appeared and behaved normally during the test.

Test Conditions:

Organisms per Replicate:	10	Preaeration Time:	30 min.
Test Volume:	35 L	Rate of aeration:	6.5 ml/min/L
Loading Density:	0.34 g/L		

Test Organism: Rainbow Trout (*Oncorhynchus mykiss*)

Weight (Mean + SD):	1.18 ± 0.33 g	Length (Mean + SD):	5 ± 0.5 cm
Weight (Range):	0.76– 1.95 g	Length (Range):	4.2– 5.8 cm

Reference Toxicant: Phenol
Test was conducted on: 11/29/2007
Test gave a 96-h LC50 of 11.97 (10, 22) mg/L

Dilution Water: Vancouver Tapwater hardened and dechlorinated
EDTA Hardness: 19 mg $CaCO_3$/L Other parameters available on request

Test Method:
Biological Test Method: Reference Method for Determining Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13, Second Edition, December 2000. Results contained in this report refer only to the testing of samples as submitted.

Analyst **Verified By**

Appendix 8

Biological and Sediment Monitoring Program at Rose Creek, Faro, YT,

2007 Laberge Environmental Services, December 2007

Gartner Lee

BIOLOGICAL AND SEDIMENT MONITORING PROGRAM

AT

VANGORDA CREEK, FARO, Y.T. 2007

Submitted to:

DELOITTE & TOUCHE INC

Prepared by:

B. E. Burns

Laberge ENVIRONMENTAL SERVICES

P.O. Box 21072, Whitehorse Yukon. Y1A 6P7

December, 2007

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	STUDY AREA	2
3.0	METHODS	4
3.1	Water Quality	4
3.1.1	Field Measurements	4
3.1.2	Chemical Analyses	4
3.2	Water Quantity	4
3.3	Stream Sediment Sampling	4
3.4	Benthic Invertebrate Sampling	5
3.4.1	Field Collection	5
3.4.2	Laboratory Analysis	5
4.0	RESULTS AND DISCUSSION	6
4.1	Water Quality	6
4.1.1	Temperature	6
4.1.2	Conductivity	6
4.1.3	pH	6
4.1.4	Dissolved Oxygen	6
4.1.5	Alkalinity	7
4.1.6	Sulphate	7
4.1.7	Ammonia	8
4.1.8	Non-filterable Residue (NFR)	8
4.1.9	Total Hardness	8
4.1.10	Total and Dissolved Metals	8
4.2	Water Quantity	9
4.3	Stream Sediment Quality	9
4.3.1	Metal Analyses for the 2007 Survey	9
4.3.2	Comparisons with Past Data	10
4.4	Benthic Invertebrates	14
4.4.1	Abundance and Taxonomic Richness	14
4.4.2	Distribution	15
4.4.3	Comparisons with Past Data	18
5.0	SUMMARY	22
6.0	REFERENCES	23

APPENDICES

Appendix A	July 2007 Water Quality Data
Appendix B	August 2007 Water Quality & Stream Sediment Data
Appendix C	Benthic Invertebrate Data, 2007

LIST OF TABLES

Table		Page
1	Water Quality Data at Vangorda Creek, 2007	7
2	CCME Recommended Guidelines for Protection of Freshwater Aquatic Life	8
3	Summary of Stream Sediment Metal Concentrations, 2007	10
4	Comparisons of Metals in Stream Sediments Over Time (1993 to 2007)	11
5	Community Characteristics at Sites on Vangorda Creek, 2007	14
6	Taxonomic Distribution of Benthic Invertebrates	16
7	Presence (+) and Absence (-) of Sensitive Taxa at Vangorda Creek, 2007	18
8	Comparisons of Benthic Data Over Time (1991 to 2007)	19

LIST OF FIGURES

Figure		Page
1	Location of Sample Sites on Vangorda Creek, Faro	3
2	Comparison of Copper Concentrations in Stream Sediments	12
3	Comparison of Iron Concentrations in Stream Sediments	12
4	Comparison of Lead Concentrations in Stream Sediments	12
5	Comparison of Zinc Concentrations in Stream Sediments	12
6	Abundance and Taxonomic Richness at Vangorda Creek, 2007	15
7	Pie Charts showing the Composition of Each Community, 2007	16
8	Community Abundance Over Time (1991 to 2007) in Vangorda Cr	21
9	Community Diversity Over Time (1991 to 2007) in Vangorda Cr	21

1.0 INTRODUCTION

On November 8, 1994 Anvil Range Mining Corporation (Anvil) was officially assigned Licence Number IN89-002, which was originally issued to Curragh Resources Inc, by the Yukon Territory Water Board. The mine has not operated since January 1998. Low metal prices (zinc and lead) and financial difficulties experienced by Anvil indicated that this closure had the potential to be long term. On April 21, 1998, Deloitte & Touch Inc was appointed as the interim receiver for the Faro Mine property, operations and assets.

On March 30, 2004, Deloitte and Touch Inc was issued Licence Number QZ03-059 to continue care and maintenance of the Anvil Range Mine site, and to conduct and/or manage additional studies and plans for another five years.

To comply with Part G, Section 64 and Schedule B of the water licence, a biological and sediment monitoring program is to be undertaken every two years on the Vangorda Creek system. Deloitte and Touch Inc contracted Laberge Environmental Services (LES) to conduct these programs during the summer of 2007. The following report presents all data collected and includes some comparisons with past monitoring programs.

2.0 STUDY AREA

The lead-zinc mine near Faro, located at approximately 62° 20' N and 133° 25' W (Figure 1), consisted of three open pits, Faro, Grum and Vangorda.

The Grum and Vangorda deposits were extracted within the Vangorda Creek watershed and the ore was transported via the haul road to the mill for concentrating. The following four sampling stations are located upstream and downstream of the mined area (Figure 1):

V1: Vangorda Creek upstream of the 'Blind Creek Road' and the Vangorda pit.

V27: Vangorda Creek upstream of the confluence with Shrimp Creek and downstream of all mining related activity.

V5: West Fork of Vangorda Creek upstream of the mine access road and downstream of the haul road.

V8: Vangorda Creek upstream of the new bridge to the Faro town water supply, and approximately 850 metres upstream of the confluence with the Pelly River. Note that this is the first year that benthic invertebrates have been collected from this site. The current site was moved 300 metres upstream of the original site. The reasons for this were; easier access with the construction of the recent bridge, and to conform to the location where hydrometric measurements and water samples are collected.

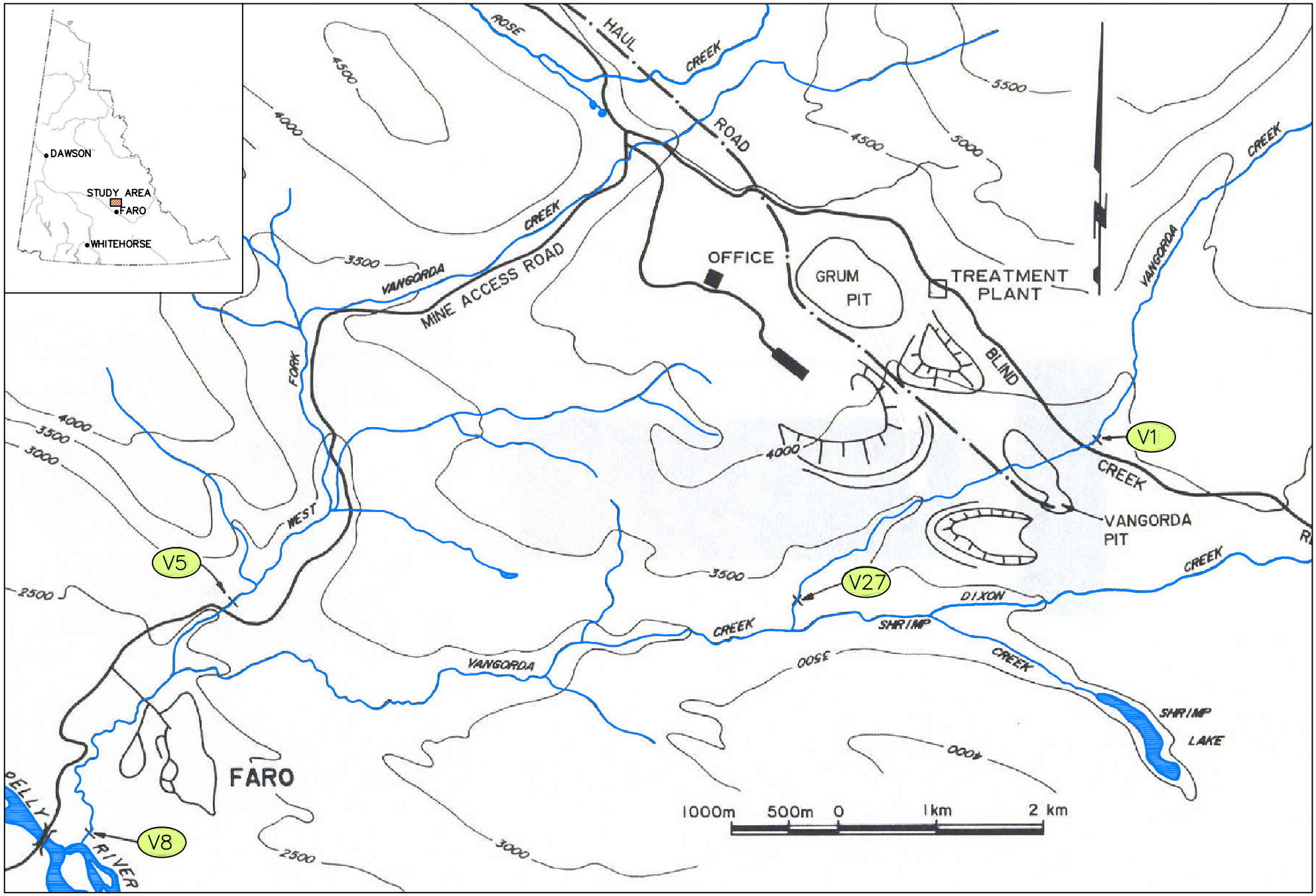


FIGURE 1 : LOCATION OF SAMPLING SITES ON VANGORDA CREEK, FARO

3.0 METHODS

3.1 Water Quality

Water quality samples were collected on two occasions during the biological monitoring program; on July 23rd and 25th, and on August 27th to 29th , 2007.

3.1.1 Field Measurements

In-situ measurements were taken at each site during both surveys. Conductivity and temperature were determined with a 3301 WTW conductivity meter. Dissolved oxygen readings were determined with a YSI 556 multiprobe and pH measurements were taken using a Denver Instrument UP5 pH meter.

3.1.2 Chemical Analyses

All sample bottles were supplied by Cantest Laboratories of Burnaby, B.C. and were provided to LES personnel at the Faro Mine Security Office. At each site, the sample bottles were rinsed three times with the sample water prior to filling. Samples were collected in two litre plastic bottles for sulphates, alkalinity, hardness, colour, turbidity and nonfilterable reside analyses. Ammonia samples were collected in 500 mL plastic bottles and preserved with sulphuric acid. Samples to be analyzed for total and dissolved metals were each collected in 250 mL acid washed plastic bottles. The total metals samples were preserved with nitric acid. The dissolved metals samples were left unpreserved to be filtered and treated at the Cantest lab. Samples were kept cool prior to shipment to Cantest.

3.2 Water Quantity

Discharge was measured at each of the sites on both visits. An area with a uniform cross section was chosen and the velocity and depth were measured using a AA Price meter. Ten or more readings were taken across the profile of the stream. Total discharge was calculated as the sum of these individual discharges (area x velocity).

3.3 Stream Sediment Sampling

Triplicate sediment samples were collected from the four sites (V1, V27, V5 and V8) during the August visit. Sample sites were selected from an exposed area of the stream bank where possible, generally characterized by the finest grain size evident at the site. Samples were collected with a

stainless steel trowel and placed in glass jars provided by Cantest. The samples were packed on ice when shipped to Cantest in B.C.

At the lab, the samples were dried and passed through a 100 mesh (0.15 mm) stainless steel sieve. The portion passing through the stainless steel sieve was run through an ICP scan for the determination of total metal concentrations.

3.4 Benthic Invertebrate Sampling

3.4.1 Field Collection

Substrate samplers were used for benthic invertebrate sampling. The basket samplers were cylindrical in shape, measured 26 cm long with a diameter of 17 cm, and were constructed of galvanized wire with a 1 cm mesh. Each substrate sampler was filled with washed indigenous gravels collected from the stream bed or the bank at each sample site. The surface area provided has been estimated to be approximately 6000 ± 1000 cm^2 (Baker 1979). Three rock filled samplers were submerged in riffle areas of the stream at each site on July 23rd or 25th, 2007. These samplers were left to colonize for five weeks. The substrate samplers were retrieved August 27th to 29th by placing a screened bucket with a 300 micron mesh, downstream and under the basket. On shore the basket was opened in the bucket. Individual rocks were then carefully washed in the screened bucket to remove and collect all invertebrates from that sample. The debris and benthic invertebrates remaining in the bucket were placed in a one litre nalgene bottle and preserved with 10% formalin. These samples were sent to Charles Low PhD, an entomologist in Victoria, B.C. for enumeration and identification.

3.4.2 Laboratory Analysis

All samples were washed through two screens with mesh sizes 1 millimetre and 180 microns. All of the organisms retained by the coarse screen were counted and identified, whereas the organisms on the 180 micron screen were subsampled as necessary. A Folsom plankton splitter was used for the subsampling. The majority of the benthos was identified to the genus level.

4.0 RESULTS AND DISCUSSION

To aid in interpretation, site V27 has been placed after V1 and prior to V5 in all of the tables and graphs. V27 is geographically located below V1 but is upstream of the confluence with the West Fork of Vangorda Creek.

4.1 Water Quality

Water quality samples were collected in July and August, 2007, at the four sites. The analytical results for July are presented in Appendix A and for August in Appendix B. Nine elements were below the method detection limit in all samples: mercury (Hg), antimony (Sb), beryllium (Be), bismuth (Bi), boron (B), silver (Ag), tellurium (Te), tin (Sn), and zirconium (Zr).

Schedule B(3) of the Licence explicitly requests the analysis of total hardness, alkalinity, sulphate, suspended solids, ammonia, and total and dissolved ICP metals scans, specifically copper, iron, lead and zinc. The results for these parameters are presented in Table 1.

4.1.1 Temperature

The temperature values reflected the diurnal and seasonal timing of the sampling, ranging from 6.5°C at V1 in August, to 11.2°C in July at V8.

4.1.2 Conductivity

Conductivity, a measure of the total concentration of ionic constituents in water, was low at V1 and significantly higher at the other sites. The highest value of 525 uS/cm was recorded at V5 in August.

4.1.3 pH

The waters at V1 were near neutral and slightly alkaline at the other three sites.

4.1.4 Dissolved Oxygen

All sites were well aerated on both occasions.

TABLE 1

WATER QUALITY DATA AT VANGORDA CREEK, 2007

Sample Site	V1		V27		V5		V8		CCME (1999)
Date, 2007	July 25	August 28	July 25	August 28	July 24	August 29	July 24	August 27	
Temp °C	7.9	6.5	10.1	7.8	7.0	8.1	11.2	6.6	
Conductivity (uS/cm) Field	65	72	210	208	398	512	334	387	
Conductivity (uS/cm) Lab	64	72	206	204	412	525	341	381	
pH Field	7.0	6.8	7.8	8.0	8.2	8.5	8.2	8.2	6.5 - 9
pH Lab	7.2	7.62	7.63	7.96	8.14	8.4	8.1	8.31	
Dissolved Oxygen (mg/L)	14.8	12.2	13.4	12.3	12.8	12.5	10.8	13.6	9.5
Dissolved Oxygen (%)	131.0	99.0	126.0	102.7	111.0	105.2	104.0	111.2	
Alkalinity mg/L as CaCO3	25.7	27.4	53.7	56.7	174	228	127	150	
Cu: total	<0.001	0.0004	0.001	0.0008	**0.022**	0.0013	**0.005**	0.0012	0.003[1]
Cu: dissolved	<0.001	0.0003	0.001	0.0009	0.002	0.0009	0.002	0.0010	
Pb: total	<0.001	<0.0002	<0.001	0.0003	**0.012**	0.0005	0.002	0.0004	0.007[1]
Pb: dissolved	<0.001	<0.0002	<0.001	<0.0002	<0.001	<0.0002	<0.001	<0.0002	
Zn: total	<0.005	<0.001	0.029	0.020	**0.055**	0.002	0.018	0.007	0.03
Zn: dissolved	<0.005	<0.001	0.029	0.016	<0.005	<0.001	<0.005	0.002	
Fe: total	<0.05	0.03	0.09	0.050	**12.2**	**0.33**	**2.51**	0.19	0.3
Fe: dissolved	<0.05	0.02	0.05	0.03	0.08	0.03	<0.05	0.04	
Sulphate	7.55	9.0	47.4	47	59.6	82.2	57.1	70	
Ammonia	<0.01	<0.01	0.01	<0.01	0.03	<0.01	0.01	<0.01	1.04[2]
Total Suspended Solids (TSS)	<1	<1	<1	<1	338	10	60	<1	
Total Hardness mg/L as CaC03	28	28.8	100	91.4	283	279	198	188	
Flow m³/sec	0.377	0.205	0.340	0.262	0.369	0.149	0.601	0.386	

NOTE: All units are expressed as mg/L unless indicated otherwise.
Vaules in **bold** indicated exceedence of the CCME guideline for the protection of freshwater aquatic life.
[1] : Guideline derived for hardness > 180 mg/L as $CaCO_3$
[2] : Guideline derived for temperature of 10°C and pH of 8.0

4.1.5 Alkalinity

Alkalinity was low at V1 and V27 and considerably higher at V5 and V8.

4.1.6 Sulphate

Sulphate levels were very low at V1 and somewhat higher at the other three sites. Sulphate concentrations normally vary from 10 to 80 mg/L in surface waters (Canadian Council of Resource and Environment Ministers (CCREM) 1987) and levels downstream of V1 fell within this range.

4.1.7 Ammonia

Ammonia levels were very low and met the CCME guideline of 1.04 mg/L.

4.1.8 Non-filterable Residue (NFR)

Both V1 and V27 had very clear waters on both occasions. The water was visually turbid at V5 in July and had a concentration of 338 mg/L of suspended matter. Conditions were improved further downstream where a concentration of 60 mg/L was documented at V8. Both sites had much clearer water in August.

4.1.9 Total Hardness

Calcium and magnesium are considered to be the primary contributors to hardness but other cations such as strontium, barium, manganese, iron and aluminum also contribute to total hardness. The hardness varied at each of the sites: V1 was very soft, V27 was moderate, and V5 and V8 were very hard.

4.1.10 Total and Dissolved Metals

Most metal concentrations were very low where detected. The Canadian Council of Ministry of the Environment (CCME) has established recommended guidelines for the protection of freshwater aquatic life. Note that these guidelines have generally been established under laboratory conditions or at southern locations, usually using aquatic species exotic to the Yukon. As such, the levels recommended for aquatic life are simply guidelines, and not standards. The guidelines for copper and lead vary with hardness (Table 2) as these metals tend to be more toxic to aquatic life in softer waters.

TABLE 2
CCME RECOMMENDED GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE

HARDNESS as $CaCO_3$ mg/L		COPPER mg/L	LEAD mg/L	IRON mg/L	ZINC mg/L
0 - 60	soft	0.002	0.001	0.3	0.030
60 - 120	moderate	0.002	0.002	0.3	0.030
120 - 180	hard	0.003	0.004	0.3	0.030
>180	very hard	0.004	0.007	0.3	0.030

All recommended CCME guidelines were met in all of the samples collected from V1 and V27.

Guidelines for the four metals were exceeded in the July total metals sample at V5. The west fork of Vangorda Creek was flowing very turbid at the time of sampling in July and had a TSS of 338 mg/L. A great deal of this total suspended matter was iron (12.2 mg/L). Although suspended matter was significantly less in August (10 mg/L), the guideline for iron was slightly exceeded.

The recommended guidelines for copper and iron were exceeded in the July total metals sample at V8, but were met in the dissolved metals sample. The waters at V8 were affected by the high suspended sediment loading from V5 in July, with a recorded TSS value of 60 mg/L.

In August, all parameters met the guidelines with the exception of iron at V5.

Mine site personnel have observed turbid waters at V5, and thus influencing conditions at V8, as a fairly prevalent condition in recent times. Site personnel flew the West Fork of Vangorda Creek on August 29, 2006, and confirmed that the elevated TSS is originating from "non-mining sources" downstream of the old ski hill area (Gartner Lee Ltd, 2007).

4.2 Water Quantity

Flows were measured at each of the sites in July and August. These data are presented with the water quality data in Table 1. Flows were considerably lower in August than in July.

4.3 Stream Sediment Quality

4.3.1 Metal Analyses for the 2007 Survey

Triplicate stream sediment samples were collected from each of the sites in August (Appendix B). The triplicates were averaged, and standard deviation was calculated to determine the spread of the triplicates. Generally the replicates showed little spread and thus were representative samples of the sites. Of the 30 metals analyzed, two were below the method detection limit in all samples, beryllium (Be) and tin (Sn).

To conform with past studies, the metals copper, iron, lead and zinc were examined in greater detail. The mean concentrations of these metals were compared to the CCME (1999) interim freshwater sediment quality guidelines (ISQG) and to the probable effects levels (PEL) in Table 3.

Concentrations greater than the PEL have a 50% incidence of creating adverse biological effects.

The Vangorda Creek watershed is located in a mineralized area and the concentration of metals in the stream sediments reflect that. The stream sediments at V5 had the lowest concentrations of all metals examined and met all applicable guidelines. The concentrations of metals in the stream sediments at the background site, V1, were generally low although the ISQG was exceeded for copper, lead and zinc. The ISQG was also exceeded for lead and zinc in the stream sediments at V8. The highest concentration of the four metals was reported in the stream sediments at V27, which would be expected as it is the most directly affected site of those sampled. The ISQG was exceeded for copper and the PEL was exceeded for lead and zinc.

TABLE 3
SUMMARY OF STREAM SEDIMENT METAL CONCENTRATIONS, 2007

STATION NUMBER	STATION DESCRIPTION	COPPER (ug/g)	LEAD (ug/g)	IRON (ug/g)	ZINC (ug/g)
V-1	Vangorda Cr u/s all mining activity	**37.0**	**61.9**	26,400	**131**
V-27	Vangorda Cr d/s activity and u/s Shrimp Cr	**45.0**	**269**	27,833	**564**
V-5	West Fork of Vangorda Cr	31.0	25.2	20,967	113
V-8	Vangorda Cr approx 850 m u/s Pelly R	34.0	**51.1**	22,100	**187**
ISQG		35.7	35.0		123
PEL		197.0	91.3		315

Note: ISQG = Interim freshwater Sediment Quality Guidelines, in **bold** where exceeded
PEL = Probable Effects Level in **bold** and shaded where exceeded

4.3.2 Comparisons with Past Data

Stream sediments were collected at these sites in 1993 (Burns, 1993), in 1995 (Burns, 1996), in 1997 (Burns, 1998), in 1999 (Burns, 2000) in 2001 (Burns, 2002), in 2003 (Burns, 2003) and in 2005 (Burns, 2005) as a requirement of the company's water licence. The data for selected metals are presented in Table 4 and in Figures 2, 3, 4 and 5. The average for the eight sampling events has been plotted for each metal in each graph.

Metals in sediment tend to be difficult to interpret because levels can vary widely as a function of natural mineralization of local soils in a given watershed, making it difficult to obtain truly representative samples. The data over the years has generally fluctuated, notably at V27. No trends can readily be produced, however the following observations were noted:

- Concentrations of each of the four metals at V5 have been relatively consistent over time and the averages are the lowest of the four sites.

TABLE 4

COMPARISONS OF METALS IN STREAM SEDIMENTS OVER TIME (1993 to 2007)

Site	Year	Copper (mg/L)	Iron (%)	Lead (mg/L)	Zinc (mg/L)
V1	1993	24 (4)	3.7 (4.6)	30 (8)	120 (13)
	1995	33 (2)	3.1 (2.6)	43 (14)	177 (40)
	1997	53 (19)	2.7 (1.0)	58 (35)	132 (71)
	1999	39 (2)	4.0 (0.1)	45 (16)	141 (12)
	2001	19 (7)	2.4 (0.3)	18 (7)	88 (32)
	2003	26 (2)	2.5 (0.3)	37 (10)	132 (16)
	2005	17 (3)	1.6 (0.2)	19 (5)	60 (14)
	2007	37 (21)	2.6 (0.1)	62 (40)	131 (68)
V27	1993	52 (4)	3.2 (1.5)	587 (518)	436 (126)
	1995	59 (11)	2.7 (4.0)	1305 (1215)	519 (43)
	1997	88 (12)	3.8 (7.0)	1492 (642)	652 (55)
	1999	129 (45)	4.3 (0.7)	2069 (375)	921 (290)
	2001	102 (8)	3.9 (0.2)	2802 (1154)	868 (88)
	2003	74 (9)	3.0 (0.1)	1383 (340)	951 (125)
	2005	36 (5)	2.0 (0.02)	188 (77)	288 (26)
	2007	36 (9)	2.7 (0.9)	269 (36)	564 (149)
V5	1993	28 (1)	2.2 (0.6)	23 (1)	98 (5)
	1995	36 (2)	1.8 (0.3)	52 (2)	129 (4)
	1997	36 (2)	2.1 (0.6)	35 (3)	100 (5)
	1999	25 (1)	1.8 (0.0)	30 (2)	81 (2)
	2001	28 (7)	1.9 (0.2)	32 (7)	116 (22)
	2003	22 (4)	1.7 (0.1)	25 (8)	80 (15)
	2005	25 (3)	1.7 (0.04)	21 (1)	86 (6)
	2007	31 (3)	2.0 (0.03)	25 (1)	113 (15)
V8	1993	37 (0)	2.8 (0.3)	214 (11)	251 (12)
	1995	48 (4)	2.2 (1.0)	218 (70)	391 (111)
	1997	36 (5)	2.3 (0.6)	114 (6)	221 (25)
	1999	29 (2)	2.0 (0.1)	89 (40)	148 (40)
	2001	34 (1)	2.2 (0)	110 (33)	248 (41)
	2003	29 (4)	1.7 (0.1)	74 (12)	243 (73)
	2005	35 (1)	1.9 (0.01)	75 (7)	192 (6)
	2007	34 (7)	2.2 (0.3)	51 (15)	187 (18)

NOTE: The number in brackets represents the standard deviation for that set.

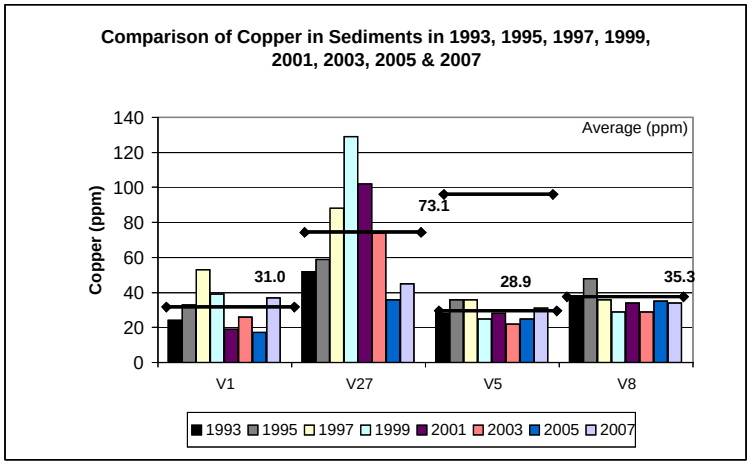


Figure 2 Comparison of copper in stream sediments

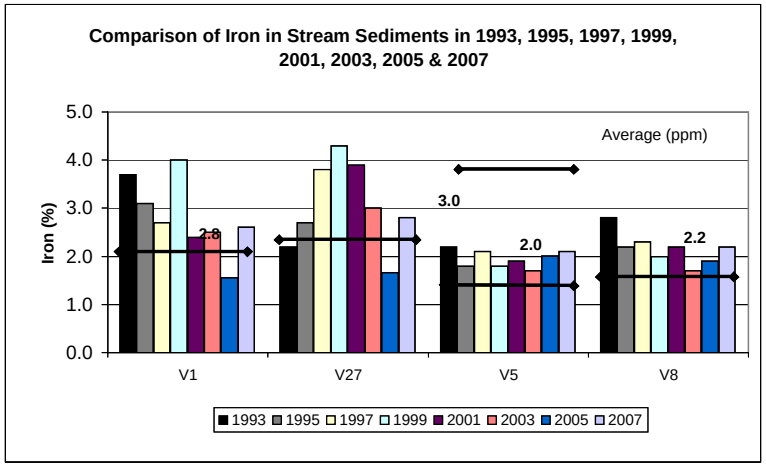


Figure 3 Comparison of iron in stream sediments

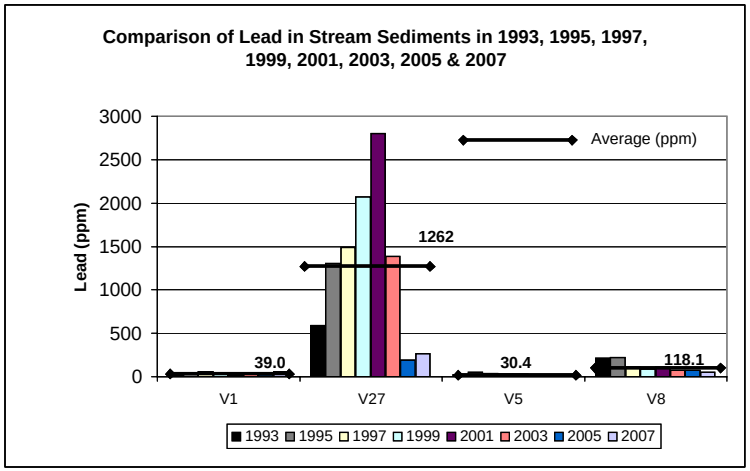


Figure 4 Comparison of lead in stream sediments

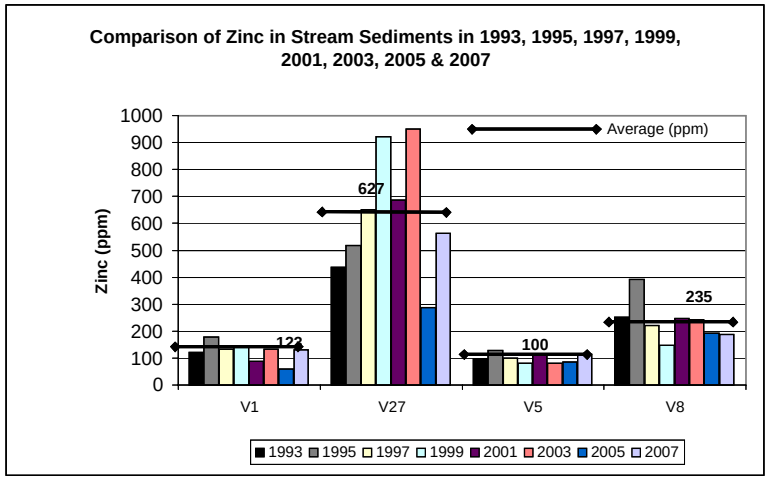


Figure 5 Comparison of zinc in stream sediments

- The average for each of the four metals was the highest in the stream sediments at V27.

- Copper concentrations have not varied much at V8. The concentration of copper peaked in the stream sediments at V27 in 1999 and has decreased since then. There was a slight increase in concentration in 2007 over 2005, but continued to be well below the average.

- Iron is relatively similar throughout the years and at the sites, with V1 and V27 having slightly higher averages.

- Very low levels of lead have been documented over time in the stream sediments at V1 and V5, and concentrations are usually below the ISQG. Concentrations of lead in the stream sediments at V8 have regularly exceeded the ISQG, and frequently the PEL, notably in the earlier sampling periods. Lead concentrations have been significantly greater at V27 with concentrations peaking in 2001. Levels have decreased significantly since, with concentrations in 2005 and 2007 falling well below the average. Lead concentrations at V27 have consistently exceeded the PEL.

- Zinc concentrations have remained fairly consistent at V1 and V5 over time. Considerably higher levels have been documented at V27 with concentrations peaking in 1999 and 2003. Zinc levels have been relatively constant over time at V8, with the highest concentration occurring in 1995. Zinc concentrations have frequently exceeded the ISQG at V1 and at V8, and have exceeded the PEL at V27.

4.4 Benthic Invertebrates

Four phyla were found in the study area: Arthropoda, Mollusca, Annelida and Nematoda. A total of 16,120 individuals, representing 70 different taxonomic groups were identified within these phyla. These data are presented in Appendix C.

4.4.1 Abundance and Taxonomic Richness

The number of organisms of the triplicates for each site was summed to give a total abundance value for that site. Population numbers varied in the study area, ranging from 2,338 individuals at V27 to 7,479 at V5.

Taxonomic richness was determined for each site by enumerating all the taxonomic groups identified from species to phylum as a measure of community diversity. The diversity ranged from 36 different taxonomic groups at V27 to 49 different taxonomic groups at V5. Community diversity was similar at V1 and V27. Communities at V5 and V8 were somewhat more diverse. To further characterize the taxonomic wealth of each community, the diversity was related to the population size using the formula: (Diversity –1) divided by the natural log of the population. The community at V8 had the highest richness index with a value of 5.8.

The benthic community located at V8 reflects conditions in Vangorda Creek upstream of its confluence with the Pelly River. The diverse and abundant community documented at V8 would indicate that habitat conditions (water and stream sediment quality) are favourable and consequently there should be negligible impact on the Pelly River from Vangorda Creek.

Abundance and diversity values are summarized in Table 5 and plotted in Figure 6.

TABLE 5

COMMUNITY CHARACTERISTICS AT SITES ON VANGORDA CREEK, 2007

SITE	LOCATION	ABUNDANCE	DIVERSITY	TAXONOMIC RICHNESS INDEX
V1	Vangorda Cr u/s all mining activity	2,918	37	4.5
V27	Vangorda Cr d/s activity u/s Shrimp Cr	2,338	36	4.5
V5	West fork of Vangorda Creek	7,279	49	5.4
V8	Vangorda Creek 850 m u/s Pelly River	3,385	48	5.8

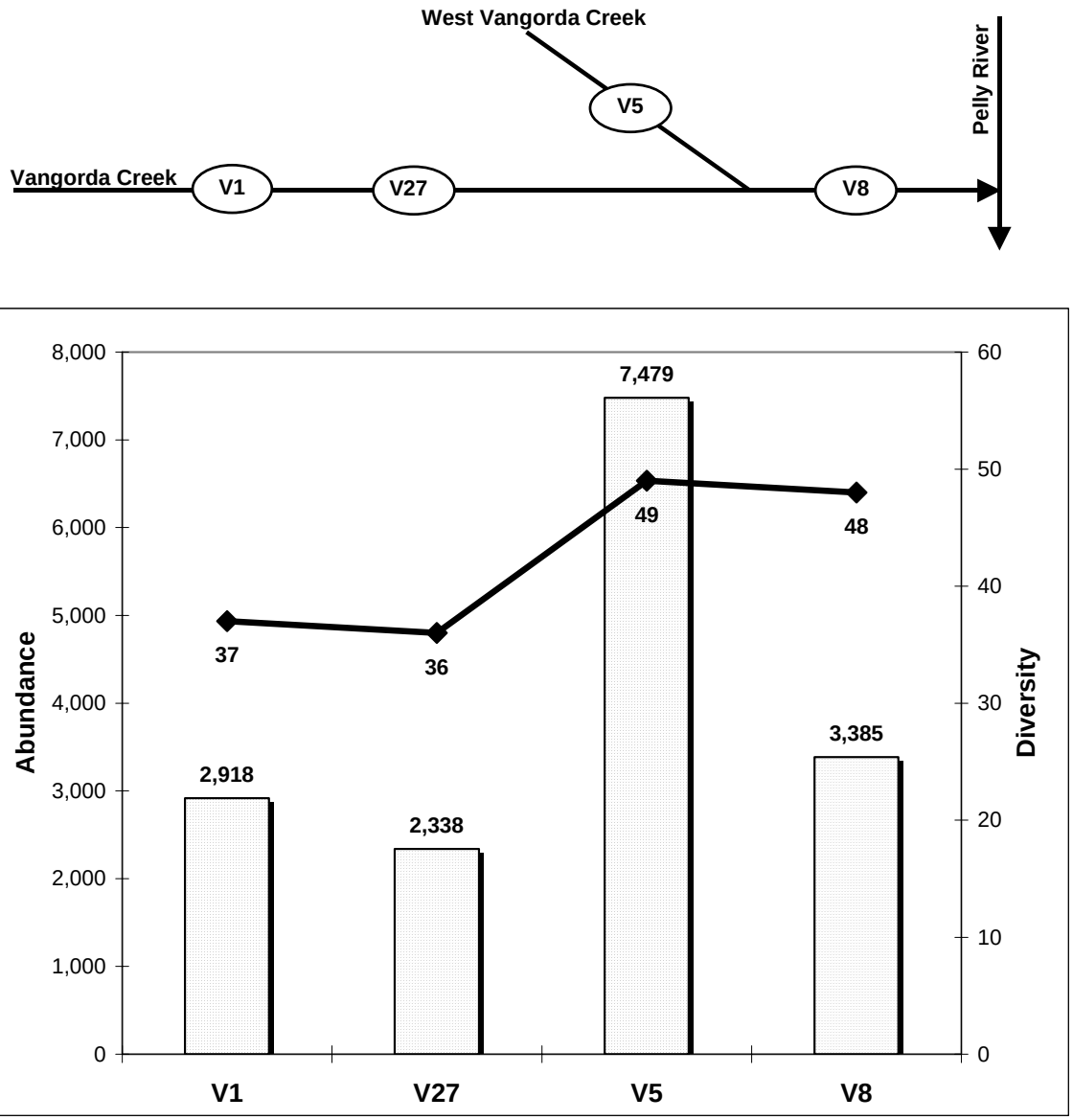
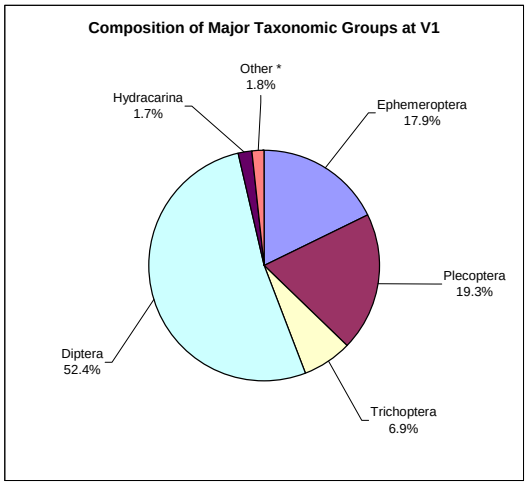


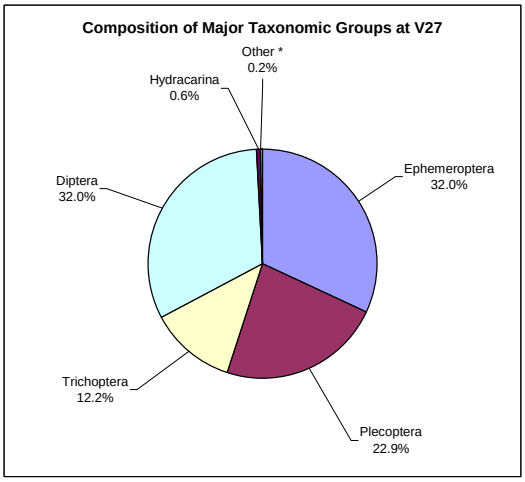
FIGURE 6 Abundance and Diversity at Vangorda Creek, 2007

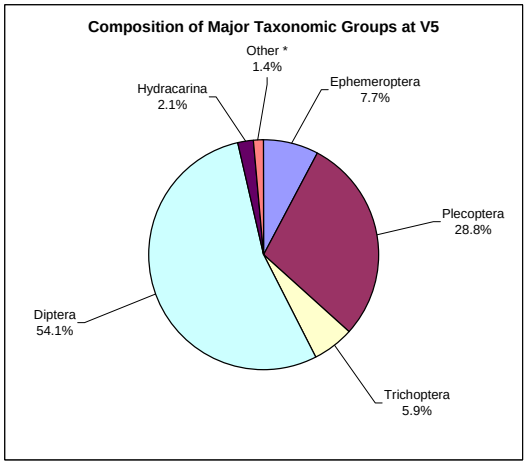
4.4.2 Distribution

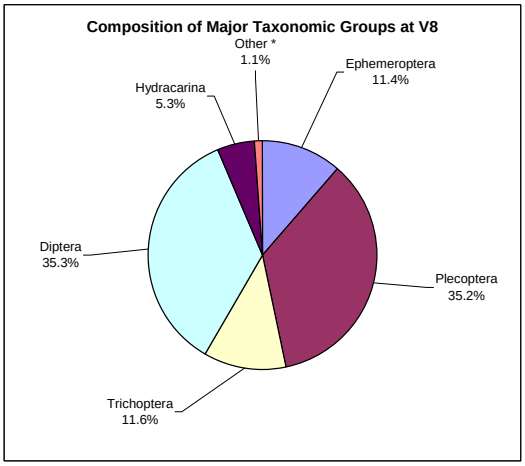
The composition of the benthos communities was displayed as a percentage of the major taxonomic orders for each station (Figure 7). Based on this, taxa were classified with respect to their dominance within the community (Table 6).

Figure 7 The Composition of the Benthic Invertebrate Community at Each Site, 2007









* Other includes one or more of the following taxonomic groups: Collembola, Coleoptera, Homoptera, Hymenoptera, Lepidoptera, Thysanoptera, Aranaea, Copepoda, Ostracoda, Gastropoda, Oligochaeta and Nematoda.

TABLE 6
TAXONOMIC DISTRIBUTION OF BENTHIC INVERTEBRATES

SITE	LOCATION	DOMINANT (≥25%)	SUBDOMINANT (10% to 24.9%)	COMMON (1.0% to 9.9%)	RARE (0.1% to 0.9%)
V1	Vangorda Cr u/s all mining activity	Diptera	Plecoptera Ephemeroptera	Trichoptera Other Hydracarina	
V27	Vangorda Cr d/s mining activity & u/s Shrimp Cr	Ephemeroptera Diptera	Plecoptera Trichoptera		Hydracarina Other
V5	West Fork of Vangorda Cr	Diptera Plecoptera		Ephemeroptera Trichoptera Hydracarina Other	
V8	Vangorda Cr approx 800 m u/s Pelly R	Plecoptera Diptera	Trichoptera Ephemeroptera	Hydracarina Other	

Diptera was the dominant or co-dominant order at each of the sites. Ephemeroptera shared dominance with Diptera at V27, and Plecoptera shared dominance at V5 and V8. Ephemeroptera was the subdominant group at V1 and V8, and common at V5. Trichopterans were subdominant at V27 and V8, and common at V1 and V5. Hydracarina and Other were rare at V27 and common at the other sites.

The community structure at V1 and V5 was quite similar to each other. Although the composition of Diptera and Trichoptera were similar at V27 and V8, the other groups ranged considerably between the two sites.

The dominant single organism identified in the study area was Chironomidae larvae of the order Diptera, forming 27.4% of the total number of invertebrates collected. This was followed by *Zapada sp.*, family Nemouridae of the order Plecoptera, at 19.7%.

In terms of the number of species and individuals, chironomids are likely the dominant aquatic family of Diptera (Clifford, 1991) and can occur in almost all types of aquatic ecosystems (Merritt and Cummins, 1988).

Zapada sp. are shredders of leaf litter (Merritt and Cummins, 1988). The high numbers recorded in the study area could be due to the provision of leaf litter from the riparian shrubs and trees during the late summer/early fall time of sampling. The *Zapada* population was elevated at all of the sites.

Ephemeroptera, Trichoptera and Plecoptera are sensitive to most types of pollution (Rosenberg and Resh, 1993). Lehmkuhl (1979) has identified several groups within these insect orders that have very low tolerance to chemical pollution. Eight taxa (three taxa within Plecoptera, three taxa within Ephemeroptera and two taxa within Trichoptera) were identified in the Vangorda watershed (Table 7).

TABLE 7

Presence (+) and Absence (-) of Sensitive Taxa at Vangorda Creek, 2007

Sensitive Taxa	V1	V27	V5	V8
Plecoptera				
Nemouridae	+	+	+	+
Perlodidae	+	+	+	+
Capniidae	+	+	+	+
Ephemeroptera				
Epeorus	+	+	+	+
Ephemerellidae	+	+	+	+
Rhithrogena	+	+	+	+
Trichoptera				
Rhyacophilidae	+	+	+	+
Brachycentridae	-	+	-	+
Total # of sensitive taxa:	7	8	7	8

After Lehmkuhl (1979)

All eight sensitive taxa were recorded at V27 and V8. Seven sensitive taxa were present at V1 and V5. As there appears to be good representation of pollution sensitive species at the Vangorda sites, including the downstream potentially impacted sites, it can be assumed that the water and stream sediments are of good quality for the support of aquatic life.

The above statement appears contradictory to the results presented in Section 4.3. The concentration of lead in the stream sediments at V27 was well over the probable effects level (PEL). According to CCME (1999), there should be severe adverse effects on the aquatic biota under these conditions. However, representatives of all of the sensitive taxa identified in the study area were collected, some in high numbers, at V27. This would indicate that the elevated levels of metals documented in the sediments are likely not in a bioavailable form.

4.4.3 Comparisons with Past Data

Benthic invertebrate monitoring has been conducted at the four sites on Vangorda Creek every two years commencing in 1991, as a requirement of the company's water licence. Substrate samplers were used for each survey with a colonization period of five to six weeks. To assess the health of the benthic communities, abundance (total population), diversity (taxonomic richness), taxonomic dominance, and presence of sensitive taxa were examined for each site per year (see Table 8). A healthy benthos community would be characterized by numerous individuals, many different types of organisms and the presence of pollution sensitive species.

TABLE 8

COMPARISONS OF BENTHIC DATA OVER TIME (1991to 2007)

Site	Year	Total Abundance	Taxonomic Richness	Dominant Taxa	Total # of Sensitive Taxa
V1	1991	763	17	Diptera & Ephemeroptera	6
	1993	3,090	19	Diptera & Plecoptera	7
	1995	1,758	26	Plecoptera & Diptera	8
	1997	1,663	29	Diptera & Plecoptera	9
	1999	1,025	20	Diptera & Plecoptera	7
	2001	707	21	Diptera & Plecoptera	9
	2003	1,025	30	Diptera & Plecoptera	7
	2005	5,534	32	Diptera, Plecoptera & Ephemeroptera	8
	2007	2,918	30	Diptera	7
V27	1991	953	24	Diptera	6
	1993	5,952	17	Plecoptera & Diptera	5
	1995	4,929	28	Plecoptera & Diptera	9
	1997	11,751	29	Diptera & Plecoptera & Ephemeroptera	8
	1999	1,061	23	Diptera & Plecoptera	7
	2001	3,698	24	Plecoptera & Trichoptera	7
	2003	1,301	27	Ephemeroptera & Plecoptera	8
	2005	6,329	28	Plecoptera	7
	2007	2,338	32	Ephemeroptera & Diptera	8
V5	1991	1,298	29	Diptera	7
	1993	2,193	21	Diptera & Plecoptera	6
	1995	1,550	28	Diptera	8
	1997	9,291	38	Diptera	9
	1999	1,284	32	Diptera & Plecoptera	8
	2001	17,232	40	Plecoptera & Diptera	10
	2003	3,377	42	Plecoptera & Diptera	9
	2005	13,570	35	Diptera	7
	2007	7,279	40	Diptera & Plecoptera	7
V8	1991	594	22	Diptera	6
	1993	3,024	19	Diptera & Plecoptera	6
	1995	8,340	35	Diptera	8
	1997	904	25	Diptera & Plecoptera	6
	1999	1,061	28	Diptera	9
	2001	5,867	28	Diptera	7
	2003	3,989	31	Diptera & Plecoptera	8
	2005	6,687	36	Diptera & Plecoptera	8
	2007	3,385	41	Plecoptera & Diptera	8

Population numbers have fluctuated considerably at each site over time (Figure 8). Low populations were documented at all of the sites in 1991 and 1999. During 1991, the samplers were washed into shore during a flood event leaving the baskets at V5 and V8 only partially submerged (Burns, 1991). Consequently, only the lower portion of each sampler was available for colonization, which may account for the lower populations. Overall, populations have generally been lowest at V1 and highest at V5. In recent years, very high populations, relative to the other three sites, have been documented at V5. The highest population recorded to date occurred at V5 in 2001 (17,232 individuals). The variation in abundance can be attributed to many natural factors such as climate, stream flow, life cycles of the various organisms, timing of the sampling, as well as the chemistry of the water and the stream sediments.

To enable comparisons between the surveys, taxonomic richness was determined by using the lowest common dominator. For example, in 1991 and 1993, some of the insect orders were identified to the family level only. If genera or species were identified within this family in 1995, 1997, 1999, 2001, 2003 and/or in 2005, they were lumped together and considered as one taxon. The total taxonomic richness for 1995, 1997, 1999, 2001, 2003, 2005 and 2007 are therefore lower in Table 8 than that determined in the individual studies. These diversity values are graphed per site in Figure 9. Overall, the diversity has been increasing over time in each of the communities. Frequently, V5 has had the most diverse community during the sampling periods.

One or more insect orders were dominant at each of the sites over time. Diptera was the dominant or co-dominant group at all of the sites during each of the surveys, with the exception of V27. In 2001, 2003 and 2005 Plecoptera, Trichoptera and/or Ephemeroptera were dominant here. Plecoptera has shared dominance at each of the sites on many occasions. Overall, the community structure appears to be stable over time.

The total number of sensitive taxa identified at the sites ranged from five to ten and indicates the presence of good water and sediment quality.

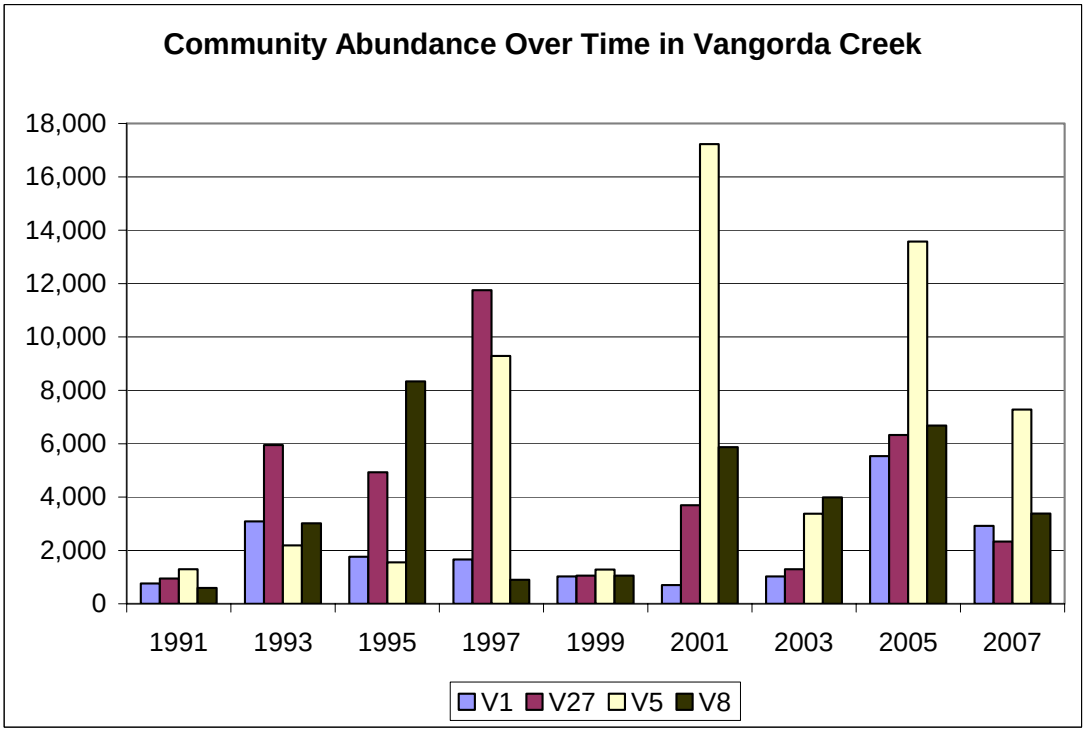


FIGURE 8 Community Abundance Over Time (1991 to 2007) in Vangorda Creek

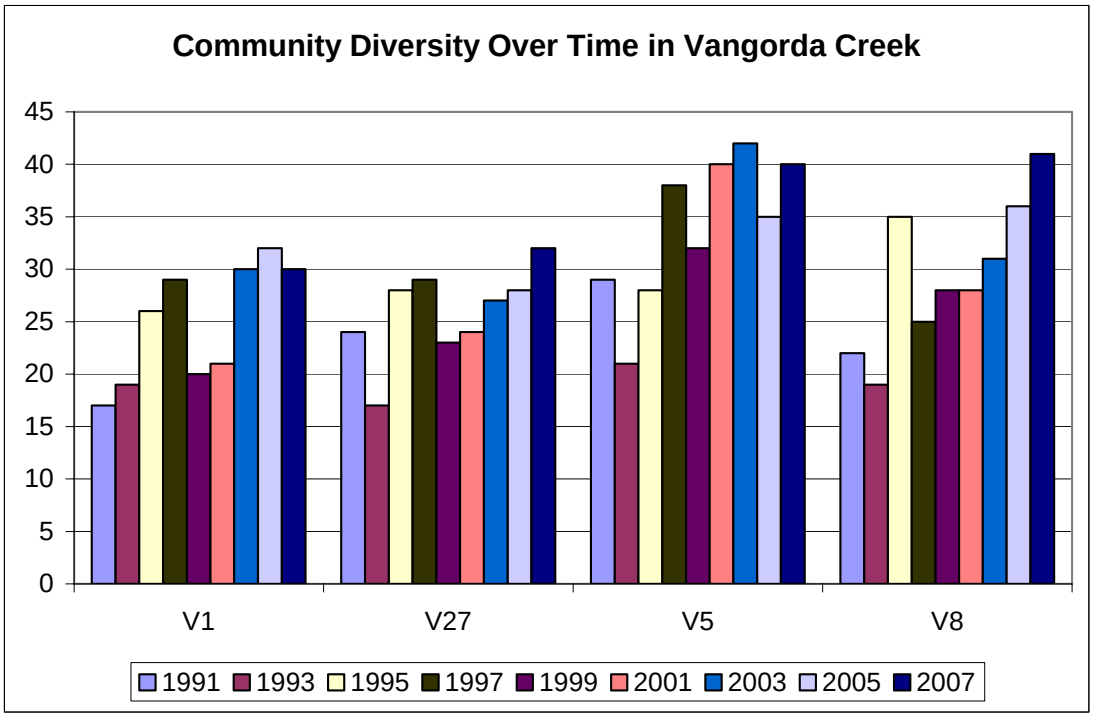


FIGURE 9 Community Diversity Over Time (1991 to 2007) in Vangorda Creek

5.0 SUMMARY

Water quality was generally good throughout with cool, slightly alkaline flows. The water was visually turbid at V5 during July and had a high TSS. Metal concentrations were low when detected, however copper, lead, iron and zinc exceeded the recommended CCME guideline for the protection of freshwater aquatic life in the July total metals sample at V5. During July, the water at V8 was slightly turbid and the CCME guideline for copper and iron was exceed in the totals metals sample. In August, all parameters met the guidelines with the exception of iron at V5.

The levels of metals present in the stream sediments in upper Vangorda Creek show that it drains a mineralized area. V27, which is located downstream of the Vangorda deposit, shows a general increase in the concentrations of copper, lead and zinc from 1991 to 1999, with values typically greater than the PEL. Concentrations of the metals have generally been decreasing since 1999, with a drastic reduction in the concentrations in 2005 and 2007, nevertheless levels have remained greater than the ISQG and often the PEL. These levels would be a matter of concern if there was degradation of the benthic population at this site, however the high concentrations of these metals in the sediments at V27 do not appear to have impacted the benthic community.

The benthic communities were robust and diverse. The population at V5 had the greatest diversity and the highest number of individuals.

All communities had good representation from the major groups of organisms that are usually present in lotic waters, including several pollution sensitive species. There appears to be a trend in increasing diversity at each of the sites over time, and the communities show no perceptible impacts as a result of any mining related activity.

6.0 REFERENCES

Baker, S.A. 1979. Environmental quality of Rose Creek as affected by Cyprus Anvil Mining Corporation Ltd. (survey data from 1974, 75, 76). Env. Prot. Serv. Regional Program Report No. 79-25. 138 pp.

Burns, B.E. 1991. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 1991. Prepared for Curragh Resources Inc.

Burns, B.E. 1993. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 1993. Prepared for KPMG Environmental Services.

Burns, B.E. 1996. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 1995. Prepared for Anvil Range Mining Corporation.

Burns, B.E. 1998. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 1997. Prepared for Anvil Range Mining Corporation.

Burns, B.E. 2000. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 1999. Prepared for Deloitte & Touche Inc.

Burns, B.E. 2002. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 2001. Prepared for Deloitte & Touche Inc.

Burns, B.E. 2003. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 2003. Prepared for Deloitte & Touche Inc.

Burns, B.E. 2005. Biological Monitoring Program at Vangorda Creek, Faro, Y.T. 2005. Prepared for Deloitte & Touche Inc.

Canadian Council of Resource and Environment Ministers (CCREM) 1987. Canadian water quality guidelines. Task force of water quality guidelines. Ottawa, Ontario.

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Environmental Guidelines. Task Force of Water Quality Guidelines. Ottawa, Canada.

Clifford, Hugh F. 1991. *Aquatic Invertebrates of Alberta*. The University of Alberta Press. Edmonton, Alberta

Gartner Lee Ltd. 2007. Anvil Range Mine Complex 2006 Annual Environmental Report Water Licence QZ03-059, Appendix 12: Anvil Range Mine Adaptive Management Plan – Annual Review for 2006.

Lehmkuhl, Dennis M. 1979. How to know the aquatic insects. University of Saskatchewan. Wm. C. Brown Co. Publishers. Dubuque, Iowa.

Merrit, R.W. and K.W. Cummins. 1988. An Introduction to the Aquatic Insects of North America, Second Edition. Kendall/Hunt Publishing Co. ISBN 0-8403-3180

Rosenberg, David M. and Vincent H. Resh. 1993. Freshwater biomonitoring and benthic macroinvertebrates. Chapman & Hall Inc. New York.

APPENDIX A

JULY 2007 WATER QUALITY ANALYTICAL RESULTS

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V5-West Fork Vangorda Cr	V8-Vangorda Cr @gauge	V27-Vangorda Cr U/S Shrimp	DETECTION LIMIT	UNITS
DATE SAMPLED:		Jul 25/07	Jul 24/07	Jul 24/07	Jul 25/07		
CANTEST ID:		707270514	707270515	707270516	707270517		
pH, Laboratory		7.20	8.14	8.10	7.63	-	pH units
Conductivity		64	412	341	206	1	µS/cm
Hardness	CaCO3	30	240	216	108	1	mg/L
Hardness (Total)	CaCO3	28	283	198	100	1	mg/L
Total Suspended Solids		<	338	60	<	1	mg/L
Total Alkalinity	CaCO3	25.7	174	127	53.7	0.5	mg/L
Bicarbonate Alkalinity	HCO3	31.3	212	155	65.5	0.5	mg/L
Carbonate Alkalinity	CO3	<	<	<	<	0.5	mg/L
Hydroxide Alkalinity	OH	<	<	<	<	0.5	mg/L
Dissolved Sulphate	SO4	7.55	59.6	57.1	47.4	0.5	mg/L
Ammonia Nitrogen	N	<	0.03	0.01	0.01	0.01	mg/L

µS/cm = microsiemens per centimeter mg/L = milligrams per liter
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V1-Vangorda Cr U/S	V5-West Fork Vangorda Cr	V5-West Fork Vangorda Cr	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Jul 25/07	Jul 25/07	Jul 24/07	Jul 24/07		
CANTEST ID:		707270514	707270514	707270515	707270515		
Aluminum	Al	0.021	0.013	6.94	<	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	<	<	0.006	0.001	0.001	mg/L
Barium	Ba	0.023	0.025	0.25	0.058	0.001	mg/L
Beryllium	Be	<	<	<	<	0.001	mg/L
Bismuth	Bi	<	<	<	<	0.001	mg/L
Boron	B	<	<	<	<	0.05	mg/L
Cadmium	Cd	<	<	0.0003	<	0.0002	mg/L
Calcium	Ca	9.44	10.0	69.6	60.5	0.05	mg/L
Chromium	Cr	<	<	0.018	<	0.001	mg/L
Cobalt	Co	<	<	0.006	<	0.001	mg/L
Copper	Cu	<	<	0.022	0.002	0.001	mg/L
Iron	Fe	<	<	12.2	0.08	0.05	mg/L
Lead	Pb	<	<	0.012	<	0.001	mg/L
Lithium	Li	<	<	0.016	<	0.005	mg/L
Magnesium	Mg	1.16	1.29	26.6	21.6	0.05	mg/L
Manganese	Mn	0.002	<	0.26	0.005	0.001	mg/L
Mercury	Hg	<	-	<	-	0.02	µg/L
Molybdenum	Mo	<	<	0.0012	0.0010	0.0005	mg/L
Nickel	Ni	<	<	0.025	0.001	0.001	mg/L
Phosphorus	P	<	<	0.3	<	0.15	mg/L
Potassium	K	0.4	0.4	2.5	1.1	0.1	mg/L
Selenium	Se	<	<	0.002	0.002	0.001	mg/L
Silicon	Si	4.0	4.4	15.2	4.8	0.25	mg/L
Silver	Ag	<	<	<	<	0.00025	mg/L
Sodium	Na	1.71	1.83	3.60	3.29	0.05	mg/L
Strontium	Sr	0.045	0.045	0.26	0.22	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	<	<	<	<	0.0001	mg/L
Thorium	Th	<	<	0.0028	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L

(Continued on next page)

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V1-Vangorda Cr U/S	V5-West Fork Vangorda Cr	V5-West Fork Vangorda Cr	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Jul 25/07	Jul 25/07	Jul 24/07	Jul 24/07		
CANTEST ID:		707270514	707270514	707270515	707270515		
Titanium	Ti	<	<	0.18	<	0.001	mg/L
Uranium	U	<	<	0.0035	0.0029	0.0005	mg/L
Vanadium	V	<	<	0.018	<	0.001	mg/L
Zinc	Zn	<	<	0.055	<	0.005	mg/L
Zirconium	Zr	<	<	<	<	0.01	mg/L

mg/L = milligrams per liter
µg/L = micrograms per liter
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V8-Vangorda Cr @gauge	V8-Vangorda Cr @gauge	V27-Vangorda Cr U/S Shrimp	V27-Vangorda Cr U/S Shrimp	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Jul 24/07	Jul 24/07	Jul 25/07	Jul 25/07		
CANTEST ID:		707270516	707270516	707270517	707270517		
Aluminum	Al	1.44	0.008	0.020	0.014	0.005	mg/L
Antimony	Sb	<	<	<	<	0.001	mg/L
Arsenic	As	0.002	<	<	<	0.001	mg/L
Barium	Ba	0.083	0.055	0.030	0.030	0.001	mg/L
Beryllium	Be	<	<	<	<	0.001	mg/L
Bismuth	Bi	<	<	<	<	0.001	mg/L
Boron	B	<	<	<	<	0.05	mg/L
Cadmium	Cd	<	<	<	<	0.0002	mg/L
Calcium	Ca	49.6	54.2	26.7	28.4	0.05	mg/L
Chromium	Cr	0.004	<	<	<	0.001	mg/L
Cobalt	Co	0.001	<	<	<	0.001	mg/L
Copper	Cu	0.005	0.002	0.001	0.001	0.001	mg/L
Iron	Fe	2.51	<	0.09	0.05	0.05	mg/L
Lead	Pb	0.002	<	<	<	0.001	mg/L
Lithium	Li	0.006	<	<	<	0.005	mg/L
Magnesium	Mg	18.0	19.5	8.07	8.90	0.05	mg/L
Manganese	Mn	0.058	0.005	0.005	0.003	0.001	mg/L
Mercury	Hg	<	-	<	-	0.02	µg/L
Molybdenum	Mo	0.0007	0.0008	<	<	0.0005	mg/L
Nickel	Ni	0.006	0.001	<	<	0.001	mg/L
Phosphorus	P	<	<	<	<	0.15	mg/L
Potassium	K	1.2	1.0	0.6	0.6	0.1	mg/L
Selenium	Se	0.001	0.001	0.001	<	0.001	mg/L
Silicon	Si	6.7	5.1	4.2	4.5	0.25	mg/L
Silver	Ag	<	<	<	<	0.00025	mg/L
Sodium	Na	2.87	3.21	2.13	2.24	0.05	mg/L
Strontium	Sr	0.18	0.20	0.094	0.10	0.001	mg/L
Tellurium	Te	<	<	<	<	0.001	mg/L
Thallium	Tl	<	<	<	<	0.0001	mg/L
Thorium	Th	<	<	<	<	0.0005	mg/L
Tin	Sn	<	<	<	<	0.001	mg/L

(Continued on next page)

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V8-Vangorda Cr @gauge	V8-Vangorda Cr @gauge	V27-Vangorda Cr U/S Shrimp	V27-Vangorda Cr U/S Shrimp	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Jul 24/07	Jul 24/07	Jul 25/07	Jul 25/07		
CANTEST ID:		707270516	707270516	707270517	707270517		
Titanium	Ti	0.044	<	<	<	0.001	mg/L
Uranium	U	0.0026	0.0026	0.0010	0.0012	0.0005	mg/L
Vanadium	V	0.004	<	<	<	0.001	mg/L
Zinc	Zn	0.018	<	0.029	0.029	0.005	mg/L
Zirconium	Zr	<	<	<	<	0.01	mg/L

mg/L = milligrams per liter

µg/L = micrograms per liter

< = Less than detection limit

Analysis Report

CANTEST®

CANTEST LTD.

Professional
Analytical
Services

4606 Canada Way
Burnaby, B.C.
V5G 1K5

FAX: 604 731 2386

TEL: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Water Samples

REPORTED TO: Anvil Range Mining Corporation
P.O. Bag 1000
Faro, YT
Y0B 1K0

Att'n: Mr. Dana Haggar

CHAIN OF CUSTODY: 174380
PROJECT NAME: Vangorda Benthic Program

NUMBER OF SAMPLES: 4

REPORT DATE: August 3, 2007

DATE SUBMITTED: July 27, 2007

GROUP NUMBER: 80727118

SAMPLE TYPE: Water

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

TEST METHODS:

Anions in Water by Ion Chromatography - was determined based on Method 4110 in Standard Methods (21st Edition) and EPA Method 300.0 (Revision 2.1).

Alkalinity in Water - was performed based on Method 2320 in Standard Methods (21st Edition).

Alkalinity in Water - was performed based on Method 2320 in Standard Methods (21st Edition).

Conductivity in Water - was performed based on Method 2510 in Standard Methods (21st Edition) and Method X322 in the BC Laboratory Manual (2005 Edition).

Ammonia in Water - analysis was performed based on Method 4500-NH3 in Standard Methods for the Examination of Water and Wastewater (21st Edition).

pH in Water - was determined based on Method 4500-H in Standard Methods (21st Edition) and Method X330 in the BC Laboratory Manual (2005).

Total Suspended Solids in Water - was determined based on Method 2540 D in Standard Methods (21st Edition) and Method X332 in the BC Laboratory Manual (2005).

Conventional Parameters - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the

(Continued)

CANTEST LTD.

Richard S. Jornitz
Supervisor, Inorganic Testing

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: August 3, 2007

GROUP NUMBER: 80727118

Conventional Parameters

Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

Mercury in Water - analysis was performed using procedures based on U. S. EPA Method 245.7, oxidative digestion using bromination, and analysis using Cold Vapour Atomic Fluorescence Spectroscopy.

Metals in Water - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

Dissolved Metals in Water - Samples were filtered in the laboratory and quantitatively determined using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP) and/or Inductively Coupled Plasma-Mass Spectroscop (ICP/MS).

TEST RESULTS:

(See following pages)

APPENDIX B

AUGUST 2007 WATER QUALITY & STREAM SEDIMENT ANALYTICAL RESULTS

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V5-West Fork Vangorda	V8-Vangorda Cr @ Gauge	V27-Vangorda Cr U/S Shrimp	DETECTION LIMIT	UNITS
DATE SAMPLED:		Aug 28/07	Aug 29/07	Aug 27/07	Aug 28/07		
CANTEST ID:		708310458	708310469	708310471	708310473		
pH, Laboratory		7.62	8.40	8.31	7.96	-	pH units
Conductivity		72	525	381	204	1	µS/cm
Hardness	CaCO3	28.8	259	182	91.7	0.2	mg/L
Hardness (Total)	CaCO3	28.8	279	188	91.4	0.2	mg/L
Total Suspended Solids		<	10	3	<	1	mg/L
Total Alkalinity	CaCO3	27.4	228	150	56.7	0.5	mg/L
Bicarbonate Alkalinity	HCO3	33.5	263	177	69.1	0.5	mg/L
Carbonate Alkalinity	CO3	<	7.8	2.8	<	0.5	mg/L
Hydroxide Alkalinity	OH	<	<	<	<	0.5	mg/L
Dissolved Sulphate	SO4	8.95	82.2	70.0	47.0	0.5	mg/L
Ammonia Nitrogen	N	<	<	<	<	0.01	mg/L

µS/cm = microsiemens per centimeter mg/L = milligrams per liter
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V1-Vangorda Cr U/S	V5-West Fork Vangorda	V5-West Fork Vangorda		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Aug 28/07	Aug 28/07	Aug 29/07	Aug 29/07		
CANTEST ID:		708310458	708310458	708310469	708310469	DETECTION LIMIT	UNITS
Aluminum	Al	0.010	0.005	0.13	0.001	0.001	mg/L
Antimony	Sb	<	<	<	<	0.0002	mg/L
Arsenic	As	<	<	0.0007	0.0005	0.0002	mg/L
Barium	Ba	0.021	0.021	0.062	0.054	0.0002	mg/L
Beryllium	Be	<	<	<	<	0.0002	mg/L
Bismuth	Bi	<	<	<	<	0.0002	mg/L
Boron	B	<	<	<	<	0.01	mg/L
Cadmium	Cd	<	<	6.E-05	<	0.00004	mg/L
Calcium	Ca	9.53	9.52	71.0	65.2	0.01	mg/L
Chromium	Cr	<	<	0.0006	<	0.0002	mg/L
Cobalt	Co	<	<	0.0002	<	0.0002	mg/L
Copper	Cu	0.0004	0.0003	0.0013	0.0009	0.0002	mg/L
Iron	Fe	0.03	0.02	0.33	0.03	0.01	mg/L
Lead	Pb	<	<	0.0005	<	0.0002	mg/L
Lithium	Li	<	<	0.004	0.004	0.001	mg/L
Magnesium	Mg	1.22	1.21	24.7	23.4	0.01	mg/L
Manganese	Mn	0.0008	0.0003	0.021	0.0058	0.0002	mg/L
Mercury	Hg	<	-	<	-	0.02	µg/L
Molybdenum	Mo	<	<	0.0013	0.0014	0.0001	mg/L
Nickel	Ni	0.0002	0.0002	0.0019	0.0012	0.0002	mg/L
Phosphorus	P	<	<	<	<	0.03	mg/L
Potassium	K	0.36	0.36	1.08	0.87	0.02	mg/L
Selenium	Se	<	<	0.0007	0.0007	0.0002	mg/L
Silicon	Si	3.96	3.92	4.74	4.34	0.05	mg/L
Silver	Ag	<	<	<	<	0.00005	mg/L
Sodium	Na	1.59	1.62	3.28	3.15	0.01	mg/L
Strontium	Sr	0.046	0.048	0.247	0.235	0.0002	mg/L
Tellurium	Te	<	<	<	<	0.0002	mg/L
Thallium	Tl	<	<	2.E-05	<	0.00002	mg/L
Thorium	Th	<	<	<	<	0.0001	mg/L
Tin	Sn	<	<	<	<	0.0002	mg/L

(Continued on next page)

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V1-Vangorda Cr U/S	V1-Vangorda Cr U/S	V5-West Fork Vangorda	V5-West Fork Vangorda	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Aug 28/07	Aug 28/07	Aug 29/07	Aug 29/07		
CANTEST ID:		708310458	708310458	708310469	708310469		
Titanium	Ti	0.0002	<	0.0070	<	0.0002	mg/L
Uranium	U	0.0003	0.0003	0.0038	0.0035	0.0001	mg/L
Vanadium	V	<	<	0.0006	0.0002	0.0002	mg/L
Zinc	Zn	<	<	0.002	<	0.001	mg/L
Zirconium	Zr	<	<	<	<	0.002	mg/L

mg/L = milligrams per liter

µg/L = micrograms per liter

< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V8-Vangorda Cr @ Gauge	V8-Vangorda Cr @ Gauge	V27-Vangorda Cr U/S Shrimp	V27-Vangorda Cr U/S Shrimp		
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Aug 27/07	Aug 27/07	Aug 28/07	Aug 28/07		
CANTEST ID:		708310471	708310471	708310473	708310473	DETECTION LIMIT	UNITS
Aluminum	Al	0.076	0.002	0.014	0.004	0.001	mg/L
Antimony	Sb	<	<	<	<	0.0002	mg/L
Arsenic	As	0.0004	0.0004	0.0003	0.0003	0.0002	mg/L
Barium	Ba	0.044	0.038	0.024	0.025	0.0002	mg/L
Beryllium	Be	<	<	<	<	0.0002	mg/L
Bismuth	Bi	<	<	<	<	0.0002	mg/L
Boron	B	<	<	<	<	0.01	mg/L
Cadmium	Cd	<	0.00006	<	0.00004	0.00004	mg/L
Calcium	Ca	46.7	46.0	24.8	24.8	0.01	mg/L
Chromium	Cr	0.0003	<	<	<	0.0002	mg/L
Cobalt	Co	<	<	<	<	0.0002	mg/L
Copper	Cu	0.0012	0.0010	0.0008	0.0009	0.0002	mg/L
Iron	Fe	0.19	0.04	0.05	0.03	0.01	mg/L
Lead	Pb	0.0004	<	0.0003	<	0.0002	mg/L
Lithium	Li	0.003	0.003	0.002	0.002	0.001	mg/L
Magnesium	Mg	17.3	16.3	7.15	7.20	0.01	mg/L
Manganese	Mn	0.013	0.0063	0.0031	0.0019	0.0002	mg/L
Mercury	Hg	<	-	<	-	0.02	µg/L
Molybdenum	Mo	0.0007	0.0008	0.0003	0.0003	0.0001	mg/L
Nickel	Ni	0.0013	0.0010	0.0005	0.0006	0.0002	mg/L
Phosphorus	P	<	<	<	<	0.03	mg/L
Potassium	K	0.87	0.75	0.50	0.47	0.02	mg/L
Selenium	Se	<	0.0004	<	<	0.0002	mg/L
Silicon	Si	4.40	4.11	4.14	4.05	0.05	mg/L
Silver	Ag	<	<	<	<	0.00005	mg/L
Sodium	Na	2.70	2.55	1.94	1.90	0.01	mg/L
Strontium	Sr	0.182	0.175	0.091	0.091	0.0002	mg/L
Tellurium	Te	<	<	<	<	0.0002	mg/L
Thallium	Tl	<	0.00004	<	<	0.00002	mg/L
Thorium	Th	<	<	<	<	0.0001	mg/L
Tin	Sn	<	<	<	<	0.0002	mg/L

(Continued on next page)

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		V8-Vangorda Cr @ Gauge	V8-Vangorda Cr @ Gauge	V27-Vangorda Cr U/S Shrimp	V27-Vangorda Cr U/S Shrimp	DETECTION LIMIT	UNITS
SAMPLE PREPARATION:		TOTAL	DISSOLVED	TOTAL	DISSOLVED		
DATE SAMPLED:		Aug 27/07	Aug 27/07	Aug 28/07	Aug 28/07		
CANTEST ID:		708310471	708310471	708310473	708310473		
Titanium	Ti	0.0025	<	<	<	0.0002	mg/L
Uranium	U	0.0030	0.0028	0.0011	0.0010	0.0001	mg/L
Vanadium	V	0.0003	<	<	<	0.0002	mg/L
Zinc	Zn	0.007	0.002	0.020	0.016	0.001	mg/L
Zirconium	Zr	<	<	<	<	0.002	mg/L

mg/L = milligrams per liter
µg/L = micrograms per liter
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Conventional Parameters in Soil

CLIENT SAMPLE IDENTIFICATION:	V1-A	V1-B	V1-C	V5-A	
DATE SAMPLED:	Aug 28/07	Aug 28/07	Aug 28/07	Aug 27/07	DETECTION LIMIT
CANTEST ID:	708310477	708310481	708310482	708310483	
pH	7.6	6.4	7.6	7.2	0.1

Results expressed as pH units

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

CANTEST

Conventional Parameters in Soil

CLIENT SAMPLE IDENTIFICATION:	V5-B	V5-C	V8-A	V8-B	
DATE SAMPLED:	Aug 27/07	Aug 27/07	Aug 28/07	Aug 28/07	DETECTION LIMIT
CANTEST ID:	708310484	708310485	708310486	708310487	
pH	7.1	7.3	7.2	7.1	0.1

Results expressed as pH units

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Conventional Parameters in Soil

CLIENT SAMPLE IDENTIFICATION:	V8-C	V27-A	V27-B	V27-C	
DATE SAMPLED:	Aug 28/07	Aug 28/07	Aug 28/07	Aug 28/07	DETECTION LIMIT
CANTEST ID:	708310488	708310489	708310490	708310491	
pH	7.2	6.1	7.2	7.5	0.1

Results expressed as pH units

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

CANTEST

Strong Acid Soluble Metals in Soil

CLIENT SAMPLE IDENTIFICATION:		V1-A	V1-B	V1-C	V5-A	
DATE SAMPLED:		Aug 28/07	Aug 28/07	Aug 28/07	Aug 27/07	DETECTION LIMIT
CANTEST ID:		708310477	708310481	708310482	708310483	
Antimony	Sb	0.6	<	0.7	1.3	0.1
Arsenic	As	27.0	5.7	23.1	12.3	0.1
Barium	Ba	193	81	197	297	1
Beryllium	Be	<	<	<	<	1
Cadmium	Cd	0.5	0.2	0.4	0.7	0.2
Chromium	Cr	38	15	39	51	2
Cobalt	Co	22	6	22	14	1
Copper	Cu	52	13	46	32	1
Lead	Pb	90.1	15.6	80.1	24.7	0.2
Mercury	Hg	0.08	0.01	0.07	0.08	0.01
Molybdenum	Mo	0.6	0.3	0.7	1.7	0.1
Nickel	Ni	48	15	50	72	2
Selenium	Se	0.7	0.3	0.6	1.1	0.2
Silver	Ag	0.2	<	0.2	0.2	0.1
Thallium	Tl	0.2	<	0.2	0.1	0.1
Tin	Sn	<	<	<	<	5
Vanadium	V	32	14	32	29	1
Zinc	Zn	190	56	147	105	1
Aluminum	Al	13000	7550	13500	7990	10
Boron	B	4	4	4	4	1
Calcium	Ca	6760	2090	6000	18800	1
Iron	Fe	32500	15100	31600	21100	2
Magnesium	Mg	8120	3410	8260	12400	1
Manganese	Mn	861	361	783	464	1
Phosphorus	P	917	386	790	1030	20
Potassium	K	950	730	974	696	10
Sodium	Na	131	133	126	107	5
Strontium	Sr	33	25	30	60	1
Titanium	Ti	248	173	223	155	1
Zirconium	Zr	2	1	2	4	1

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

CANTEST

Strong Acid Soluble Metals in Soil

CLIENT SAMPLE IDENTIFICATION:		V5-B	V5-C	V8-A	V8-B	
DATE SAMPLED:		Aug 27/07	Aug 27/07	Aug 28/07	Aug 28/07	DETECTION LIMIT
CANTEST ID:		708310484	708310485	708310486	708310487	
Antimony	Sb	1.4	1.2	1.2	0.9	0.1
Arsenic	As	13.0	11.4	14.2	10.7	0.1
Barium	Ba	285	288	317	218	1
Beryllium	Be	<	<	<	<	1
Cadmium	Cd	0.8	0.6	1.0	0.8	0.2
Chromium	Cr	56	51	47	36	2
Cobalt	Co	15	13	16	11	1
Copper	Cu	33	28	41	28	1
Lead	Pb	24.9	26.0	46.0	39.7	0.2
Mercury	Hg	0.07	0.07	0.11	0.09	0.01
Molybdenum	Mo	1.8	1.6	1.7	1.2	0.1
Nickel	Ni	79	68	66	50	2
Selenium	Se	1.2	1.0	1.3	0.9	0.2
Silver	Ag	0.2	0.1	0.2	0.2	0.1
Thallium	Tl	0.1	0.1	0.2	0.1	0.1
Tin	Sn	<	<	<	<	5
Vanadium	V	30	28	33	24	1
Zinc	Zn	104	131	187	170	1
Aluminum	Al	8100	7950	11800	7850	10
Boron	B	5	5	5	5	1
Calcium	Ca	20100	18700	16400	11900	1
Iron	Fe	21200	20600	25300	18000	2
Magnesium	Mg	13500	12300	11200	8630	1
Manganese	Mn	472	462	729	534	1
Phosphorus	P	987	1040	914	724	20
Potassium	K	690	642	1020	645	10
Sodium	Na	118	107	137	97	5
Strontium	Sr	63	60	58	42	1
Titanium	Ti	169	169	162	142	1
Zirconium	Zr	4	3	4	3	1

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Strong Acid Soluble Metals in Soil

CLIENT SAMPLE IDENTIFICATION:		V8-C	V27-A	V27-B	V27-C	
DATE SAMPLED:		Aug 28/07	Aug 28/07	Aug 28/07	Aug 28/07	DETECTION LIMIT
CANTEST ID:		708310488	708310489	708310490	708310491	
Antimony	Sb	1.1	0.9	1.3	1.5	0.1
Arsenic	As	15.0	25.6	43.6	37.4	0.1
Barium	Ba	302	185	198	339	1
Beryllium	Be	<	<	<	<	1
Cadmium	Cd	0.8	0.9	1.5	1.6	0.2
Chromium	Cr	43	28	55	41	2
Cobalt	Co	14	12	24	20	1
Copper	Cu	33	32	50	53	1
Lead	Pb	67.5	229	279	299	0.2
Mercury	Hg	0.11	0.15	0.20	0.36	0.01
Molybdenum	Mo	1.3	1.0	1.5	1.5	0.1
Nickel	Ni	56	32	59	47	2
Selenium	Se	1.1	0.6	0.6	0.7	0.2
Silver	Ag	0.2	0.3	0.5	0.5	0.1
Thallium	Tl	0.2	0.2	0.3	0.3	0.1
Tin	Sn	<	<	<	<	5
Vanadium	V	29	16	30	24	1
Zinc	Zn	205	394	632	667	1
Aluminum	Al	9660	6320	15400	11700	10
Boron	B	5	4	4	4	1
Calcium	Ca	13700	4570	10500	10000	1
Iron	Fe	23000	17300	36000	30200	2
Magnesium	Mg	10300	5720	15400	11300	1
Manganese	Mn	785	931	2020	1950	1
Phosphorus	P	944	459	635	577	20
Potassium	K	809	418	553	570	10
Sodium	Na	116	75	98	109	5
Strontium	Sr	49	21	39	38	1
Titanium	Ti	175	143	142	144	1
Zirconium	Zr	3	1	4	3	1

Results expressed as micrograms per gram, on a dry weight basis. (µg/g)
< = Less than detection limit

Analysis Report

CANTEST®

CANTEST LTD.

Professional
Analytical
Services

4606 Canada Way
Burnaby, B.C.
V5G 1K5

FAX: 604 731 2386

TEL: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Soil, Water Samples

REPORTED TO: Anvil Range Mining Corporation
P.O. Bag 1000
Faro, YT
Y0B 1K0

Att'n: Mr. Dana Haggar

CHAIN OF CUSTODY: 174381, 174382
PROJECT NAME: Vangorda Benthic Program

NUMBER OF SAMPLES: 16

REPORT DATE: September 11, 2007

DATE SUBMITTED: August 31, 2007

GROUP NUMBER: 80831107

SAMPLE TYPE: Water, Soil

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

TEST METHODS:

Anions in Water by Ion Chromatography - was determined based on Method 4110 in Standard Methods (21st Edition) and EPA Method 300.0 (Revision 2.1).

Alkalinity in Water - was performed based on Method 2320 in Standard Methods (21st Edition).

Alkalinity in Water - was performed based on Method 2320 in Standard Methods (21st Edition).

Conductivity in Water - was performed based on Method 2510 in Standard Methods (21st Edition) and Method X322 in the BC Laboratory Manual (2005 Edition).

Ammonia in Water - was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream, which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically @ 590 nm.

pH in Water - was determined based on Method 4500-H in Standard Methods (21st Edition) and Method X330 in the BC Laboratory Manual (2005).

pH in Soil or Solid - analysis was performed based on procedures described in the Manual on Soil Sampling and Methods of Analysis, published by the Canadian Society of Soil Science,1993. The test was performed using a deionized water leach with measurement by pH meter.

(Continued)

CANTEST LTD.

Greg Sparrow, B.Sc.
Senior Analyst

REPORTED TO: Anvil Range Mining Corporation

REPORT DATE: September 11, 2007

GROUP NUMBER: 80831107

Total Suspended Solids in Water - was determined based on Method 2540 D in Standard Methods (21st Edition) and Method X332 in the BC Laboratory Manual (2005).

Conventional Parameters - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

Mercury in Water - analysis was performed using procedures based on U. S. EPA Method 245.7, oxidative digestion using bromination, and analysis using Cold Vapour Atomic Fluorescence Spectroscopy.

Metals in Water - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS).

Dissolved Metals in Water - Samples were filtered in the laboratory and quantitatively determined using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP) and/or Inductively Coupled Plasma-Mass Spectroscop (ICP/MS).

Silver in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Arsenic in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Cadmium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Mercury in Soil - analysis was performed using Cold Vapour Atomic Fluorescence.

Molybdenum in Soil - analysis was performed using an acid digestion followed by determination using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Strong Acid Leachable Metals in Soil - analysis was performed using B.C. MOELP Method "Strong Acid Leachable Metals in Soil, Version 1.0". The method involves drying the sample at 60 C, sieving using a 2 mm (10 mesh) sieve and digestion using a mixture of hydrochloric and nitric acids. Analysis was performed using Inductively Coupled Argon Plasma Spectroscopy (ICAP) or by specific techniques as described.

Selenium in Soil - analysis was using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

Thallium in Soil - analysis was performed using Inductively Coupled Plasma Mass Spectrometry (ICP/MS).

TEST RESULTS:

(See following pages)

APPENDIX C

BENTHIC INVERTEBRATE DATA, 2007

APPENDIX C **BENTHIC INVERTEBRATES, VANGORDA WATERSHED, 2007**

	V1b	V1c 1/4	V1d 1/4	V5c 1/8	V5d 1/2	V5e 1/16	V8b 5/16	V8c	V8a	V27a 1/4	V27b	V27c	Total/ Taxa	% of total collected
PHYLUM ARTHROPODA														
Class Insecta														
Order Ephemeroptera														
Family Siphlonuridae														
Ameletus sp	22		3	1				2				1	**29**	**0.2**
Family Baetidae														
Baetis sp	3	124	165		68	336	157	41	3	262	45	62	**1266**	**7.9**
Family Heptageniidae														
Cinygmula sp	43	24	72	73	8	32	26	29	21	86	137	95	**646**	**4.0**
Epeorus sp	4	17	12	4	19	12	9	30	12	19	6	4	**148**	**0.9**
Rhithrogena sp		13	6	1			1	3	16	3	15	4	**62**	**0.4**
Family Ephemereliidae														
Drunella doddsi							3	4		2	5	3	**17**	**0.1**
Drunella grandis							1						**1**	**0.01**
Ephemerella flavilinea	2		2				28	1					**33**	**0.2**
Ephemerellidae J	5		4	24									**33**	**0.2**
Order Plecoptera														
Family Capniidae														
Capnia sp	6	4	16	200	12	24	51	36	2	5	10	7	**373**	**2.3**
Family Perlodidae														
Megarcys sp		4	3	1	1		4				2	1	**16**	**0.1**
Skwala paralella						1							**1**	**0.01**
Sweltsa sp group	1	1		1	3			5	1		2	1	**15**	**0.1**
Family Nemouridae														
Zapada sp	15	264	188	542	122	869	398	209	73	339	76	87	**3182**	**19.7**
Podmosta sp		20	40	128	39	208	298	116			2	4	**855**	**5.3**
Order Trichoptera														
Trichoptera Unid J	1	14	16	40	2	16	3	1			4	3	**100**	**0.6**
Trichoptera P		1											**1**	**0.01**
Family Hydropsychidae														
Arctopsyche sp		8	4	10	3	46	138	84	19	101	31	22	**466**	**2.9**
Family Brachycentridae														
Brachycentrus sp								4		1			**5**	**0.03**
Family Limnephilidae														
Ecclisomyia sp									1				**1**	**0.01**
Family Glossosomatidae														
Glossosoma sp	1	4								8	14	29	**56**	**0.3**
Family Hydroptilidae														
Hydroptila sp								1					**1**	**0.01**
Family Rhyacophilidae														
Rhyacophila acropedes or vao		2	144	50	182	93	41	14	44	24	10		**604**	**3.7**
Rhyacophila angelita									1				**1**	**0.01**
Rhyacophila hyalinata		4	1		1	1	21	10	11	21	14	4	**88**	**0.5**
Order Diptera														
Diptera Unid A				1		1	1			1			**4**	**0.02**
Diptera Unid L						16	4	1		1			**22**	**0.1**
Family Chironomidae														
Chironomidae A			1					1					**2**	**0.01**
Chironomidae P	7	30	35	67	4	54	27	24	4	4	5	9	**270**	**1.7**
Chironomidae L	12	484	442	962	164	1571	250	110	3	354	9	48	**4409**	**27.4**
Sub Family Orthocladinae														
Brillia sp							47	8		2	1	3	**61**	**0.4**
Cardiocladius sp		17	45	32			11	1	1	1			**108**	**0.7**
Corynoneura sp	1												**1**	**0.01**
Cricotopus sp	10	84	80	83	30	67	151	57	16	15	5	3	**601**	**3.7**
Eukiefferiella sp	3	56	20	99	13	128	174	177	23	66	4	8	**771**	**4.8**
Euryhapsis sp	3	1		8							1		**13**	**0.1**
Synorthocladius sp						16							**16**	**0.1**
Thienemanniella sp									1				**1**	**0.01**
Family Diamesinae														
Diamesa sp	1	94	77	72	13	66	23	6		51	8	2	**413**	**2.6**
Family Empididae														
Chelifera sp				2		3	4						**9**	**0.1**
Weidemannia sp										30	3	3	**36**	**0.2**
Family Psychodidae														
Pericoma sp		2		82	6	19	4	1		2			**116**	**0.7**
Family Simulidae														
Prosimulium L	1	15	12	116	28	193	16	4		75	14	3	**477**	**3.0**
Prosimulium sp P				3		6		1		2			**12**	**0.1**
Simulium sp L						1	18	13	3	14			**49**	**0.3**
Simulium sp P							4	2					**6**	**0.0**
Family Tipulidae														
Dicranota sp				50	10	49	3						**112**	**0.7**
Hexatoma sp						1							**1**	**0.01**
Tipula sp				1									**1**	**0.01**

Unid = unidentified A = adult P = pupae J = juvenile L = larvae D = damaged terr = terristrial

APPENDIX C **BENTHIC INVERTEBRATES, VANGORDA WATERSHED, 2007**

	V1b	V1c 1/4	V1d 1/4	V5c 1/8	V5d 1/2	V5e 1/16	V8b 5/16	V8c	V8a	V27a 1/4	V27b	V27c	Total/ Taxa	% of total collected
Order Collembola														
Dicyrtoma sp				1									**1**	**0.01**
Isotomurus sp							7						**7**	**0.04**
Podura sp							8						**8**	**0.05**
Order Coleoptera														
Coleoptera Unid/D A			1							1			**2**	**0.01**
Chrysomelodea A				1									**1**	**0.01**
Order Homoptera														
Aphididae (terr)				16		1							**17**	**0.1**
Order Hymenoptera														
Family Formicidae (terr)				1		2							**3**	**0.02**
Order Lepidoptera L (terr)					1	1							**2**	**0.01**
Order Thysanoptera (terr)					2								**2**	**0.01**
Class Arachnida														
Order Aranaea						1	3	2					**6**	**0.04**
Order Hydracarina														
Hydracarina Unid J	1	9	4	8	2	16	6	1					**47**	**0.3**
cf Hydrozetes sp				8									**8**	**0.05**
Sperchon sp	3	1	9	16			7	6				1	**43**	**0.3**
Unioncola sp	1	22		32	4	48	115	36	7	8	4	2	**279**	**1.7**
Oribatei				8	2	16							**26**	**0.2**
Class Crustacea														
Sub Class Copepoda														
Sub Order Harpacticoida		16	4										**20**	**0.1**
Sub Class Ostracoda														
Cypria sp			4				3						**7**	**0.04**
PHYLUM MOLLUSCA														
Class Gastropoda														
Gastropoda, terr. Dam.	1												**1**	**0.01**
PHYLUM ANNILIDA														
Class Oligochaeta														
Family Enchytraeidae				1	2			2					**5**	**0.03**
Family Tubificidae				8	2								**10**	**0.1**
PHYLUM NEMATODA		13	13	17	4	48	10	5		4			**114**	**0.7**
Total per sample	**147**	**1348**	**1423**	**2770**	**747**	**3962**	**2075**	**1048**	**262**	**1502**	**427**	**409**	**16,120**	**100**
Total per site	**2,918**			**7,479**			**3,385**			**2,338**				
Taxonomic Richness per sample	**23**	**29**	**29**	**39**	**28**	**34**	**38**	**37**	**20**	**29**	**25**	**25**	**70**	
Taxonomic Richness per site	**37**			**49**			**48**			**36**				

Unid = unidentified A = adult P = pupae J = juvenile L = larvae D = damaged terr = terristrial

Appendix 9

2007 Aquatic Life Sampling and Testing Program For The Anvil Range Mine Site, Rose and Vangorda Creek Watersheds, Faro, Yukon

To Meet the Requirements of Water Licence QZ03-059, Conducted: During August 2007, White Mountain Environmental Consulting, January 2008

Gartner Lee

2007

AQUATIC LIFE SAMPLING AND TESTING PROGRAM FOR THE ANVIL RANGE MINE SITE, ROSE AND VANGORDA CREEK WATERSHEDS, FARO, YUKON

TO MEET THE REQUIREMENTS OF WATER LICENSE QZ03-059

Conducted: During August, 2007

Prepared for Delloite and Touche Inc.

JANUARY, 2008

Prepared by: White Mountain Environmental Consulting, Whitehorse, Yukon
Paul Sparling and Martin Crill

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION……	3
2.0	STUDY AREA……	3
3.0	METHODS……..	4
	3.1 Metal Sample Collection and Analysis……..	5
4.0	RESULTS……	6
	4.1 Site Summary: R1 Rose Creek……..	7
	4.2 Site Summary: R2 Rose Creek..……	7
	4.3 Site Summary: R4 Rose Creek……	8
	4.4 Site Summary: R6/R8 Anvil Creek……	9
	4.5 Site Summary: V8 Vangorda Creek……	9
	4.6 Site Summary: B1 Blind Creek……	10
5.0	Discussion of multiyear results ……..	12
	5.1 Metal Concentration in Fish Tissue…….……	12
	5.2 Fish Utilization……	12

List of Figures

Figure 1: Sample sites associated with Rose Creek from 1:250,000 105K *Tay River* topographic map. ……. 4

Figure 2: Sampling sites associated with Vangorda Creek from 1:250,000 105K *Tay River* topographic map. …….. 4

Figure 3: Summary of electro fishing results for site R1 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time…….. 13

Figure 4: Summary of electro fishing results for site R2 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time……. 14

Figure 5: Summary of electro fishing results for site R4 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time……. 14

Figure 6: Summary of electro fishing results for site R6/ R8 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time…. 15

Figure 7: Summary of electro fishing results for site V8 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time……. 15

Figures 8 – 13: Minnow trap results for all sites comparing catches from 2004 through 2007……. 16

Figures 14: Comparison of four key metal concentrations in slimy sculpin tissue from all six Faro Aquatics sample stations for 2004 through 2007. ……..16

Figures 15: Comparison of four key metal concentrations in Arctic grayling tissue from all six Faro Aquatics sample stations for 2004 through 2007…….. 17

List of Tables

Table 1: Summary of electro-fishing results from all stations sampled during Faro Aquatics program, August, 2007…….. 11

Table 2: Summary of minnow trapping results for all sites sampled during Faro Aquatics program, August 2007. The number presented equals the total number of fish captured in all traps at each site …….. 11

Table 3: Summary of angling results for all sites sampled during Faro Aquatics program, August 2007…….. 12

Appendix 1: General Site Descriptions …….. 19
Site R1 Rose Creek…….. 19
Site R2 Rose Creek…….. 21
Site R4 Rose Creek…….. 22
Site R6 Anvil Creek…….. 24
Site R6A Anvil Creek……25
Site B1 Blind Creek…….. 27
Site V8 Vangorda Creek…….. 28
Appendix 2: Metal analysis data…….. Attached
Appendix 3: Fish sample information for fish taken for tissue samples…. Attached
Appendix 4: Minnow Trapping Results …….. Attached

1.0 Introduction

The following report details the results of the fourth consecutive year of field investigations conducted under the *Aquatic Life Sampling and Testing Program* for the Anvil Range Mine Site at Faro, Yukon, as required under water license QZ03-059. Field investigations for this project were conducted during August, 2007 under the authority of License No. 07-52, issued by the Department of Fisheries and Oceans, Canada.

The primary goal of these investigations has been to annually sample watersheds potentially affected by the Faro and Vangorda Plateau mine sites. Specific sites within the Rose and Vangorda Creek watersheds have been investigated for the past four years to track the presence, relative abundance and condition of fish. From each sampling site, flesh samples from slimy sculpin (*Cottus cognatus*) and Arctic grayling (*Thymallus arcticus*) were taken and analyzed to determine the level of metals in fish tissue.

This investigation also continued the collection of quality data on fish habitats and fish utilization for use in long term monitoring. The sampling methodology used in 2007 was consistent with that used in previous investigations to allow comparison between annual data sets.

2.0 Study Area

Investigations were conducted within the Rose and Vangorda Creek watersheds in potentially affected waters as well as on control (unaffected) sites on Anvil and Blind Creeks. Sample sites for the 2007 investigation were all previously established sites. Site V8 was expanded to include a reach of Vangorda Creek 300 meters downstream of the original sample location to allow for the collection of slimy sculpin samples for metal analysis. The following sites were sampled during the investigation:

Sample sites associated with Rose Creek (Figure 1):

R1 South Fork of Rose Creek immediately upstream of the confluence of North and South Fork of Rose Creek;

R2 The mixing zone downstream of the intersection of Rose Creek and the tailings pond discharge channel;

R4 Rose Creek just upstream of the confluence with Anvil Creek; and

R6A Anvil Creek upstream of the confluence with Rose Creek (control site), this site has been referred to as site R8 in previous reports.

Sampling sites associated with Vangorda Creek (Figure 2):

V8 Lower Vangorda Creek below the town of Faro access road; and an additional reach 300 meters downstream of the main site, and

B1 Blind Creek near the lower bridge (control site)

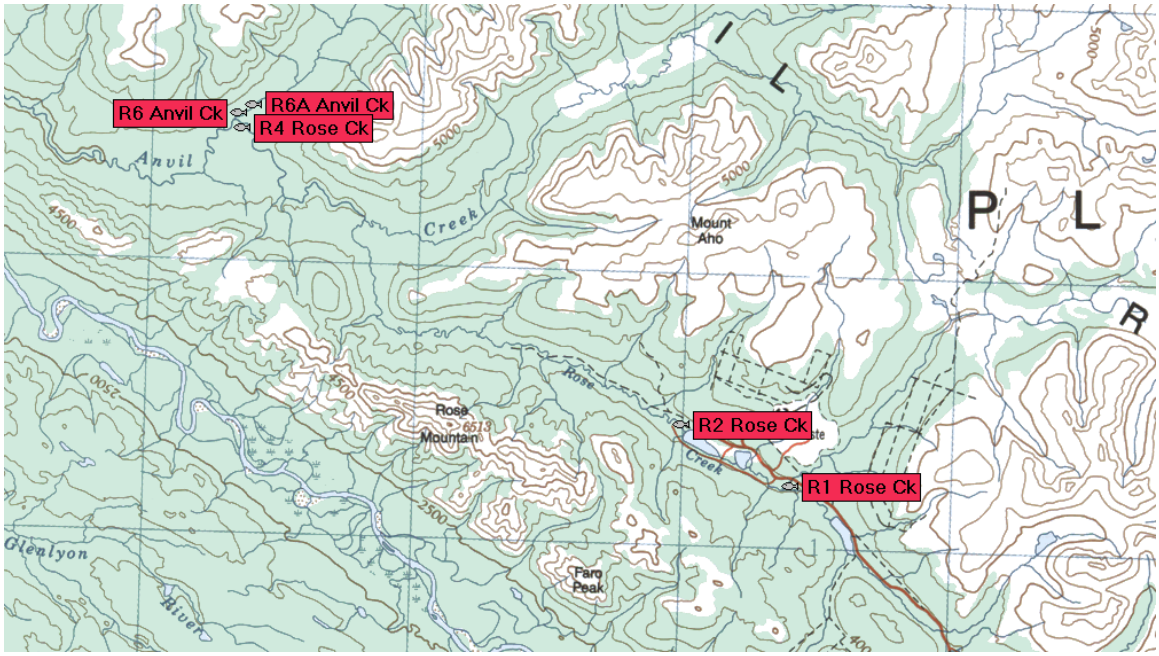


Figure 1: Sample sites associated with Rose Creek from 1:250,000 105K *Tay River* topographic map.

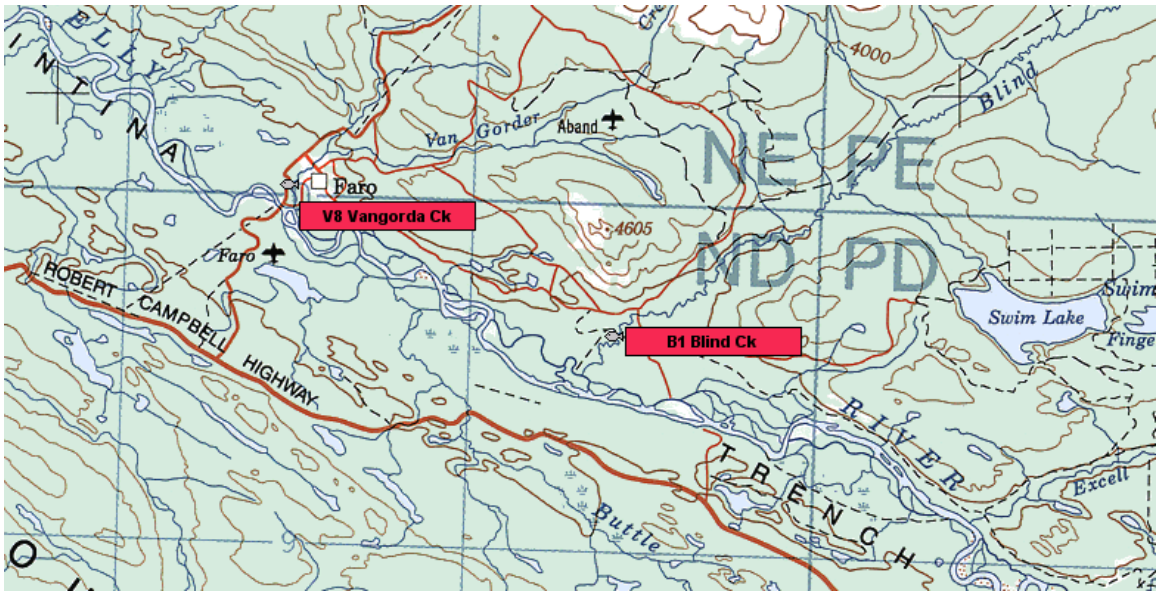


Figure 2: Sampling sites associated with Vangorda and Blind Creeks from 1:250,000 105K, Tay River topographic map.

3.0 Methods

Field investigations were conducted between August 15 and 18, 2007 when water levels were stable and fish distribution was at its seasonal peak. This timing corresponds with the previous investigations which were also conducted during mid August.

Each site sampled corresponded to the locations sampled during previous years. The only site that was altered from past investigations was Vangorda Creek where a secondary sample site 300 meters downstream of the existing sample reach was included as a site for the collection of slimy sculpin for metal analysis of fish flesh. The

two sample sites near the confluence of Rose and Anvil Creeks were accessed with a helicopter; all other sample sites were accessed by road.

The general description of fish habitat compiled in past years was re-evaluated at each site, including; flow parameters consisting of velocities (floating object method), depth, wetted and channel width, substrates, channel configuration, bank stability, water temperature, riparian vegetation and an assessment of available fish cover. Photographs representative of each site were taken.

The principle fish collection technique used was electro-fishing. Secondary techniques included minnow trapping, angling, and beach seining. Crew members wore polarized glasses at all times to enhance fish viewing abilities and all visual observations of fish were recorded.

Electro-fishing was conducted with a Smith-Route POW type 12A battery powered, back pack electro-fisher. The electro-fisher operator was accompanied by a crew member with a dip net. Each site was investigated using a single pass technique with sampling effort similar to that of previous years. Each site was sampled by moving in an upstream direction and sweeping from side to side through each reach; all shoreline areas were fished and attempts at covering all mid-stream habitats were made. Electro-fishing results have been calculated as the number of fish recorded per 100 seconds of shock time to allow comparison between sites and different years.

Minnow trapping was conducted with “Gee type” minnow traps (¼” mesh). Traps were baited with salmon roe (Yukon River origin) suspended in the trap in a perforated plastic bag, and were set in a variety of habitat types at each site. Traps were set for an overnight period and the results have been expressed as number of fish captured per site per 24 hour period.

Beach seining was only conducted to collect metal analysis specimens from Blind Creek. Catch per unit effort from seining was not calculated as the effectiveness of seine pulls varied due to such factors as shoreline configuration, bottom substrates, water depth and velocity. Area seined and seine catches were recorded in a field note book.

Angling was conducted with light spin casting gear and a variety of small lures and dry flies. Effort was recorded as minutes fished and all fish captured or observed were recorded. Improvements to angling techniques in 2007 dramatically improved the catch success making data from 2007 non comparable to previous years in terms of catch per unit of effort.

All fish captured were handled delicately to allow for live release after sampling. Anaesthetics were not used. All fish captured or observed were identified as to species and general life stage (fry, juvenile, sub-adult, adult)**,** a sub-sample was measured for fork length (±1 mm) and then released unharmed as near as possible to the location from which they were sampled. All fish captured or observed were recorded into a field book and the information was later entered into an excel data base.

3.1 Metal Sample Collection and Analysis

Fish samples for metal content analysis were collected during the course of general field assessments. A maximum of 5 Arctic grayling and 5 slimy sculpins samples were collected from each site for analysis of metals in tissue. Extra seine and minnow trap effort was conducted at Blind Creek to procure slimy sculpin samples and additional electro-fishing effort was conducted on Vangorda Creek to collect slimy sculpins.

Arctic Grayling with a fork length >200 mm and slimy sculpins 80 mm or longer were selected for tissue sampling when possible. At sites where less than 5 sculpins over 80 mm in length were caught, a composite sample of 2 or more individual sculpins was utilized.

Specimens collected for metal sample analysis were placed into labeled zip loc baggies immediately after capture. The collected specimens were sampled later in a controlled environment. For sacrificed Arctic grayling, internal and external observations of fish health, sex and maturity, diet, fork length and round weight was recorded. From each grayling a tissue sample weighing approximately 50 grams was taken from the caudal area and placed in separate labeled bags and then frozen. Stomach contents were analyzed at the time of sampling. Sample data and stomach content analysis from Arctic grayling was entered to an excel data base format at the completion of the field season.

For slimy sculpins sacrificed, the total length and round weight for each specimen was recorded, including the individuals from composite samples. Each sculpin sample was bagged and labeled separately; each composite sample was bagged and labeled as a single sample, the samples were then frozen.

The frozen tissue samples were submitted to Norwest Labs for metals analysis. Metal analysis included microwave acid digest for ICP metals and metals semi trace in tissue. The metal results were expressed as ug/gram. The lab technique used to analyze the 2007 samples was the same as for the 2006 and 2005 samples, an upgrade from the process used in 2004.

4.0 2007 Results

The sample sites showed little physical variation from conditions observed in previous years and fish habitats remained stable at all sample locations. In general, water levels during 2007 were similar to 2004, slightly lower than in 2006 and significantly lower than in 2005. An updated general description of fish habitats and a representative photo for each site has been presented in Appendix 1.

Fish distribution and habitat utilization varied slightly between each site; most sites had consistent speciation, juvenile chinook salmon (jcs) were common in Blind Creek and Vangorda Creek at low levels and were absent from Rose and Anvil Creeks. A summary of electro-fishing results for all species for 2007 has been presented in Table 1. A summary of minnow trapping results has been presented in Table 2 with a complete listing of all minnow trapping results for 2007 presented in Appendix 4. Angling data have been presented in Table 3.

Arctic grayling adults were present at all sites. At site R2 grayling were again dispersed, though less difficult to catch than in 2006. At site R6A grayling were abundant and easier to catch than in 2006. Slimy sculpin were uncommon and difficult to capture at Blind Creek, were uncommon at site V8, and common and easily captured at the other sites.

A complete set of 5 Arctic grayling were taken for metal analysis from each site. Lengths ranged from 213 to 375 mm. A complete listing of sample information for specimens collected has been presented in Appendix 3.

Stomach content analysis from all Arctic grayling sampled in 2007 consisted of 48% Tricoptera. This proportion has ranged from between 33% and 64% in 2004, which

clearly indicates that Trichoptera is the primary food source for Arctic grayling at these sites at this time of year. Terrestrial insects, including ants (6.5%), spiders (5%), beetles, unidentified insects (16%) and flies (2.5%), together accounted for 30%. Salmon eggs were only observed in Grayling stomachs from Blind Creek where they comprised 51% of the sample's stomach contents. Other food items included snails, caterpillars, rose hips, bastard toad flax seeds and larvae. As in 2006, bees and wasps were noticeably absent from the 2007 diet.

Sample information for Arctic grayling stomach content analysis has been presented in Appendix 3 in conjunction with all other sample information for the fish sacrificed for metal sample analysis.

Slimy sculpin taken for metals analysis ranged in length from 32 to 119 mm. The weights of the single fish sculpin samples ranged from 3.7 to 12.3 grams. A total of 21 whole fish samples and 8 composite samples were taken. As in 2006, all of the composite samples came from Vangorda and Blind Creeks. Data for slimy sculpin samples has been presented in Appendix 3.

No unusual spikes or anomalies in metal concentrations in fish flesh were noted in 2007 data. A complete discussion of metal concentrations in fish tissue has been presented in the discussion of multi year results (page 12).

4.1 Site Summary: R1 Rose Creek

4.1.a Fish Habitat and Utilization

Electro-fishing consisting of 873 seconds of effort was conducted through the 100 meter reach. Fish recorded by electro-fishing consisted of 27 slimy sculpin adults and 1 fry (Table 1), and 3 juvenile Arctic grayling.

Minnow trapping at site R1 consisted of 9 traps set for an average soak time of 18.5 hours each. No fish were caught (Table 2).

Angling effort at site R1 for 90 minutes produced a catch of 9 Arctic grayling (Table 3). Grayling were dispersed in the study area as habitat for larger grayling remains limited.

4.1.b Metal Samples

Samples taken for metal analysis included; 5 Arctic grayling (3 mature females and 2 mature males), and 5, single fish, adult slimy sculpin.

The Arctic grayling samples ranged in length from 302 to 338mm, and in weight from 298 to 448 gms. The samples, 3 males and 2 females, all mature fish, were considerably larger than those taken from this site in previous years. Stomach contents consisted of 62% caddis fly, 11% ants, 2% beetles, unidentified terrestrial insects, 6%, fly, 1%, unidentified, 18%.
The individual sculpin samples ranged in length from 88 to 106 mm and in weight from 7.3 to 12.3 gms and were of similar size to previous years samples.

4.2 Site Summary: R2 Rose Creek

4.2.a Fish Habitat and Utilization

This site provides a wide variety of stable habitats, including riffles, rapids, glide areas and deep corner and side pools.

Electro-fishing consisting of 1,114 seconds of effort was conducted through most of the 100 meter reach downstream of the tailings pond channel. A deep corner pool in the middle of the reach could not be shocked due to depth (Table 1).A total of 57 adult and 2 fry Slimy sculpin and 2 juvenile Arctic grayling were recorded.

Minnow trapping at site R2 consisted of 9 traps set for an average soak time of15.5 hours each. The total catch from the minnow trapping consisted of 1 adult slimy sculpin and 1 burbot (Table 2). The minnow traps set at R2 were all set downstream of the confluence of the tailings pond channel with Rose Creek.

Angling for 110 minutes downstream of the tailings pond channel captured 5 Arctic grayling (Table 3). There were few grayling observed along the reach and they were well dispersed.

4.2.b Metal Samples

Samples taken for metal analysis consisted of 5 single slimy sculpin adults and 5 adult Arctic grayling.

The Arctic grayling samples ranged in length from 232 to 354 mm, and in weight from 129 to 511 gms. The samples consisted of 3 mature females, 1 immature female and 1 mature male.

The five individual sculpin samples ranged in length from 86 to 97 mm and in weight from 6.1 to 14.7gms.

Metal content in Arctic grayling flesh from R2 was similar to that found at all other sample sites.

Metal content in sculpins from R2 showed significant decreases for most metals from 2005 levels. Zinc levels, however, remained similar to the 2005 levels and were the highest of all sites sampled (Table 6). The 2004 samples from R2 had the lowest zinc levels of the sample sites other than B1.

4.3 Site Summary: R4 Rose Creek

4.3.a Fish Habitat and Utilization

Electro-fishing was conducted through all areas of the 110 meter reach and 885 seconds of effort recorded a total of 99 slimy sculpin adults, 6 juvenile and 1 sub-adult Arctic grayling (Tables 1). Neither jcs nor burbot were recorded at this site during 2007.

Minnow trapping at site R4 consisted of 9 traps set for an average soak time of 23.43 hours each. 12 slimy sculpin and 1 Arctic grayling were caught.

Angling for 40 minutes captured 12 adult Arctic grayling (Table 4). A further 7 juveniles and sub adults were released.

4.3.b Metal Samples

A complete sample of 5 Arctic grayling adults were taken from R4. The grayling ranged in length from 303 to 352 mm, in weight from 262 to 432 gms and consisted of 4 mature

females and 1 mature male. The stomach contents from Arctic grayling consisted of 43% Trichoptera, 40% terrestrial insects, 10% larvae and a few ants.

All five slimy sculpin samples consisted of single, whole fish ranging in length from 86 to 97mm and in weight from 6.9 to 8.9gms.

4.4 Site Summary: R6 Anvil Creek

4.4.a Fish Habitat and Utilization

Flows in Anvil Creek during 2007 were slightly higher than in 2005 and it was impossible to work at site R6 at the confluence. The new site, R6A, located 800 meters in a direct line upstream of original site was sampled as in 2006. The new site offers greater separation from site R4 on Rose Creek, provides more diverse fish habitats, has better benthic collection opportunities and is a safer work environment.

Electro-fishing, conducted by moving back and forth across the entire width of the creek to cover the entire 100 meter reach was not possible. Shoreline shocking was conducted along both banks and in the shallow side flow on the right bank and covered similar areas to the 2006 investigation. A total of 1,096 seconds of effort recorded 55 adult slimy sculpin and 2 sub adult burbot (Tables 1). This represents an increase in catch from site R6; however the increase can be attributed to better habitats and ability to electro-fish.

Minnow trapping at site R6 consisted of 9 traps set for an average soak time of 21.5 hours each. The total catch from the minnow trapping was 2 adult slimy sculpin (Table 2).

A total of 40 minutes of angling effort captured 12 adult Arctic grayling, five were taken for metal samples and 7 measuring <250 mm were released. Arctic grayling were observed to be abundant in both of these locations; however the fish were obviously well fed and were difficult to hook (Table 4).

4.4.b Metal Samples

Arctic grayling samples taken for metal analysis at site R8 consisted of 3 mature females and 2 mature males, and ranged in length from 283 to 375 mm, and weight from 231 to 492 gms. Stomach contents consisted of 73% caddis fly, 4% ants, and 9 % insect larvae.

Slimy sculpin samples consisted of 5 individual fish samples ranging in length from 86 to 108mm and in weight from 7.0 to 11.6 grams.

4.5 Site Summary: V8 Vangorda Creek

4.5.a Fish Habitat and Utilization

The reach of Vangorda Creek investigated had extensive utilization by several fish species. Jcs were the most abundant. Arctic grayling sub- adults and juveniles were occasional and slimy sculpin were uncommon, as were burbot..

Electro-fishing was conducted for a total of 893 seconds through the entire 120 meter reach (Tables 1). Fish recorded included 2 slimy sculpin adults, 138 juvenile chinook, 8 sub-adult and 18 juvenile Arctic grayling and 1 sub adult round whitefish. Additional electro fishing for 250 seconds covering 140 meters downstream of the bridge was extended to capture Arctic grayling and slimy sculpin for metal samples. Shocking was

conducted moving downstream at the speed of the current and recorded a further 6 sub adult Arctic grayling.

Minnow trapping at site V8 consisted of 8 traps set for an average soak time of 17.4 hours each. The total catch from the minnow trapping consisted of 200 jcs, representing only 60% of the 2005 catch and only 16% of the catch made in 2004 (Table 3).

No angling was attempted on Vangorda Creek.

4.5.b Metal Samples

4 sculpin samples were taken of which only one was a single fish, the others being one composite sample of two fish and 2 composites of three fish. They ranged in length from 55 to 72 mm, and in weight from 3.7 to 7.6 gms.

A full set of 5 Arctic grayling samples, consisting of 2 immature females, 1 mature male and 2 immature males were collected. They ranged in length from 213 to 245 mm and in weight from 99 to 138 gms. Their stomach contents consisted of 20% caddis fly 35% unidentified terrestrial insects, 13% spider, ants 8%, and 13% unidentified invertebrates.

4.6 Site Summary: B1

4.6.a Fish Habitat and Utilization

Electro-fishing was not and has not been conducted on Blind Creek at the request of the Department of Fisheries and Oceans due to the presence of spawning adult chinook salmon. A chinook salmon enumeration weir located 50 meters downstream of the bridge was in place at the time of sampling. Adult salmon were observed below the bridge and active redds were within the study area.

Arctic grayling were in groups throughout the study area, with most aggregated in deep pools near the active redds. Slimy sculpin were uncommon even near salmon redds.

Extra minnow traps for the capture of slimy sculpin for metal samples were set as in previous years. A total of 14 minnow traps were set for an average soak time of 21.3 hours each (Table 3). The catch consisted of 222 jcs (0+) and 38 jcs (1+).

Seining effort was exerted on Blind Creek to procure a suitable sample of slimy sculpin for metal analysis. Seining effort was conducted both upstream and downstream of the bridge. A total of 18 seine pulls were made, 5 were ruined by logs, the catch from the other hauls consisted of 12 small adult and 40 fry slimy sculpins, 11 juvenile round whitefish and 60 jcs.

Angling effort at Blind Creek, both upstream and downstream of the bridge for 60 minutes captured 12 Arctic grayling adults (Table 4). Grayling, though very plentiful, were well fed on salmon eggs and hard to entice to the hook. Dry flies were used with light spinning gear. Having learned from angling on these creeks in 2006, our angling technique in 2007 was clearly more effective, so improved catch per unit angling effort should not be interpreted as an indication of increased grayling abundance at any of these sample sites.

The number and behavior of adult chinook salmon at site B1 was different from past years. There were visually fewer adult salmon present and different spawning locations were used than in previous years. Some spawning took place adjacent to old redds and

two new redds upstream of the bridge were observed in an area that none had been observed in before. Water levels were only slightly lower than in previous years.

4.6.b Metal Samples

A complete set of 5 Arctic grayling samples were taken for metals analysis, they ranged in length from 272 to 342mm, and in weight from 204 to 396 gms. The sample consisted of 2 mature females and 3 mature males. Stomach contents consisted of 51% salmon eggs, 20% caddis fly, 16% slimy sculpin, 8% dragon fly.

Five composite sculpin samples, two of 7 fish and the other three consisting of 4, 5 and 6 fish each ranged in length individually from 32 to 69mm and in weight as composite samples from 4.4 to 6.8 gms.

Concentrations of metals in fish flesh from Blind Creek remained lower for most metals than in fish from the other sites investigated, although similar to site R8, and were lower than in previous years (Tables 5 and 6).

Table 1: Summary of electro-fishing results from all stations sampled during Faro Aquatics program, August, 2007.

Sample Site	Date Sampled	Sample Effort (seconds)	Sample Effort (area)	Arctic Grayling	Slimy Sculpin	Burbot	Juvenile chinook salmon	Round W.fish
R1	Aug. 15	873	100 m	3 juv.	27 ad 1 fry	0	0	0
R2	Aug. 15	1,114	100 m.	2 juv.	57 ad 2 fry	0.	0	0
R4	Aug. 17	885	110 m.	6 juv. 1 s ad	99 ad	1	0	0
R6a	Aug. 17	1,096	120 m.	0	55 ad	2 s ad	0	0
V8	Aug. 18	893	120 m.	18 juv 23 s ad	2 ad	1 s ad	138 juv	1 s ad

Summary of abbreviations: ad= adult, juv.= juvenile, sub. ad.= sub adult Round W. fish= round whitefish

Table 2: Summary of minnow trapping results for all sites sampled during Faro Aquatics program, August 2007. The number presented equals the total number of fish captured in all traps at each site.

Sample Site	No. of traps	Average soak time (hrs)	Arctic Grayling	Slimy Sculpin	Burbot	Juvenile chinook salmon	Juv. Ch. Salmon +1
R1	9	18.50	0	0	0	0	0
R2	9	15.50	0	0	0	0	0
R4	9	23.43	1	12	0	0	0
R6a	9	21.46	0	2	0	0	0
V8	13	17.42	0	0	0	285	0
B1	14	21.29	0	1	0	222	38

Table 3: Summary of angling results for all sites sampled during Faro Aquatics program, August 2007

Sample Site	Angling Effort (minutes)	Catch (Number of Arctic Grayling)
R1	90	9
R2	110	5
R4	40	12
R6a	40	12
B1	60	12

5.0 Discussion of Multi-Year Results

5.1 Metal Concentration in Fish Tissue

Concentrations in the tissue of Arctic grayling and slimy sculpin have been plotted for cadmium, copper, lead, manganese and zinc; between 2004 and 2007 (See figures 14 and 15). Broken graph lines for grayling indicate missing data from R2 for 2005 and for sculpin missing data from V8 for 2006.

In Arctic grayling, zinc, manganese and cadmium concentrations peaked in 2005 at all sites (including control sites), and declined toward a minimum (again at all sites) in 2007. Not only has 2007 seen the lowest concentrations of these metals, but the range of values between sites is also markedly lower than in previous years. At site R4, levels of manganese and cadmium in particular spiked strongly in 2005, before falling back to the low levels recorded at other sites for 2006 and 2007.

In slimy sculpin, any trends that can be discerned are more specific to a given metal than is the case in grayling. With regard to copper, concentrations in fish taken both from control and mine-affected sites rose slightly during 2004-2005 and fell in 2006, before rising more slightly again in 2007.

The only significant spikes are for lead in 2005 (all sites, but especially R2) and manganese in 2007 at R2 and R4. Given the spatial relationship between these two sites and discharge waters from the tailings reservoir, metal levels from these two sites should be the subject of particular attention in future years, especially as this pattern was not mirrored in control sites.

5.2 Fish Utilization

Comparisons of utilization recorded during the past four years has been graphed and presented as figures 3 through 13. Dramatic variations such as those noted for jcs likely reflect an accurate shift in numbers of the species in the area for each year. Small variations in occurrence of other species may be a function of sampling conditions.

As in 2006, juvenile chinook salmon (jcs) were not recorded in the Rose/ Anvil drainage during 2007. Jcs were captured however at B1 and V8, as in previous years though numbers since 2004 had shown a marked decline to 2006, there was a slight upturn in 2007. This pattern of chinook utilization corresponds with escapement numbers for adult chinook salmon from the year proceeding each year of capture. Low escapements of Yukon River chinook during 2007 will likely result in low numbers of jcs in the Faro area

during 2008. Unlike in previous years numerous 2 and 3 year old (age estimated by weight) jcs were recorded in Blind Creek.

Both Arctic grayling and burbot were more common in 2004 at site R1 than in any other year, the numbers of both species have steadily declined over the subsequent three years. Large numbers of burbot and grayling were removed from the freshwater reservoir basin at the time of dewatering and it is not unlikely that remnant populations remained in the creek after dewatering and have slowly reduced in number since.

Slimy sculpin numbers from site R4 have steadily increased over the past 4 years and have remained relatively stable at each of the other sites.

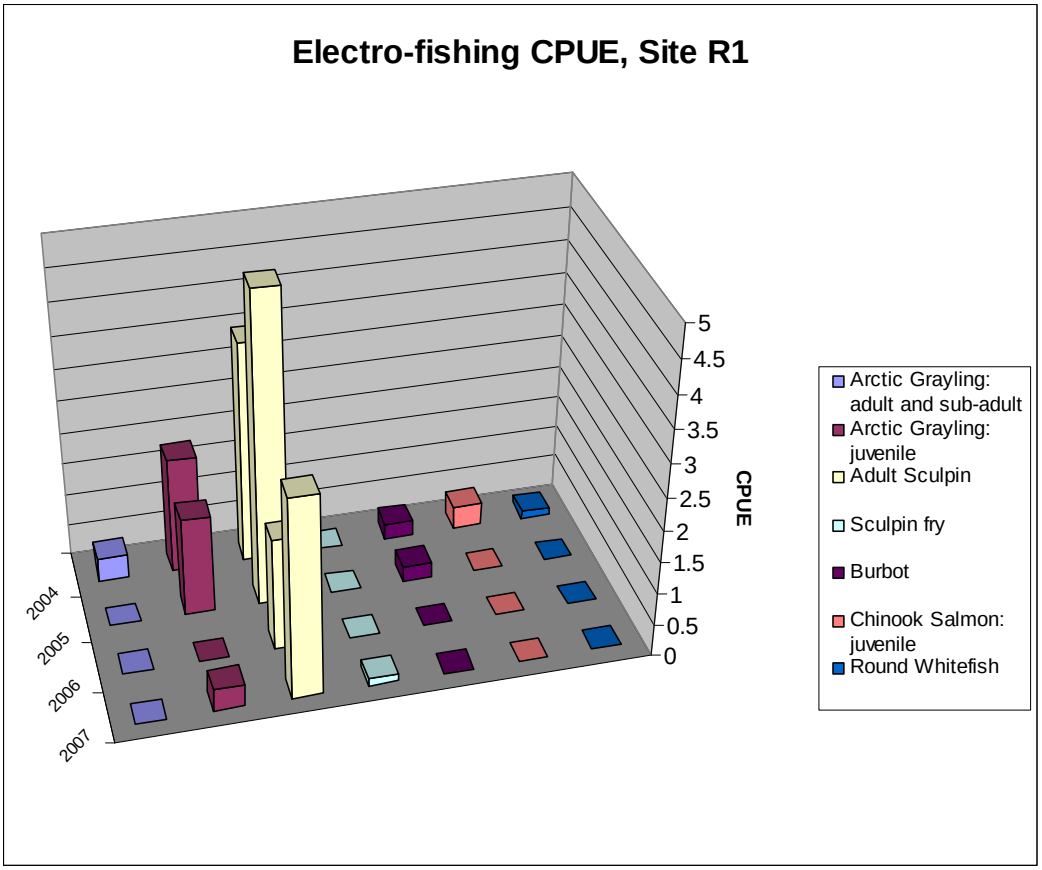


Figure 3: Summary of electro fishing results for site R1 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time.

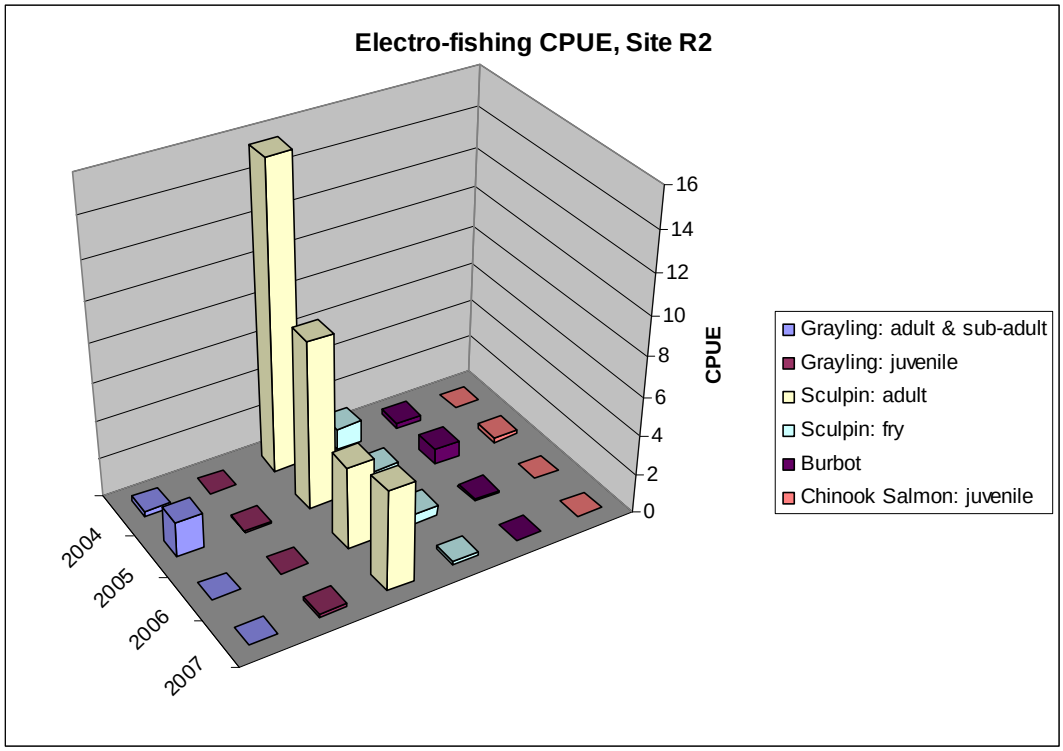


Figure 4: Summary of electro fishing results for site R2 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time.

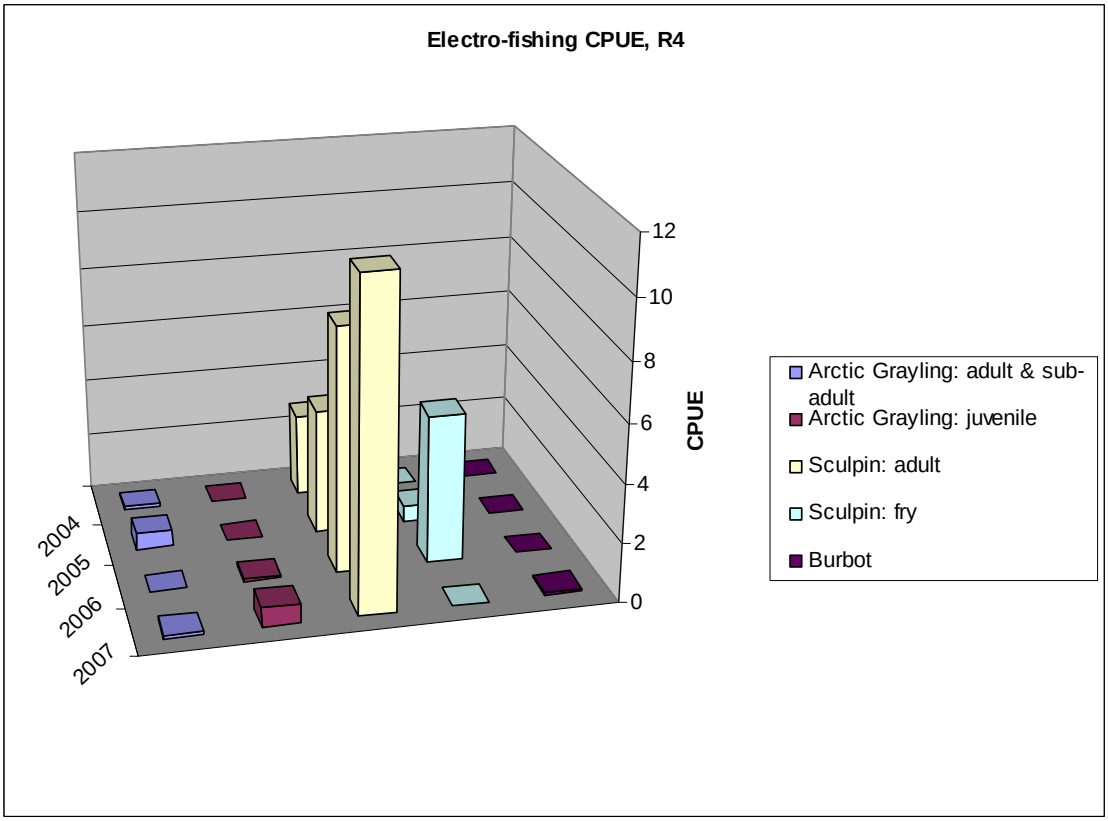


Figure 5: Summary of electro fishing results for site R4 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time.

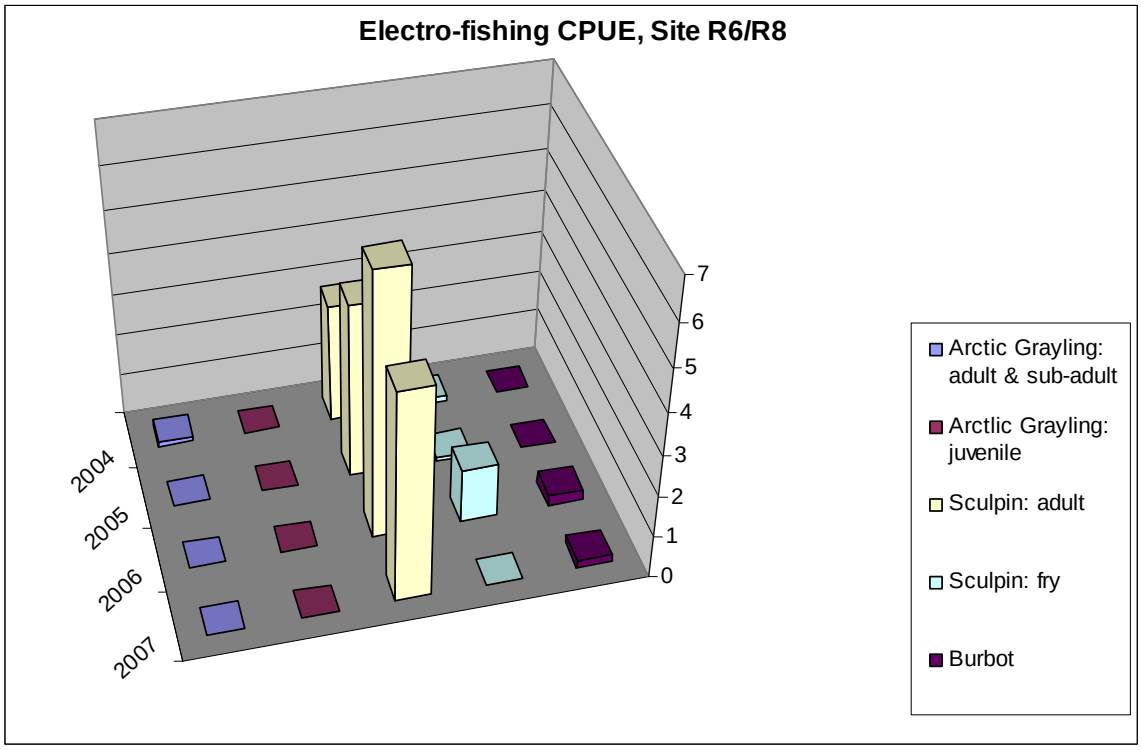


Figure 6: Summary of electro fishing results for site R6/ R8 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time.

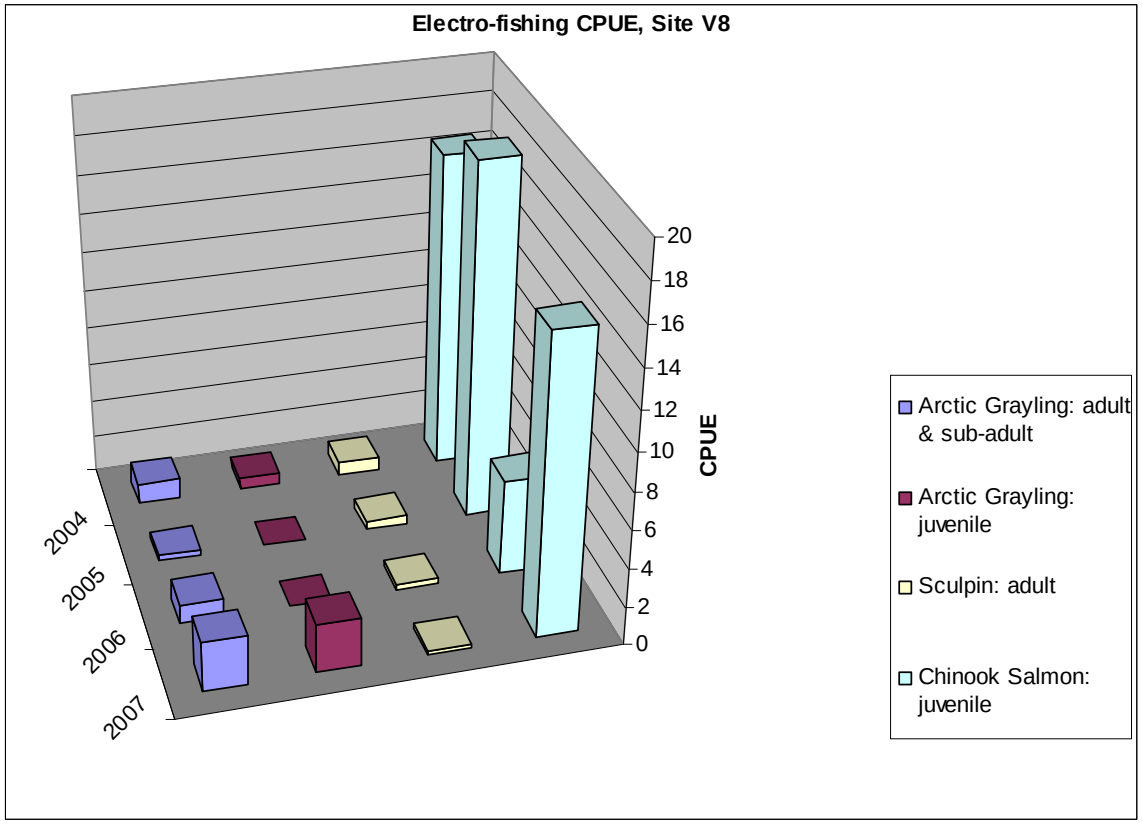
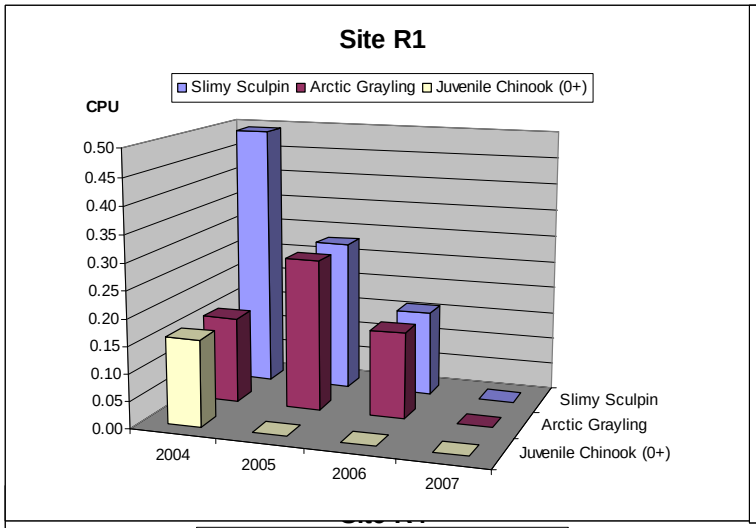
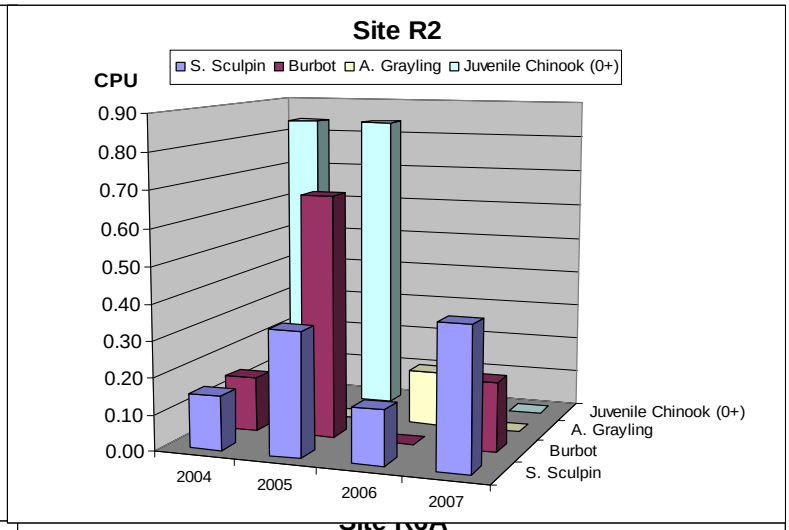
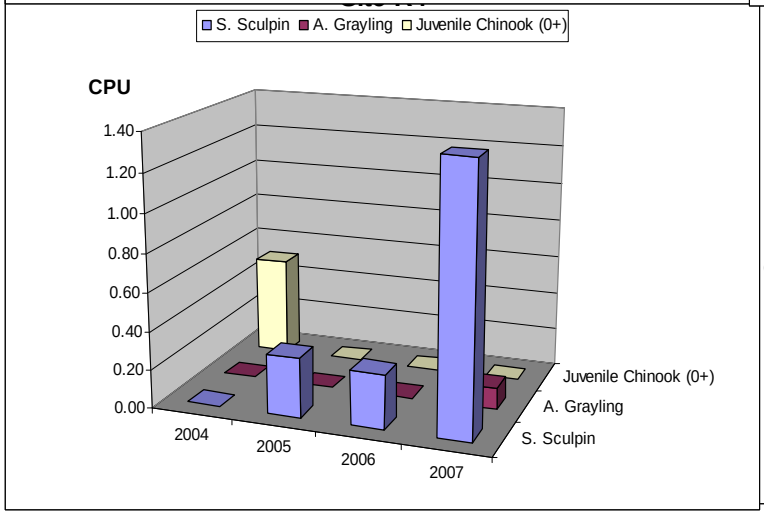
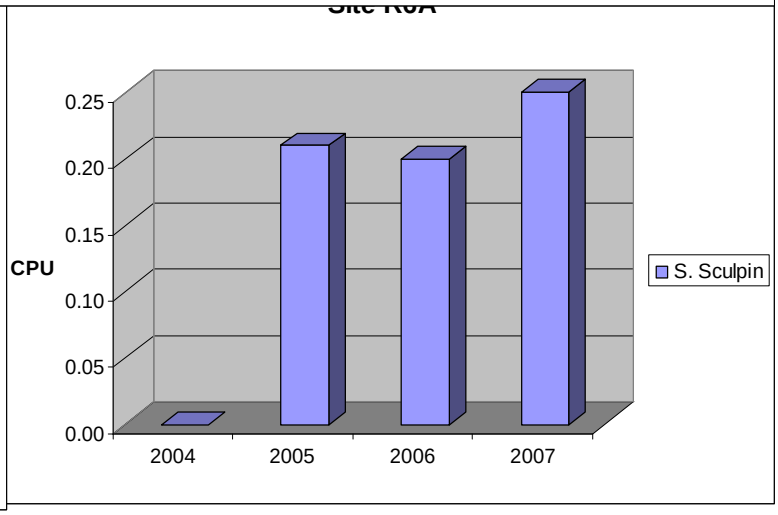


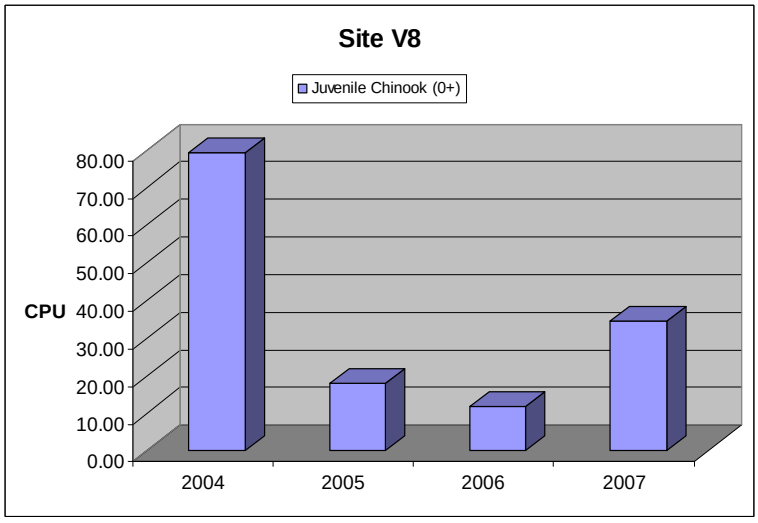
Figure 7: Summary of electro fishing results for site V8 for 2004 through 2007. CPUE has been expressed as number of fish per 100 seconds of shock time.

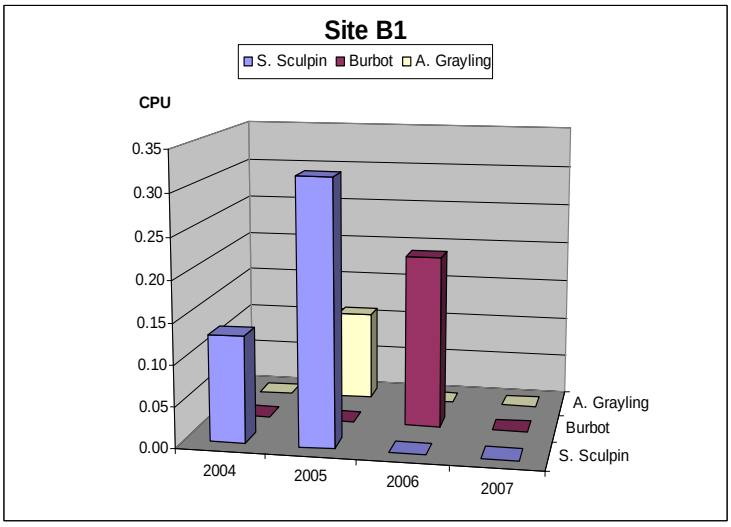




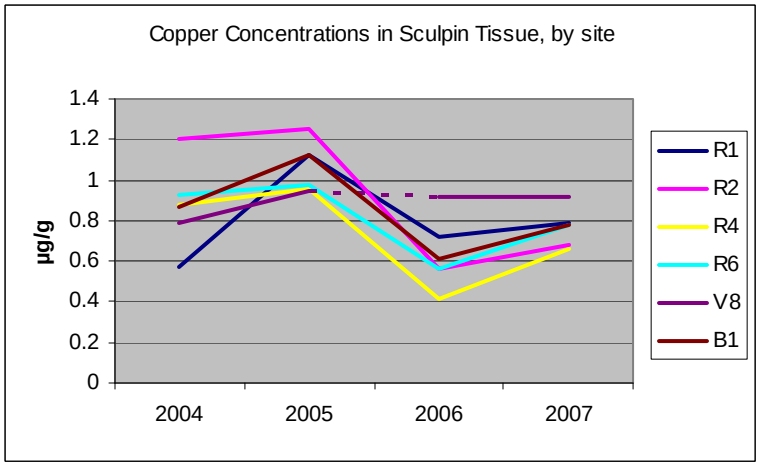


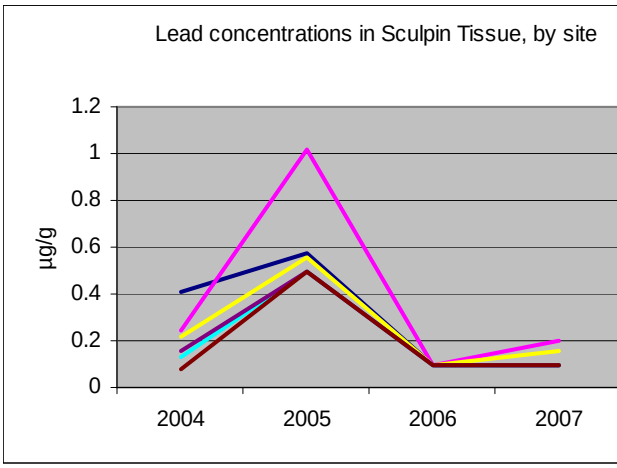


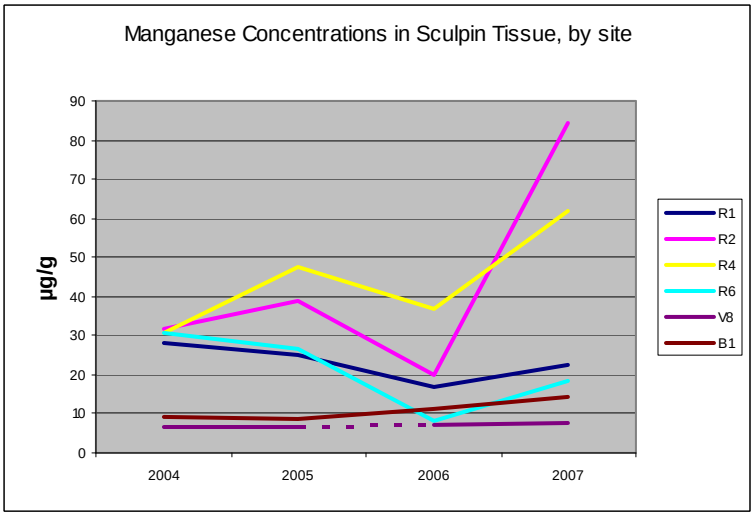




Figures 8 – 13: Minnow trap results for all sites comparing catches from 2004 through 2007.







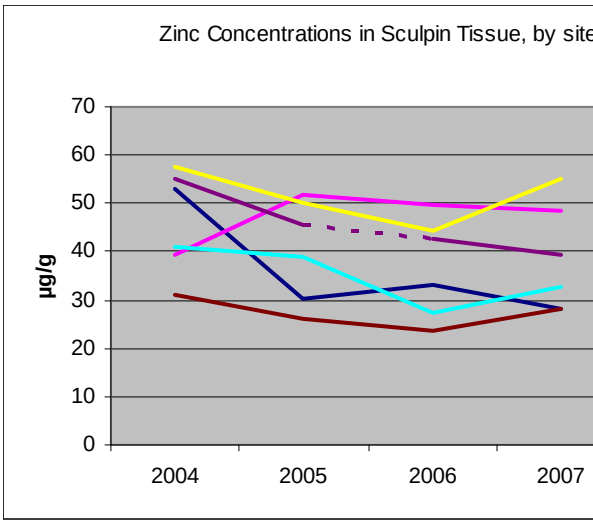
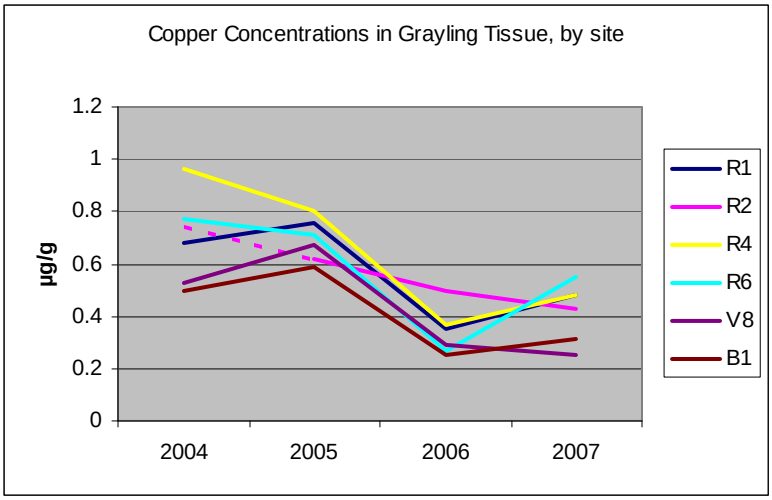
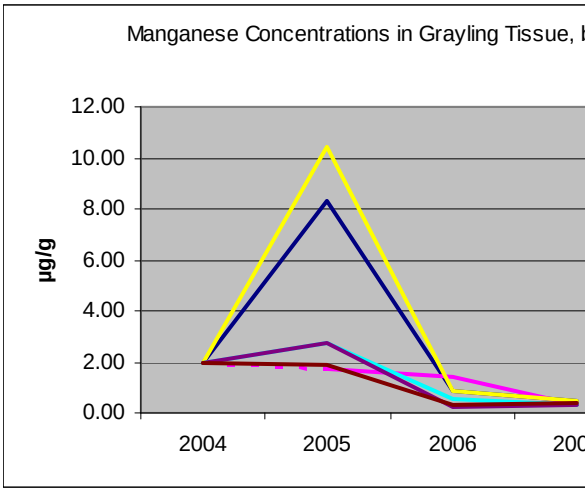
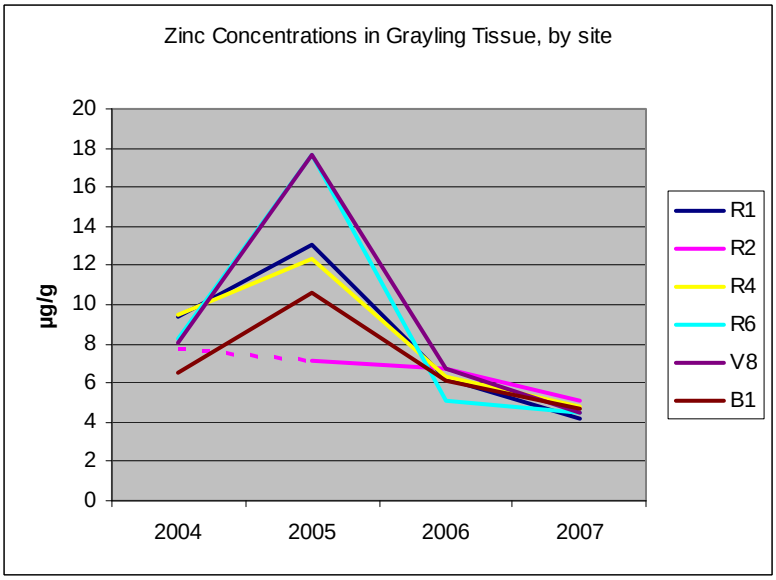
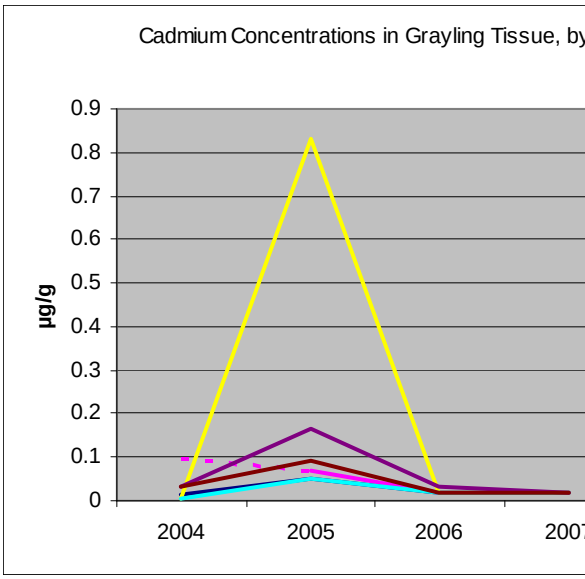


Figure 14: Comparison of four key metal concentrations in slimy sculpin tissue from all six Faro Aquatics sample stations for 2004 through 2007.









Figures 15: Comparison of four key metal concentrations in Arctic grayling tissue from all six Faro Aquatics sample stations for 2004 through 2007.

APPENDIX 1
GENERAL SITE DESCRIPTIONS

SITE: R1 Rose Creek

UTM: Down stream end 05 83 739 E, 69 12 390 N
Site Location: reach starts 10 meters upstream of the confluence of the north and south forks of Rose Creek and extends upstream for 110 meters.
Date Sampled: August 17 and 18, 2004, August 13 and 14, 2005
August 16 and 17, 2006, August 14 and 15, 2007

CHANNEL CHARACTERISTICS:

Surveyed Length:	3000 m
Average Channel Width:	4 meters
Average Wetted Width:	4 meters
Average Depth:	0.4 meters
Average Velocity	1.5 meters per second
% Pool, Riffle, Run / Glide:	65% riffles through boulders, 25% run and 10% small boulder and side pools
Cover	Dominant cover is boulder pools and perched boulders
Overhead vegetation	10% overhanging
Riparian Vegetation	Willow, dwarf birch, cinquefoil, with spruce adjacent

BED MATERIAL:

70% boulder, 20% cobble, 5% gravel, 5% sand with occasional bedrock outcrop in lower part of reach

BANK CHARACTERISTICS: Well defined channel with bedrock confining the channel on the left bank, the right bank has an open flood plain above an abrupt bank rise of 0.4 meters.

CHANNEL MORPHOLOGY CHARACTERISTICS: Uniform channel with a mostly flat bottom, some contour is provided by small pools near submerged bedrock along the left bank and boulders causing small cascades. A small island exists at the top of the reach. Flows within the South Fork of Rose Creek at site R1 were slightly greater in 2006 than previous years and in 2007. A long riffling run that extends approximately 800 meters upstream of the sample station was used as a collection area for angling Arctic grayling; this reach has similar morphology to the sample area although with more small pools.



Photo 1:, Rose Creek looking upstream at Site R1 from near the bottom of the sample reach, 2005.



Photo 2: Ariel view of site R1 (on right) and the confluence with North Fork Rose Creek, 2007. The sample reach extends from the confluence to just below the first bend of the creek in the centre of the photo.

SITE: R2 Rose Creek

UTM: down stream end 05 79 401 E, 69 14 972 N
Site Location: reach starts at the confluence of the tailing pond discharge channel with Rose Creek and extends downstream for 110 meters through the mix water zone.
Date Sampled: August 18 and 19, 2004 August 15 and 16, 2005
August 15 and 16, 2006 August 14 and 15, 2007

CHANNEL CHARACTERISTICS:

Surveyed Length:	110 meters
Average Channel Width:	14 meters
Average Wetted Width:	12 meters
Average Depth:	0.7 meters
Average Velocity	0.8 meters per second
% Pool, Riffle, Run / Glide:	30% pool, 30% riffle, 40% glide
Cover	Large woody debri, undercut banks and deep pools
Overhead vegetation	No overhead vegetation
Riparian Vegetation	Willow, dwarf birch and dead spruce

BED MATERIAL:

30% cobble, 50% gravel, 20% sand with sand and gravel increasing in deeper pools and exposed point bars mostly sand and gravel.

BANK CHARACTERISTICS: Sand and gravel point bars opposite of mud cut banks that rise 1.5 to 2.5 meters to an open flood plain.

CHANNEL MORPHOLOGY CHARACTERISTICS: Meandering channel with corner pools, small riffles and point bars adjacent to cut banks. Water levels in 2007 were similar to during 2004, 2006 and approximately 0.3 meters lower than during 2005.



Photo 3: The tailings pond discharge channel just prior to entering Rose Creek at sample reach site R2 during high flow of 2005.



Photo 4: Site R2, Rose Creek. The downstream end of the diversion channel flows in to the photo from the right upstream of the out flow of treated water and the sample site. August 2007.

SITE: R4 Rose Creek

UTM: down stream end 05 67 827 E, 69 21 736 N
Site Location: reach starts 80 meters upstream of the confluence of Rose Creek and Anvil Creek and extends upstream for 110 meters.
Date Sampled: August 12, 2004 August 17 and 18, 2005
August 16 and 17, 2006, August 17 and 18, 2007

CHANNEL CHARACTERISTICS:

Surveyed Length:	130 meters
Average Channel Width:	20 meters
Average Wetted Width:	14.5 meters
Average Depth:	0.5 meters
Average Velocity	> 1.0 meters per second
% Pool, Riffle, Run / Glide:	60% riffle, 15% boulder pool and 25% run
Cover	Boulder pools and overhead vegetation
Overhead vegetation	20% coverage
Riparian Vegetation	Alder and willow with spruce behind

BED MATERIAL:

5% large boulder, 20% boulder, 30% cobble, 40% gravel, 5% sand.

BANK CHARACTERISTICS: Open flood plain with gentle rise adjacent to well defined stepped banks that rise to a maximum of 2 meters to an open flood plain.

CHANNEL MORPHOLOGY CHARACTERISTICS: Mostly flat channel with one side typically deeper than the opposite side. Some exposed large boulders and a large side

pool exists near the bottom of the reach. Water levels in 2007 were slightly higher than those of 2004 the lowest water year and 0.3 meters lower than the highest year in 2005.



Photo 5: Boulder habitats and side pool in the sample reach at site R4, August 17, 2006.



Photo 6: Rose Creek looking upstream at site R4, August 2007. The boulder strewn area to the left supports large numbers of slimy sculpin.

SITE: R6 Anvil Creek

UTM: down stream end 05 67 917 E, 69 21 804 N
Site Location: reach starts 100 meters upstream of the confluence of Anvil Creek with Rose Creek and extends upstream a further 100 meters.
Date Sampled: August 12, 2004
August 17 and 18, 2005

Anvil Creek just upstream of the confluence with Rose Creek (control site).
This reach is located at and begins 150 meters upstream of the confluence and then extends upstream for 100 meters. This site has not been sampled for fish since 2005 due to impracticalities with flow conditions. Site R6A, 500 meters upstream on Anvil Creek was established in 2006 as an alternate site for fish and benthic collections.

CHANNEL CHARACTERISTICS:

Surveyed Length:	100 meters
Average Channel Width:	15 meters
Average Wetted Width:	14 meters
Average Depth:	0.4 meters
Average Velocity	1.5 meters per second
% Pool, Riffle, Run / Glide:	15% rapid, 45% riffle, 20% run, 20% boulder pool
Cover	Turbulence, perched boulders and cobbles, and limited undercut and cut banks.
Overhead vegetation	< 5% cover
Riparian Vegetation	Willow with a sedge fringe and spruce adjacent

BED MATERIAL:

5% large boulder, 50% small boulder, 30% cobble, 15% sand

BANK CHARACTERISTICS: Well defined and stable banks rise to even 2 meter height on 50% slope.

CHANNEL MORPHOLOGY CHARACTERISTICS: Channel mostly flat but the mid channel areas are elevated with deep flows occurring towards the banks. Water levels in Anvil Creek were 0.5 meters deeper during 2005 investigations than those of 2004 and 0.2 meters higher again in 2006. This site has not been sampled since 2005.



Photo 7: Looking upstream to the top of the sample reach at site R6, from the edge of the confluence with Rose Creek, 2005.

SITE: R6A Anvil Creek

UTM: down stream end 05 68 768 E, 69 21 412 N
Site Location: reach starts 1.35 km by creek channel (800 meters direct) upstream of the confluence of Anvil Creek with Rose Creek and extends upstream a further 100 meters.
Date Sampled: August 16 and 17, 2006
August 17 and 18, 2007

Anvil Creek upstream of the confluence with Rose Creek (control site).

CHANNEL CHARACTERISTICS:

Surveyed Length:	130 meters
Average Channel Width:	14 meters
Average Wetted Width:	9 meters
Average Depth:	0.7 meters
Average Velocity	>1 meter per second
% Pool, Riffle, Run / Glide:	10% rapid, 15% riffle, 20% run, 40% race, 15% pool
Cover	Large boulders, pools and LOD and undercut bank.
Crown Closure	< 5% cover
Riparian Vegetation	Alder, spruce, willow mix with grasses, sedge and cinquefoil

BED MATERIAL:

80% small boulder, 15% cobble, 5% gravel, with sand deposits at downstream point bar.

BANK CHARACTERISTICS: Consistent well defined and stable banks rise abruptly 0.7 to 1.0 meter height.

CHANNEL MORPHOLOGY CHARACTERISTICS: The channel is partially entrenched by a small hill on the upper right bank, becomes confined and deep centered before spreading to over 50 meters wide at a small side channel in the lower portion of the reach on the right bank. The reach ends with a shoot rapid entering a deep corner pool with undercut banks.

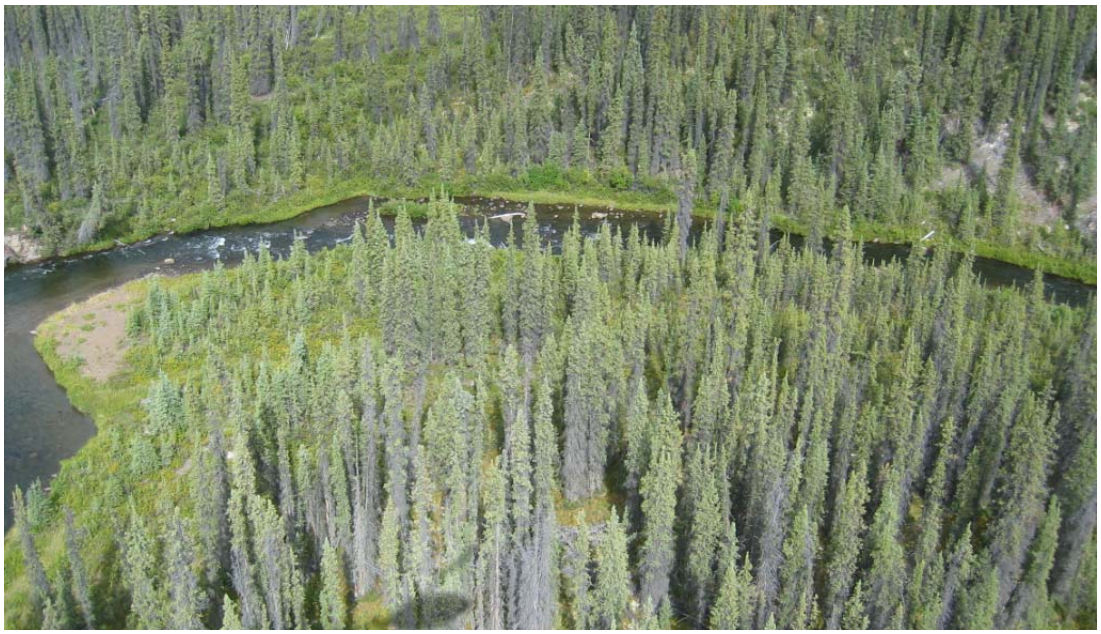


Photo 8: Reach R8 sample site, flowing right to left. August, 2006.



Photo 9: Site R6A pool immediately downstream of the previous photo during 2007 sampling. This corner pool is the lower end of the reach and the location used to capture Arctic grayling samples.

SITE: B1 Blind Creek

UTM: down stream end 05 36 680 E, 68 96 005 N
Site Location: reach starts immediately upstream of the bridge and extends upstream for 100 meters, reaches below the bridge have been used for fish sample collections.
Date Sampled: August 14 and 15, 2004 August 19 and 20, 2005
August 18 and 19, 2006 August 17 and 18, 2007

CHANNEL CHARACTERISTICS:

Surveyed Length:	350 meters
Average Channel Width:	15.5 meters
Average Wetted Width:	14 meters
Average Depth:	0.7 meters
Average Velocity	0.4 meters per second
% Pool, Riffle, Run / Glide:	100% glide
Cover	Fine organic debris, cut banks (up to 40%), small woody debris against shore and a beaver lodge
Overhead vegetation	10% cover
Riparian Vegetation	Alder, willow with some spruce, with high bush cranberry, raspberry and cinquefoil adjacent

BED MATERIAL:

Sand silt and organic debris overlaying 60% cobble, 40% gravel.

BANK CHARACTERISTICS: Shallow point bars occur opposite of cut and eroding banks near gentle corners. Cut banks rise between 1 and 2 meters to an open flood plain.

CHANNEL MORPHOLOGY CHARACTERISTICS: Uniform channel with a deep side opposite of a side of deposition. Flows in Blind Creek were slightly higher in 2006 than during 2005 sampling which were very similar to those encountered during 2004.



Photo 10: Blind Creek, the salmon enumeration weir was located 120 meters downstream from the bridge. Note the adult chinook salmon in the foreground



Photo 11: Blind creek downstream of the weir site and near active chinook salmon redds, August 19, 2006

SITE: V8 Vangorda Creek

UTM: down stream end 05 84 790 E, 69 00 606 N
Site Location: reach starts immediately upstream of a small foot bridge that crosses the creek at the site of the town of Faro sewage discharge pipe crossing and extends upstream for 100 meters
Date Sampled: August 14 and 15, 2004 August 17 and 18, 2005
August 17 and 18, 2006 August 15,16,17 and 23, 2007

CHANNEL CHARACTERISTICS:

Surveyed Length:	100 meters
Average Channel Width:	6.0 meters
Average Wetted Width:	3.3 meters
Average Depth:	0.5 meters
Average Velocity	1.5 meters per second
% Pool, Riffle, Run / Glide:	80% riffle (almost rapid), 20% eddy and side pools
Cover	Over head vegetation, large and small woody debri, flood washed shrubby vegetation and boulder pools
Overhead vegetation	20% cover
Riparian Vegetation	Alder and willow with occasional spruce and poplar

BED MATERIAL: 50% boulder, 20% cobble, 15% gravel, 15% sand with occasional bedrock outcrop in upper part of reach. Most substrates loosely consolidated and highly silted. Creek channel was heavily modified by a high water event this season.

BANK CHARACTERISTICS: Well defined channel with newly eroded, but stable, banks that rise gently to a maximum of 2 meters. A small area of bedrock confines the channel on the left bank at the upstream end of the reach.

CHANNEL MORPHOLOGY CHARACTERISTICS: Very little meandering in an entrenched valley, unconsolidated materials from 2004 have been washed out and boulders protrude in most of the channel.



Photo 12: Looking upstream at the sample reach from the new bridge crossing Vangorda Creek at site V8, August 2006.



Photo 13: Site V8 in 2007, note that the old sewage force main has been removed and the turbidity of the creek is much lower than in any of the previous years .

Appendix 10

BCG Project Memorandums

A. Summary of Seepage Event and Remediation Efforts
B. Supplementary Memo on Channel Rehabilitation Needs, Faro Creek Diversion Channel
C. Remediation Construction Summary, Faro Creek Diversion Channel

BGC ENGINEERING INC.

AN APPLIED EARTH SCIENCES COMPANY

1605, 840 – 7 Avenue S.W., Calgary, Alberta, Canada. T2P 3G2
Phone (403) 250-5185 Fax (403) 250-5330

PROJECT MEMORANDUM

To:	**Anvil Range Mining Corp./INAC/ Deloitte & Touche**	**Fax No.:**	**By email**
Attention:	**Dana Haggar/Mike Nahir/Wes Treleavan**	**CC:**	**Gerry Ferris**
From:	**Jim Cassie, P.Eng.**	**Date:**	**May 23, 2007**
Subject:	**Summary of Seepage Event and Remediation Efforts Faro Creek Diversion Channel, Faro Mine, YT**		
No. of Pages (including this page): 6 plus figures		**Project No:**	**0257-045-01**

1.0 INTRODUCTION

On Wednesday, May 16, 2007, BGC Engineering Inc. (BGC) was notified of some seepage discharge occurring at the toe of Faro Creek Diversion Channel (FCDC). Following direction from site management (Messrs. Haggar, Treleavan and Stevens), Mr. Jim Cassie, P.Eng. traveled to Faro Mine to assist with the assessment and remediation measures regarding the channel seepage. The memo provided herein provides a summary of the seepage event, reviews potential mechanisms for the seepage and provides recommendations for future work at the seepage location.

2.0 SUMMARY OF EVENTS

The following points outline the chronology of events, based on information collected from site staff, photos and video forwarded to BGC, along with observations made on site by BGC.

Wednesday – May 16th

- Significant seepage discharge observed in the morning by Faro environmental staff during routine site inspection trip. The discharge was occurring from the toe of the FCDC roadway embankment into the Faro Creek Valley, as shown on Figure 1. Dana Haggar and Deloitte staff notified of seepage event.
- At approximately noon (MDT), Jim Cassie notified of the seepage event. Following direction was provided verbally and then later by email:
    1. Water in the channel should be controlled or lowered, either by diversion or side breach if possible.
    2. Ice should be removed from the channel to locate seepage inlet location, if possible.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

3. Measures should be implemented to plug seepage location when so located, if possible.
4. Continue to monitor seepage quantity and any associated slope deformation.

- Photos and video of the discharge emailed to Jim Cassie around 12:30 pm (MDT). Site staff estimated initial seepage discharge at 60 to 70 l/s. Mr. Cassie makes travel arrangements to Faro Mine.
- Mine site staff undertake a number of measures during the day to mitigate the seepage as noted below:
    1. Removed ice blockage from the channel which reduced the water level in the channel. This reduced the toe seepage quantity.
    2. Conducted some salt/conductivity tracer tests in the channel bottom. Located the seepage inlet point based on test results. Seepage location appears to occur almost directly adjacent to the upper end of the GCL liner previously placed in the channel bottom.
    3. Placed and compacted some fine-grained soil into the channel bottom at the seepage inlet location. Seepage quantity was again reduced.
- Jim Cassie left Calgary at 6:55 pm (MDT) bound for Whitehorse. Arrived Whitehorse at 10:00 pm (PDT).

Thursday – May 17th

- Jim Cassie arrived at site at approximately noon. Snowstorm in the morning prevented earlier arrival in Faro.
- Jim Cassie and Dana Haggar observed seepage discharging at toe – site staff estimates perhaps 1/10th of the flow occurring from Wednesday morning (Figure 2).
- Seepage is located approximately 0.9 km northeast of the FCDC corner (584947/6915573). Following GPS locations were determined (NAD27 coordinates) for the two noted features:
    - Discharge location at toe: 585404/6916358.
    - Leak location in FCDC: 585425/6916352.
- Diversion berm and 24 inch diameter diversion pipe placed into channel bottom to divert channel flow around seepage location marked with stake (Figure 3).
- Excavated bottom of channel around noted seepage location. Abundant ice noted on channel bottom (below waterline) and in the substrate below the channel (Figure 4). Impractical to properly excavate material around seepage discharge location due to ice inclusions, soft material and remaining water flow in the channel.
- Plug installed into the bottom of the FCDC where site staff confirmed seepage location with salt test. Approximately 30x50 lbs bags of Pure Gold (CETCO product) bentonite grout followed by 40X50 lbs bag of Pure Gold bentonite chips. In addition, piece of GCL (4.5 m wide by 8 m long) placed over the bentonite plug (Figure 5). Placed some armour rock over top of the GCL patch but appeared pretty "soft" in the seepage location.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

- Seepage after placement of plug appeared greater than during that morning (Figure 6). Decided to wait overnight to see if plug effective upon saturation.

Friday – May 18th

- Dana Haggard and Jim Cassie inspected the seepage discharge at 7:30 am. Flow amount has increased (perhaps doubled) over amount seen last night at 6:00 pm. Seepage at toe does not include any tan brown sediment but some gray sediment (perhaps bentonite?) appears in the discharge.
- Remedial plug does not appear to be effective (perhaps was washed out due to seepage gradient) and decision made to construct channel by-pass to reduce hydraulic head in the channel (which would certainly increase in the future as freshet will occur in the next two weeks or so).
- Dana Haggar and Jim Cassie discuss plan with Greg Stevens over the phone. Staff getting organized with work preparations.
- Initially placed 40 feet of 36 inch diameter CMP into channel bottom, along with sand bags, GCL and soil deflection berm. Majority (~75%) of channel flow diverted over seepage location. Still significant toe seepage occurring though.
- Spotted circular whirlpool in channel bottom (Figure 7) where basal flow was disappearing. Undertook second salt conductivity test and confirmed seepage source. Noted several large ice inclusions (20 to 30 cm in diameter) within areas of the channel base, as shown on Figure 8.
- Decided to extend culvert with another 20 foot section to get discharge further down the channel bottom and away from the seepage inlet point.
- When culvert was extended, saw basal channel flow seeping into the upstream face of the road dike (Figure 9). Excavated into seepage inlet and observed frozen schist bedrock with ice inclusions. Could stick hand into initial part of the seepage inlet but not able to observe completely.
- Decided to place plug into seepage inlet. Placed ten pails (50 lbs) of Volclay pellets (bentonite) along with five bag of powdered bentonite. Also placed piece of GCL across the inlet. Basal flow level in channel began to increase indicating that plug was effective initially (Figure 10). Then backfilled over the plug with soil, along with compaction with the hoe bucket. Toe seepage was significantly reduced (approximately same quantity as end of Thursday) immediately afterwards.
- Dana and Jim discussed final measures to be implemented as outlined below:
    - Complete armour placement on diversion berm at the inlet to the 36 inch CMP.
    - Place second pipe (likely 24 inch plastic pipe) beside CMP, along with second diversion berm, to capture majority of basal flow that occurs past the initial diversion berm.
    - Place armour material over plug backfill in case on overflow during freshet.
    - Continue to monitor seepage amount at toe, along with any signs of roadway embankment deformation or settlement.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

- Inspect and maintain diversion works for next several weeks to months until final repair can be properly undertaken in June or July.

- Mr. Cassie left the site at approximately 4:30 pm (PDT).

3.0 SEEPAGE MECHANISM

Channel seepage was occurring on the channel cut slope in a "well-developed" seepage conduit within schist bedrock in the foundation of the roadway embankment.

The seepage occurred in an area where some seepage had always occurred, perhaps indicating the relatively high conductivity of local bedrock (potentially frost-affected). Anecdotal information from site indicates extremely cold winter temperatures coupled with low snowfalls in the early portion of this winter. This would have resulted in extensive frost penetration rates and overall depth. Deep frost penetration proximal to water source would have created idea conditions for frost heaving, even within the upper portions of the bedrock. Extensive winter cold also lead to ice blockage within the FCDC (in fact, all channels experienced excessive icing conditions this winter), which increased water levels in the channels due to ice blockage. Excess head from increased channel levels was perhaps the initiating condition, in combination with seepage conduit exacerbated by frost heaving of the bedrock from the winter cold.

This postulated seepage mechanism is supported by the following evidence:

1. On-going seepage discharge at the toe even with low water levels in the channel.
2. Frozen schist bedrock noted at seepage inlet area, along with ice inclusions in the bedrock.
3. Lack of sediment in the seepage discharge water due to seepage occurring through bedrock (seepage but not piping).
4. No visible signs of embankment instability (sloughing, erosion, settlement, etc.) from piping.

As such, the root cause of the seepage relates to the impact of extreme winter conditions upon an informally-designed diversion channel. In addition, the seepage occurred in the channel section just before where liner had been previously placed. The seepage conduit will likely remain in the roadway foundation and proper repair measures will be required in the future.

4.0 SUMMARY AND RECOMMENDATIONS

Information at hand suggests that seepage occurred through the ice-affected bedrock located beneath the road embankment. Given that seepage is occurring through bedrock, there is only a small chance of embankment piping and related deformation. Monitoring of the situation must continue until a proper repair can be carried out.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

In order to move forward, the following recommendations are provided for consideration:

1. Faro Mine specific climate information (from the weather station on the Faro dumps) should be forwarded to BGC in order to assess the freezing index (FI) and snow cover depth profile for the winter of 2006-07. These values should be compared to long term mean values to validate concept of extreme cold of last winter.
2. Continue to monitor channel flow and toe seepage during the next 4 to 8 weeks, until proper repair is implemented.
3. Undertake proper repair of the channel section once frost has left the ground. Ice-free substrate will be required to facilitate proper channel repair.
4. Design of the final seepage repair measures can be field engineered between BGC and Faro site staff but would likely include the following elements:
    a. Channel flow would have to diverted in its entirety, either by use of diversion pipe (usually subject to some leakage at inlet), complete channel breach into Faro Creek Valley or upstream side diversion channel.
    b. All loose and soft materials would be excavated from the channel and wasted.
    c. If practical, slush grouting may be required on the exposed bedrock surface in the area of the seepage location. Alternatively, bedrock grouting into the conduit may be required.
    d. Structural backfill (sand and gravel) compacted to 100% SPMDD would be placed back into any excavations undertaken to remove softened materials and re-establish channel grade.
    e. Appropriate liner material (GCL or BGM) would be installed into channel bottom and side slopes in order to cut off any further potential for seepage under the road embankment.
    f. Rounded cobbles would be placed over the liner for erosion control.
5. The FCDC is an informal channel with no formal design or specific design criteria to the writer's knowledge. BGC recommended that some basic hydrological data be collected on the channel in Section 5.2.5 of BGC's 2006 Annual Inspection Report. Following from that data collection, the role of the FCDC within the next few years of care and maintenance, along with its role in the closure phase, should be evaluated in detail. Following from that assessment, it may be necessary to undertake final design of an upgraded diversion channel to meet the selected design criteria.

In addition, numerous miscellaneous bags and pails of powdered bentonite, bentonite chips and bentonite grout and a roll of GCL were used for the recent repairs. The Faro Mine site should undertaken an inventory of such repair materials and have adequate stock of said materials on-site for emergency repairs such as this.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

5.0 CLOSURE

The assessment provided herein is for the exclusive use of Deloitte and Touche and INAC. The information and proposed seepage mechanism are based on third-party observations and measurements, along with selected site observations by BGC. No intrusive investigations were undertaken. As such, the recommendations provided herein are based are based on the information at hand. Other field investigations or seepage observations that derive additional information should be forwarded to BGC for consideration against the postulated seepage mechanism.

Please contact the undersigned should you have any questions or comments on the information provided herein. In addition, please provide BGC with direction should you wish to proceed with the recommendations provided by BGC.

Yours truly,
BGC Engineering Inc.
per:



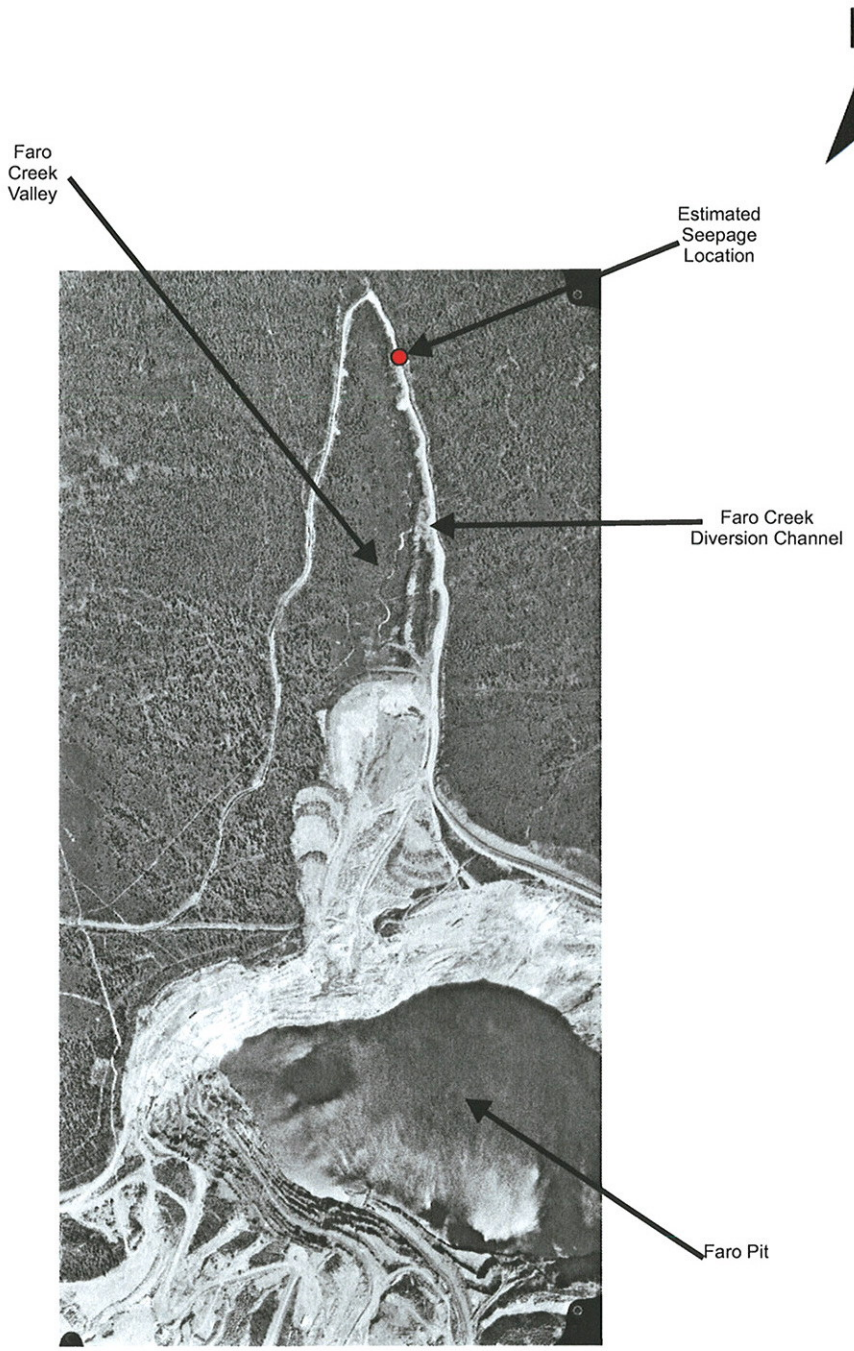
James W. Cassie, M.Sc., P.Eng.
Specialist Geotechnical Engineer

Attachments: Figures 1 to 10

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

FIGURES

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.



0 500 1000

Metres

Note: scanned from original aerial photo G0307502-5-154
Dated: 03/07/25

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	As Shown	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: FCDC SEEPAGE LOCATION

PROJECT No.	DWG. No.	REV.
0257-045-01	1	0

Thursday, May 17, 2007



Toe discharge amount at 11:52 am

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	2	0

Thursday, May 17, 2007



Plastic diversion pipe installed across seepage location, looking in the downstream direction.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

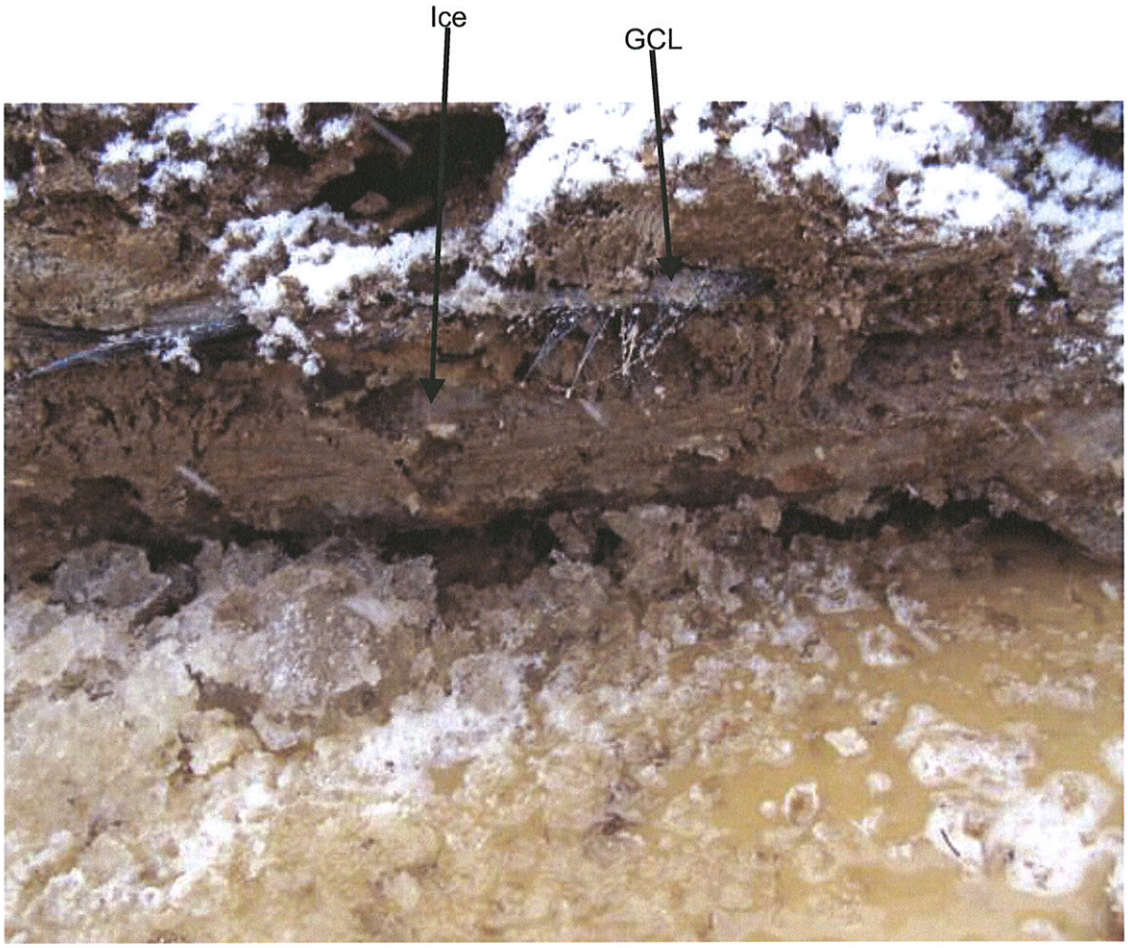
BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	3	0

Thursday, May 17, 2007



Ground ice in substrate below previously installed GCL.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	4	0

Thursday, May 17, 2007



View of GCL patch placed over seepage location, looking in the upstream direction.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	5	0

Thursday, May 17, 2007



View of toe seepage at 5:03 pm.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	6	0

Friday, May 18, 2007



Basal flow disappearing into seepage location in channel.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	7	0

Friday, May 18, 2007



Large ice inclusion within channel base material.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	8	0

Friday, May 18, 2007



Channel flow disappearing into frozen schist bedrock on the upstream face of the retention embankment.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

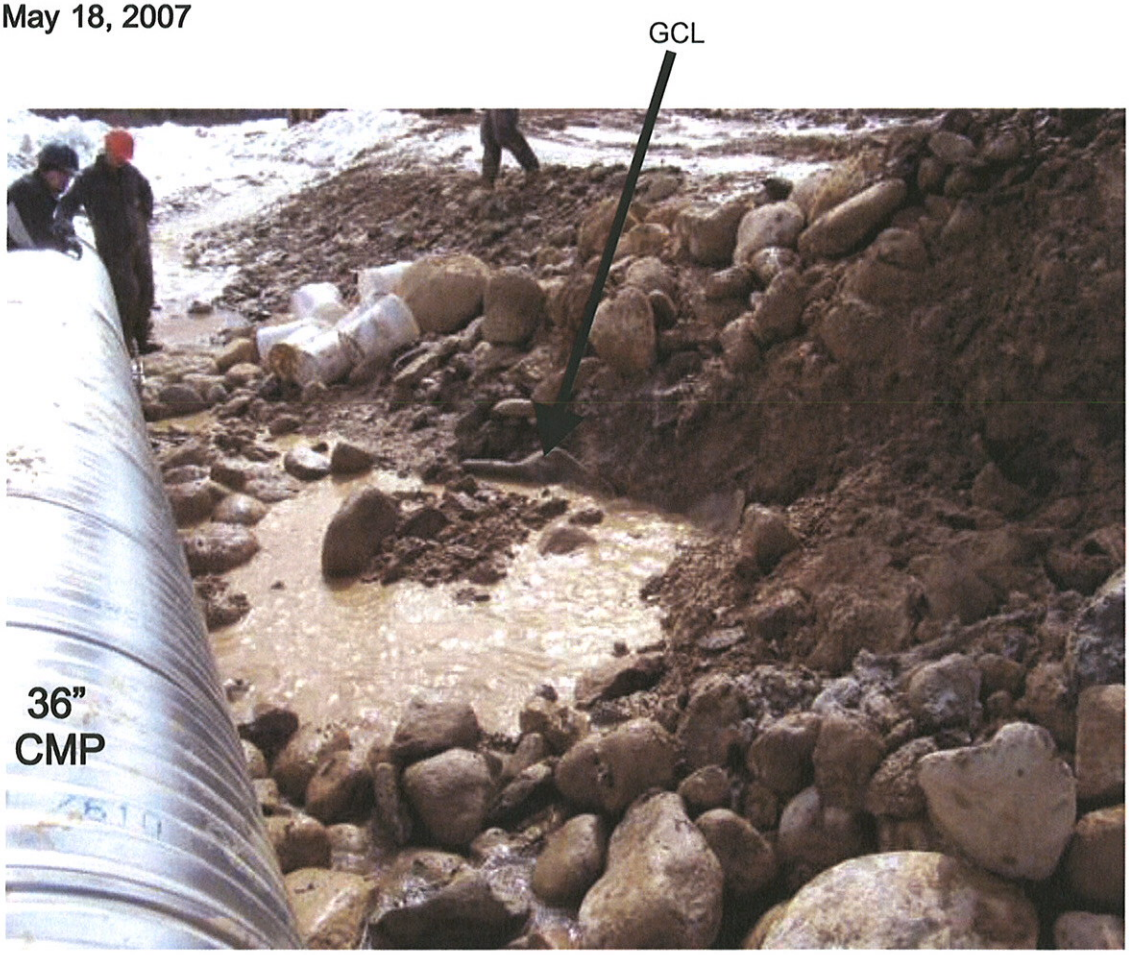
BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	9	0

Friday, May 18, 2007



Water in channel being impounded against GCL/bentonite plug.

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA STATEMENTS CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

SCALE:	N/A	DESIGNED:	JWC
DATE:	MAY 2007	CHECKED:	JWC
DRAWN:	SLF	APPROVED:	JWC

CLIENT: Deloitte & Touche

BGC Engineering Inc.
AN APPLIED EARTH SCIENCES COMPANY
Calgary, Alberta. Phone: (403) 250-5185

PROJECT: FCDC SEEPAGE ASSESSMENT

TITLE: SELECTED SITE PHOTOS

PROJECT No.	DWG. No.	REV.
0257-045-01	10	0

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
1605, 840 – 7 Avenue S.W., Calgary, Alberta, Canada. T2P 3G2
Phone (403) 250-5185 Fax (403) 250-5330

PROJECT MEMORANDUM

To:	**Anvil Range Mining/Deloitte &Touche/ Brodie Consulting**	**Fax No.:**	**By email**
Attention:	**Dana Haggar/Doug Sedgwick/ Wes Treleaven/John Brodie**	**CC:**	**By email**
From:	**Jim Cassie, P.Eng.**	**Date:**	**June 28, 2007**
Subject:	**Supplementary Memo on Channel Rehabilitation Needs Faro Creek Diversion Channel Faro Mine, YT**		
No. of Pages (including this page): 18		**Project No:**	**0257-045-03**

1.0 INTRODUCTION

On May 16, 2007, a seepage event initiated at the toe of the upper section of the Faro Creek Diversion Channel (FCDC). The chronology, assessment and preliminary recommendations for repair are summarized in BGC (2007). Since that time, BGC has returned to the Faro site and undertaken further inspection and assessment work on the channel rehabilitation. In addition, some recent sloughing and surficial instability has occurred proximal to both sides of the channel.

This current memo summarizes background information on the FCDC, details of the June investigation work, a review of design considerations for the channel, suggested methodology for the repair design and some approximate cost estimates for repair options.

2.0 BACKGROUND INFORMATION/PREVIOUS ASSESSMENTS

The FCDC passes clean water from the original Faro Creek, above and around the main Faro open pit before it is discharged into the north fork of Rose Creek. The diversion channel is composed of two main segments:

- The upper 1.1 km segment that runs parallel to the Faro Creek Valley (north-south); and
- The 1 to 1.1 km long (before dropping down the Rose Creek Valley) segment that run above the northeast wall of the Faro open pit.

These two sections then lead into a steeper section that drains into the North Fork Rose Creek.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

To BGC's knowledge, no design criteria, design documents, construction information or as-built reports are available on the FCDC. In addition, no design criteria for this diversion are mentioned in any Water Licence clauses.

The FCDC is known to leak and is partially the cause of slope retrogression occurring above the Faro pit wall, as noted in various Golder reports on the pit wall stability. Work performed by site staff in 2003 included the installation of a geocomposite liner (GCL) into selected portions of the FCDC, partially in an effort to reduce seepage quantities from the channel. No channel measurements were available to quantify the improvements potentially incurred through this work.

The upper sections of the channel are original dating back to 1968-69. The 1996 ICAP (RGC 1996) estimated that mean annual flow in the channel was 4.3 million m^3. This document also noted the following hydrological quantities for this channel:

- 1:500 year event – 27 m^3/s.
- ½ PMF event – 75 m^3/s.
- PMF event – 150 m^3/s.

Denholm (2002) provided a summary of information on the FCDC, along with estimates of expected seepage and related water treatment costs. Based on the information and assumptions provided therein, and based on a 10 year time frame (approximate care and maintenance and permitting period), he recommended that upgrading of the channel should be undertaken. He did note that assumptions and costs would need to verified before finally accepting this recommendation.

As part of the closure scoping work, Golder Associates (2002) looked at six conceptual options for relocation of the FCDC and came up with the following options that are relevant to the discussion herein:

Option No.	Comments	Estimated Cost
1. Do nothing	Self-explanatory	N/A
2 Upgrade existing FCDC	Line (using GCL) entirety of both the FVI and the FCDC to reduce seepage.	$1.32 million
5. Upper catchment interceptor with FCDC upgrade	Place interceptor channel in the upper watershed to redirect water away. FCDC and FVI also require upgrading.	$2.46 million
6. Upslope interceptor	Construct new diversion channel to intercept Faro Creek.	$2.71 million

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

Nhc (2004) noted that Faro Creek was un-gauged (at that time) and that channel gauging for flood forecasting was not recommended. The report also notes that Faro Creek has a drainage area of 16 km^2 at its confluence with North Fork Rose Creek. Table 5 within nhc (2004) provided the following flood estimates for the FCDC just above North Fork Rose Creek (referred to as Location 1):

- Mean annual – 1.9 m^3/s.
- 1:100 year – 9.4 m^3/s.
- 1:200 year – 11 m^3/s.
- 1:500 year – 14 m^3/s.
- 1:1000 year – 16 m^3/s.

The estimated flood quantities are significantly lower than the values referred to earlier in RGC (1996). This fact is either related to updated hydrological information or a more accurately defined watershed area.

Two staff gauges were installed into the FCDC last month by Lebarge Environmental, as recommended by BGC in their 2006 annual report on the Faro site. Initial measurements by LeBarge on June 7th, 2007 indicated a flow quantity of 0.66 m^3/s at the top of the FCDC and 0.53 m^3/s at the bottom, a loss of approximately 20% of the incoming flow (assumably due to seepage losses). Flow depths observed in the channel on June 13 and 14, 2007 (after freshet) ranged from approximately 0.3 to 0.6 m by visual estimation.

These previous assessments are based on a variety of assumptions, but their cost estimates and conclusions are useful context for the issues reviewed herein.

INVESTIGATION RESULTS

During Mr. Cassie's annual Faro inspection visit of June 13, 2007, two testpits were excavated in the canal dike on the downstream side of the seepage location. One test pit was excavated into the crest and one was excavated in the downstream slope. Following is a brief summary of the conditions encountered in the two test pits:

Test Pit 1 (on the dike crest)

0 – 1.3 m Sand and gravel (sulphidic waste fill), some silt and cobbles, rust brown, damp to wet.

1.3 – 1.5 m Sand and silt (till fill ?), some gravel, dark gray, frozen, V_x/V_r = 1 to 3%.

1.5 m End of test pit. Refusal due to frozen nature. No water seepage or slough noted.

Photo 1 provides a record of the test pit.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

Test Pit 2 (on the downstream slope)
Depths are very approximate and referenced to the dike crest.
Due to the unstable nature of this pit, no one entered the pit for detailed logging.
0 to 1.5 m Sulphidic waste, rust brown, damp to wet.
1.5 to 2.5 m Other fill, brownish grey, dry to damp (likely frozen).
2.5 to 3 m Organic soil (native), very dark grey.
Noted significant void within dike in the back of the test pit.
Also encountered significant seepage with the test pit.
Photos 2 and 3 show some of the features.

The void was a significant finding which indicated that piping of the dike fill had occurred. No surface deformations occurred due to the arching strength of the frozen dike fill. Following from that observation, numerous surface cracks occurred as the backhoe attempted to traffic over the void area (Photo 4).

BGC collected one sample of the sulphidic waste material from the stockpile in the Faro Creek valley. This sample was submitted for basic geotechnical index testing and the results are attached. The sample was described as sand (57%), gravely (26%), some silt (7%) and trace clay (10%). This material would likely be classified as frost-heave susceptible. Standard Proctor Maximum Dry Density was 2,085 kg/m^3 with an optimum water content of 11.0% and a natural moisture content of 12.1%.

Inspection of toe area of the containment dike indicated soft and saturated conditions (likely from seepage) approximately 60 m north of the upstream limit of the May 16th seepage location.

3.0 DESIGN CRITERIA

Background information on the channel appears to indicate the channel was informally constructed without specific design criteria or construction control for the following:

- Design flow quantity and appropriate freeboard.
- Related flow velocities and associated erosion protection armouring within the channel.
- Allowable channel seepage quantity.
- Static and seismic stability (likely not an issue for the low containment dikes).

To BGC's knowledge, no site investigation has ever been undertaken for the FCDC. It would be possible to understand and the hydraulic capacity of the existing channel following a detailed survey of the channel. Without any characterization of the subsurface conditions and current dike materials, it would be difficult to accurately quantify the seepage and stability of the existing channel. Two staff gauges installed by last month will give some indications of the channel seepage quantity, once additional channel flow information is collected.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

Given that there is no formal design requirements for the diversion channel, any subsequent rehabilitation work could follow one of two potential approaches:

1. Rehabilitate without any explicit design criteria, which would be consistent with the remainder of the FCDC.
2. Rehabilitate to appropriate design criteria for the care and maintenance period.

The first approach is simpler to implement but comes with currently unquantifiable risks which may not be appropriate for the stakeholders. The second approach is more complex and requires more assessment work but potentials risks would be understood. The second approach, if implemented, would also likely require the rehabilitation of the entire channel.

4.0 REPAIR ELEMENTS AND STEPS

BGC would recommend, that at a minimum, approximately an 85 m length of the channel should be repaired to prevent additional seepage and piping concerns in the near future. Alternatively, it is also possible that only a 25 m length of the channel be repaired, but it is likely that more potential channel seepage and piping events would exist with this shorter repaired section. The cost of the expected repair, along with potential risks, need to be considered by Deloitte (and other Faro stakeholders) when making a final decision on the repair length.

In order to undertake the repair of the seeping section, the following construction steps are likely required to achieve repair of either the 25 or the 85 m length:

1. Diversion channel needs to be diverted upstream of the repair section. Options include dike breach into the Faro Creek valley or digging new channel on the upstream side.
2. Remove and stockpile all rip rap from the existing channel bottom and sides.
3. Excavate dike fill over the void area (25 m length) down to the base of the void (as a minimum depth of excavation). Excavation should proceed down to competent subgrade, as decided by Field Engineer (alternatively, geotextile reinforcement could be used over weaker subgrade). Place and compact appropriate granular fill (well-graded with <10% fines content) in 0.75 (initial) to 0.3 (higher up) m thick lifts.
4. Examine bottom of channel section and excavate/replace any soft/weak substrate in the channel section. Excavate and grade substrate to smooth and consistent lines for liner placement.
5. Place synthetic liner into the channel bottom. For this application, it is suggested that a bituminous geomembrane liner (BGL) be used. The material is quite robust and can be easily field repaired with simple tools and equipment.
6. It will be necessary to place the upstream edge of the liner into an anchor trench to prevent having a loose upstream edge (will be caught by water and ice). In addition, the upstream anchor trench should attempt to cut-off shallow water flow just below the liner element.
7. Rip rap (from stockpile and some new hauled up to repair location) will then be placed gently over the BGL within the wetted area of the channel section.
8. Channel diversion can be reconstructed so that water flow resumes within the channel.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

Appropriate field engineering and monitoring will be required to complete this project. A brief as-built report summarizing steps taken, materials used and field survey results should be provided.

It is suggested that the repair work be undertaken between late July and early September when the substrate is thawed and channel flows are low.

5.0 COST ESTIMATES

In order to facilitate decision making, approximate cost estimates were prepared for the 25 and 85 m lengths of channel repair. In both cases, a 25 m section of the containment dike will need to be excavated and replaced to remove the noted void from the dike interior. Tables 1 and 2 provide estimates of the quantities and costs. In round values, it is expected that 25 m repair would cost approximately $100,000 while the longer (and recommended) 85 m length would cost approximately $140,000.

Previous assessment work have provided some costs for the relining the entire FCDC which amounted to $1.32 million. If additional assessment and investigation work was undertaken, it is possible that only selected sections of the FCDC would require upgrading, since some of the channel has now been lined. For illustrative purposes, Table 3 provides a cost estimate to upgrade (new dike crest fill and channel liner) two 300 m long sections within the FCDC. Based on the noted assumptions, this upgrade would be expected to cost $0.5 million, significantly less than the complete upgrade of the channel.

This example was proposed to illustrate that an intermediate solution between localized repair and complete upgrading may be an effective means to manage risk and future problems. Unfortunately, some basic data collection and assessment work would need to be completed to finally determine what critical upgrading should be undertaken.

6.0 SUMMARY AND PATH FORWARD

1. A void was encountered within the dike fill proximal to the May 16th seepage area. BGC recommends that an 85 m long section be repaired this summer (during low flow period). A minimal repair length of 25 m is also possible, but not recommended.
2. Sloughing, slumping and seepage events are on-going with the channel. These events are may be indicative of risks with the channel that are not currently understood or possibly due to the age of the informal channel.
3. Survey sections of selected reaches of the FCDC should be collected in July. Following from that, preliminary estimates of the channel hydraulic capacity should be undertaken to understand the hydrological risks of channel overtopping.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

4. Following that preliminary assessment, BGC recommends that a one day risk assessment meeting be held with representatives from Anvil Range, Deloitte, INAC and the FMCPO. During this meeting, an attempt will be made to assess the risks and related consequences. The following risks would be qualitatively assessed; hydraulic capacity, seepage and piping and stability and sloughing. Following from that review, some path forward regarding the future of the FCDC could be formulated in terms of further assessment work and/or the need for channel rehabilitation or possible relocation.

7.0 LIMITATIONS AND CLOSURE

BGC Engineering Inc. was requested to undertake some site investigation to follow from their previous seepage assessment work in May 2007. Two shallow testpits were excavated as practical but frost and water conditions prevented extensive investigations. As such, the comments and recommendations provides herein are based on surficial observations coupled with only two shallow test pits. Noted subsurface conditions are valid only at the test pit locations. In addition, accurate in-pit logging of the subsurface conditions was not possible due to the unsafe access conditions. Variation is subsurface conditions should be expected.

BGC prepared this report for the account of Anvil Range Mining Corp. and Deloitte and Touche Inc. only. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a third party makes of this report, or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

As a mutual protection to our client, the public, and BGC, all memos, drawings and photos are submitted for the confidential information of our client for a specific project. Authorization for any use and/or publication of this memo or any data, statements, conclusions or abstracts from or regarding our memos, drawings and photos, through any form of print or electronic media, including without limitation, posting or reproduction of same on any website, is reserved pending BGC's written approval.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

We trust the information supplied herein is sufficient for your present purposes. Please contact the undersigned should you have any questions or comments or wish to continue the discussion on channel design.

Respectfully submitted,
BGC Engineering Inc.
per:



James W. Cassie, M.Sc., P.Eng.
Specialist Geotechnical Engineer

Reviewed by:



Gerry Ferris, M.Sc., P.Eng.
Geotechnical Engineer

Attachment – Tables and Photos

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

REFERENCES

BGC Engineering Inc., 2002. Scoping Review of Water Conveyance Canals and Spillways. Memo produced for SRK, July 25, 2002, 4 pages.

BGC Engineering Inc., 2007. Summary of Seepage Event and Remediation Efforts, Faro Creek Diversion Channel, Faro Mine, YT. Memo submitted to Anvil Range Mining and Deloitte and Touche, May 23, 2007, 6 pages plus figures.

Eric Denholm, 2002. Faro Creek Diversion – Upgrade Versus Leave-As. Memo produced for SRK, 3 pages.

Golder Associates Ltd., 2002. Conceptual Alternatives for the Relocation of the Faro Creek Diversion, Faro YT. Report prepared for Deloitte and Touche Inc., October 7, 2002, 10 pages plus figures.

Northwest Hydraulic Consultants, 2004. Hydrotechnical Study for Closure Planning, Faro Mine Site Area, Yukon Final Report. Report prepared for SRK Consulting Inc., June 2004, 29 pages plus appendices.

Robertson Geoconsultants Inc., 1996. Anvil Range Mining Complex, Integrated Comprehensive Abandonment Plan. November 1996.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

TABLES

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

Table 1 Cost Estimate for 25 m Length of Channel Repair

Item	Length	Width	Area (m^2)	Height	Volume (m^3)	Unit Cost	Item Cost
Channel diversion (assume local breach into FCV)						L.S.	$5,000
Excavation of dike fill below void	30	15		7	3,150	$3.00	$9,450
Geotextile for reinforcement in the base (possible cost savings if geotextile on-site can be used)	30	15	450			$12.00	$5,400
Replace dike fill with good quality granular compacted	30	15		7	3,150	$8.00	$25,200
Removal and stockpile and channel rip rip	30	10	300			$4.00	$1,200
Grading of channel bottom	30	12	360			$3.00	$1,080
Installation of geomembrane liner (BGL)	30	12	360			$25.00	$9,000
Placement of covering rip rap (mostly from stockpile and some new) over liner	30	10	300			$8.00	$2,400
Block/plug channel diversion						L.S.	$15,000
Survey support						L.S.	$3,000
					subtotal		$76,730
Contingency						20%	$15,346
Field engineering support (estimate 5 days)						L.S.	$8,500
					total		**$100,576**

** Refer to notes below Table 3.

Table 2 Cost Estimate for 85 m Length of Channel Repair

Item	Length	Width	Area (m^2)	Height	Volume (m^3)	Unit Cost	Item Cost
Channel diversion (assume local breach into FCV)						L.S.	$5,000
Excavation of dike fill below void	30	15		7	3,150	$3.00	$9,450
Geotextile for reinforcement in the base (possible cost savings if geotextile on-site can be used)	30	15	450			$12.00	$5,400
Replace dike fill with good quality granular compacted	30	15		7	3,150	$8.00	$25,200
Removal and stockpile and channel rip rip	90	10	900			$4.00	$3,600
Grading of channel bottom	90	12	1,080			$3.00	$3,240
Installation of geomembrane liner (BGL)	90	12	1,080			$25.00	$27,000
Placement of covering rip rap (mostly from stockpile and some new) over liner	90	10	900			$8.00	$7,200
Block/plug channel diversion						L.S.	$15,000
Survey support						L.S.	$4,500
					subtotal		$105,590
Contingency						20%	$21,118
Field engineering support (estimate 8 days)						L.S.	$13,000
					total		**$139,708**

** Refer to notes below Table 3.

Table 3 Cost Estimate for Assumed Upgrade to FCDC (two 300 m sections)

Item	Length	Width	Area (m^2)	Height	Volume (m^3)	Unit Cost	Item Cost
Channel diversion (assume local breach into FCV)						L.S.	$5,000
Excavation of dike fill below void	30	15		7	3,150	$3.00	$9,450
Geotextile for reinforcement in the base (some cost savings possible if material on-site can be used)	30	15	450			$12.00	$5,400
Replace dike fill with good quality granular compacted	30	15		7	3,150	$8.00	$25,200
Raise dike crest with compaction of fill	600	15		0.75	6,750	$8.00	$54,000
Removal and stockpile and channel rip rip	600	10	6000			$4.00	$24,000
Grading of channel bottom	600	12	7,200			$3.00	$21,600
Installation of geomembrane liner (BGL)	600	12	7,200			$25.00	$180,000
Placement of covering rip rap (mostly from stockpile) over liner	600	10	6000			$8.00	$48,000
Block/plug channel diversion						L.S.	$15,000
Survey support						L.S.	$9,000
					subtotal		$396,650
Contingency						20%	$79,330
Field engineering support (estimate 20 days)						L.S.	$30,000
					total		**$505,980**

Notes:

1. The unit rates provided within are based on other northern experience, calibrated with some experience at Faro Mine.
2. Actual unit rates by third-party contractor may be significantly different.
3. No allowance for rehabilitation of soft/weak locations in the channel subgrade have been made. Could be significant cost item if subgrade work required.
4. No allowance for extra water treatement costs were made as FCDC water will be directed into the open pit during repair work.
5. No allowances made for related assessment/design work or the preparation of as-built reports.

PHOTOS FROM JUNE 13, 2007

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.



Photo 1 View of Test Pit 1 on the crest.



Photo 2 View of conditions in Test Pit 2 on the downstream slope.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.



Photo 3 View of void in the back of Test Pit 2.



Photo 4 Surface cracking occurring on the dike crest.

This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

TEST RESULTS

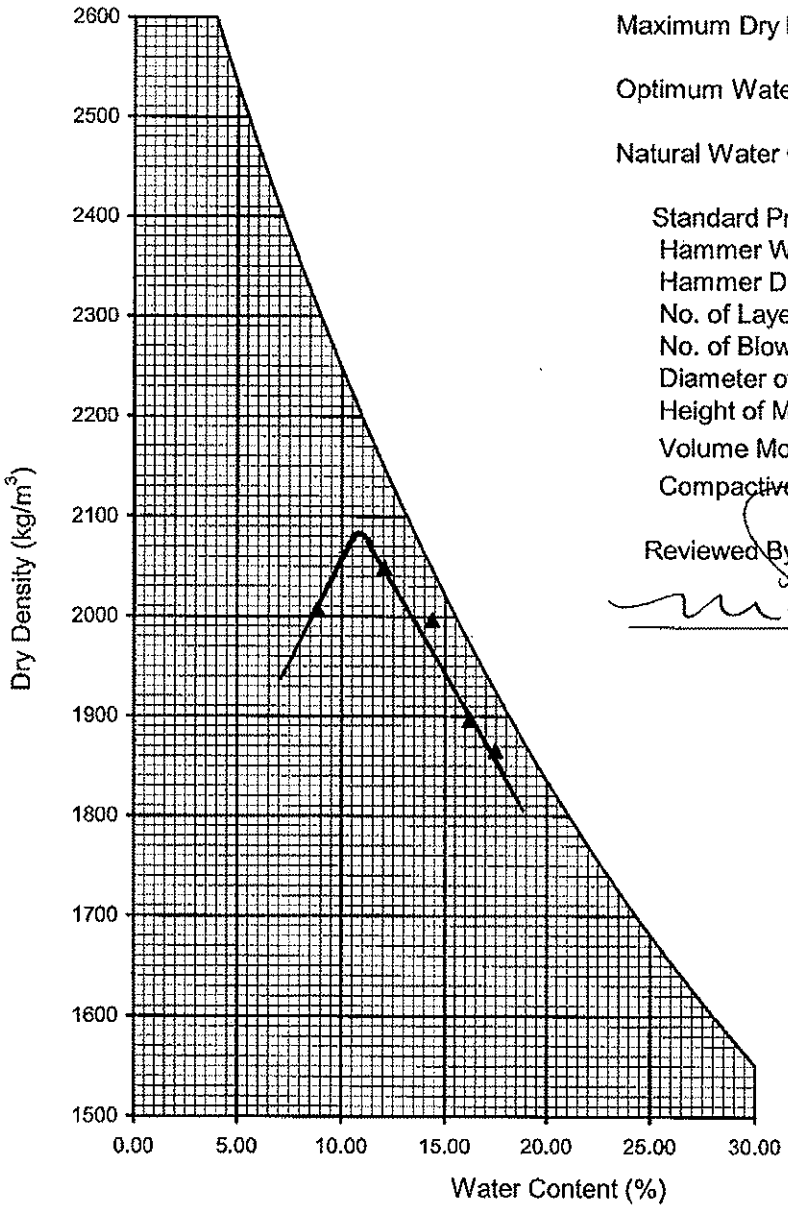
This communication is intended for the use of the above named recipient. Any unauthorized use, copying, review or disclosure of the contents by other than the recipient is prohibited.

EBA Engineering Consultants Ltd.

MOISTURE-DENSITY RELATIONSHIP

Project: BGC Soil Testing
Address: Faro Creek Diversion Ditch
Anvil Range Mine Near Faro
Project No.: W14101046
Date Tested: 15-Jun-07 By: JTP
Client: B.G.C. Engineering Inc.
Attention: Jim Cassie, M.Sc., P.Eng.

Sample No.: SA01
Date Sampled:
Sample Location: Anvil Range Mine
Sample Description: SAND - gravelly, some silt, trace of clay



Maximum Dry Density: 2085 kg/m^3

Optimum Water Content: 11.0 %

Natural Water Content: 12.1 %

Standard Proctor (ASTM D 698)

Hammer Weight:	2.5	kg
Hammer Drop:	305	mm
No. of Layers:	3	
No. of Blows / Layer:	56	
Diameter of Mould:	152	mm
Height of Mould:	116	mm
Volume Mould	2.125 x 10^{-3}	m^3
Compactive Effort	600	kJ/m^3

Reviewed By:

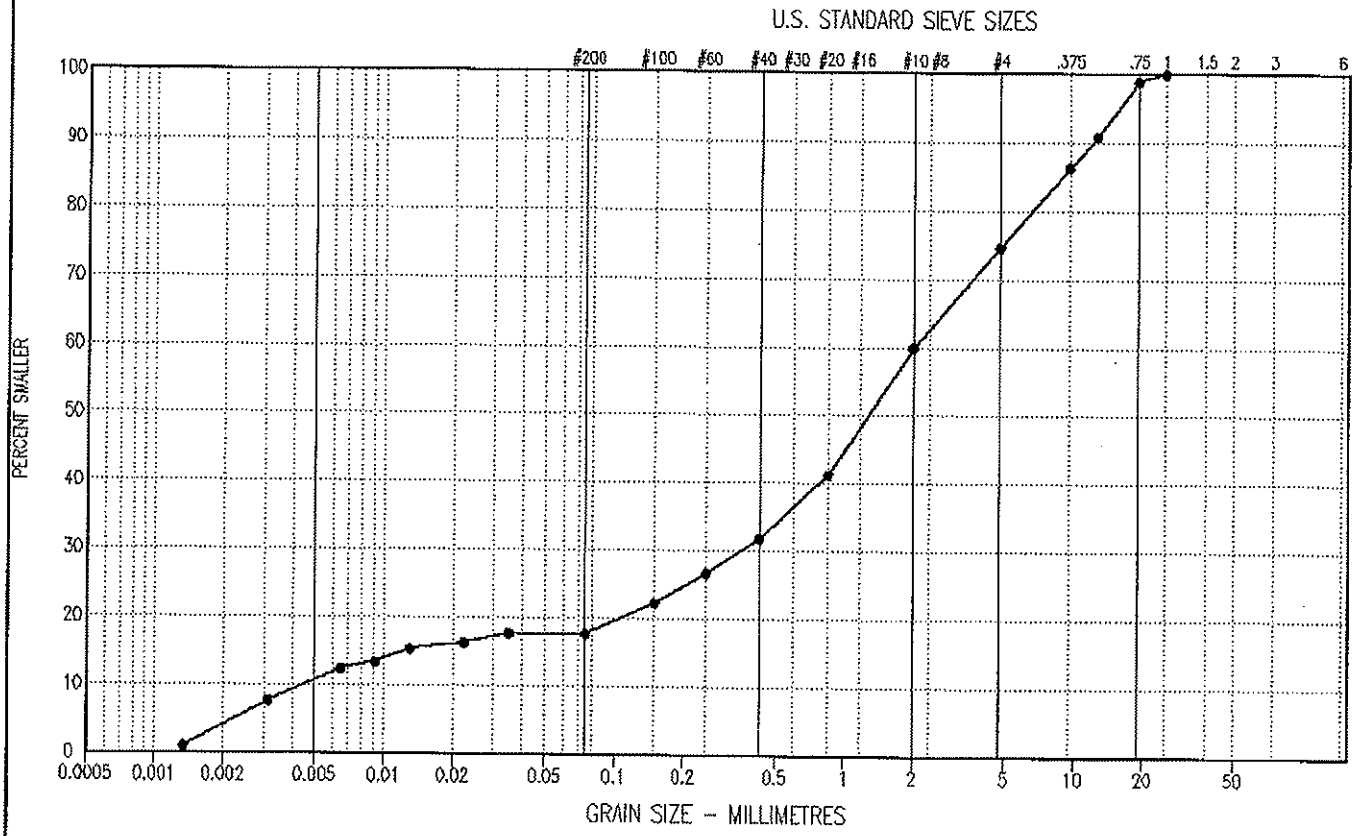
Data presented hereon are for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA.

The testing services reported herein have been performed by an EBA technician to recogr industry standards., unless otherwise noted. No other warranty is made. These data do r include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

EBA Engineering

PARTICLE SIZE – ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	SA01	0.00	10.0	7	57	26	–	13.8	SC

Project: W141-01046

Date Tested: 07/06/21 BY: MR

Tested in accordance with ASTM D422 unless otherwise noted.

Data presented hereon is for the sole use of the stipulated client. EBA is not responsible, nor can be held liable, for use made of this report by any other party, with or without the knowledge of EBA

The testing services reported herein have been performed by an EBA technician to recognized industry standards, unless otherwise noted. No other warranty is made. These data do not include or represent any interpretation or opinion of specification compliance or material suitability. Should engineering interpretation be required, EBA will provide it upon written request.

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Suite 500 - 1045 Howe Street, Vancouver, British Columbia, Canada. V6Z 2A9
Telephone (604) 684-5900 Fax (604) 684-5909

BGC PROJECT MEMORANDUM

To:	**Anvril Range Mining / Deloitte & Touche**	**Project No.:**	**0257-045-05**
Attention:	**Dana Haggar**	**CC:**	**Gerry Ferris, Jim Cassie**
From:	**Brad Russell**	**Date:**	**September 17, 2007**
Subject:	**Remediation Construction Summary, Faro Creek Diversion Channel** **Faro Mine, YT**		
No. of pages (including this page):	**23**		

INTRODUCTION

On May 16, 2007, a seepage event initiated at the toe of the upper section of the Faro Creek Diversion Channel (FCDC). The chronology, assessment and preliminary recommendations for repair are summarized in BGC (May 2007). BGC undertook further site inspection and assessment to prepare a methodology for the repair as outlined in BGC (June 2007).

This memorandum summarizes the conditions that were encountered in the field during the repair work, steps taken to complete the work and any changes that were encountered during the course of completing the work. The primary scope of the repair work was to:

- Excavate dike fill in the vicinity of the previously identified void. Replace the dike fill with compacted granular fill as much as practical;
- Replace any weak/soft substrate within the channel section;
- Place a bituminous geomembrane liner (BGL) within the channel section;
- Place appropriate channel rip rap over the liner to allow water to once again pass through the section.

A complete photographic record of the works undertaken is provided in Appendix I.

BGC was represented through the repair work by Mr. Brad Russell and Mr. Gerry Ferris. Mr. Russell was on-site throughout the entire duration of the work, September 5th to September 8th, while Mr. Ferris was on-site September 5th and September 6th.

Mr. Russell completed a Daily Inspection Summary for each day on-site. A copy of the previous days' form was provided to site personnel at the start of each shift. A complete record of these forms is provided in Appendix II.

SUMMARY OF WORK

Repair Location

For the duration of the work, a point within the channel had been designated as Sta. 0+00m and used as reference. A hand-held GPS unit was used to capture the approximate co-ordinates of Sta. 0+00m. In the UTM NAD83 datum, the co-ordinates were 6 916513m N, 585 295m E. Station references progress positively in the upstream direction.

Materials Used

A combination of fill materials and geotextile products were utilized to complete both the repair of the dike as well as the diversion channel.

The main fill material used in completing the dike repair was a 'pit-run' granular fill that could be classified as sandy gravel with trace cobbles and trace silt. Pit run fill consisted of subrounded particles at a maximum diameter of 200mm.

The main fill material used in the channel repairs was a granular fill that could be classified as sandy gravel with trace silt. The material was in fact the pit-run fill processed once to have the cobbles removed and as such was referred to as 'fines' during the construction. The material consisted of subrounded particles at a maximum diameter of 20mm.

Stabilization of the dike fill utilized AGES HS woven geotextile. The material featured high grab tensile strength as well as high tear strength.

The channel repair employed a bituminous geomembrane liner (BGL) manufactured by Soprema of type ES2. Adjacent sections of the liner were field welded in-place. Three rolls were on-site for the repair and all three rolls were used for the work. Serial numbers of each roll were documented as follows in the order they were used:

- Roll #1 – 07/000650
- Roll #2 – 07/00065

- Roll #3 – 07/000629

Preparation Work

To allow the repairs to be conducted in dry conditions, the channel flow was diverted around the section of interest. A berm was constructed to hold back the channel water while a combination of 4 Flygt pumps passed the water into a 12" Sclair pipeline that discharged the water downstream of the repair section. The system is shown in Photograph 1. Screens were placed in the channel upstream of the pumps to filter as much debris (mostly leaves) as possible.

Dike Repair

The work commenced with the Cat 345 Hoe removing the top 1m of dike fill, starting at Sta. 0+00m and progressing upstream. This fill was mainly composed of sulphide waste material.

At approximately 1m depth, the excavation encountered very soft substrate at Sta. 0+08m. The hoe attempted to determine the depth of the soft substrate but the soft material sloughed into the excavation as quick as it was removed. It was deemed the oversaturated material extended to considerable depth and it would not be practical to remove all the material.

To help release some of the water within the substrate, a toe drain was installed on the downslope side of the dike at Sta. 0+08m. The drain used large diameter stone placed within an excavated trench. The bottom of the drain was constructed to approximately 2m below the dike crest.

As the excavation progressed in the upstream direction, a second area of very soft substrate was encountered at Sta. 0+26m. Along the channel side of the dike at this location, fractured rock was present that appeared to be holding a large amount of water. It was deemed that accumulated water within the fractured rock was causing the saturation of the substrate within the dike. The fractured rock, shown in Photograph 3, was excavated and removed as much as possible to a depth of approximately 2m below the dike crest.

The fractured rock was replaced with large diameter stone, creating a drain that connected to the previously constructed drain at Sta. 0+08m. From Sta. 0+08m to 0+26m, the drain ran parallel with the channel as shown in Photograph 4. At Sta. 0+26m, the drain terminated.

To stabilize the weak substrate and allow construction of the dike back to grade, the woven geotextile was placed directly over the substrate and newly constructed drain. The geotextile placement extended from Sta. 0+00m to Sta. 0+32m and over the full width of the dike. A

thick lift (approximately 450mm) of pit run fill was spread over the geotextile as shown in Photograph 5. This lift was track packed with the dozer.

Surficial cracking was noted at the completion of this lift between Sta. 0+22m and Sta. 0+32m. The cracking, shown in Photograph 6, was attributed to the softness of the substrate and as a result, a second layer of woven geotextile was placed in this section.

A second lift of pit run fill was placed at a thickness of 300mm. No cracking was noted and the fill appeared stable under machinery. This lift was compacted with the smooth drum roller, shown in Photograph 7, over 8 passes but with no vibration applied. It was a concern that vibration may pump water up from the soft substrate into the freshly placed fill.

Two additional lifts of pit run fill were placed in 200mm thick lifts. Each lift was compacted with 4 passes of the smooth drum roller and vibration. Each lift was visually observed during machinery passes and showed very little deflection.

Channel Repair

Rip rap had previously been removed from the repair section of the channel. This allowed the hoe to shape the channel subgrade and pack the surfaces to ensure a smooth, firm base was provided for the liner.

A thin layer (approximately 200mm thick) of sandy gravel (fines) was then placed over the subgrade to act as a protective blanket for the liner as shown in Photograph 8. Some softness was noted in areas along the upslope side of the channel where seepage was occurring on the slope face. This is shown in Photograph 9.

The entire repair section was broken up into 4 smaller sections. The first 3 sections (starting from Sta. 0+00m) were approximately 13m long which allowed 4 panels of the BGL to be placed across the channel with a 300mm overlap and enough liner to provide an adequate cross anchor.

Each section was prepared in similar fashion. A cross anchor trench was excavated first, along each slope and through the channel bottom. It was fit with a small pump and acted as a sump to collect and remove any water accumulation from upstream. The trench was 300mm deep and allowed the work for each section to be conducted in the dry. The hoe then dug anchor trenches along the sides of the channel. On the upslope side, machine and space limitations restricted the depth of the trenches to be approximately 300mm deep while on the dike side of the channel, these trenches were approximately 600mm deep. A prepared section of the channel is shown in Photograph 10.

Consideration was given to not allow the liner within 300mm of the dike crest. In the future, grader operations may cause liner damage if it were too near the crest. Excess liner was also cut back to the base of the anchor trenches for the same reason.

Panels of BGL were then placed over the prepared section of channel. Each adjacent panel was overlapped 300mm with the upstream panel lapping over the downstream panel. Each overlap was field welded in-place with care taken to ensure wrinkles were completely sealed. The welding process is shown in Photograph 11 while Photograph 12 shows a typical seam welded. A portion of the upstream panel of each section was then placed into the cross anchor trench with typically 300mm of liner running along the base of the trench. The trench was then backfilled with the sandy gravel (fines) fill. The start point for the next section then overlapped the previous section of liner at channel grade by 300mm.

In Section 3 at Sta. 0+29m, some punctures were encountered in the liner. A total of 4 puncture holes were patched by placing a small piece of liner over the hole and welding the overlap on each side.

The final section of liner was slightly longer, extending from Sta. 0+40m to Sta. 0+60m, and featured a deeper cross anchor trench of approximately 600mm. A total of 6 panels of BGL were placed through this section. The completed liner placement is shown in Photograph 13.

When liner placement was complete, the hoe began placing large rounded stone onto the liner to act as rip-rap. Placement started at Sta. 0+00m and progressed upstream. It had been completed to only Sta. 0+40m by end of shift on September 7th.

When the crew arrived on site September 8th, the section of liner that had not been rip-rapped was found to be bulging from an accumulation of water beneath it as seen in Photograph 14. Sections with rip-rap in-place were found to have no bulging and it appeared there was no water accumulated beneath these sections. It was deemed that seepage from the upstream section of channel (upstream of the berm) had accumulated beneath the liner. Seepage that had been noted along the upslope side of the channel would have also contributed. While some uplift force had accumulated beneath the liner at this time, the uplift would later be offset by the mass of the rip rap and the mass of the channel water on the liner.

To complete the placement of the rip-rap it was felt necessary that the water had to be released from beneath the liner. In order to do this, a hole was cut through the liner at the downstream end of the bulge (Sta. 0+41m). Water flowed from the hole and slowly drained from beneath the liner. At the same time, rip-rap placement recommenced from Sta. 0+60m and progressed downstream. With some water still beneath the liner and the softened state of the subgrade, the placement of rip rap caused some puncturing of the liner. Including the hole that was made, a total of 7 punctures were patched between Sta. 0+41m and Sta.

0+60m employing the same method as previously described. One of these patches can be seen in Photograph 15. Some pinhole leaks were noted in a couple of the patches but they were not deemed detrimental to the liner.

When all patching was complete, small cobbles were placed as an initial rip-rap on the liner surface. The repaired channel with initial rip-rap in place is shown in Photograph 16. The upstream berm was then breached and Photograph 17 shows water passing through the channel.

At the time of Mr. Russell's departure from site, the anchor trenches were being partially backfilled along the entire length of the repair section. It was discussed that the anchor trenches on each side of the channel would be completely backfilled in the very near future and there would also be additional rip-rap placed within the channel.

CLOSURE

BGC prepared this report for the account of Anvil Range Mining Corp. and Deloitte & Touche Inc only. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use that a Third Party makes of this report or any reliance on decisions to be based on it is the responsibility of such Third Parties. BGC accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report. BGC also does not assume any liability for possible losses in property values that may result from this report.

As a mutual protection to our client, the public, and ourselves, all reports and drawings are submitted for the confidential information of our client for a specific project and authorization for use and/or publication of data, statements, conclusions or abstracts from or regarding our reports and drawings is reserved pending our written approval.

We trust that this letter report meets your current requirements. Please do not hesitate to contact the undersigned at if you require additional information.

Respectfully submitted,
BGC ENGINEERING INC.
Per:

Reviewed by:

Brad Russell, M.Sc., EIT
Geotechnical Engineer

Gerry Ferris, M.Sc., P.Eng
Geotechnical Engineer

REFERENCES

BGC Engineering Inc., May 2007. Summary of Seepage Event and Remediation Efforts, Faro Creek Diversion Channel, Faro Mine, YT. Memo submitted to Anvil Range Mining and Deloitte and Touche, May 23, 2007, 6 pages plus figures.

BGC Engineering Inc., June 2007. Supplementary Memo on Channel Remediation Needs, Faro Creek Diversion Channel, Faro Mine, YT. Memo submitted to Anvil Range Mining and Deloitte and Touche, June 28, 2007, 18 pages.

APPENDIX I

PHOTOGRAPHIC RECORD



Photograph 1. The repair section was maintained dry by diverting channel flow. The berm backed up water within the channel and 4 Flygt pumps passed the flow through the diversion pipe.



Photograph 2. Construction of drain along downslope side of dike at Sta. 0+08m.



Photograph 3. Fractured rock was encountered along the channel side of the dike. This rock was removed as much as possible.



Photograph 4. The drain replaced the fractured rock, running parallel with the channel to Sta. 0+26m.



Photograph 5. Woven geotextile was placed over soft soils. 'Pit run' granular fill was placed over the geotextile.



Photograph 6. Cracking was noted within the first lift of 'pit run' dike fill. As result, a second layer of woven geotextile was placed within the fill.



Photograph 7. A smooth drum roller was used to compact the 'pit run' granular fill.



Photograph 8. A blanket of sandy gravel (fines) was placed within the channel to provide a smooth, stable and protective base for the liner.



Photograph 9. Some seepage points were observed along the upslope side of the channel slope.



Photograph 10. Section 1 prepared for liner placement. The cross anchor trench acted as sump to collect seepage water during liner placement.



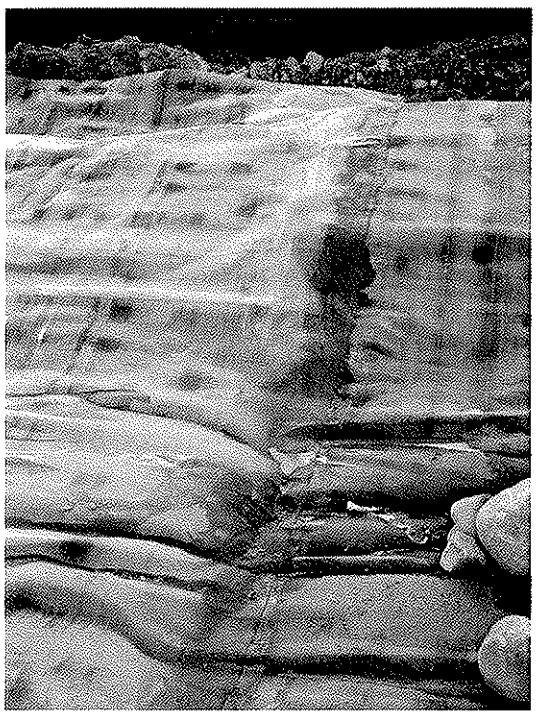
Photograph 11. Labourers weld the seams between adjacent sections of liner.



Photograph 12. Typical seam weld.



Photograph 13. Placement of liner within the channel completed. Upstream cross anchor trench backfilled.



Photograph 14. Accumulation of seepage overnight caused bulging of the upstream section of the liner.



Photograph 15. A total of 7 liner punctures were identified and patched in Section 4.



Photograph 16. Placement of rip-rap over liner completed.



Photograph 17. Water passing through the repaired channel section.

APPENDIX II

DAILY INSPECTION SUMMARY REPORTS

Appendix 11

Town of Faro Water Wells Report - 2007

Gartner Lee

Gartner Lee Limited

February 6, 2008

Mr. Doug Sedgwick
Environmental Services
Deloitte & Touche Inc.
79 Wellington Street West, Suite 1900
Toronto, Ontario M5K 1B9

Dear Mr. Sedgwick:

Re: GLL 70-497 – 2007 Town of Faro Water Wells Investigation

We are pleased to submit this letter report that incorporates results of studies completed in 2007 supporting the Town of Faro Water Wells Investigation project. The 2007 program incorporated a focussed sampling program in Vangorda Creek to investigate the source of elevated nitrate and chloride concentrations, detected in earlier investigations.

This letter report also incorporates a complete summary of all investigations undertaken on this project since 2004. The work completed in 2007 addresses all recommendations outlined in study work completed the previous year and effectively completes the Town of Faro Water Wells Investigation.

If you have any questions concerning this report, please do not hesitate to contact me at (604) 299-4144 x 250.

Yours very truly,
GARTNER LEE LIMITED

Don McCallum, MASc., P.Eng.
Senior Environmental Engineer / Regional Manager

DM:jf

Please find the following documents attached:

Figure 1.	Site Plan
Figure 2.	Sampling Locations
Figure 3.	2007 Nitrate Concentrations – Vangorda Creek
Table 1.	Vangorda Creek Focussed Water Quality 2007 – Comparison to Guidelines
Table 2.	Vangorda Creek Water Quality 2005 to 2007 – Comparison to Guidelines
Table 3.	Town of Faro Water Supply Quality 2004 to 2006 – Comparison to Guidelines
Appendix A:	Photo Log - 2007 Focussed Sampling Program
Appendix B:	Laboratory Reports

Sperling Plaza, 6400 Roberts Street, Suite 490, Burnaby, BC, V5G 4C9 tel 604.299.4144 fax 604.299.1455
Toronto | Vancouver | Calgary | Montreal | St. Catharines | Whitehorse | Yellowknife | Bracebridge
www.gartnerlee.com

1. 2007 Study Objectives

The Gartner Lee (February 2006) report, entitled "Town of Faro Water Wells Investigation", contained a recommendation to investigate the source of elevated nitrate and chloride concentrations detected in lower Vangorda Creek samples. A sampling and analytical program conducted in 2007 has addressed this recommendation. A further objective of the current study is to determine if future studies and monitoring efforts are required to address the Town of Faro Water Wells Investigation.

2. Reporting Framework

In addition to the 2007 results, this letter report provides a brief overview of results obtained from previous studies completed in support of the Town of Faro Water Wells Investigation. All of the combined results are used to support the final summary and conclusions for this investigation.

3. Background

The Anvil Range water license QZ03-059 contains a condition requiring an investigation of the potential influence of Vangorda Creek on the Town of Faro water supply. In response to this water license condition, Gartner Lee completed a February 2006 report entitled "Town of Faro Water Wells Investigation". This study indicated that water is being recharged to the Town of Faro water supply aquifer by Vangorda Creek. However, the study also indicated that the Town of Faro water supply is consistently of very good quality. Further, the Gartner Lee report noted that metal concentrations measured in Vangorda Creek throughout the study period were well below Canadian Drinking Water Quality Guidelines and therefore posed minimal risks to the Town of Faro water supply.

Continued routine monitoring of Vangorda Creek was recommended in the Gartner Lee Ltd. (2006) report because of the observed hydraulic connection between Vangorda Creek and the Town of Faro water supply aquifer. It was also observed during the study that concentrations of two compounds - nitrate and chloride - were elevated in the Vangorda Creek samples compared to samples obtained in the Pelly River. All measurements of these compounds were well below the respective Canadian Drinking Water Quality Guidelines (CDWQG). The source of these elevated concentrations (natural or anthropogenic) could not be determined in the study owing to the lack of data from historical monitoring (of these parameters) throughout Vangorda Creek.

A focussed sampling and analysis program was initiated in Spring 2007 to investigate the elevated nitrate and chloride concentrations observed in lower Vangorda Creek. This letter report provides a summary of all data previously collected, in addition to the results of the 2007 investigations.

4. Summary of Data Collected

4.1 2004 – 2005 Site Activities

A hydrogeological investigation was conducted as part of the initial study, to determine if the Town's water supply was drawing a portion of its water from Vangorda Creek. An initial site visit during Summer 2004 facilitated an interpretation of the geological setting and site characterization of the area. Based on this characterization and a background data review (site air photo, drilling logs, site elevation data, preliminary terrain analysis including ground-truthing) a conceptual hydrogeological flow regime was hypothesized with Vangorda Creek surface water recharging the groundwater system. A site survey of the local study area was completed during Summer 2004, including pertinent land features and reference points such as the top of monitoring wells and gauging locations. This allowed for the precise measurement of water elevations in the vicinity of the town pumping wells, two observation wells, lower Vangorda Creek, and the Pelly River (Figure 1), and also provided a 'snapshot' of surveyed water elevations at the time the survey was conducted ultimately providing insight for a local flow regime under summer conditions. During October 2004 level loggers were installed within each observation well, and in Vangorda Creek and the Pelly River, adjacent to the Town pumping wells. Installation of the Level Loggers commenced a year-long study involving continuous water depth and temperature measurements at each point of interest. Daily measurements of groundwater flow and temperature data were also obtained for the town water supply wells. In addition, stream flow measurements were obtained at two locations in Vangorda Creek during each of the concurrent water quality sampling visits in 2004 and 2005.

Water quality data were also obtained during the study, encompassing the collection of surface water samples from Vangorda Creek and the Pelly River, and groundwater samples from both observation wells and the Town's water supply wells. Comparison of indicator water quality parameters among monitored stations provided an additional line of evidence to seasonal variability and chemical similarities and differences among sampling locations. Nitrate, chloride, and sulphate were strategically chosen for their ability to provide useful information regarding source water characteristics to graphically portray these trends (GLL 2006, Figure 6.). A review of historical water quality for the Town of Faro water supply wells and lower Vangorda Creek was also carried-out as part of the study.

4.2 2007 Follow-Up Work

Follow-up work to the Town of Faro Water Wells Investigation conducted in 2007 was initiated to investigate elevated concentrations of nitrate and chloride in lower Vangorda Creek. A focussed sampling and analysis program was then carried-out involving the collection of water quality samples at four locations along Vangorda Creek during the months of June and October. The sampling locations of Vangorda Creek (see Figure 2) were selected as follows:

- V1 – upstream of mine site (background);
- V27 – immediately downstream of all mining activity;
- V8 – upstream of Town; and
- VCWLS1-04 – downstream of Town (2004-2005 Gartner Lee study site).

Field parameters collected during each site visit included pH, specific conductance, and temperature. Analyses by ALS Environmental Laboratories in Vancouver included general chemistry (pH, conductivity, TDS, TSS, hardness) and an anion scan (bromide, chloride, fluoride, sulphate, nitrate, nitrite). A photo upstream and downstream of each sampling location was taken during the June and October site visits (Appendix A).

5. Results

5.1 Hydrogeological Analysis

The hydrogeological study (encompassing the components described in Section 3.1 of this report) conducted for a period of one year by GLL in 2005-2006, revealed the Town water supply wells were receiving a varying portion of their water from Vangorda Creek, and identified three key flow regimes occurring within the local study area:

- *Late Summer-Fall Flow Regime* – begins in August following Spring high flow and continues through January; well field receives recharge water from both Vangorda Creek and the Pelly River.
- *Late Winter Flow Regime* – occurs primarily in February and March; well field receives recharge water from both Vangorda Creek and the Pelly River; however, recharge from Vangorda Creek is likely reduced during this time period due to reduced flow in the creek and freezing of the creek bottom in the lower reaches, preventing infiltration.
- *Spring-Early Summer Flow Regime* – occurs in May through July; begins with a rapid rise in water levels in the aquifer and streams due to Spring freshet and represents the most significant aquifer recharge event; well field is primarily fed by recharge from Vangorda Creek.

The flow regimes described above were supported by individual study components. Stream gauging results indicated that a portion of Vangorda Creek flow in the vicinity of the water supply wells is lost as recharge to the underlying sediments. Each flow regime was primarily identified through trends observed on a surface water and groundwater hydrograph (GLL, 2006, Figure 7), constructed through water elevation data obtained via the Level Loggers. Calculated groundwater travel times from Vangorda Creek and/or the Pelly River were found to be less than seven days. This also supports that the Town's wells are at least seasonally, under the direct influence of surface water. The collection of water quality samples also supported the hydrogeological flow results described herein. Previously reported water quality results are discussed in Section 5.2 of

this report. Water quality results obtained from the 2007 sampling program are discussed in Section 5.3.

5.2 Water Quality Analysis (Previous Studies)

The collection of water quality samples during 2005-2006 within the local study area also supports the recharge of Vangorda Creek water to the Town water supply wells. This was indicated by a distinct variation in the Town water quality throughout the course of a year suggesting the influence of surface water recharge sources. In addition, the Town of Faro water supply was consistently higher in indicator parameters of chloride, nitrate, and sulphate than was the Pelly River. Other water quality observations included the Town water supply being of good quality compared to CDWQG, indicated by historical monitoring and monitoring undertaken during this study period. Table 1 includes a summary of routine monitoring data collected in Vangorda Creek between 2005 and 2007 (as part of the Anvil Range water license). A discussion of the 2005 and 2006 routine Vangorda Creek monitoring data was provided in the February 2007 Gartner Lee letter report titled, "2006 Town of Faro Water Wells Investigation". As the data in Table1 indicates, trace metal concentrations measured in Vangorda Creek are below CDWQG with only very few exceptions, indicating minimal risk to the Town water supply. Vangorda Creek drinking water quality guideline exceedances highlighted in the table generally relate to aesthetic parameters such as colour, iron, and manganese.

The Town of Faro conducts annual monitoring of their drinking water supply as a condition of their water license #MN05-058. Sampling of the Town's water supply wells generally occurs during the month of May. As indicated in Table 2, no exceedances of drinking quality guidelines associated with the Town's water supply were observed between 2004 and 2006.

5.3 Water Quality Analysis (2007 Sampling Program)

The results of all water quality data obtained during the 2007 field program are summarized in Table 3. As discussed previously, this sampling and analytical program was initiated to investigate elevated concentrations of nitrate and chloride in lower Vangorda Creek *relative* to the Pelly River (as observed in the Gartner Lee 2006 study).

Chloride concentrations were non-detectable (<0.05 mg/L) at all sampling stations during both events, with the exception of the October result of 0.79 mg/L at the lower Vangorda Creek location (VCWLS1-04). This measurement was well below the aesthetic drinking water quality guideline of 250 mg/L. The data provide no indication of chloride sources associated with mine-related activities or land uses. The source of chlorides detected at VCWLS1-4 is not known but could be related to road maintenance activity.

Nitrate concentrations observed at each Vangorda Creek location are summarized in Table 3 and illustrated in Figure 3. All results are at least one order of magnitude (and sometimes two orders of magnitude) lower than the Canadian Drinking Water Quality Guideline of 10 mg/L. Nitrate

concentrations in Vangorda Creek were found to be highest (maximum of 0.257 mg/L) during each sampling event at station V27. This suggests some degree of influence from mining related activity to nitrate levels within Vangorda Creek. However, the relatively low concentration observed at location V27 (compared to the guideline) indicates minimal risk to the Town of Faro water supply.

6. Key Findings from 2007 Sampling and Analytical Program

- There is no indication of mining-related sources of chlorides to Vangorda Creek; and
- Elevated levels of nitrate concentrations in Vangorda Creek, relative to Pelly River, may be related to mining-related activities and land uses. Nitrate concentrations observed downstream of the Anvil Range site pose minimal risks to the Town of Faro water supply.

7. Conclusions

The following conclusions are based on the current 2007 study results in conjunction with previous studies reported by Gartner Lee in their February 2006 report, "Town of Faro Water Wells Investigation".

- water is being recharged to the Town of Faro water supply aquifer by Vangorda Creek. Year-round the wells receive varying portions of their water from Vangorda Creek and the Pelly River.
- surface water quality in Vangorda Creek is generally very good when compared to Drinking Water Quality Guidelines.
  - elevated chloride levels detected in lower Vangorda Creek, relative to Pelly River, are not related to mining-related sources. Chloride concentrations detected in lower Vangorda Creek are well below Canadian Drinking Water Quality guidelines.
  - elevated levels of nitrate concentrations in Vangorda Creek, relative to Pelly River, may be related to mining-related activities and land uses. Nitrate concentrations observed downstream of the Anvil Range site are well below Canadian Drinking Water Quality guidelines and pose minimal risks to the Town of Faro water supply.
- the Town of Faro water supply is of very good quality, including low metal concentrations, as compared to Canadian Drinking Water Quality Guidelines.
- the potential influence of Vangorda Creek on the Town of Faro water supply has been adequately investigated, as a condition of Anvil Range water license QZ03-059.

8. Closure

This report was prepared for Deloitte and Touche Inc. The report, which specifically includes all text, figures, tables and appendices, is based on data and information collected during the investigations conducted by Gartner Lee Limited, and is based solely on the conditions of the site at the time of the investigation, supplemented by historical information and data obtained by Gartner Lee Limited, as described in this report.

The work described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibility of such third parties. Gartner Lee Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on the information contained in this report.

If you have any questions regarding the contents of this report do not hesitate to contact Don McCallum at 604-299-4144 ext. 250.

Report Prepared By:	**Report Reviewed By:**
Jennifer Funston, B.Sc. Hydrogeologist GARTNER LEE LIMITED	Don McCallum, MASc., P.Eng. Senior Environmental Engineer / Principal GARTNER LEE LIMITED

9. References

Gartner Lee Limited, 2007:

GLL 60-614 – 2006 Town of Faro Water Wells Investigation. Prepared for Deloitte & Touch Inc., February 2007.

Gartner Lee Limited, 2006:

Town of Faro Water Wells Investigation, Project #25. Prepared for Deloitte & Touche Inc., February 2006.

Health Canada, 2007:

Guidelines for Canadian Drinking Water Quality, Summary Table. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, March 2007.

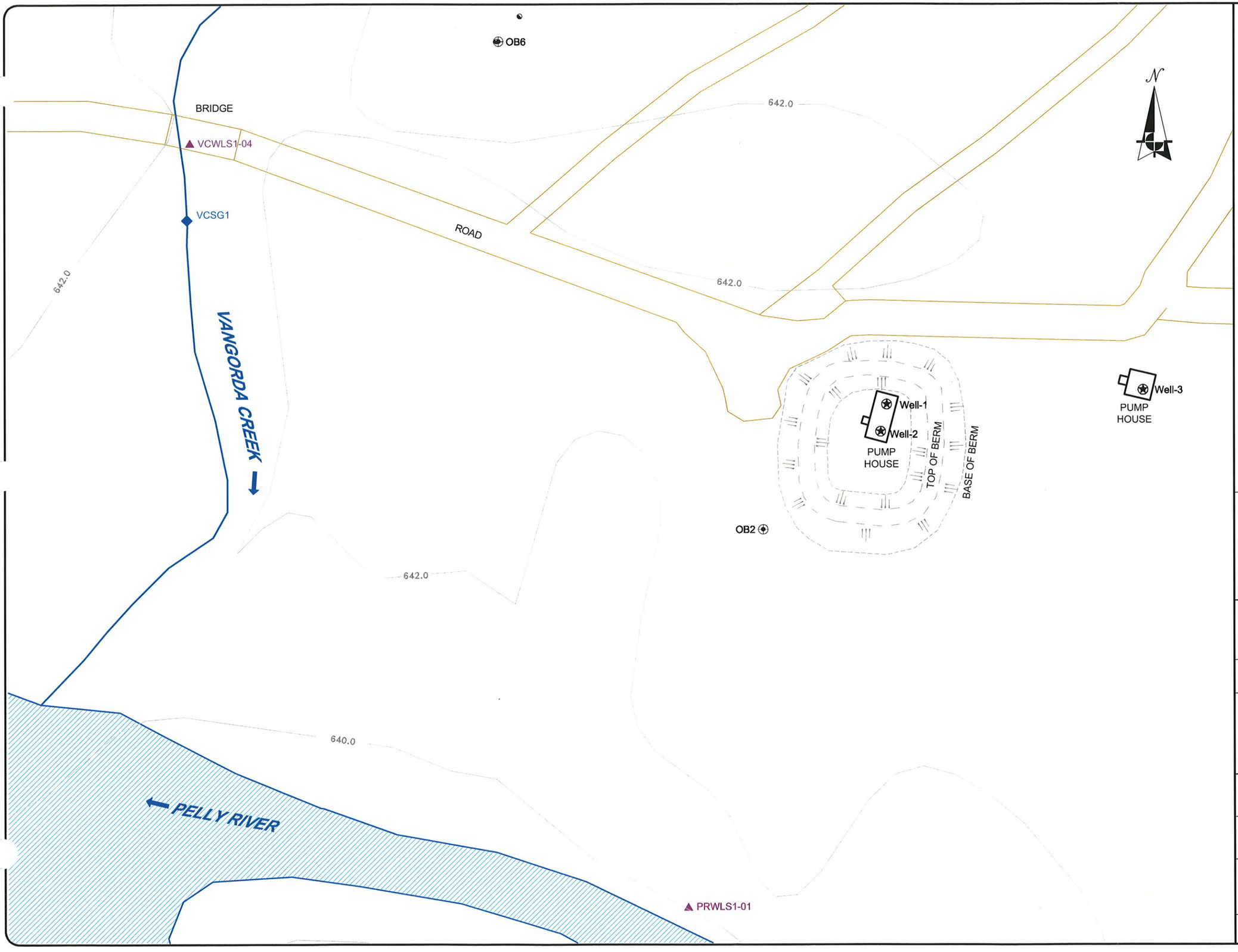
Health Canada, 1987:

Guidelines for Canadian Drinking Water Quality – Supporting Documents. Nitrate/Nitrite. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, Edited October 1992.

Health Canada, 1979:

Guidelines for Canadian Drinking Water Quality – Supporting Documents. Chloride. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment, Updated November 1987.

Figures



Legend:

- Building
- Stream, River
- Road
- VCSG1 — Location of Stream Gauge
- PRWLS1-04 — Water Level Sensor
- OB6 — Observation Well 2" or 6" diameter
- Well-2 — Town of Faro Water Supply Well
- Abandoned Well

Data Sources:

1. Digital copy of 1:50,000 topographic map and orthophoto supplied by SRK Consulting.
2. Survey conducted in summer 2004 by Yukon Engineering Services

0 5 10 20 Metres

SCALE 1:500

Projection : UTM NAD 27 Zone 8
Contour Interval : 2 m (ASL)

Reviewed By : DMcC/JK
Prepared By : PW
Date Issued : February 3, 2006
Project No. : 50-564
File Name : 50564_B2_06bFeb03_Fig2.DWG
Revision : 0

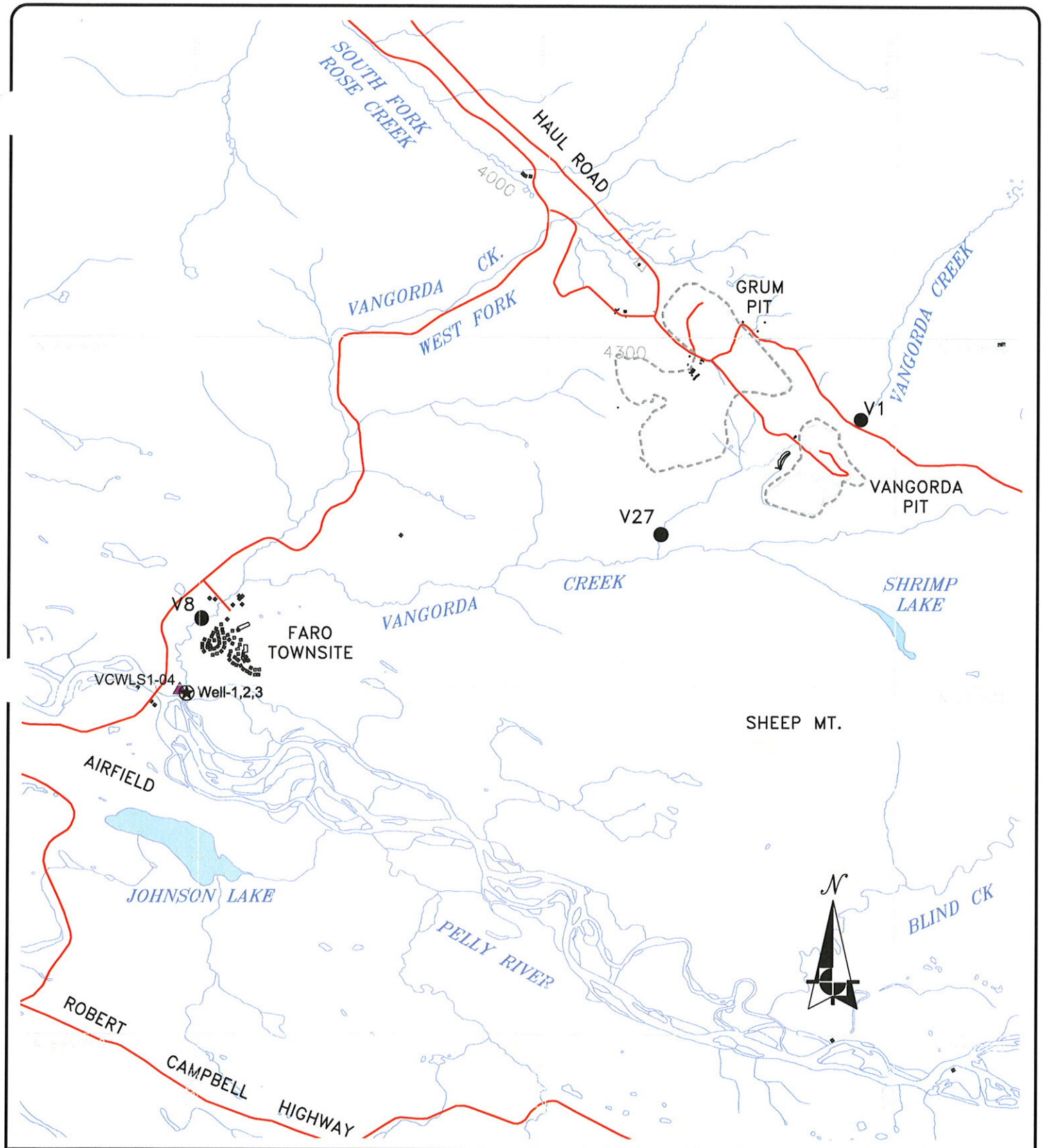
Deloitte & Touche

Project: Faro Townsite Water Supply
Location: Faro, Yukon Territory
Client: Deloitte & Touche

SITE PLAN

Gartner Lee

Figure No. 1



LEGEND:

- Main Road
- Surface Drainage
- Footprint of Open Pits and Rock Dumps
- Water Well
- Water Level Sensor
- V27 ● Key Monitoring Locations

0 500 1000 2000 3000 m

1 : 75,000

COORDINATES ARE UTM NAD83 ZONE 8
CONTOUR INTERVAL 100 FT.

DRAWING INFORMATION:	
REVIEWED BY:	RM
DRAWN BY:	MP
DATE ISSUED:	Jan, 2007
PROJECT NUMBER:	60-614
FILE NAME:	60614_By1_Fig01_Report.dwg
REVISION:	0

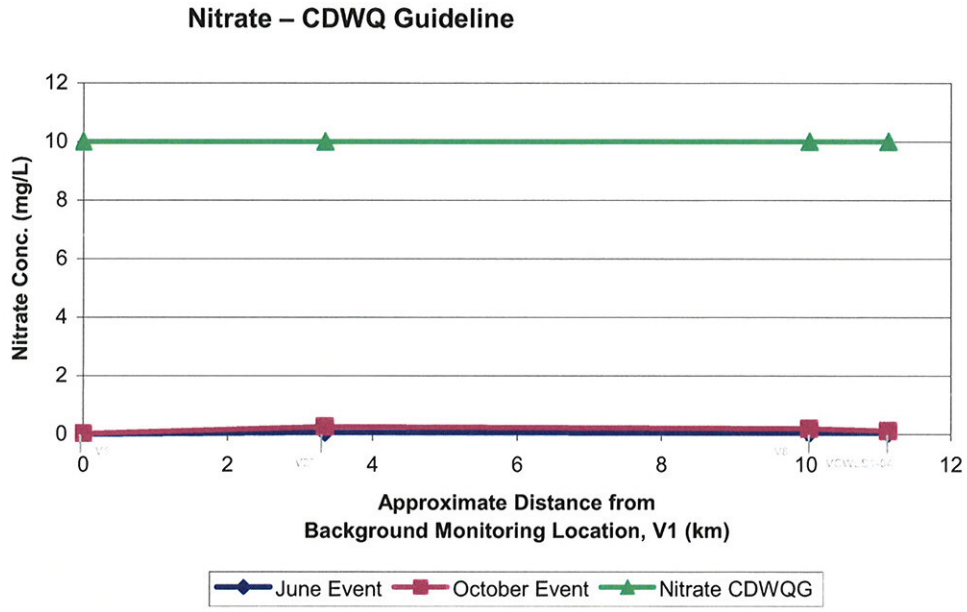
Town of Faro
Water Wells Investigation

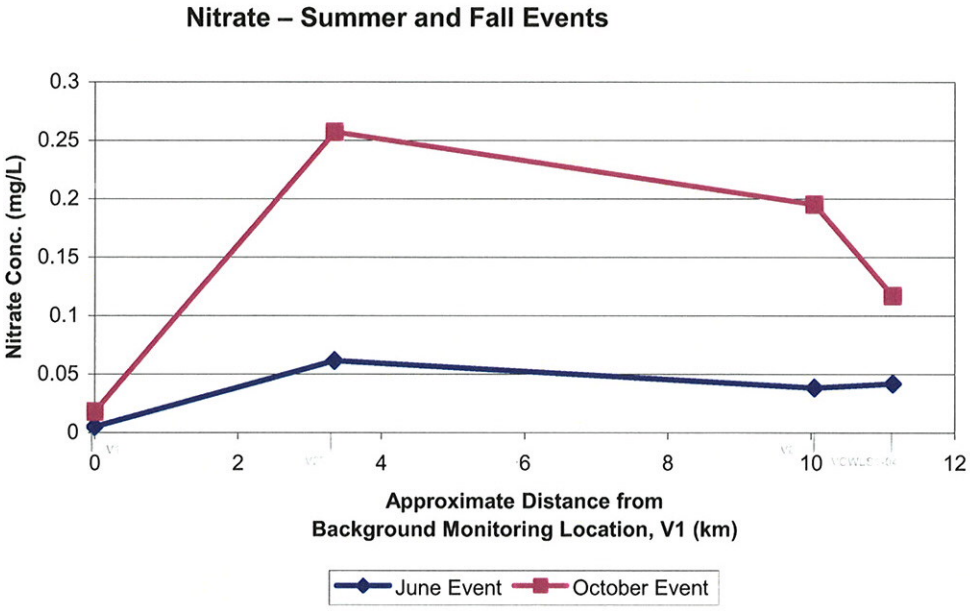
SAMPLING LOCATIONS

Gartner Lee

FIGURE NO. 2

Figure 3. 2007 Nitrate Concentrations – Vangorda Creek





Notes:

1. Less than detection limit values are shown at the d.l. (0.005 mg/L).

Tables

Table 1. Vangorda Creek Water Quality
2005 to 2007 - Comparison to Guidelines

Parameter		Canadian Drinking Water Quality Guidelines[1]		Vangorda Creek Sampling Sites																	
				V1										V27							
				07-Mar-05	07-Jun-05	12-Sep-05	01-Dec-05	20-Mar-06	05-Jun-06	09-Jun-06	06-Sep-06	18-Jun-07	24-Sep-07	26-May-05	21-Sep-05	29-May-06	01-Aug-06	26-Sep-06	04-Jun-07	25-Jul-07	10-Oct-07
Physical Tests																					
Colour	TCU	15	AO	-	-	-	-	-	-	-	-	8	<5	-	-	-	-	-	28	6	< 5
Conductivity	uS/cm	-		-	42	67	104	121	35	73	73	48	71	185	152	129	235	221	47	204	239
Hardness	CaCO3	-		56	18	29	47	59	13	29	29	21	26	57	84	55	110	94	17	100	108
pH		6.5-8.5	AO	-	7	8	8.1	8.1	8.3	8.1	8.1	7.5	7.2	-	-	8.2	7.9	7.9	7.5	7.8	7.7
Total Dissolved Solids	mg/L	500	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	0.3/1.0/0.1	AO[2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.25
Dissolved Anions (mg/L)																					
Alkalinity-Total	CaCO3	-		-	18.8	-	35.5	45.4	14.8	26.2	26.2	21.4	25.8	-	48.5	-	-	-	-	-	-
Chloride	Cl	250	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoride	F	1.5	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	SO4	500	AO	10.7	4.6	10.5	10.8	10.8	3.62	9.71	9.71	5.31	9.75	28.5	48.5	25.3	56.4	52	8.46	47.5	64.1
Nutrients (mg/L)																					
Nitrate Nitrogen	N	10	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite Nitrogen	N	1	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate - P	P	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals (mg/L)																					
Aluminum	T-Al	-		0.012	0.043	0.013	0.006	0.99	0.099	0.024	0.024	0.033	0.012	0.12	0.023	0.083	0.021	< 0.005	0.16	0.021	0.018
Antimony	T-Sb	0.006	MAC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	<0.001	< 0.001
Arsenic	T-As	0.01	MAC	< 0.001	0.002	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Barium	T-Ba	1	MAC	0.037	0.016	0.025	0.037	0.12	0.013	0.025	0.025	0.014	0.022	0.018	0.026	0.019	0.032	0.029	0.012	0.03	0.035
Beryllium	T-Be	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Boron	T-B	5	MAC	< 0.05	0.07	< 0.05	< 0.05	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	T-Cd	0.005	MAC	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Calcium	T-Ca	-		17.9	6.03	9.61	14.7	18.7	4.31	9.48	9.48	6.62	7.73	14.3	22.3	14.9	28.2	24.2	4.68	26.5	28.6
Chromium	T-Cr	0.05	MAC	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	T-Co	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	T-Cu	1	AO	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.002	0.002	< 0.001	0.001	0.001	< 0.001
Iron	T-Fe	0.3	AO	0.08	0.09	< 0.05	< 0.05	< 0.05	0.14	< 0.05	< 0.05	0.07	< 0.05	0.19	< 0.05	0.16	0.06	< 0.05	0.36	0.09	0.07
Lead	T-Pb	0.010	MAC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.002	< 0.001	< 0.001	0.002	< 0.001	< 0.001
Magnesium	T-Mg	-		2.87	0.75	1.3	2.46	2.89	0.64	1.4	1.4	0.97	1.11	5.25	6.83	4.37	9.46	8.2	1.35	8.22	8.86
Manganese	T-Mn	0.05	AO	< 0.001	0.002	0.001	< 0.001	< 0.001	0.005	< 0.001	< 0.001	0.014	0.002	0.008	0.008	0.023	0.004	0.003	0.039	0.004	0.003
Mercury	T-Hg	0.001	MAC	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.02	< 0.02	< 0.00002	< 0.00002	-	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.02	< 0.00002	< 0.00002	< 0.02
Molybdenum	T-Mo	-		0.0006	< 0.0005	< 0.0005	0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nickel	T-Ni	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Potassium	T-K	-		1.4	0.8	0.3	0.6	0.6	0.4	0.3	0.3	0.4	0.3	0.6	0.5	0.8	0.6	0.5	0.5	0.6	0.5
Selenium	T-Se	0.01	MAC	< 0.001	0.011	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Sodium	T-Na	200	AO	2.71	1.61	1.7	1.89	2.27	0.87	1.79	1.79	1.89	1.64	1.39	2.03	1.22	2.14	2.05	0.69	2.12	2.01
Titanium	T-Ti	-		< 0.001	0.001	< 0.001	< 0.001	0.001	0.003	< 0.001	< 0.001	0.002	< 0.001	0.003	0.001	0.001	< 0.001	< 0.001	0.005	< 0.001	< 0.001
Uranium	T-U	0.02	MAC	0.0014	< 0.0005	< 0.0005	0.0006	0.0012	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.001	0.0009	0.0009	0.0014	0.0013	< 0.0005	0.001	0.0018
Vanadium	T-V	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Zinc	T-Zn	5	AO	0.011	0.006	< 0.005	< 0.005	0.038	< 0.005	< 0.005	< 0.005	< 0.005	0.006	0.031	0.017	0.022	0.018	0.023	0.016	0.031	0.026

Notes:

[1] *Summary of Guidelines for Canadian Drinking Water Quality, March 2007.*

AO *Aesthetic objective (taste, odour, appearance, etc.).*

MAC *Maximum Acceptable Concentration.*

[2] *1 NTU maximum allowed for water entering distribution systems.*

< *Indicates less than the detection limit.*

- *Indicates no guideline or analysis for this parameter.*

bold *Indicates parameter exceeded guideline.*

Table 1. Vangorda Creek Water Quality
2005 to 2007 - Comparison to Guidelines

Parameter		Canadian Drinking Water Quality Guidelines[1]		Vangorda Creek Sampling Sites																	
				V8																	
				21-Jan-05	08-Feb-05	15-Mar-05	11-Apr-05	09-May-05	20-Jun-05	25-Jul-05	22-Aug-05	05-Sep-05	10-Oct-05	01-Nov-05	14-Dec-05	24-Jan-06	13-Feb-06	24-Mar-06	24-Apr-06	17-May-06	19-Jun-06
Physical Tests																					
Colour	TCU	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	uS/cm	-		628	632	661	662	174	390	581	716	267	237	302	614	673	694	781	737	272	220
Hardness	CaCO3	-		373	374	395	382	116	214	321	449	210	237	275	328	384	381	402	356	143	118
pH		6.5-8.5	AO	7.3	8.3	8.3	8	8.1	8.1	8	8.1	8.3	8.5	8.3	8.1	8.1	8	7.8	8.2	8.5	8
Total Dissolved Solids	mg/L	500	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	0.3/1.0/0.1	AO [2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Anions (mg/L)																					
Alkalinity-Total	CaCO3	-		225	241	231	236	78.6	96.7	121	133	134	137	168	192	207	214	231	222	89.1	76.6
Chloride	Cl	250	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoride	F	1.5	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	SO4	500	AO	159	155	176	175	33.3	133	238	312	102	82.1	112	139	166	191	204	184	51.9	35
Nutrients (mg/L)																					
Nitrate Nitrogen	N	10	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite Nitrogen	N	1	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate - P	P	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals (mg/L)																					
Aluminum	T-Al	-		0.012	0.009	0.007	0.011	1.05	0.078	0.28	0.048	0.04	0.024	0.018	0.019	0.012	0.017	< 0.005	< 0.005	0.9	0.5
Antimony	T-Sb	0.006	MAC	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	T-As	0.01	MAC	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001
Barium	T-Ba	1	MAC	0.077	0.073	0.081	0.072	0.065	0.056	0.083	0.074	0.044	0.053	0.058	0.07	0.073	0.078	0.082	0.065	0.067	0.045
Beryllium	T-Be	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Boron	T-B	5	MAC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	T-Cd	0.005	MAC	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Calcium	T-Ca	-		87.5	87.1	97	88.1	28.8	55.4	84.4	120	51.8	55.8	65.4	77.4	87.6	87.2	91.6	82.1	34.8	29.9
Chromium	T-Cr	0.05	MAC	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	0.003	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.002
Cobalt	T-Co	-		< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001
Copper	T-Cu	1	AO	< 0.001	< 0.001	< 0.001	0.001	0.006	0.002	0.002	< 0.001	0.001	< 0.001	0.045	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.006	0.003
Iron	T-Fe	0.3	AO	0.18	< 0.05	0.26	0.13	**1.92**	0.27	0.44	< 0.05	0.19	< 0.05	0.05	0.13	0.14	0.07	< 0.05	< 0.05	1.71	0.82
Lead	T-Pb	0.010	MAC	< 0.001	< 0.001	< 0.001	< 0.001	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	0.002
Magnesium	T-Mg	-		37.5	37.8	36.9	39.4	10.7	18.4	26.8	36.3	19.6	23.7	27	32.6	39.9	39.5	42	36.6	13.7	10.6
Manganese	T-Mn	0.05	AO	0.035	0.034	0.037	0.033	**0.094**	0.047	**0.32**	**0.38**	0.016	0.015	0.015	0.028	0.029	0.028	0.035	0.029	**0.098**	0.03
Mercury	T-Hg	0.001	MAC	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Molybdenum	T-Mo	-		0.0011	0.0011	0.0013	0.0013	< 0.0005	< 0.0005	0.0005	0.0005	0.0015	0.0007	0.0008	0.0009	0.0011	0.0011	0.0012	0.0012	0.0006	< 0.0005
Nickel	T-Ni	-		0.002	0.002	0.003	0.002	0.007	0.001	0.002	< 0.001	0.002	0.001	0.001	< 0.001	0.002	0.002	0.002	0.003	0.006	0.002
Potassium	T-K	-		1.3	1.3	1.3	1.4	1.2	0.9	1.1	1.3	0.9	0.9	0.9	1.1	1.1	1.4	1.4	1.3	1.6	0.8
Selenium	T-Se	0.01	MAC	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.002	< 0.001	< 0.001	0.001	< 0.001	0.002	0.001	0.001	< 0.001	< 0.001
Sodium	T-Na	200	AO	4.55	4.71	5.31	5.04	1.5	2.64	3.2	3.73	2.87	3.25	3.2	4.15	4.89	5.01	5.16	4.45	1.67	1.97
Titanium	T-Ti	-		< 0.001	< 0.001	< 0.001	< 0.001	0.025	0.001	0.007	0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.022	0.014
Uranium	T-U	0.02	MAC	0.0071	0.0074	0.0082	0.008	0.0014	0.0021	0.0028	0.0034	0.0031	0.003	0.0047	0.0052	0.0067	0.0071	0.0081	0.0067	0.002	0.0018
Vanadium	T-V	-		< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.001
Zinc	T-Zn	5	AO	0.012	0.014	0.009	0.011	0.037	0.022	0.024	0.015	0.026	0.007	0.031	0.022	0.015	0.017	0.019	0.013	0.022	0.011

Notes:

[1] *Summary of Guidelines for Canadian Drinking Water Quality, March 2007.*

AO *Aesthetic objective (taste, odour, appearance, etc.).*

MAC *Maximum Acceptable Concentration.*

[2] *1 NTU maximum allowed for water entering distribution systems.*

< *Indicates less than the detection limit.*

- *Indicates no guideline or analysis for this parameter.*

bold *Indicates parameter exceeded guideline.*

Table 1. Vangorda Creek Water Quality
2005 to 2007 - Comparison to Guidelines

Parameter		Canadian Drinking Water Quality Guidelines[1]		Vangorda Creek Sampling Sites															
				V8															
				17-Jul-06	21-Aug-06	11-Sep-06	16-Oct-06	14-Nov-06	13-Dec-06	15-Jan-07	13-Feb-07	11-Mar-07	18-Apr-07	14-May-07	18-Jun-07	16-Jul-07	13-Aug-07	10-Sep-07	23-Oct-07
Physical Tests																			
Colour	TCU	15	AO	-	-	-	-	-	-	<5	<5	<5	<5	70	18	8	<5	<5	< 5
Conductivity	uS/cm	-		271	580	339	434	585	633	673	695	715	729	361	232	288	363	361	476
Hardness	CaCO3	-		143	309	166	230	312	328	362	369	410	371	197	112	133	202	180	260
pH		6.5-8.5	AO	8.1	8.1	8.4	8	8	8.2	8	8.1	7.8	8	8.1	8	7.9	8.2	7.9	8.1
Total Dissolved Solids	mg/L	500	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	0.3/1.0/0.1	AO[2]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7
Dissolved Anions (mg/L)																			
Alkalinity-Total	CaCO3	-		101	214	119	160	212	222	238	237	255	242	129	84.7	107	148	150	183
Chloride	Cl	250	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoride	F	1.5	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	SO4	500	AO		85	58.7	84	130	144	165	163	201	185	61.2	35.8	48.4	73	74	99.8
Nutrients (mg/L)																			
Nitrate Nitrogen	N	10	MAC	-	0.095	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite Nitrogen	N	1	MAC	-	< 0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate - P	P	-		-	0.008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Metals (mg/L)																			
Aluminum	T-Al	-		0.39	0.1	0.13	0.22	0.026	0.018	0.016	0.015	0.008	0.026	0.19	0.3	1.37	0.054	0.014	0.04
Antimony	T-Sb	0.006	MAC	< 0.001	0.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001
Arsenic	T-As	0.01	MAC	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
Barium	T-Ba	1	MAC	0.042	0.084	0.042	0.056	0.068	0.073	0.077	0.072	0.085	0.075	0.051	0.036	0.074	0.055	0.053	0.057
Beryllium	T-Be	-		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Boron	T-B	5	MAC	< 0.05	< 0.001	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cadmium	T-Cd	0.005	MAC	< 0.0002	< 0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Calcium	T-Ca	-		34.7	76.1	38.8	53.3	69.2	77.3	83.8	84.9	90.9	85.5	47.1	26.9	32.3	48.4	42.3	60.6
Chromium	T-Cr	0.05	MAC	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.003	< 0.001	< 0.001	< 0.001
Cobalt	T-Co	-		< 0.001	0.007	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	T-Cu	1	AO	0.002	0.006	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	0.004	0.002	0.005	0.001	< 0.001	0.001
Iron	T-Fe	0.3	AO	0.64	0.049	0.25	0.42	0.12	0.08	0.06	0.14	0.12	0.2	0.49	0.5	2.13	0.1	0.07	0.13
Lead	T-Pb	0.010	MAC	< 0.001	0.04	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.001	< 0.001	< 0.001
Magnesium	T-Mg	-		13.8	36.6	16.8	23.5	33.7	32.8	37	38.2	44.3	38.1	19.3	11	12.8	19.7	18.1	26.4
Manganese	T-Mn	0.05	AO	0.018	0.014	0.011	0.024	0.016	0.017	0.034	0.018	0.028	0.028	0.026	0.019	0.038	0.011	0.006	0.009
Mercury	T-Hg	0.001	MAC	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.02
Molybdenum	T-Mo	-		0.0005	0.02	0.0005	0.0007	0.001	0.0009	0.0012	0.0012	0.001	0.0013	0.0014	< 0.0005	0.0006	0.0007	0.0008	0.001
Nickel	T-Ni	-		0.002	< 0.02	0.001	0.002	0.001	0.002	0.003	0.002	0.003	0.006	0.004	0.002	0.005	0.001	0.001	0.001
Potassium	T-K	-		0.7	0.8	0.6	0.9	0.9	1.1	1.2	1.3	1.5	1.5	1.5	0.7	0.9	0.8	0.8	1
Selenium	T-Se	0.01	MAC	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.001	0.002	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Sodium	T-Na	200	AO	2.34	4.3	2.7	3.42	4.09	4.28	4.61	4.66	5.38	4.59	2.48	2.01	2.14	3.08	2.77	3.84
Titanium	T-Ti	-		0.008	< 0.002	0.003	0.006	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.008	0.008	0.036	< 0.001	< 0.001	< 0.001
Uranium	T-U	0.02	MAC	0.0017	0.0022	0.0021	0.0038	0.0057	0.0071	0.0072	0.0074	0.0089	0.0063	0.0037	0.0016	0.002	0.0032	0.0033	0.0044
Vanadium	T-V	-		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.001	< 0.001	< 0.001
Zinc	T-Zn	5	AO	0.01	0.028	0.01	0.011	0.013	0.028	0.064	0.011	0.028	0.045	0.018	0.03	0.017	0.019	0.007	0.01

Notes:

[1] *Summary of Guidelines for Canadian Drinking Water Quality, March 2007.*

AO *Aesthetic objective (taste, odour. appearance, etc.).*

MAC *Maximum Acceptable Concentration.*

[2] *1 NTU maximum allowed for water entering distribution systems.*

< *Indicates less than the detection limit.*

- *Indicates no guideline or analysis for this parameter.*

bold *Indicates parameter exceeded guideline.*

Table 2. Town of Faro Water Supply Quality 2004 to 2006 – Comparison to Guidelines

Parameter		Canadian Drinking Water Quality Guidelines [1]		Town of Faro Water Supply		
				May-04	May-05	May-06
Physical Tests						
Colour	CU	15	AO	<5	<5	5
Conductivity	uS/cm	-		-	582	536
Hardness	CaCO3	-		266	297	327
pH		6.5-8.5	AO	7.7	7.52	7.43
Total Dissolved Solids	mg/L	500	AO	277	370	430
Turbidity	NTU	5	AO [2]	-	0.2	0.2
Dissolved Anions (mg/L)						
Alkalinity-Total	CaCO3	-		177	199	192
Chloride	Cl	250	AO	0.8	1.6	1.28
Fluoride	F	1.5	MAC	0.12	0.1	0.1
Sulphate	SO4	500	AO	77	115	129
Nutrients (mg/L)						
Nitrate Nitrogen	N	10	MAC	0.1	0.32	0.33
Nitrite Nitrogen	N	1	MAC	<0.05	<0.03	<0.03
Phosphate - P	P			-	<0.001	-
Total Metals (mg/L)						
Aluminum	T-Al	-		0.026	0.005	<0.005
Antimony	T-Sb	0.006	MAC	<0.001	<0.0002	<0.0002
Arsenic	T-As	0.025	MAC	<0.001	0.0002	<0.0002
Barium	T-Ba	1	MAC	0.086	0.089	0.105
Beryllium	T-Be	-		-	-	<0.0001
Boron	T-B	5	MAC	0.035	0.003	0.003
Cadmium	T-Cd	0.005	MAC	<0.00005	0.00002	0.00004
Calcium	T-Ca	-		57.9	72.6	81.7
Chromium	T-Cr	0.05	MAC	<0.002	<0.0005	<0.0005
Cobalt	T-Co	-		-	-	-
Copper	T-Cu	1	AO	<0.005	0.004	0.006
Iron	T-Fe	0.3	AO	<0.5	<0.1	<0.1
Lead	T-Pb	0.010	MAC	<0.0005	0.0004	0.0001
Magnesium	T-Mg	-		24.0	28.0	30
Manganese	T-Mn	0.05	AO	<0.02	<0.005	<0.005
Mercury	T-Hg	0.001	MAC	<0.0002	<0.0002	<0.0001
Molybdenum	T-Mo	-		-	-	-
Nickel	T-Ni	-		-	-	-
Potassium	T-K	-		<2	0.9	1.2
Selenium	T-Se	0.01	MAC	0.0016	0.001	0.0016
Sodium	T-Na	200	AO	3.1	3	3.9
Titanium	T-Ti	-		-	-	-
Uranium	T-U	0.02	MAC	0.0041	0.0055	0.0058
Vanadium	T-V	-		-	-	-
Zinc	T-Zn	5	AO	<0.005	0.009	0.007

Notes:

1	*Summary of Guidelines for Canadian Drinking Water Quality, April 2004.*
AO	*Aesthetic objective (taste, odour, appearance, etc.).*
MAC	*Maximum Acceptable Concentration.*
2	*1 NTU maximum allowed for water entering distribution systems.*
<	*Indicates less than the detection limit.*
-	*Indicates no guideline or analysis for this parameter.*
bold	*Indicates parameter exceeded guideline.*

Table 3. Vangorda Creek Focussed Water Quality 2007 - Comparison to Guidelines

Station		Drinking Water Guideline [1]	Detection Limits	VI	V8	V27	VCWCS1-04	V1	V8	V27	VCWLS1-04
Date		GCDWQ		02-JUN-07	03-JUN-07	02-JUN-07	02-JUN-07	11-OCT-07	11-OCT-07	11-OCT-07	11-OCT-07
Physical Tests											
	Hardness (as CaCO3)	-	0.5	13.6	60	45.5	119	32	183	122	216
	Conductivity (uS/cm)	-	2	32.1	118	94.8	205	73.1	365	259	418
	pH (pH unit)	6.5-8.5 (AO)	0.01	7.54	7.90	7.68	8.13	7.71	8.26	8.05	8.36
	Total Dissolved Solids	500 (AO)	10	32.0	76.0	74.0	135	57.0	235	168	269
	Total Suspended Solids	-	3	<3.0	11.0	<3.0	13.0	<3.0	<3.0	<3.0	3.3
Dissolved Anions											
	Bromide (Br)	-	0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl)	250 (AO)	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.79
	Fluoride (F)	1.5 (MAC)	0.02	0.035	0.058	0.042	0.085	0.048	0.071	0.052	0.095
	Sulfate (SO4)	500 (AO)	0.5	3.05	21.5	22.8	36.1	10.1	72.3	68.1	76.8
	Nitrate (as N)	10 (MAC)	0.005	<0.0050	0.0383	0.0615	0.0418	0.0178	0.195	0.257	0.117
	Nitrite (as N)	3.2 (MAC)	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals											
	Calcium (Ca)	-	0.05	4.35	15.0	11.7	29.8	10.3	46.0	31.4	52.3
	Magnesium (Mg)	-	0.1	0.67	5.45	3.97	10.9	1.53	16.5	10.6	20.6

Notes:

Results are expressed as milligrams per litre except where noted.

Samples collected in June 2007 reported as Total Metals.

[1] Guidelines for Canadian Drinking Water Quality, March 2007.

AO = Aesthetic Objective.

MAC = Maximum Acceptable Concentration.

< = Less than detection limit.

- = No guideline for this parameter.

Appendix A

Photo Log – 2007 Focussed Sampling Program

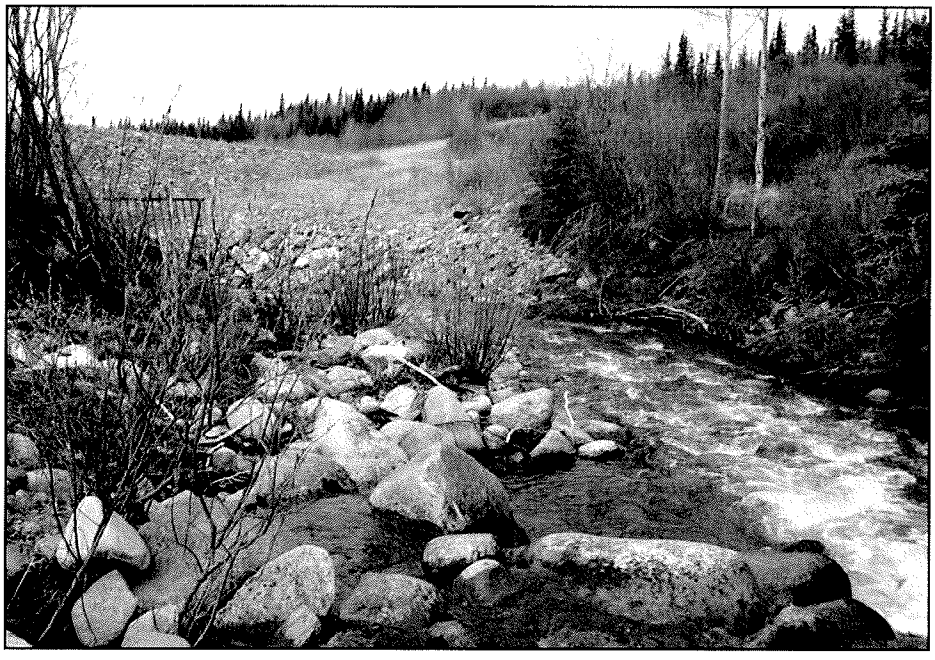
- PHOTOGRAPHS -

PHOTOGRAPH 1



Site V1 looking upstream, June 2007.

PHOTOGRAPH 2



Site V1 looking downstream, June 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 3



Site V27 looking upstream, June 2007.

PHOTOGRAPH 4



Site V27 looking downstream, June 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 5



Site V8 looking upstream, June 2007.

PHOTOGRAPH 6



Site V8 looking downstream in June 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 7



Site VCWLS1-04 looking upstream, June 2007.

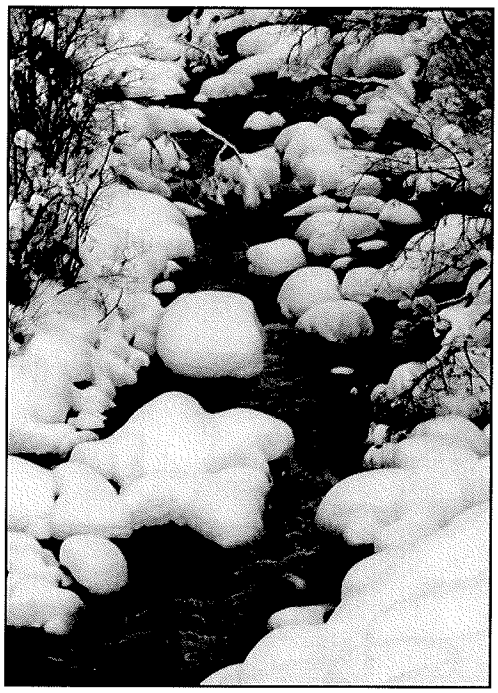
PHOTOGRAPH 8



Site VCWLS1-04 looking downstream, June 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 9



Site V1 looking upstream, October 2007.

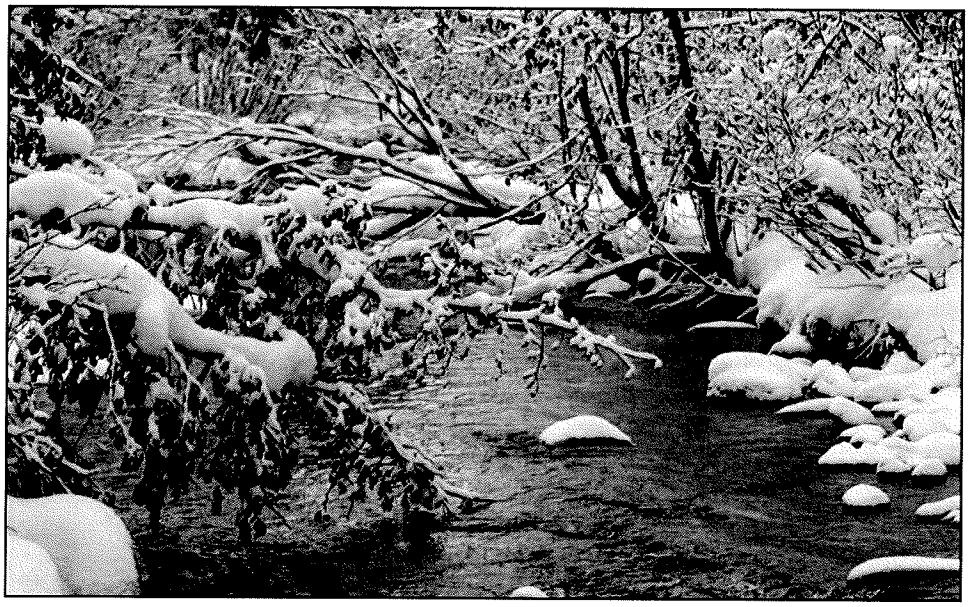
PHOTOGRAPH 10



Sitel V1 looking downstream, October 2007.

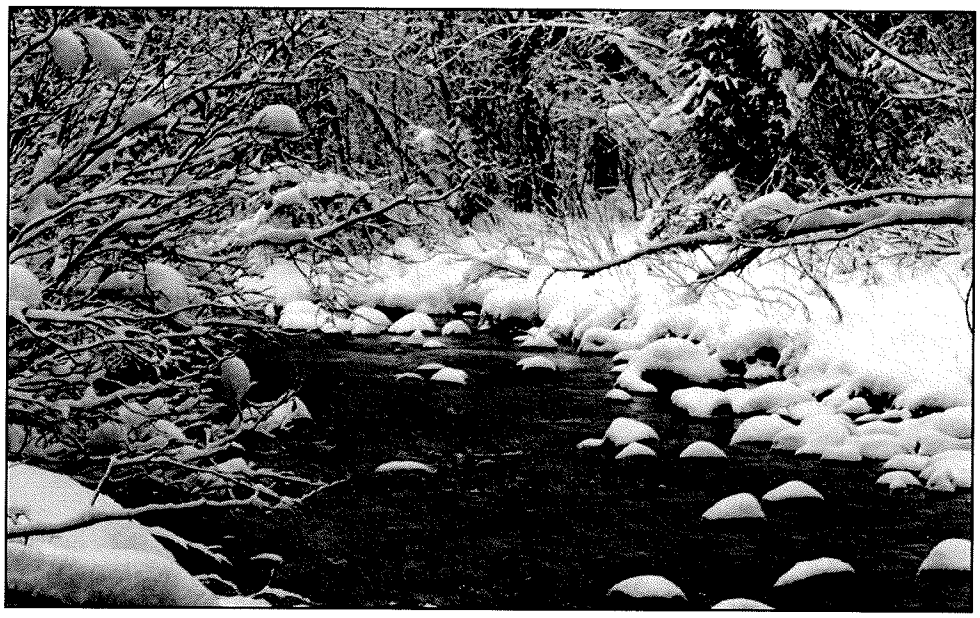
- PHOTOGRAPHS -

PHOTOGRAPH 11



Site V27 looking upstream, October 2007.

PHOTOGRAPH 12



Site V27 looking downstream, October 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 13



Site V8 looking upstream (from footbridge), October 2007.

PHOTOGRAPH 14



Site V8 looking downstream (from footbridge), October 2007.

- PHOTOGRAPHS -

PHOTOGRAPH 15



Site VCWLS1-04 looking upstream, October 2007.

PHOTOGRAPH 16



Site VCWLS1-04 looking downstream, October 2007.

Appendix B

Laboratory Reports

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

ANALYTICAL REPORT

GARTNER LEE LTD.

ATTN: JEN FUNSTON

Reported On: 22-JUN-07 10:54 AM

2251 2ND AVENUE

WHITEHORSE YT Y1A 5W1

Lab Work Order #: **L513916** **Date Received:** **05-JUN-07**

Project P.O. #:
Job Reference: TBD GILL/TOWN OF FARO
Legal Site Desc:
CofC Numbers: A005285

Other Information:

Comments:

T. G. Crowther

Timothy Guy Crowther
General Manager, Vancouver

For any questions about this report please contact your Account Manager:

Can Dang

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

Grouping	Analyte	Sample ID / Description / Sampled Date / Sampled Time / Client ID	L513916-1 02-JUN-07 VI	L513916-2 03-JUN-07 V8	L513916-3 02-JUN-07 V27	L513916-4 02-JUN-07 VCWCS1-04
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)		13.6	60.0	45.5	119
	Conductivity (uS/cm)		32.1	118	94.8	205
	pH (pH)		7.54	7.90	7.68	8.13
	Total Dissolved Solids (mg/L)		32	76	74	135
	Total Suspended Solids (mg/L)		<3.0	11.0	<3.0	13.0
Anions and Nutrients	Bromide (Br) (mg/L)		<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)		<0.50	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)		0.035	0.058	0.042	0.085
	Sulfate (SO4) (mg/L)		3.05	21.5	22.8	36.1
	Nitrate (as N) (mg/L)		<0.0050	0.0383	0.0615	0.0418
	Nitrite (as N) (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010
Total Metals	Calcium (Ca)-Total (mg/L)		4.35	15.0	11.7	29.8
	Magnesium (Mg)-Total (mg/L)		0.67	5.45	3.97	10.9

Reference Information

Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA	Water	Solids by Gravimetric	APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Reference Information

Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # A005285

REPORT TO:	REPORT FORMAT / DISTRIBUTION	SERVICE REQUESTED
COMPANY: Gartner Lee Limited	STANDARD ✓ OTHER	✓ REGULAR SERVICE (DEFAULT)
CONTACT: Jennifer Funston	PDF ✓ EXCEL ✓ CUSTOM FAX	RUSH SERVICE (2-3 DAYS)
ADDRESS: 2251 2nd Avenue	EMAIL 1: jfunston@gartnerlee.com	PRIORITY SERVICE (1 DAY or ASAP)
Whitehorse, Yukon, Y1A 5W1	EMAIL 2:	EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS
PHONE: 867.633.~~6274~~ FAX: 867.633.6321		ANALYSIS REQUEST
INVOICE TO: SAME AS REPORT ? (YES) NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P) →	
COMPANY:	CLIENT / PROJECT INFORMATION: GLL / Town of Faro	
CONTACT:	JOB #: TBD	
ADDRESS:	PO / AFE:	
	Legal Site Description:	
PHONE: FAX:	QUOTE #:	
Lab Work Order # (lab use only):	SAMPLER (Initials): JF, KW	

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	General Chemistry	pH, cond, TDS, TSS, hardness, anions scan	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	V1	June 2, 2007		SW	X				
	V8	June 3, 2007		SW	X				
	V27	June 2, 2007		SW	X				
	VCWCSI-04	June 2, 2007		SW	X				

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
Jen Funston	June 5 2007 15:20	AG	June 5 14:36	TEMPERATURE: 7°C	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) / NO (if no provide details) Ice Pack
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:		

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

ANALYTICAL REPORT

GARTNER LEE LTD.
ATTN: JEN FUNSTON
2251 2ND AVENUE
WHITEHORSE YT Y1A 5W1

Reported On: 28-OCT-07 11:49 AM

Lab Work Order #: **L566064** **Date Received:** **15-OCT-07**

Project P.O. #: 70947
Job Reference: 70497
Legal Site Desc: TOWN OF FARO
CofC Numbers: A010550

Other Information:

Comments:

Joyce Chow
General Manager, Vancouver

For any questions about this report please contact your Account Manager:

NATASHA MARKOVIC-MIROVIC

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

	Sample ID	L566064-1	L566064-2	L566064-3	L566064-4
	Description				
	Sampled Date	11-OCT-07	11-OCT-07	11-OCT-07	11-OCT-07
	Sampled Time				
	Client ID	V1	V8	V27	VCWLS1-04
Grouping	**Analyte**				
WATER					
Physical Tests	Hardness (as CaCO3) (mg/L)	32.0	183	122	216
	Conductivity (uS/cm)	73.1	365	259	418
	pH (pH)	7.71	8.26	8.05	8.36
	Total Dissolved Solids (mg/L)	57	235	168	269
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	3.3
Anions and Nutrients	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50	0.79
	Fluoride (F) (mg/L)	0.048	0.071	0.052	0.095
	Sulfate (SO4) (mg/L)	10.1	72.3	68.1	76.8
	Nitrate (as N) (mg/L)	0.0178	0.195	0.257	0.117
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
Dissolved Metals	Calcium (Ca)-Dissolved (mg/L)	10.3	46.0	31.4	52.3
	Magnesium (Mg)-Dissolved (mg/L)	1.53	16.5	10.6	20.6

Reference Information

Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO2-IC-VA	Water	Nitrite by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-NO3-IC-VA	Water	Nitrate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 "Determination of Anions by IC

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

TDS-VA	Water	Total Dissolved Solids by Gravimetric	APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TSS-VA	Water	Solids by Gravimetric	APHA 2540 Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.
The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Reference Information

Methods Listed (if applicable):

Test Code	Matrix	Test Description	Analytical Method Reference(Based On)	
Laboratory Definition Code		Laboratory Location	Laboratory Definition Code	Laboratory Location
VA		ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS
Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in enviromental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.
The reported surrogate recovery value provides a measure of method efficiency.
mg/kg (units) - unit of concentration based on mass, parts per million
mg/L (units) - unit of concentration based on volume, parts per million
N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM

CANADA TOLL FREE 1-800-668-9878

www.alsenviro.com

COC # A010550

REPORT TO: Jennifer Funston	REPORT FORMAT / DISTRIBUTION
COMPANY: Gartner Lee Limited	STANDARD ✓ OTHER
CONTACT: Natasha Markovic-Mirovic	PDF ✓ EXCEL ✓ CUSTOM FAX
ADDRESS: 2251 2nd Avenue	EMAIL 1: jfunston@gartnerlee.com
Whitehorse Yukon Y1A 5W1	EMAIL 2:
PHONE: 867.633.6474 FAX: 867.633.6321	
INVOICE TO: SAME AS REPORT ? (YES) NO	INDICATE BOTTLES: FILTERED / PRESERVED (F/P)
COMPANY:	CLIENT / PROJECT INFORMATION:
CONTACT:	JOB #: 70497
ADDRESS:	PO /AFE: 70497
	Legal Site Description: Town of Faro
PHONE: FAX:	QUOTE #:
Lab Work Order # (lab use only): L566664	SAMPLER (initials): KW, JF

SERVICE REQUESTED
✓ REGULAR SERVICE (DEFAULT)
RUSH SERVICE (2-3 DAYS)
PRIORITY SERVICE (1 DAY or ASAP)
EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS

ANALYSIS REQUEST

Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	General Chemistry	(pH, cond, TDS, TSS, hardness, anions scan)	HAZARDOUS ?	HIGHLY CONTAMINATED ?	NUMBER OF CONTAINERS
	V1	Oct. 11, 2007		SW	X				1
	V8	Oct. 11, 2007		SW	X				1
	V27	Oct. 11 2007		SW	X				1
	VCW-SI-04	Oct. 11, 2007		SW	X				1

GUIDELINES / REGULATIONS	SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS

Failure to complete all portions of this form may delay analysis. Please fill in this form *LEGIBLY*.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:
Jen Funston	Oct. 13, 2007	HD 071015	10:21
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME

SAMPLE CONDITION (lab use only)

TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? (YES) NO (If no provide details)
9°C	

Appendix 12

Anvil Range Mine
Adaptive Management Plan, Annual Review for 2007, Gartner Lee Limited, February 2008

Gartner Lee

Anvil Range Mine Adaptive Management Plan - Annual Review for 2007



Prepared for

Deloitte & Touche Inc.
(acting as Court Appointed Interim Receiver for Anvil Range Mining Corporation)

Submitted by

Gartner Lee Limited
Gomm Environmental Engineering Consulting

February 2008

Gartner Lee

Anvil Range Mine Adaptive Management Plan - Annual Review for 2007

Prepared for

Deloitte & Touche Inc.

(acting as Court Appointed Interim Receiver for Anvil Range Mining Corporation)

February 2008

Reference: **GLL 70546**

Distribution:

6 Yukon Water Board
11 Deloitte & Touche Inc.
2 Gartner Lee Limited
1 Gomm Environmental Engineering Consulting

Gartner Lee

Executive Summary

The Water Licence for the Anvil Range Mine (QZ03-059) provides primarily for the continuation of environmental care and maintenance activities to the end of 2008, when a Final Closure and Reclamation Plan is scheduled to be in place. In addition to water and facilities that will receive active management, there are other waters and facilities on the mine site that are recognized as representing potential environmental risks but which do not require immediate intervention. Long term management of these waters and facilities will be addressed in the Final Closure and Reclamation Plan. However, a short term management strategy is required to monitor for potential degradation of conditions to the point where active intervention might be necessary prior to the end of February 2009 and to provide a framework for ensuring that appropriate management actions are implemented.

Such a strategy is provided for in the Water Licence through the Adaptive Management Plan ("AMP"). A conceptual AMP was developed and reviewed by parties to the Environmental Assessment and Water Licencing processes through 2002 and 2003. The Water Licence then required that a detailed AMP Implementation Protocol be developed that follows from the conceptual plan. The AMP Implementation Protocol was filed with the Water Board in June 2004. The Implementation Protocol also requires that an annual review of the AMP program be undertaken. The annual review provides a mechanism whereby any necessary or beneficial modifications to the AMP program can be identified and proposed to the Water Board on a regular basis.

Eight AMP "events" were developed through the Environmental Assessment and Water Licence Renewal processes. These events represent possible future environmental conditions that would require a management response, if they were to occur.

The eight events are as follows with a summary for 2007 activities:

1. Degraded Groundwater Quality in Rose Creek Valley Aquifer;
   Two new triggers activated in 2007 at the 2003 Multi-level Wells: sulphate at P03-09-6, P03-09-07, P03-04-2 and P03-04-3.
2. Degraded Water Quality in Vangorda Creek Downstream of the Mine Facilities;
   No triggers activated in 2007.
3. Degraded Water Quality in Rose Creek Downstream of the Mine Facilities;
   One trigger activated in 2007 for sulphate. Data analysis demonstrated that this was due to the elevated sulphate concentrations during winter low flow period, consistent with historical trends, particularly during periods of discharge of compliant effluent during low flow conditions.
4. Degraded Seepage Quality from the Grum Rock Dump;
   No new triggers at V2 in 2007. A consistent rise in dissolved zinc concentration observed at V15 in 2007. The transfer of water from station V15 to station V2A was implemented in 2007, via Grum Creek diversion as a proactive intervention.

5. Degraded Water Quality in the North Fork of Rose Creek;
   One new trigger at X2 for zinc in 2007. Specifically, three consecutive zinc concentrations above the threshold value. A comprehensive analysis of these triggers is presently underway, incorporating new information that has been generated as part of the ongoing development of the Final Closure and Reclamation Plan by the Faro Project Management Team.
6. Water level in Grum Pit Reaches Maximum Desired Elevation;
   No triggers activated in 2007.
7. Disruption of Fannin Sheep Migration Through the Mine Site; and
   No triggers activated in 2007.
8. Wind Dispersed Tailings Result in Adverse Effects in the Terrestrial Environment.
   No triggers activated in 2007.

Other than the specific recommendations listed above, the AMP program functioned in 2007 as intended and no other changes should be made.

Table of Contents

Executive Summary

Page

1 Introduction 1

1.1 Background 1
1.2 AMP Events 2
1.3 Approach to the Annual Review 3

2 AMP Event 1, Degraded Groundwater Quality in Rose Creek Valley Aquifer 3

2.1 Description 3
2.2 Summary of Implementation Protocol Information 4
2.3 Background 5
2.3.1 X24 and X25 5
2.3.2 P03 Multi-Level Wells 8
2.4 2007 Review 9
2.4.1 Wells X24 and X25 9
2.4.2 P03 Multi-Level Wells 10

3 AMP Event 2, Degraded Water Quality in Vangorda Creek Downstream of Mine Facilities 11

3.1 Description 11
3.2 Summary of Implementation Protocol Information 11
3.3 Review 12

4 AMP Event 3, Degraded Water Quality in Rose Creek Downstream of Mine Facilities 15

4.1 Description 15
4.2 Summary of Implementation Protocol Information 15
4.3 Review 16

5 AMP Event 4, Degraded Seepage Quality from the Grum Rock Dump 19

5.1 Description 19
5.2 Summary of Implementation Protocol Information 19
5.3 Background 19
5.4 2007 Review 21

6 AMP Event 5, Degraded Water Quality in the North Fork of Rose Creek 23

6.1 Description 23
6.2 Summary of Implementation Protocol Information 24

6.3 Follow Up to 2006 Review 24
6.4 2007 Review 25

7 AMP Event 6, Water level in Grum Pit Reaches Maximum Desired Elevation 28

7.1 Description 28
7.2 Summary of Implementation Protocol Information 29
7.3 Review 29

8 AMP Event 7, Disruption of Fannin Sheep Migration Through the Mine Site 33

8.1 Description 33
8.2 Summary of Implementation Protocol Information 33
8.3 Review 33

9 AMP Event 8, Wind Dispersed Tailings Result in Adverse Effects in the Terrestrial Environment 34

9.1 Description 34
9.2 Summary of Implementation Protocol Information 34
9.3 Review 34

10 Recommendations 36

List of Figures

Figure 3-1. Vangorda Creek (V8) Sulphate (2003 – 2007) 13
Figure 3-2. Vangorda Creek (V8) Total Suspended Solids (TSS) (2003 – 2007) 14
Figure 3-3. Vangorda Creek (V8) Total Zinc (2003 – 2007) 14
Figure 4-1. Rose Creek (X14) Sulphate (2003 – 2007) 18
Figure 4-2. Rose Creek (X14) Total Zinc (2003 – 2007) 18
Figure 6-1. North Fork Rose Creek (X2) Sulphate (2003 – 2007) 27
Figure 6-2. North Fork Rose Creek (X2) Zinc (2003 – 2007) 27
Figure 7-1. Grum Pit Water Elevations and Projection 32
Figure 7-2. Grum Pit Water, Rate of Rise 32

List of Tables

Table 2-1. Sulphate and Zinc Data for Rose Creek Valley Aquifer - X24 (2007) 9
Table 2-2. Sulphate and Zinc Data for Rose Creek Valley Aquifer - X24 (2007) 10
Table 3-1. Summary of 2007 AMP Data for Vangorda Creek (V8) 13
Table 4-1. Summary of 2007 AMP Data for Rose Creek (X14) 17
Table 6-1. Summary of AMP Data at X2 (2007) 26
Table 7-1. Monthly Precipitation at Faro Airport to 2007 31

Appendices

A. AMP Event #4 Response: 2007 Status Report

1. Introduction

1.1 Background

The Anvil Range Mine, inclusive of both the Faro and Vangorda Plateau mine sites, is located near the Town of Faro, Yukon. The mine produced lead and zinc mineral concentrates from 1969 to 1998 and was, at one time, the largest open pit, lead-zinc mines in the world. All mining and processing operations ceased permanently in early 1998 when the mine owner, Anvil Range Mining Corporation, entered into receivership. The mine has been under the management of a court appointed interim receiver, Deloitte & Touche Inc., since April 1998.

The Water Licence for the Anvil Range Mine (QZ03-059) provides primarily for the continuation of environmental care and maintenance activities to the end of February 2009, when a Final Closure and Reclamation Plan is scheduled to be submitted. The licenced care and maintenance activities address specifically water and facilities that require active management to ensure that adequate environmental protection is provided in the short term (i.e., to 2008).

In addition to water and facilities that will receive active management, there are other waters and facilities on the mine site that are recognized as representing potential environmental risks but which do not require immediate intervention. Long term management of these waters and facilities will be addressed in the Final Closure and Reclamation Plan. However, a short term management strategy is required to monitor for potential degradation of conditions to the point where active intervention might be necessary prior to the end of 2008 and to provide a framework for ensuring that appropriate management actions are implemented.

Such a strategy is provided for in the Water Licence through the Adaptive Management Plan ("AMP"). A conceptual AMP was developed and reviewed by parties to the Environmental Assessment and Water Licencing processes through 2002 and 2003. The Water Licence then required that a detailed AMP Implementation Protocol be developed that follows from the conceptual plan. Part F, Item 54 of the Water Licence reads:

> *An Adaptive Management Plan for the facilities authorized by this licence shall be prepared and submitted to the Board by June 30, 2004. The plan shall identify the indicators and triggers for action, the measures of statistically significant changes to be tracked, the monitoring locations and parameters, the sampling frequencies, the methods to be used to analyze and evaluate the data, and the actions to be taken.*

The AMP Implementation Protocol was filed with the Water Board in June 2004. The Implementation Protocol provided all of the information that was required by the Water Licence for the eight AMP "events" that had been developed in the conceptual plan.

The Implementation Protocol also requires that an annual review of the AMP program be undertaken. The annual review provides a mechanism whereby any necessary or beneficial modifications to the AMP program can be identified and proposed to the Water Board on a regular basis. The annual review also ensures that all of the year's activities under the AMP program are compiled and documented.

1.2 AMP Events

Eight AMP "events" were developed through the Environmental Assessment and Water Licence Renewal processes. These events represent possible future environmental conditions that would require a management response, if they were to occur.

The eight events are as follows:

1. Degraded Groundwater Quality in Rose Creek Valley Aquifer;
2. Degraded Water Quality in Vangorda Creek Downstream of the Mine Facilities;
3. Degraded Water Quality in Rose Creek Downstream of the Mine Facilities;
4. Degraded Seepage Quality from the Grum Rock Dump;
5. Degraded Water Quality in the North Fork of Rose Creek;
6. Water level in Grum Pit Reaches Maximum Desired Elevation;
7. Disruption of Fannin Sheep Migration Through the Mine Site; and
8. Wind Dispersed Tailings Result in Adverse Effects in the Terrestrial Environment.

Each of the AMP events is described according to nine common elements. This ensures that a consistent approach is followed for each event that achieves the general objectives of the AMP Implementation Protocol. The common elements are as follows:

1. Description of the event and possible environmental consequences;
   As developed through the Environmental Assessment and Licence Renewal Processes
   The possible environmental consequences will lead to the narrative trigger and specific thresholds.
2. Discussion of event-specific information or issues;
   Any unique issues or information that have a direct influence for applying the AMP.
3. Narrative response trigger;
   As developed through the Environmental Assessment and Licence Renewal Processes.
   The narrative trigger will lead to the specific indicators.
4. Specific indicators;
   The environmental parameters to be monitored and assessed.
5. Specific Thresholds;
   Defines the conditions, in terms of the specific indicators, when management actions should be taken.

There may be a series of staged thresholds for an individual event.

6. Monitoring requirements;
   The frequency and means for monitoring of the specific indicators.
7. Evaluation of monitoring results;
   The means of evaluating whether any specific thresholds have been crossed.
8. General approach to responses; and
   As developed through the Environmental Assessment and Licence Renewal Processes.
   Describes the general approach to management responses, if necessary.
9. Specific thresholds and responses.
   Describes the specific responses to be implemented if any specific thresholds have been crossed.

The details of these AMP elements are not provided in this report. Readers are referred to the AMP Implementation Protocol for this level of detail (Gartner Lee Limited on behalf of the Interim Receiver, June 2004).

1.3 Approach to the Annual Review

This report provides the annual review of the AMP for the year 2007, as described in the AMP Implementation Protocol. The prime purpose of the annual review is to assess the adequacy and appropriateness of the elements of each event, such as trigger locations, specific indicators and thresholds, and monitoring requirements. Updates, amendments or other changes to the AMP may be recommended based on the annual review.

Each AMP Event includes a routine management review of the monitoring data against the triggers and thresholds. The results of these reviews are reported to the Water Board as part of the Monthly Reports submitted under Part A, Item 15 of the Water Licence. The results of these reviews are summarized as part of the Annual Review. Where required for some of the AMP Events, the results of the annual review are also summarized.

Each AMP event is reviewed individually in the following sections of the report.

2. AMP Event 1, Degraded Groundwater Quality in Rose Creek Valley Aquifer

2.1 Description

Groundwater in the Rose Creek Valley aquifer collects seepage and contaminants released from the surface tailings impoundments and has the potential to become contaminated to the degree

where discharge from the aquifer to Rose Creek may result in a sustained adverse effect in Rose Creek. The groundwater quality in the Rose Creek Valley aquifer is presently measured twice per year, in spring and fall, at various locations within the tailings facility and downstream of the tailings facility. Samples are analyzed for dissolved metals, pH, temperature, conductivity, total dissolved solids, sulphate, and alkalinity as per the Water Licence (YWB, 2004). Additional groundwater quality data is also provided for through a series of monitoring wells which were installed in 2003 as part the ongoing hydrogeological and geochemical investigations of the Rose Creek Tailings Facility and the Rose Creek Valley Aquifer.

Since degradation of groundwater quality is anticipated to occur progressively from the source area (tailings deposit) in a downgradient direction (Cross Valley Dam and downstream), the trigger locations for the implementation of the AMP are designed to provide for the early detection of emerging trends or "plumes". The trigger locations include locations downgradient of the tailings deposit as well as location directly underlying the tailings deposit as follows:

- groundwater quality downgradient of the Cross Valley Dam (location P03-09);
- groundwater quality at the Intermediate Dam, below the downstream extent of the tailings deposit (locations X24 and X25);
- groundwater quality (i.e., the aquifer underlying the tailings deposit) approximately mid-length of the Intermediate Impoundment (location P03-08); and
- groundwater quality at the Second Impoundment Dam, approximately mid-length of the tailings facility (location P03-04).

The environmental consequences of degraded water quality in the Rose Creek Valley aquifer are the potential exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Rose Creek, Anvil Creek and the Pelly River. Zinc is currently the primary contaminant of concern and zinc and sulphate are currently the primary indicators of acid rock drainage.

A substantial amount of work has been carried out to characterize the environmental conditions in the Rose Creek Valley aquifer. This work serves to provide information that is important to the Adaptive Management Plan as well as the long term needs of the Final Closure and Reclamation Plan that is currently being developed. The results of the ongoing studies of the Rose Creek Valley aquifer need to be continually incorporated into the AMP.

2.2 Summary of Implementation Protocol Information

The following is a summary of the AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
$Zn_{(D)}$, SO_4	X24, X25	■ 3 consecutive results > 75th percentile of reference period; or ■ statistically significant trend projects >75th percentile of reference period within three years.	Quarterly
	P03-04, -08 and -09	■ statistically significant trend.	Quarterly

Dissolved iron was initially identified as an indictor in the Rose Creek Valley Aquifer AMP but was removed after 2005 due to issues related to the sensitivity of dissolve iron concentrations on sampling methodology in samples collected during the reference period.

Note that there was insufficient data for monitoring wells P03-04, -08 and -09 to form a "reference period" because these wells were installed in 2003.

2.3 Background

2.3.1 X24 and X25

As documented in the 2004 Adaptive Management Plan Annual Report the following triggers were activated at the toe of the Intermediate Dam for zinc, sulphate and iron:

1. *Sulphate in monitoring wells X24-A, X24-C and X24-D;*
2. *Dissolved zinc in X24-D; and*
3. *Dissolved iron in monitoring wells X25-A and X25-B.*

In response to the activation of these triggers the procedures described in the Adaptive Management Plan Implementation Protocol (AMPIP) were initiated. The following four action steps are described in the AMPIP and, as stated in the AMPIP, were initiated in 2004:

1. *Verification of the monitoring information followed by notification to the YG Water Inspector (completed 2004);*
2. *Additional monitoring, if necessary (completed 2004);*
3. *Data analysis and predictive impact modeling, if necessary; and*
4. *Mitigation (Response) plan, if necessary.*

The first two steps outlined above were completed in 2004 and summarized in the 2004 Annual Adaptive Management Annual Report. In early 2005, a data analysis of the related monitoring results was carried out, incorporating new information that has been developed for development of the Final Closure and Reclamation Plan. The results of this analysis indicated that the increased concentrations being seen at the AMP trigger locations, specifically X24, may in part be due to

contaminant loading to the aquifer from drainage in the Old Faro Creek Channel, including loading from the Faro rock dumps (location X23) and the Emergency Tailings Area.

Data analysis was then carried out in February 2005 using predictive modeling to assess the potential for contaminant loading to the receiving environment and any associated impacts. This was done using the aquifer loading balance model that has developed by Robertson Geoconsultants as part of the closure planning studies. The fundamental outcome of this modeling exercise was to determine if the current groundwater conditions are having an effect on Rose Creek and, further, provide an indication of the rate and development of contaminant loading, if any, to the receiving environment. The following provides a summary of the results of predictive modeling. Details of the modeling were summarized in a letter to Government of Yukon, Water Resources Branch in May 2006 (Appendix A).

The predictive model was run based on the fall 2004 groundwater quality data for X24 (A, B and C) and X25 for sulphate and dissolved zinc. The following four scenarios were run using the calibrated Rose Creek Water and Load Balance Model to estimate the loading to Rose Creek from groundwater and subsequent sulphate and dissolved zinc concentrations in Rose Creek.

- "Base Case" using fall 2004 concentrations;
- Sensitivity Run 1 – 20% increase in sulphate and dissolved zinc concentrations at X24 and X25;
- Sensitivity Run 2 – 50% increase in sulphate and dissolved zinc concentrations at X24 and X25; and
- Sensitivity Run 3 – 100% increase in sulphate and dissolved zinc concentrations at X24 and X25.

The results of this predictive modeling exercise indicate that the present groundwater conditions (base case) are not predicted to have a detrimental effect on the water quality in Rose Creek in the near future. Predicted concentrations of dissolved zinc for the four scenarios (0.03 – 0.041 mg/L) are with in the range of concentrations presently seen in Rose Creek downstream of the Cross Valley Dam (X14). Based on these results there is no need for the development of a short-term response plan, other than ongoing monitoring and assessment of all related water quality data. Furthermore the degradation of water quality in the Rose Creek Valley aquifer and subsequent impacts Rose Creek, Anvil Creek and the Pelly River continues to be a major area of investigation as part of the ongoing development of the Faro Closure and Reclamation Plan.

In September 2005, an additional trigger was activated at X24-A for dissolved iron. An assessment of the water quality data and sampling techniques was carried out which indicated that the elevated levels of iron may be due to slight variation in sampling methodology during the reference period. The sensitivity of dissolved iron concentrations to minor variations in sampling methodology introduces some uncertainty in the interpretation of the results prior to 2002. Furthermore, through the ongoing aquatic risk assessment work being carried out as part of closure planning, iron was not identified as a contaminant of concern in the receiving environment. Therefore, it was

recommended that dissolved iron no longer be an indicator in the AMP Protocol for the Rose Creek Aquifer. This recommendation was subsequently adopted in 2006.

Therefore, at the end of 2005, the triggers for dissolved zinc and sulphate at X24 and X25 remained "activated" because concentrations were above the threshold values; however, the determination had been made that no immediate response was required pending the analysis of future monitoring results. The ongoing management review in 2006 of the relevant groundwater quality data from X24 and X25 indicated there were no new triggers above those already identified in 2005.

Due to ongoing sampling issues at location X24 (A/B/C) an investigation was conducted in August 2006 to assess the present conditions of the wells and determine the cause of the previous sampling difficulties. Problems at these wells were first encountered at X24-B where sand heaved within the well to above the water table. This problem seems to be progressing in the area, and issues are now being encountered at X24-A and X24-C. The following is a summary of the major observations and recommendations after the 2006 monitoring program.

- X24-A – This well has a 1 m thick sand layer at the bottom. It can be sampled but the presence of this sand layer suggests that the well has been compromised or that sediment is accumulating in the well. It was recommended that this well be investigated further in 2007 and attempts made to remove the sediment from the well. Caution should be used when using the monitoring results from this well.

- X24-B – Sand has accumulated in this well to 3.7 m below the top of the casing and above the water table. Consequently this well could not be sampled in 2005 and 2006. Data collected to date from this well should be applied with caution until it is determined what has caused sand to accumulate in the well. It was been recommended that this well be removed from the routine monitoring program.

- X24-C – This well is blocked at a depth of approximately 12 m, which is 5 m above the actual bottom of the well. Clogging of the foot valve with sand during sampling prevents the collection of a sample. It was not possible to sample this well in 2006. Similar to X24-B, data collected to date from this well should be applied with caution until it is determined what has caused sand to accumulate in the well. It was been recommended that this well be removed from the routine monitoring program.

- X24-D – Although there have not been any issues regarding sampling at X24-D, it was recommended that it be investigated in 2007 with a downhole camera to determine the present condition of the well and identify any issues.

Results of the 2007 investigation are summarized in the following section including recommendations for modifications to the AMP Event 1, Degraded Groundwater Quality in Rose Creek Valley Aquifer.

2.3.2 P03 Multi-Level Wells

Review of the water quality data from three AMP multi-level wells installed in 2003 (P03-04, P03-08 and P03-09) included an assessment of the following specific threshold for dissolved zinc and sulphate:

- a statistically significant trend in the groundwater monitoring results with a requirement of a minimum of four results.

Previously, ongoing trends previously were limited by the number of data points (degrees of freedom). At the end of 2006, sufficient data points were provide for a statistically significant determination. Annual review of the 2006 multi-level data against the threshold indicated that the following thresholds for sulphate and dissolved zinc were reached:

- *increasing trend in zinc concentrations at P03-04-2 and P03-04-3; and*
- *increasing trend in sulphate concentrations at P03-09-3 and P03-09-4.*

As outlined in the 2006 AMP Annual Review, the next step in response to activation of this trigger was verification and notification of the AMP Trigger to Government of Yukon, Water Resources Branch. This would be followed up by a detailed assessment of the trigger location including any associated water quality data. Given restrictions in the collection of groundwater samples in winter conditions, the earliest a verification sample could be collected in spring 2007. In the interim, it was planned to expedite the response to these trigger by initiating a detailed assessment of the multi-levels triggers prior to the spring sampling event. At the same time, during the 2007/2008 study planning meetings, it was identified that there was a need to provide an updated review of the groundwater quality monitoring data. This work was subsequently undertaken by Robertson GeoConsultants Inc. and a final report is anticipated to be available March 2008. Based on the preliminary findings of the RGC 2007 groundwater review, an additional study was recommended and is presently underway: geochemical assessment of groundwater quality in rose creek aquifer including the determination of the hydraulic gradients and geochemical fingerprinting was recommended to determine the cause for the recent deterioration in groundwater quality in this portion of the Rose Creek.

Therefore, it was decided to hold off on the completion of the trigger assessment until such time that the results of RGC's review could be incorporated.

2.4 2007 Review

The management review of AMP Event 1, groundwater in 2007 was confounded by laboratory QA/QC issues: one issue was concerning elevated zinc detection limits in both 2006 and 2007, and the second related to concerns of charge balance inaccuracies resulting in sulphate concentration reporting errors in 2007. As a result, a complete analysis of this AMP Event could not be fully carried out until the corrected data set was available in early 2008.

2.4.1 Wells X24 and X25

The ongoing management review in 2007 of the relevant groundwater quality data from X24 and X25 at the toe of the Intermediate Dam was carried out on four occasions in 2007: June, July, September and November. This data review included assessment of the two following specific thresholds for dissolved zinc and sulphate:

- three consecutive monitoring results greater than the upper 75th percentile of the reference period (1998 – 2002); or
- a statistically significant trend in the monitoring results (from 2003 and on) which, when extrapolated forward three years, would result in values greater than the upper 75th percentile of the reference period.

The results of the review are summarized in Table 2-1 and Table 2-2. Based on the 2007 data there were no new triggers at location X24 and X25 above those already identified other than dissolved zinc at X24-A: specifically:

- Three consecutive monitoring results greater than the upper 75th percentile of the reference period (1998 – 2002).

Table 2-1. Sulphate and Zinc Data for Rose Creek Valley Aquifer - X24 (2007)

	X24-A		X24-D	
Date	**Sulphate (mg/L)**	**Zinc (mg/L)**	**Sulphate (mg/L)**	**Zinc (mg/L)**
May 2007	Frozen		Frozen	
August 2007	*1430*	*0.0155*	1840	0.0697
October 2007	*1620*	*0.0198*	1890	0.0824
November 2007	*1510*	*0.0199*	1930	0.076
Threshold	**729**	**0.01**	**1057**	**0.03**

Table 2-2. Sulphate and Zinc Data for Rose Creek Valley Aquifer - X25 (2007)

	X25-A		X25-B	
Date	**Sulphate (mg/L)**	**Zinc (mg/L)**	**Sulphate (mg/L)**	**Zinc (mg/L)**
May 2007	285	0.0071	356	0.0058
August 2007	301	0.0064	348	<0.005
October 2007	293	0.0067	311	0.0064
November 2007	334	0.008	376	<0.005
Threshold	**294**	**0.055**	**395**	**0.02**

In 2007, X24-B and C could not be sampled due to the ongoing issues of the build up of sediment in the wells. In addition, X24-A, although it could be sampled, is also suspect due to the accumulation of sediment due to it possibly being compromised during installation, and caution should be used when using data from this well. Based on the ongoing issues associated with these three wells it has been recommended by Gartner Lee Limited, and supported by others (Robertson GeoConsultants) that these wells be decommissioned. AMP trigger location X24-D has been determined to be adequate for routine monitoring and ongoing assessment of AMP Event 1. Therefore the following modifications are being made for AMP Event 1, Degraded Groundwater Quality in Rose Creek Aquifer, specifically that X24-A, X24-B and X24-C be removed as AMP trigger monitoring stations at X24.

2.4.2 P03 Multi-Level Wells

A management review consisting of the relevant groundwater quality data from the three AMP multi-level wells installed in 2003 (P03-04, P03-08 and P03-09) was conducted in 2007. This data review included an assessment of the following specific threshold for dissolved zinc and sulphate:

- A statistically significant trend in the groundwater monitoring results with a requirement of a minimum of four results.

Annual review of the 2007 multi-level data against the threshold indicated that the following thresholds new for sulphate and dissolved zinc have been reached:

1. *Increasing trend in sulphate concentrations at P03-04-2 and P03-04-3; and*
2. *Increasing trend in sulphate concentrations at P03-09-6 and P03-09-7.*

Furthermore, review of the updated 2006 and 2007 relevant groundwater quality data from the three AMP multi-levels (P03-04, P03-08 and P03-09) indicates that the triggers identified in 2006 still remain in effect.

As outlined above a comprehensive assessment of the triggers in the Rose Creek Aquifer is presently being carried out incorporating:

- water quality data from the Reference Water Quality Stations outlined in the AMPIP;
- results of 2007 Groundwater Review carried out by Robertson GeoConsultants Limited (presently being finalized); and
- results of the Geochemical Assessment of Groundwater Quality in Rose Creek Aquifer by Robertson GeoConsultants Inc.

The results of this comprehensive assessment will be submitted to the Water Board and Government of Yukon Water Resources Branch under separate cover in May 2008.

3. AMP Event 2, Degraded Water Quality in Vangorda Creek Downstream of Mine Facilities

3.1 Description

The water quality in Vangorda Creek downstream of the Vangorda Plateau mine facilities could be negatively affected by surface water runoff from the mine facilities and groundwater seepage. The water quality in Vangorda Creek downstream of the mine facilities is measured monthly at Station V8 at the foot bridge in the Town of Faro for total metals, dissolved metals, pH, temperature, conductivity, total suspended solids, sulphate, ammonia and hardness (YWB 2004). Water quality in Vangorda Creek is also monitored monthly farther upstream in the main stem of Vangorda Creek at Station VGMAIN.

The environmental consequences of degraded water quality in Vangorda Creek is the potential exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Vangorda Creek and, possibly, the Pelly River. Zinc is currently the primary contaminant of concern and zinc and sulphate are currently the primary indicators of acid rock drainage. However, the consideration of degraded water quality should include other metals and contaminants which could source from the rock dumps, open pits and other mine facilities.

3.2 Summary of Implementation Protocol Information

As part of the 2005 Annual AMP Review, an assessment was carried out to determine if there are any statistically significant seasonal differences in the sulphate concentrations at V8, and if necessary determine seasonally based threshold values for sulphate at V8 based on the reference period (1998 – 2002). Concentrations of sulphate during the reference period were found to exhibit seasonal variability. Using the Analysis of Variance and Multiple Comparisons (Least Significant Difference) at a 5 % significance level, statistically higher concentrations are observed in the winter months (November – April) compared to the open water months (May – October). Given this

seasonal variability in the concentrations of sulphate in Vangorda Creek at V8, it was recommended that the AMP Protocol for V8 be modified for sulphate to include two seasonal components: open water season (May – October) and winter (November – April). The following is a summary of the modified AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
Zn(T), Cu(T), and TSS	V8	■ 3 consecutive results > 75th percentile of reference period; or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly
SO_4	V8	■ 3 consecutive results > 75th percentile of reference period (75 mg/L); or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly (May – October)
SO_4	V8	■ 3 consecutive results > 75th percentile of reference period (171 mg/L); or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly (November – April)

3.3 Review

A management review of the relevant water quality data from V8 was carried out on a monthly basis in 2007. This data review included assessment of the two following specific thresholds for total copper, total zinc, total suspended solid (TSS) and sulphate:

- Three consecutive monitoring results greater than the upper 75th percentile of the reference period (1998 – 2002); or
- A statistically significant trend in the monitoring results (from 2003 and on) which, when extrapolated forward three years, would result in values greater than the upper 75th percentile of the reference period.

For sulphate, the data review included the assessment based on two seasonal components: open water season (May – October) and winter (November – April).

The results of the review are summarized in Table 3-1 and in Figure 3-1, Figure 3-2, and Figure 3-3. In 2007, there were no triggers activated at V8 in 2007.

Table 3-1. Summary of 2007 AMP Data for Vangorda Creek (V8)

Date	Total Zinc (mg/L)	Total Copper (mg/L)	Total Suspended Solids (mg/L)	Sulphate (mg/L)
01/15/07	*0.064*	<0.0010	<1	165
02/15/07	0.011	<0.0010	<1	163
03/11/07	0.028	0.0010	<1	*201*
04/18/07	*0.045*	0.0010	<1	*185*
05/14/07	0.018	0.0040	7	61.2
06/18/07	0.030	0.0020	13	35.8
07/16/07	0.017	0.0050	52	48.4
08/13/07	0.019	0.0010	2	73
09/10/07	0.007	<0.0010	<1	74
10/23/07	0.010	0.0010	<1	*99.8*
11/13/07	0.010	<0.0010	2	111
12/09/07	0.013	<0.0010	2	129
Trigger	**0.042**	**0.023**	**8**	**75[a]/171[b]**

***Note**:*

Italics = Exceeds Trigger Value.

a. Open Water Trigger Value.

b. Winter Trigger Value.

Figure 3-1. Vangorda Creek (V8) Sulphate (2003 – 2007)

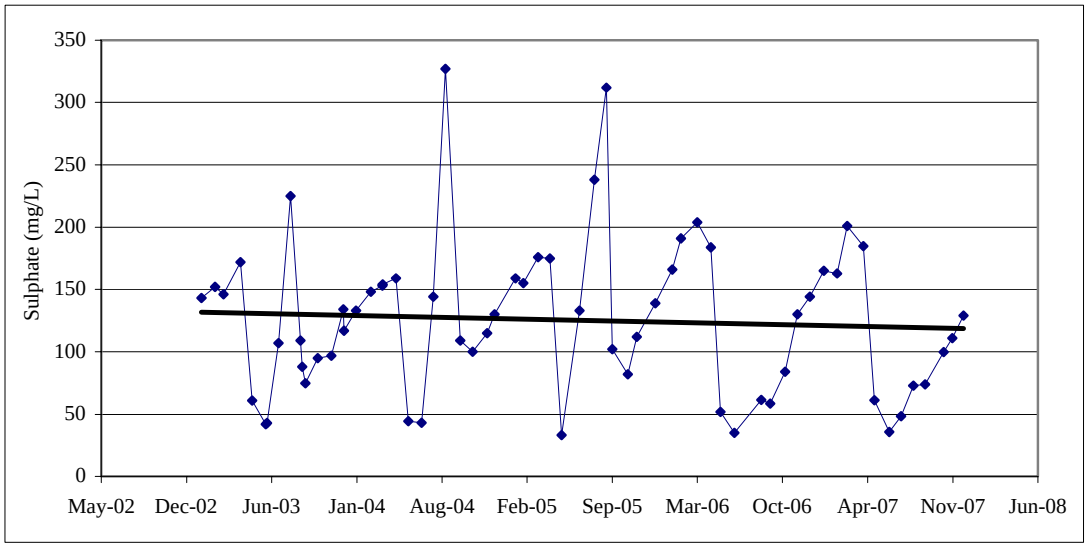


Figure 3-2. Vangorda Creek (V8) Total Suspended Solids (TSS) (2003 – 2007)

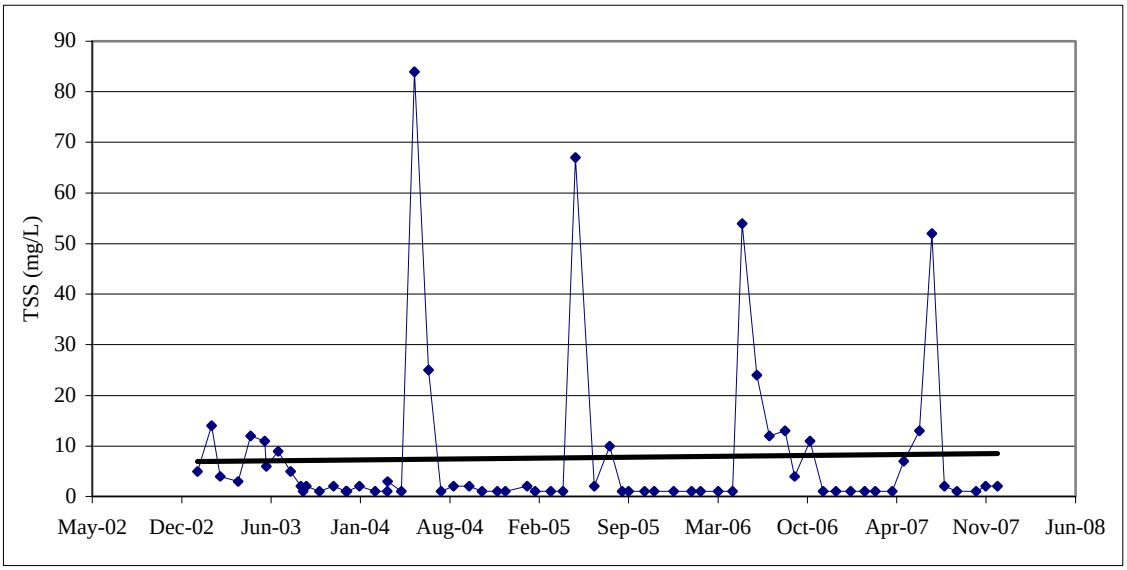
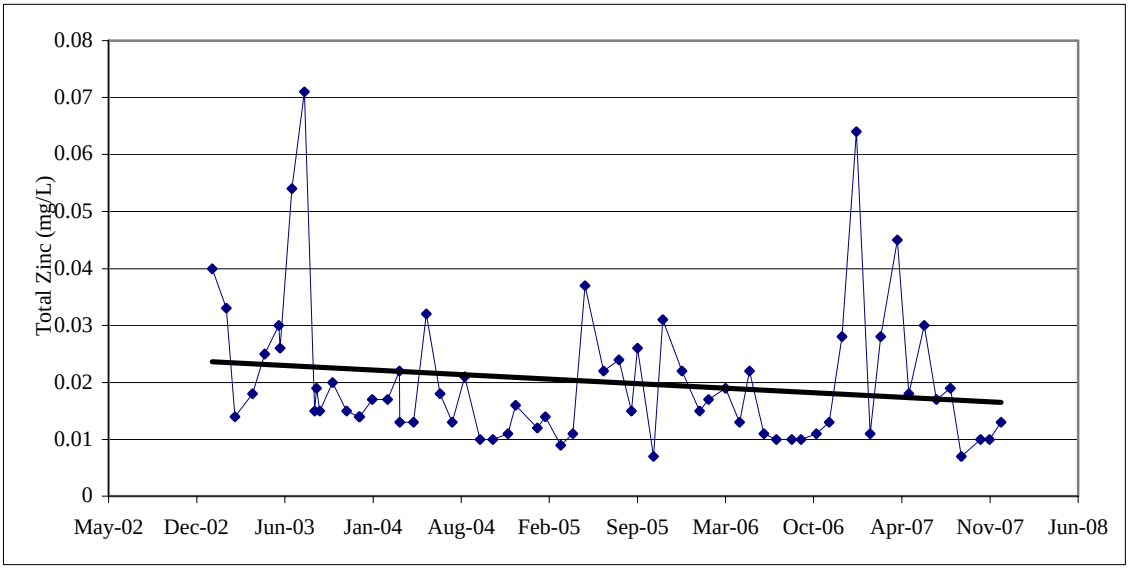


Figure 3-3. Vangorda Creek (V8) Total Zinc (2003 – 2007)



4. AMP Event 3, Degraded Water Quality in Rose Creek Downstream of Mine Facilities

4.1 Description

Water quality in Rose Creek downstream of the mine facilities could be negatively affected by surface runoff from the mine facilities and groundwater seepage from the Rose Creek Tailings Facility. The water quality in Rose Creek immediately downstream of the Mine Facilities is presently measured monthly at Station X14, and weekly during periods of effluent release (location X5), for total metals, dissolved metals, pH, temperature, conductivity, total suspended solids, sulphate, ammonia and hardness (YWB 2004). Water quality in Rose Creek is also monitored twice per year, winter and summer, in the receiving environment farther downstream at R3, mid length of Rose Creek, and at R4, upstream of the confluence with Anvil Creek.

The environmental consequences of degraded water quality in Rose Creek is the potential exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Rose Creek, Anvil Creek and the Pelly River. Zinc is currently the primary contaminant of concern and zinc and sulphate are currently the primary indicators of acid rock drainage. However, the consideration of degraded water quality should include other metals and contaminants which could source from the rock dumps, open pits, tailings and other mine facilities.

4.2 Summary of Implementation Protocol Information

The following is a summary of the AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
$Zn_{(T)}$, $Cu_{(T)}$, and SO_4	X14	■ three consecutive results > 75^{th} percentile of reference period; or ■ statistically significant trend projects >75^{th} percentile of reference period within three years.	Monthly and Weekly during periods of discharge

Given the variations in sample frequency at X14 from monthly to weekly during periods of discharge, the AMP Protocol for X14 was modified to ensure consistency with the reference period sample frequency and the basis for the determination of the thresholds. When carrying out the assessment of consecutive weekly samples during periods of discharge, the weekly concentrations are averaged for the month. This subsequent monthly average value is then assessed as per the AMP Protocol.

4.3 Review

A management review of the relevant water quality data from X14 was carried out on a monthly basis in 2007. This data review included assessment of the two following specific thresholds for total copper, total zinc and sulphate:

- Three consecutive monitoring results greater than the upper 75th percentile of the reference period (1998 – 2002); or
- A statistically significant trend in the monitoring results (from 2003 and on) which, when extrapolated forward three years, would result in values greater than the upper 75th percentile of the reference period.

The results of the review are summarized in Table 4-1 and in Figure 4-1 and Figure 4-2.

In 2007, there was one trigger activated for sulphate. Review of the March water quality data from X14 against the pre-defined thresholds indicated that the concentrations of sulphate were greater than the trigger level for three consecutive monthly samples (January 16th, February 13th and March 12th).

This was documented in the monthly data report to the Yukon Water Board dated April 24, 2007. The following short term management plan was outlined for this trigger event:

> *Upon receipt and analysis of the upcoming monthly samples for April and May at X14, an assessment will be provided to the Water Inspector (per the AMP Protocol). If appropriate, the assessment may propose a modification of the threshold values that provides recognition of the natural seasonal variation in sulphate.*

This trend in elevated sulphate concentrations during the winter low flow period is consistent with historical trends at this location where elevated concentrations of sulphate are known to occur due to the predominance of groundwater baseflow during the winter season, including the discharge of compliant water from the toe of the Cross Valley Dam (X13).

Review of the April data for X14 indicated that the concentrations of sulphate continued to exceed the threshold value, due to the presence of ongoing flow conditions and further confounded by the discharge of compliant water to Rose Creek from the Cross Valley Pond at X5 from April 3rd to April 14th. After cessation of the discharge, sulphate concentrations at X14 dropped substantially from 704 mg/L (collected April 10th during discharge) to 216 mg/L (collected April 19th). This was documented in the monthly data report to the Yukon Water Board dated May 28, 2007.

Assessment of the May 2007 data showed that with the onset of spring freshet and higher flow volumes in Rose Creek, the sulphate concentrations dropped ranging from 29.4 mg/L to 42.9 mg/L, well below the trigger value of 166 mg/L.

Table 4-1. Summary of 2007 AMP Data for Rose Creek (X14)

Date	Total Zinc (mg/L)	Total Copper (mg/L)	Sulphate (mg/L)
1/16/07	0.053	0.001	*225*
2/13/07	0.031	0.001	*273*
3/12/07	0.024	0.001	*420*
4/10/07	*0.22*	0.003	*704*
4/19/07	0.07	<0.001	*216*
5/14/07	0.043	0.003	31.1
5/15/07	0.045	0.003	29.4
5/22/07	0.034	0.003	46
5/29/07	0.016	0.003	42.9
6/5/07	0.014	0.002	22.9
6/12/07	0.016	0.002	31.4
6/18/07	0.019	0.001	66
6/19/07	0.019	0.001	82.6
6/26/07	0.02	0.002	45.6
7/3/07	0.019	0.001	53.6
7/10/07	0.066	0.012	99.3
7/16/07	0.025	0.001	68
7/17/07	0.023	0.003	135
7/24/07	0.031	0.001	110
7/31/07	0.022	<0.001	111
8/7/07	0.026	<0.001	118
8/14/07	0.032	<0.001	121
8/21/07	0.11	0.002	163
8/28/07	0.034	0.002	117
9/4/07	0.038	0.001	132
9/10/07	0.038	<0.001	122
9/11/07	0.033	0.002	78.4
9/17/07	0.027	<0.001	81.1
10/23/07	0.07	<0.001	*219*
10/29/07	0.069	0.001	*183*
11/14/07	0.051	<0.001	81.5
12/10/07	0.052	<0.001	135
Trigger	**0.08**	**0.022**	**166**

Note: Italics = Exceeds Trigger Value.

The contemplated assessment of natural seasonal variability was not completed. Such an assessment might result in recommending a two-part seasonal threshold value in the manner that was previously recommended for location V8. However, such an assessment for location X14 would be confounded by a number of complicating factors such as potentially changing groundwater discharges and releases of (sulphate-rich) effluent. Therefore, this assessment has been deferred at this time.

Figure 4-1. Rose Creek (X14) Sulphate (2003 – 2007)

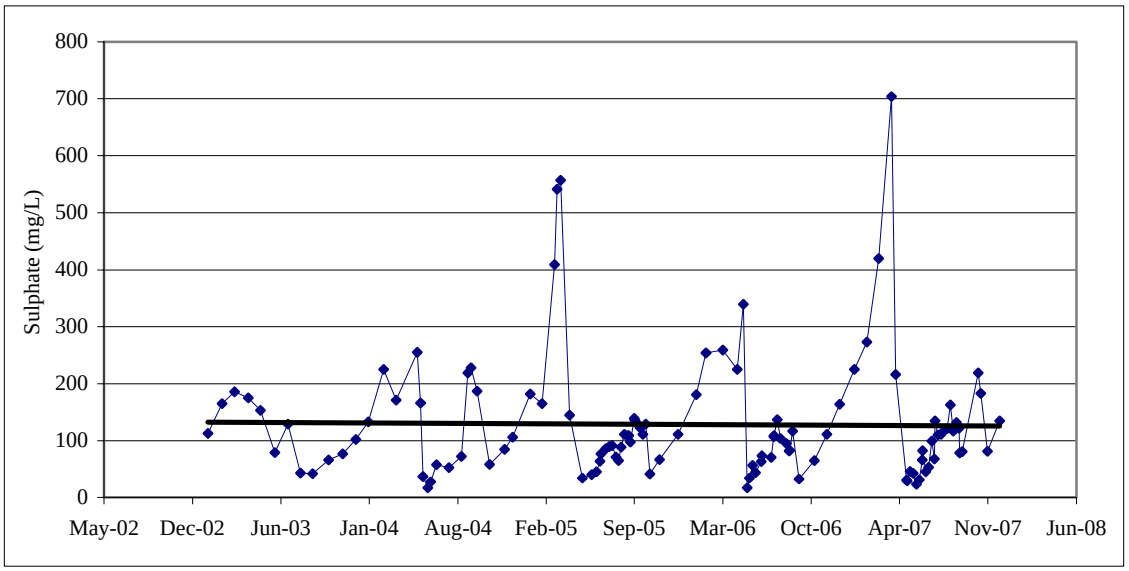
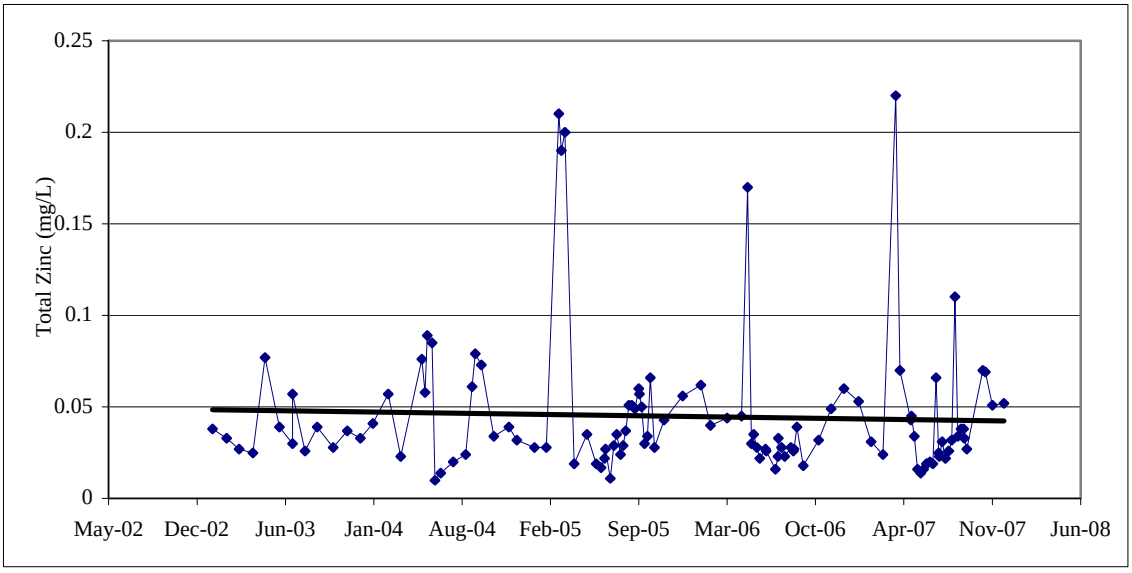


Figure 4-2. Rose Creek (X14) Total Zinc (2003 – 2007)



5. AMP Event 4, Degraded Seepage Quality from the Grum Rock Dump

5.1 Description

Surface and subsurface seepage from the Grum Rock Dump contains contaminants that are released from the waste rock dump. The water quality of Grum Dump seepage is measured monthly at V2 for total metals, dissolved metals, pH, temperature, conductivity, total suspended solids, sulphate, ammonia and hardness (YWB, 2004). This seepage water flows into Vangorda Creek and has the potential to become contaminated to the degree where the receiving environment in Vangorda Creek is adversely affected. The trigger for the implementation of contingency measures is proposed to be surface water quality in Grum Creek prior to discharging into Vangorda Creek.

5.2 Summary of Implementation Protocol Information

The following is a summary of the AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
$Zn_{(T)}$, $Cu_{(T)}$, and SO_4	V2	■ 3 consecutive results > 75th percentile of reference period; or ■ statistically significant trend projects >75th percentile of reference period within three years.	Twice monthly

5.3 Background

Review of the reference period data (1998 to 2002) carried out as part of the development of the AMP Implementation Protocol indicated that both statistical water quality thresholds had been exceeded for sulphate at Station V2 below the Grum Rock Dump. Since 2000, the concentrations of sulphate at V2 have remained elevated. This resulted in the immediate triggering of the AMP as of the date of implementation, July 1, 2004. A letter of notification was provided to the Government of Yukon, Water Resources Branch, on July 15, 2004 from SRK Consulting on behalf of the Interim Receiver.

On August 16, 2004 an additional notification was provided to the Government of Yukon from SRK Consulting, outlining the proposed response plan to address this issue. The response plan outlines

a staged approach to investigating the increase sulphate concentrations at V2. The following outlines the key components of the response plan:

- Collection of Routine Water Quality Samples;
- Review of Existing Water Quality Record;
- Detailed Contaminant Pathway Survey;
- Installation of Flow Monitoring Station on Grum Creek;
- Groundwater Monitoring Well Installation; and
- Preparation of Status Report.

In May 2005, a status report was submitted to Government of Yukon, Water Resources Branch, on from SRK Consulting on behalf of the Interim Receiver the Water Inspector which address five of the six key components of the response plan. The main findings in the status report were as follows:

- sulphate and zinc concentrations at V2 and V2A have increased over a period of several years;
- flow from V2A infiltrates into the base of Moose Pond. Downgradient seepage at Moose Seep was noted to have elevated sulphate and low zinc concentrations, which indicated that zinc attenuation was occurring along the groundwater flow path;
- sampling at the toe of the Grum Dump indicates that dump is generating zinc loads on the order of 1,700 kg/year;
- sampling downgradient of the dump showed that zinc loading from Grum Dump into Vangorda Creek is about 5 kg/year. Significant attenuation was noted along of the potential surface and shallow subsurface flow paths that were monitored;
- monitoring of Vangorda Creek at V1, upstream of the mine site, has shown that background concentrations of zinc loads in Vangorda Creek are on the order of 140 kg/year; and
- monitoring of Vangorda Creek at V27, downstream of the mine site, has had variable concentrations of zinc and sulphate, with no discernable trends since the start of mining.

Based on the review of water quality and available discharge data for Grum Dump catchments and Vangorda Creek, the May 2005 status report recommended the following actions:

- increase surface and groundwater monitoring downgradient of Grum Dump;
- discuss options for collection and transfer or surface water with site management;
- adopt a zinc concentration of 0.5 mg/L in three consecutive samples as an interim threshold for the implementation of water collection activities;
- continue Spring/Fall monitoring of seepage and surface water locations downgradient of Grum Dump that are not sampled as part of routine or AMP monitoring programs;
- install additional monitoring wells, including a well downgradient of Moose Pond; and
- continue Grum Creek flow monitoring.

During 2005, all the actions listed above were implemented. Frequency of surface water monitoring at AMP reference water quality stations V15, V2, and V2A was increased to bi-weekly, and bi-weekly sampling of Moose Seep was initiated, in September 2005. Results of this sampling were

screened as part of the monthly review of site-wide routine water quality data, to identify exceedances of thresholds for implementation of water collection. No thresholds were exceeded in 2005. A detailed summary of 2005 response activities was submitted to the Water Board and Government of Yukon, Water Resources Brand in October 2006.

In 2006, water quality at Station V2 continued to show that sulphate concentrations continued to exceed the initial trigger established in the AMP. There were no additional triggers beyond that identified for sulphate in 2004, and zinc concentrations did not show the same increasing trend observed for sulphate.

Results of 2006 dump toe seepage surveys indicated that zinc concentrations in dump seepage were stabilizing, with dissolved zinc concentrations at all toe seepage stations within the previously-observed ranges. In particular, zinc concentrations in Grum Creek (the largest discharge from Grum Dump) in 2006 were within the previously observed range.

Downgradient monitoring stations east of V2 below Moose Pond and west of V2 near Vangorda Creek showed similar elevated sulphate concentrations, but zinc concentrations were typically at or near detection levels (0.005 mg/L). The 2006 monitoring data thus showed that zinc loading from Grum Dump to Vangorda Creek continued to be minimal (~5 kg/yr, as estimated from the water and load balance) and that significant attenuation was occurring along surface and shallow subsurface flowpaths.

However, the dramatic and consistent rise in dissolved zinc concentration observed at V15 in 2006 was noteworthy. The data appeared to show a classic case of breakthrough of attenuated chemical species, and the results reviewed as of the end of 2006 did not suggest that the breakthrough process has run its course. Therefore at that time it was reasonable to expect to see some measure of continued increase in zinc concentrations at V15, and that increases at V15 will lead to an increase in zinc concentrations observed at V2. A detailed summary of 2006 response activities was submitted to the Water Board as part of the 2006 AMP Annual Report.

In response to the increasing concentrations of zinc observed at the outlet of the V15 sedimentation pond in 2006, an interim collections system was installed in January 2007 to divert this seepage into an existing ditch below the V-Notch weir on Grum Creek which routes water from Grum Creek to Moose Pond at Station V2A. This interim system consisted of a pump and pipeline to convey the water. In August 2007, this system was upgraded to a diversion ditch.

5.4 2007 Review

The ongoing management review of the relevant water quality data from the Grum Dump area was carried out monthly in 2007. Full details of the water quality data are presented in the AMP Event #4 Response: 2007 Status Report prepared by SRK Consulting and presented in Appendix A.

In 2007, water quality at Station V2 continued to show that sulphate concentrations continued to exceed the initial trigger established in the AMP. There were no additional triggers beyond that identified for sulphate in 2004, and zinc concentrations did not show the same increasing trend observed for sulphate. In 2007, the range of zinc concentrations at V2 was similar to that observed in 2004 through 2006, indicating that the partial diversion for flows from V15 to Moose Pond was successful in controlling zinc concentrations in the downstream receiving environment.

Results of the 2007 dump toe seepage surveys continue to indicate that the zinc concentrations in dump seepage may be stabilizing, with dissolved zinc concentrations at all stations within the previously observed ranges.

The consistent rise in dissolved zinc concentration observed at V15 in 2006 and 2007 remains noteworthy. The data continue to show a classic case of breakthrough of attenuated chemical species, and the results reviewed as of the end of 2007 do not suggest that the breakthrough process has run its course. It is reasonable to expect to see some measure of continued increase in zinc concentrations at V15.

Despite this increase in zinc concentrations at V15, zinc concentrations at V2 have remained very low throughout the 2007 monitoring period. Sulphate concentrations at Station V2 remain on excess of the initial trigger established in the AMP.

It appears that the partial diversion of water from Station V15 to Station V2A via Grum Creek diversion has been successful in controlling the amount of zinc reporting to station V2, without having a noticeable effect on concentrations at Station V2A in Grum Creek. Zinc concentrations are currently attenuated between Moose Pond and Vangorda Creek, and are not having a measurable impact on Vangorda Creek.

Downgradient monitoring stations east of V2 below Moose Pond and west of V2 near Vangorda Creek show elevated sulphate concentrations, but zinc concentrations are typically at or near detection levels (0.005 mg/L). The 2007 monitoring data thus showed that zinc loading from Grum Dump to Vangorda Creek continued to be minimal (~5 kg/yr, as estimated from the water and load balance) and that significant attenuation was occurring along surface and shallow subsurface flowpaths.

The following summarizes recommendations for continued monitoring of water quality downgradient of Grum Dump, and for implementation of additional water management if zinc concentrations exceed acceptable levels. Details are provided in Appendix A.

1. Continue monitoring Reference Water Quality Stations, as required under the AMP, by site environmental staff on a twice-monthly basis.
2. Continue to divert seepage from station V15 (the sedimentation pond) to station V2A in 2008, via Grum Creek diversion, as a pro-active short-term mitigation strategy to minimize zinc concentrations at station V2 until a final closure plan can be implemented.

3. Implement collection and transfer of water to Vangorda Pit if zinc concentrations exceed acceptable levels at station V2, at Moose Seep, or at Moose Well.

    a. In the absence of site specific water quality objectives, the discharge water quality criteria of 0.5 mg/L zinc will be used as an interim threshold for implementation of water collection activities. Surface water collection and transfer would be implemented if three consecutive samples either at Station V2, at Moose Seep, or at Moose Well 2 exceed 0.5 mg/L zinc.

    b. Once a site-specific water quality objective has been developed for Vangorda Creek, the threshold for implementation of contingency measures should be re-evaluated to ensure that loading from this flow pathway is within acceptable limits.

    c. In the event that the interim threshold is exceeded, notification will be sent to the Water Board within 30 days.
4. Continue Spring/ Fall downgradient pathway and dump toe seepage surveys.
5. Continue monitoring and maintenance of Grum Creek weir flow-monitoring instrumentation.
6. Review monitoring data on an ongoing basis. Results of the Reference Water Quality Station monitoring data should continue to be included as part of the regular monthly report to the Water Board.
7. Summarize the 2008 monitoring results in the AMP annual report prepared by GLL.

6. AMP Event 5, Degraded Water Quality in the North Fork of Rose Creek

6.1 Description

Water quality in the North Fork of Rose Creek could be negatively affected by rock dump seepage, seepage or overflow from the Zone 2 Pit, seepage from the disturbed area between the creek and the Zone 2 Pit and the rock drain at the haul road crossing, and contaminated groundwater from the Main/Intermediate waste rock dumps. The water quality in the North Fork of Rose Creek is measured monthly at Station X2 (YWB 2004) for total metals, dissolved metals, pH, temperature, conductivity, total suspended solids (TSS), sulphate, hardness and ammonia. The flow rate is also measured monthly at X2.

The environmental consequence of degraded water quality in the North Fork of Rose Creek is the potential exposure of aquatic resources, terrestrial resources and human resources to increased levels of contaminants in the North Fork, Rose Creek Diversion canal and, possibly, further downstream in Rose Creek, Anvil Creek and the Pelly River. Zinc is currently the primary contaminant of concern and zinc and sulphate are currently the primary indicators of acid rock

drainage. However, the consideration of degraded water quality should include other metals and contaminants which could source from the rock dumps, open pits and other mine facilities.

6.2 Summary of Implementation Protocol Information

As part of the 2005 Annual Review, an assessment was carried out to determine if there were any statistically significant seasonal differences in the sulphate concentrations at X2, and if necessary determine seasonally based threshold values for sulphate at X2 based on the reference period (1998 – 2002). Concentrations of sulphate during the reference period were found to exhibit seasonal variations. Using the Analysis of Variance and Multiple Comparisons (Least Significant Difference) at a 5 % significance level, statistically higher concentrations are observed in the winter months (November – April) compared to the open water months (May – October). Given this seasonal variability, it was recommended that the AMP Protocol for X2 be modified for sulphate to include two seasonal components: open water season (May – October) and winter (November – April). The following is a summary of the modified AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
$Zn_{(T)}$, and $Cu_{(T)}$	X2	■ three consecutive results > 75th percentile of reference period; or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly
SO_4	X2	■ three consecutive results > 75th percentile of reference period (15 mg/L); or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly (May – October)
SO_4	X2	■ three consecutive results > 75th percentile of reference period (30 mg/L); or ■ statistically significant trend projects >75th percentile of reference period within three years.	Monthly (November – April)

6.3 Follow Up to 2006 Review

Review of the April 2006 water quality data from X2 against the winter seasonal threshold indicated that the concentration of sulphate was greater than the trigger level for three consecutive monthly samples (January 23rd, February 14th and April 25th). No sample was collected in March due to the sample location being frozen. This was documented in the monthly data report to the Yukon Water Board dated May 29, 2006. This trend in elevated sulphate concentrations during the winter low flow months was consistent with historical trends due to influence of groundwater "baseflow" during the winter season. Although present at concentrations above the winter seasonal threshold value, the levels were within the range of those seen historically during the winter months at X2 (1998 – present).

The following short term management plan was outlined for this trigger event:

> *Upon receipt and analysis of the upcoming monthly samples for May at location X2, an assessment will be provided to the Water Inspector if the trigger continues (per the AMP Protocol).*

As expected the sulphate concentration at X2 in May 2006 showed that with the onset of spring freshet the concentrations of sulphate dropped to 4.85 mg/L, well below the open water threshold value of 15 mg/L. Trend analysis carried out on the 2003 to 2006 winter low-flow sulphate data indicated that there is a statistically significant increasing trend in sulphate concentrations at X2. When carried forward, this trend indicated that winter sulphate concentrations will remain above the threshold of 30 mg/L. This same trend was not seen in the corresponding open water sulphate data (2003 to 2006).

In May 2006, another trigger was identified at X2 for zinc. This was documented in the monthly data report to the Yukon Water Board dated June 29, 2006. After incorporating the May 2006 data, there was a statistically significant increasing trend in the concentration of total zinc that estimates the concentration of total zinc will exceed the threshold concentration of 0.06 mg/L in April 2007. In response to this trigger the following short term management plan was outlined:

> *Upon receipt and analysis of the upcoming monthly samples for June at location X2, an assessment will be provided to the Water Inspector if the trigger continues (per the AMP Protocol).*

Subsequent analysis of monthly samples for total zinc at location X2 confirmed the continuation of this trigger and in October 2006 concentration of total zinc reached the threshold value.

There were, therefore, two confirmed and outstanding triggers for location X2 in 2006, projected continued elevated winter sulphate concentrations and increasing zinc concentrations. As described below, these two triggers are being investigated as part of a more comprehensive assessment of the water quality trends in the area adjacent to X2.

6.4 2007 Review

A management review of the relevant water quality data from X2 was carried out on a monthly basis in 2007. This data review included assessment of the two following specific thresholds for total copper, total zinc and sulphate:

- Three consecutive monitoring results greater than the upper 75th percentile of the reference period (1998 – 2002); or
- A statistically significant trend in the monitoring results (from 2003 and on) which, when extrapolated forward three years, would result in values greater than the upper 75th percentile of the reference period.

For sulphate, the data review included the assessment based on two seasonal components: open water season (May – October) and winter (November – April).

The results of the review are summarized in Table 6-1 and in Figure 6-1 and Figure 6-2. In 2007, there was one new trigger activated at X2: zinc.

Table 6-1. Summary of AMP Data at X2 (2007)

Date	Total Zinc (mg/L)	Total Copper (mg/L)	Sulphate (mg/L)
4/18/07	*0.18*	<0.0010	*33.7*
5/14/07	*0.068*	0.0030	12.8
6/18/07	0.029	0.0020	9.25
7/16/07	0.025	0.0010	10.1
8/13/07	0.031	0.0010	*15.3*
9/10/07	0.025	<0.0010	14.2
10/22/07	*0.063*	<0.0010	*19.9*
11/13/07	*0.068*	<0.0010	24.5
12/9/07	*0.097*	<0.0010	28.1
Trigger	**0.06**	**0.028**	**15[a]/30[b]**

Notes:
Italics = Exceeds Trigger Value.
a. Open Water Trigger Value.
b. Winter Trigger Value.

Review of the April 2007 data found that three consecutive monthly total zinc concentrations exceeded the threshold value of 0.06 mg/L (0.065 mg/L in October 2006, 0.064 mg/L in November 2006 and 0.18 mg/L in April 2007). Glaciation and ice conditions at this location limited sample collection between December 2006 and March 2007. This was documented in the monthly data report to the Yukon Water Board dated May 28, 2007. After incorporating the May 2007 data, there continued to be concentrations of total zinc that exceeded the threshold concentration of 0.06 mg/L. In response to this trigger the following management plan was outlined:

> *In response to this trigger, and as outlined in the 2007 AMP Annual Review, a comprehensive assessment is being carried out including analysis of water quality from related monitoring locations. The goal of this assessment is to provide for a preliminary identification of the dominant source of the increase concentrations. This analysis will incorporate new information that has been generated as part of the ongoing development of the Final Closure and Reclamation Plan, specifically the ongoing seepage investigation in the area below the Faro Waste Rock Dump. Based on this analysis, an appropriate response plan will be developed and filed with the Water Board, the timing of which is dependent on the closure planning process.*
>
> *Preliminary assessment of the May 2007 data indicates that the total zinc concentration of 0.18 mg/L at X2 in April may be somewhat of an anomaly with the May monthly*

concentration being substantially lower at 0.068 mg/L and within the range of concentrations at this location in late 2006. It is thought that the reason for this substantially higher concentration in April is primarily associated with the conditions that were encountered at this location during sampling. The site was ice covered with minimal flow. Under these low flow conditions, there is minimal surface water contribution to the creek at this location and the flow is dominated by the influence of groundwater "baseflow".

Figure 6-1. North Fork Rose Creek (X2) Sulphate (2003 – 2007)

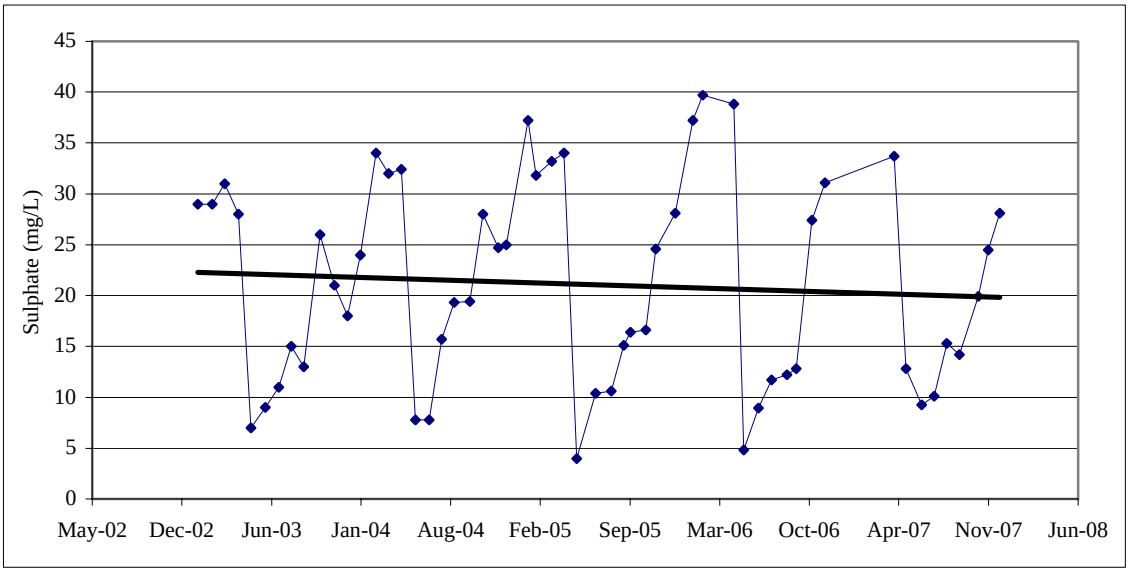
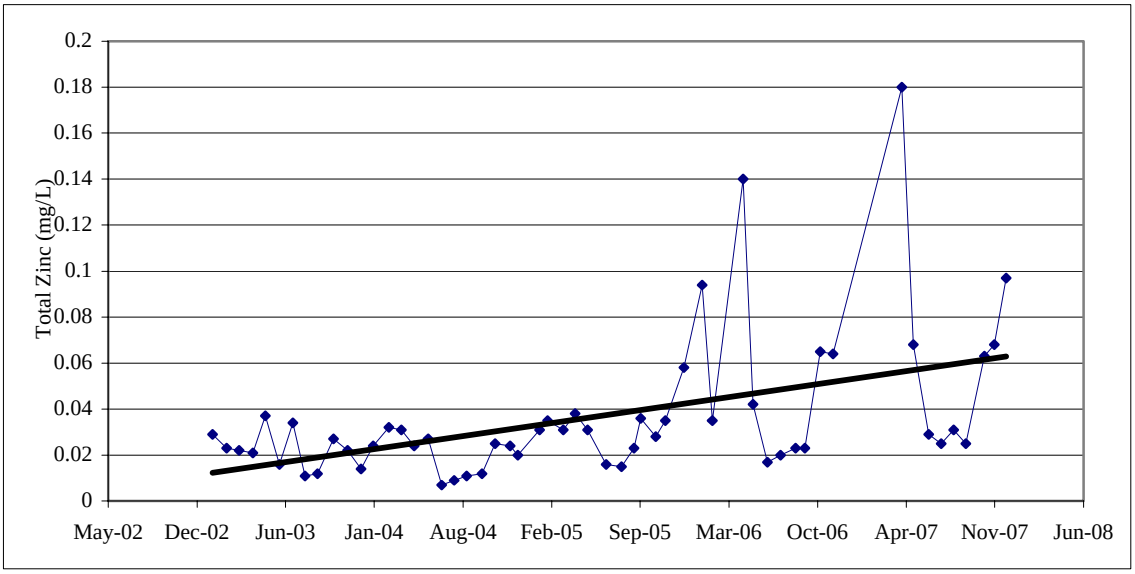


Figure 6-2. North Fork Rose Creek (X2) Zinc (2003 – 2007)



Trend analysis carried out on the 2003 to 2007 winter low-flow sulphate data indicated that there was no longer a statistically significant increasing trend in sulphate concentrations at X2 (Figure 6-3). Although, this is most likely confounded by the lack of winter data in 2007.

As outlined above a comprehensive assessment of the triggers at X2 is presently being carried out incorporating:

- water quality data from the Reference Water Quality Stations outlined in the AMPIP;
- flow data for the North Fork of Rose Creek upstream at R7 and at X2;
- results of 2005 Seepage Investigation at the S-Cluster Area by SRK Consulting; and
- results of 2007 Groundwater Review carried out by Robertson GeoConsultants Inc. (presently being finalized).

These detailed investigations have confirmed the presence of highly impacted groundwater in the area adjacent to X2 and a continued deterioration of the groundwater quality, particularly zinc. These wells are all in close proximity to the North Fork of Rose Creek, and therefore the most likely cause of the increases in zinc concentrations at X2. Based on these investigations several recommendations have been made including the development of an action plan for the management of future increases in zinc concentrations in the local groundwater in the area. This may include the establishment of a trigger for additional investigations and/or certain remedial actions such as seepage interception.

The results of this comprehensive assessment will be submitted to the Water Board and Government of Yukon Water Resources Branch under separate cover in May 2008 and will include appropriate follow up and response plan, including possible implementation of a seepage interception system.

7. AMP Event 6, Water level in Grum Pit Reaches Maximum Desired Elevation

7.1 Description

Water quality in the Grum Pit is currently non compliant with the discharge criteria in Water Licence QZ03-059 for the Faro and Vangorda Plateau mine sites (YWB 2004) and can not, therefore, be directly released to the receiving environment. The water elevation in the Grum Pit has been rising since mine shut down in 1998 but remained safely below an overflow level at the end of 2006. Further, a report has been completed (GLL 2003a) that indicated that it is unlikely that the pit will fill to a level requiring active management before 2011, under a conservative long-term projection. Nonetheless, it remains possible that a series of extreme natural events could cause the in-pit water level to rise to a maximum desired operating range during the term of the current Water

Licence and, therefore, an AMP is required to ensure that appropriate responses are implemented if necessary.

The environmental consequences of the water elevation in the Grum Pit reaching the maximum desired elevation could result in the absence of adequate emergency storage capacity for containment of a flood event and, ultimately, a release of non-compliant water to the receiving environment, Vangorda Creek. This could result in the exposure of aquatic resources, terrestrial resources and human resource users to increased levels of contaminants in Vangorda Creek and the Pelly River.

Zinc is currently the primary contaminant of concern and zinc and sulphate are currently the primary indicators of acid rock drainage. However, the consideration of degraded water quality should include other metals and contaminants that could source from the pit.

7.2 Summary of Implementation Protocol Information

The following is a summary of the AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
Pit water elevation and projected timeframe to maximum desired water elevation	Grum Pit	■ Water level of 1,210.8 m asl; or ■ Projected timeframe of 1 year or less to maximum desired water level.	■ Monthly; and ■ Annual.

7.3 Review

Water elevations were measured by mine personnel through 2007 as illustrated on Figure 7-1. The maximum measured elevation was 1198.73 m asl, which is well below the threshold elevation of 1,210.8 m asl. Therefore, the first trigger for pit water elevation was not activated in 2007. The threshold elevation was previously determined as a “safe” elevation that is below the level where any surface or subsurface seepages would occur. As illustrated on Figure 7-1, this is approximately 21.5 m below the elevation at which surface outflow would occur. This is planned to allow adequate time to develop management plans for the pit water prior to any water releases.

The timeframe for reaching the maximum desired elevation was projected using the observed rate of increase from 2003 through 2006 and the measured precipitation at the Faro airport over the available period of record, 1978 to 2006. Due to instrumentation problems at the Faro airport climate station, the complete precipitation record for 2007 is not available. The measured rate of rise is illustrated on Figure 7-2, as are a best-fit power function and the projected rate of rise used for assessment of the AMP trigger.

The “incremental” line on Figure 7-2 indicates the rate of rise for each individual (primarily monthly measurement). The “cumulative” line on Figure 7-2 indicates the cumulative rate of rise for each measurement as compared to the initial survey in 2003. The “power” curve illustrated on Figure 7-2 is a best fit curve based on the cumulative rate of rise data, which shows the “best fit” rate of rise projected into the future. Finally, the “long term projection used” curve illustrated on Figure 7-2 shows the projected rate of rise that has been used to project future water levels (as illustrated on Figure 7-1). The power curve and the long-term projection curve both begin at the most recent water level measurement, December 2007. Figure 7-2 demonstrates that the projected rate of rise that was used for this assessment is more conservative (i.e., a greater rate of rise) than would be projected from the best-fit power curve.

The precipitation measured from 2003 to 2006 has ranged from 90% (2006) to 121% (2005) of the 28-year record (Table 7-1). The overall precipitation for the four-year period is the same (103%) as the “normal” precipitation would be anticipated to be over four years. These observations suggest that the four years of observed inflows that support the long-term projection represent overall normal conditions.

The projection for the pit water level is illustrated on Figure 7-1 and demonstrates that the timeframe for reaching the AMP threshold elevation of 1,210.8 m asl is in the order of greater than three years, well beyond the threshold value of one year. Therefore, no trigger was activated in 2007 regarding the projected filling timeframe.

The projection is considered to be conservative (i.e., overestimating the rate of rise) because it does not fully account for a decreasing rate of rise over time due to the increasing area of the pit. Additional information is being developed regarding the water balance for the Grum pit through the studies that are underway for development of the Final Closure and Reclamation Plan. However, the information is not available for reporting at this time. Regardless, the conservative projection provided here is considered to provide a lower “bound” for the timeframes required to reach the stated elevations.

Table 7-1. Monthly Precipitation at Faro Airport to 2007

Year	Jan	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (mm)
1978	0.4	**miss.**	trace	4.1	11.6	27.0	38.1	41.6	7.8	32.4	20.2	19.0	
1979	8.9	18.3	20.2	6.7	10.5	68.2	55.4	13.8	13.4	11.6	12.4	34.4	273.8
1980	19.7	2.4	11.7	12.5	10.5	11.1	95.4	33.2	46.7	**miss.**	21.3	13.3	
1981	6.5	23.1	4.0	4.5	7.8	42.8	41.3	22.5	41.9	21.5	17.0	5.4	238.3
1982	10.2	18.0	9.5	4.1	18.2	14.3	58.3	47.3	47.2	42.3	11.8	13.6	294.8
1983	35.7	6.6	9.8	2.2	20.6	55.6	49.1	65.8	21.2	16.3	11.4	3.9	298.2
1984	27.6	24.1	5.9	2.4	38.8	49.0	16.6	64.9	5.5	10.8	10.7	22.5	278.8
1985	22.5	24.8	2.2	13.8	17.2	28.1	62.6	80.8	46.3	20.0	22.2	26.1	366.6
1986	8.4	4.7	34.6	12.9	35.1	12.8	81.8	77.4	44.4	22.7	15.9	5.6	356.3
1987	3.1	14.0	2.8	10	40.1	50.8	92.4	63.5	30.2	26.6	17.8	6.2	357.5
1988	7.0	10.4	17.2	8.2	38.0	37.3	97.2	25.5	43.8	29.0	17.9	16.5	348.0
1989	19.8	3.6	19.8	2.0	17.9	41.0	51.7	16.9	30.8	46.3	39.8	13.8	303.4
1990	14.4	25.8	5.0	7.0	23.4	45.4	30.0	64.4	66.2	22.7	25.4	24.8	354.5
1991	17.2	22.6	16.6	2.8	22.4	30.2	115.4	33.0	48.2	49.6	43.4	40.0	441.4
1992	22.8	24.6	7.6	15.8	14.4	11.4	66.1	34.4	47.8	13.8	18.8	13.0	290.5
1993	22.2	15.0	1.6	6.0	76.7	48.6	50.2	56.0	50.8	35.7	**miss.**	**miss.**	
1994	20.2	8.4	11.4	5.0	39.8	24.2	19.6	25.2	45.6	41.6	24.4	8.0	273.4
1995	8.4	7.8	18.4	5.2	10.9	33.9	73.4	63.4	28.8	12.2	22.3	15.4	300.1
1996	10.2	9.1	27.1	7.2	13.4	20.0	64.4	70.8	52.7	34.8	3.5	5.9	319.1
1997	6.6	8.7	1.4	14	16.5	39.3	86.4	33.2	trace	25.2	6.4	12.4	250.1
1998	7.0	2.8	4.8	4.2	14.4	29.6	19.2	24.2	23.4	24.0	4.6	8.2	166.4
1999	24.4	10.0	15.4	1.8	44.4	64.8	42.0	33.8	27.0	22.4	12.8	21.6	320.4
2000	12.2	2.0	trace	6.0	9.6	39.6	48.1	116.2	102.2	8.6	19.4	5.8	369.7
2001	7.4	3.0	4.0	14.6	30.8	35	58.4	14.2	44.6	28.6	12.2	15.4	268.2
2002	9.2	5.8	9.0	7.0	19.6	19.4	34.9	64.1	38.4	18.2	9.6	9.4	244.6
2003	22.4	8.0	16.0	0.4	7.6	45.2	63.2	30.4	30.8	12.8	32.8	19.9	289.5
2004	31.1	11.4	45.0	4.0	15.6	34.0	13.5	38.0	48.5	33.6	9.8	45.0	329.5
2005	26.7	12.4	2.6	19.5	58.6	41.0	83.8	38.6	36.6	13.0	30.0	10.8	373.6
2006	11.0	7.0	18.5	21.6	16.2	38.0	33.4	33.3	35.6	21.0	33.1	8.3	277.0
2007	**miss.**	**miss.**	**miss.**	**miss.**	**miss.**	47.2	35.4	22.2	46.4	**miss.**	**miss.**	**miss.**	
Max	35.7	25.8	45	21.6	76.7	68.2	115.4	116.2	102.2	49.6	43.4	45	
Year	1983	1990	2004	2005	1993	1979	1991	2000	2000	1991	1991	2004	
Mean	**15.3**	**11.9**	**12.7**	**7.8**	**24.2**	**36.2**	**55.9**	**45.0**	**39.8**	**24.9**	**18.8**	**15.9**	**307.1**
Min	0.4	2	1.4	0.4	7.6	11.1	13.5	13.8	5.5	8.6	3.5	3.9	
Year	1978	2000	1978	2003	2003	1980	2004	1979	1997	2000	1996	1983	
St.Dev	9.0	7.8	10.6	5.6	16.4	14.8	26.3	23.9	18.4	11.3	10.1	10.5	

All values expressed in mm as compiled by BGC Engineering Inc.

Due to instrumentation problem there were no snow measurements taken in 2007.

Figure 7-1. Grum Pit Water Elevations and Projection

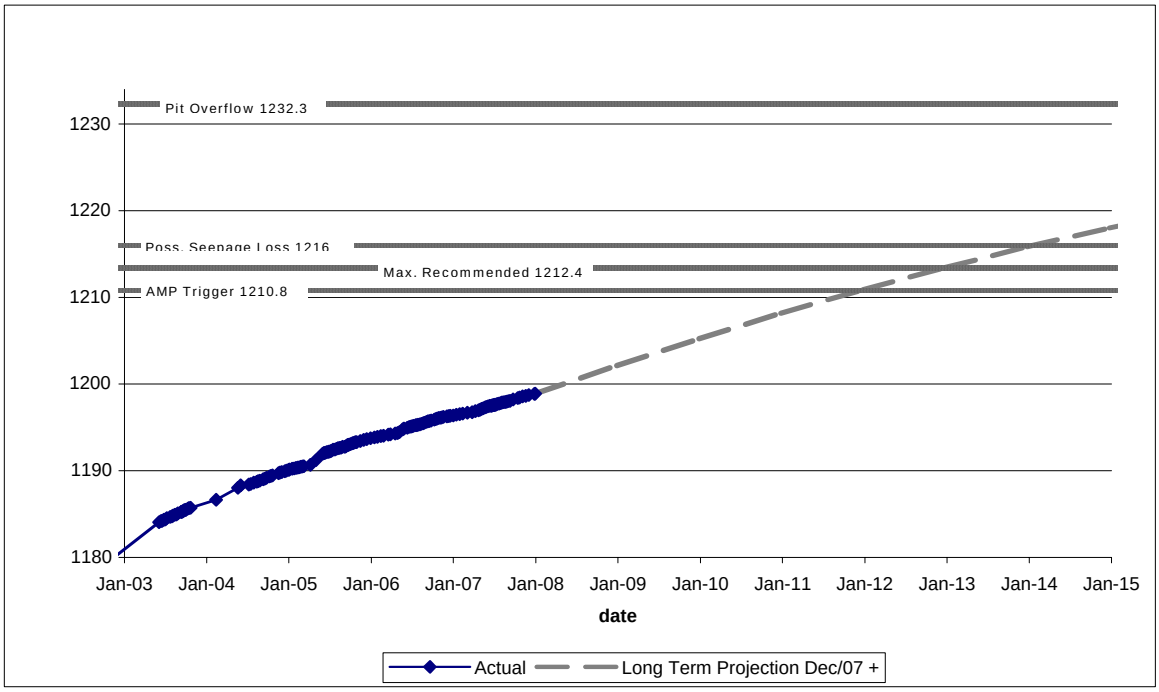
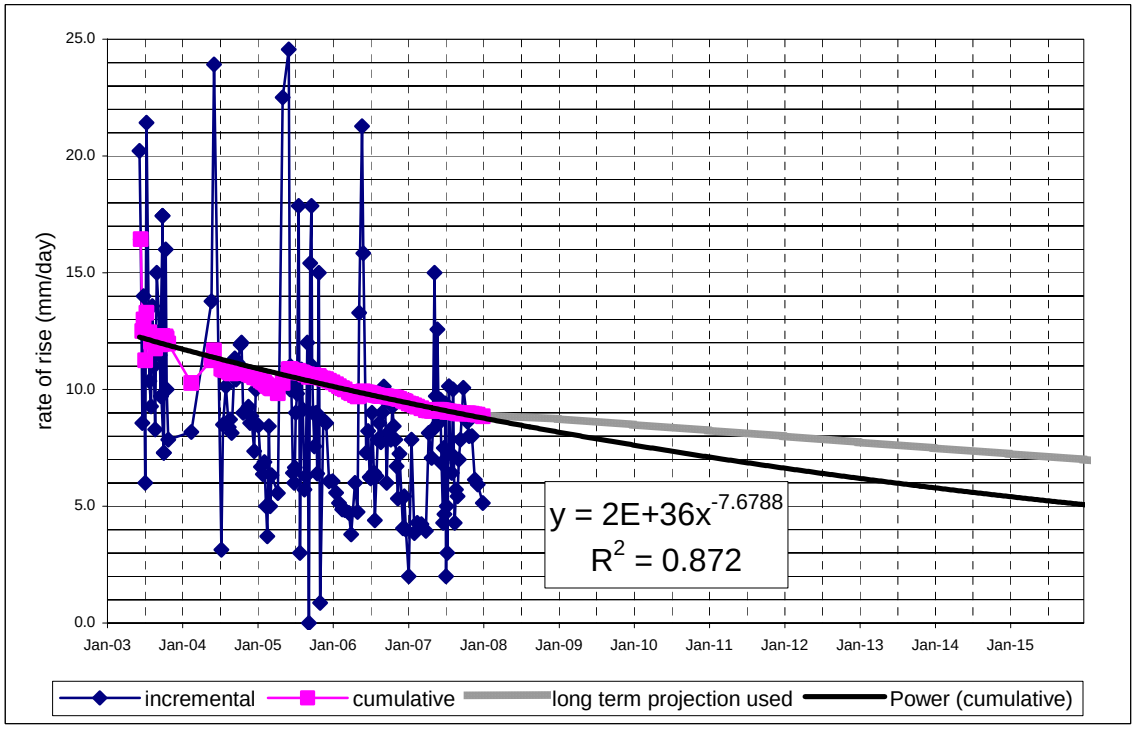


Figure 7-2. Grum Pit Water, Rate of Rise



8. AMP Event 7, Disruption of Fannin Sheep Migration Through the Mine Site

8.1 Description

It is well documented that the Fannin sheep seasonal migration route between winter and summer areas passes through the Vangorda Plateau mine site and that the sheep have continued their migration pattern through the period of mine operations and care and maintenance activities. Mine personnel routinely observe the sheep migration during the course of their activities on the mine site.

The experience gained during the 1998 to 2002 care and maintenance period indicates that the proposed continuation of care and maintenance activities to 2008 should not disrupt the sheep migration patterns. The wide ranging land use by the Fannin sheep suggests that a disruption or irregularity in the migration pattern would more likely be caused by off-site effects.

However, regardless of the source, an irregularity or disruption in the migration pattern could negatively affect the health of the herd by delaying or preventing their established pattern of land use. Alternatively, an irregularity in the sheep migration could be an indicator of a previously unidentified affect on the health of the herd.

8.2 Summary of Implementation Protocol Information

The following is a summary of the AMP Implementation Protocol information for this event to serve as a quick reference for the review that follows.

Indicators	Locations	Thresholds	Monitoring
Locations, time and conditions of Fannin Sheep sightings, number and behaviour of animals	Vangorda Plateau	Determination of specific thresholds will be done by the licencee in conjunction with YG DOE	Ongoing

8.3 Review

Wildlife observations at the site are recorded in a “Wildlife Observations Logbook”. The information recorded was passed on the YG DOE Conservation Officer every three months, with no triggers being activated.

9. AMP Event 8, Wind Dispersed Tailings Result in Adverse Effects in the Terrestrial Environment

9.1 Description

At the time the AMP Implementation Protocol was originally developed, the available information demonstrated that wind dispersed contaminants (i.e., heavy metals) were present in the terrestrial environment near the mine site. This information is described in the Water Licence Renewal Environmental Assessment Report. However, at that time, this data did not clearly identify the source of the contaminants (i.e., tailings, waste rock, mining activities or emissions from the concentrator during operating periods, for example), the extent of their distribution, or whether the effects have increased, diminished or remained static through the care and maintenance timeframe (i.e., post-1998) in comparison to the operating period of the mine.

In response to concerns with respect to this issue, the Terrestrial Effects Study was initiated under the recommendation of the Environmental Assessment conducted for the Water Licence Renewal for ongoing care and maintenance activities at the Anvil Range Mine Complex (Deloitte & Touche Inc. and Gartner Lee Limited, 2003). The broad goal of the study is to answer two fundamental questions:

1. Are there any existing and ongoing impacts to the terrestrial environment (i.e., animals, vegetation and land users) that need to be addressed during the care-and-maintenance phase, while the Final Closure and Reclamation Plan is being prepared?
2. What are the impacts of the past mining operations on the terrestrial environment (animals, vegetation and land users) that should be addressed in the Final Closure and Reclamation Plan?

9.2 Summary of Implementation Protocol Information

The trigger for implementation of contingency measures under the AMP is “the 2005 Terrestrial Effects Study Report concludes that current and on-going wind dispersion of tailings is having a negative effect of the environment such that short term (i.e., 2008) mitigation measures for a reduction in wind dispersion are recommended”.

9.3 Review

In September 2006, the two following reports were submitted to the Water Board as per Part F, Item 49 of Water Licence QZ03-059:

1. *Anvil Range Mine Complex – Terrestrial Effects Study: Investigation into Metal Concentration in Vegetation, Wildlife and Soils*, prepared by Gartner Lee Limited; and
2. *Summary Report Anvil Range Mine Tier 2 Risk Assessment of Current Conditions*, prepared by SENES Consultants Ltd.

The two combined reports fulfilled the requirements of the Water Licence. The first report presented the findings of a two-year study for gathering information on terrestrial resources (such as animals, soil, vegetation and air). The second report assessed that information for potential risks to people and wildlife. These reports, along with attached cover letter, provided a comprehensive summary of the results of the studies with respect to the requirements of the Water Licence. A copy of this was provided to the Water Board as part of the 2006 Annual Report. The key findings are presented below.

The specific objectives of the Terrestrial Effects Study were:

1. Definition of the spatial distribution of elevated metal concentrations in the terrestrial environment;
2. Determination of whether the elevated metal levels are related to historic mine activities and/or current care and maintenance activities;
3. Improvement of the characterization of natural background (reference) metal concentrations;
4. Investigation of metal levels in vegetation species of importance to humans and wildlife;
5. Investigation of metal levels in wildlife tissues, including species of importance to humans;
6. Determination of ambient air metal concentrations (required information for the Human Health and Ecological Risk Assessment (HHERA)); and
7. Identification of potential sources of ongoing metal deposition.

This work relied on the participation provided by the Ross River Dena, Selkirk First Nation, Town of Faro and scientific experts to guide the collection of information, including metal levels, in small mammals, large animals, soil, vegetation, berries and air quality.

The information collected in the terrestrial environment shows that past operations at the Anvil Range Mine have resulted in metal concentrations in the mine area that are greater than the reference/background levels. For example, lead concentrations near the mine are up to 450 times those at reference sites and the lead isotope analysis indicates that the majority of the lead deposited in the study area was from mine ores. The concentrations of metals that originated from the mine site are generally higher near the mine and decline with distance from the mine. Deposition of some metals from the mine site is still occurring in the immediate area, mostly during the snow-free period.

Metal concentrations that were greater than the reference/background levels were detected in plants, small mammals and other wildlife in the area. This information does not necessarily indicate a high risk to wildlife or people but reinforces the appropriateness of conducting a human health and ecological risk assessment, as described below.

The HHERA for the current conditions at the site was developed using the information collected at the Anvil Range mine as supplemented by other general information where necessary to complete the assessment. The assessment was based on the current care and maintenance activities being carried out at the site, as is appropriate to the requirements of the Water Licence.

The results of the ecological risk assessment indicate that no adverse health effects are expected in fish and animals that are currently present on the site. The human health risk assessment indicates that humans who use the site for approximately 1.5 months per year to gather berries and trap animals and also hunt and eat animals from the site are not at risk from adverse health effects.

Given the results of the HHERA, there is no need for short-term mitigation to ensure animals and people are adequately protected from risks associated with on-going wind dispersion of tailings while the Final Closure and Reclamation Plan is being developed.

10. Recommendations

Based on the information assessed and described in this report, we feel that the AMP program is functioning as intended.

As outlined in Section 2 we recommend that the following modifications be implemented at this time, specifically:

- AMP Event 1 – Degraded Groundwater Quality in Rose Creek Valley Aquifer – remove X24-A, X24-B and X24-C as trigger locations.

Other than these specific recommendations, the AMP program functioned as intended in 2007 and no other changes should be made.

Appendix A

AMP Event #4 Response: 2007 Status Report

Deloitte & Touche

AMP Event #4 Response: 2007 Status Report

Prepared for:

DELOITTE & TOUCHE INC.
Interim Receiver of Anvil Range Mining Corporation
Suite 1900, 79 Wellington Street West
Toronto, ON M5K 1B9





Prepared by:

SRK Consulting
Engineers and Scientists

Project Reference Number
SRK 1CD003.091

January 2008

AMP Event #4 Response: 2007 Status Report

Prepared For

Deloitte & Touche Inc.

Interim Receiver of Anvil Range Mining Corporation
Suite 1900, 79 Wellington Street West
Toronto, ON M5K 1B9

Prepared By

SRK Consulting (Canada) Inc.
Suite 2200, 1066 West Hastings Street
Vancouver, B.C. V6E 3X2

Tel: 604.681.4196 Fax: 604.687.5532
E-mail: vancouver@srk.com Web site: www.srk.com

SRK Project Number 1CD003.091

January 2008

Table of Contents

1 Introduction 1

2 Summary of 2007 Field Activities 2
2.1 Water Quality Monitoring 2
2.1.1 Reference Water Quality Stations 2
2.1.2 Waste Rock Seepage Survey 2
2.1.3 Downgradient Pathways Survey 3
2.1.4 Additional Groundwater Monitoring 3
2.2 Flow Monitoring at the Grum Creek Weir 3
2.3 Diversion of Seepage from Station V15 3

3 Results of 2007 Monitoring, Field Activities, and Data Review 5
3.1 Water Quality Monitoring 5
3.1.1 Reference Water Quality Stations 5
3.1.2 Grum Dump Toe Seeps 8
3.1.3 Downgradient Pathways Survey 9
3.1.4 Additional Groundwater Monitoring 11
3.1.5 Summary of Water Quality Monitoring Results 12
3.2 Grum Creek Flow Monitoring 13
3.3 Diversion of Seepage from Station V15 13

4 Summary and Conclusions 14
4.1 Final Implementation of AMP Event #4 Response Plan 14

5 Recommendations 16

References 18

List of Figures

Figure 1.1: Site Map with Contours, Showing Location of Reference Water Quality Station V2

Figure 2.1: 2007 Borehole and Water Sampling Stations

Figure 3.1: Zinc and Sulphate Concentrations at V15
Figure 3.2: Zinc and Sulphate Concentrations at V2
Figure 3.3: Zinc and Sulphate Concentrations at V2A
Figure 3.4: Zinc and Sulphate Concentrations at V14 and V16
Figure 3.5: Zinc and Sulphate Concentrations at Moose Seep and Moose Well 2
Figure 3.6: Zinc, Iron, and Sulphate Concentrations, and Field pH at P96-9a
Figure 3.7: Zinc, Iron, and Sulphate Concentrations at P96-9b/BH05-9b
Figure 3.8: Zinc and Sulphate Concentrations at SRK-GD01
Figure 3.9: Zinc and Sulphate Concentrations at SRK-GD05
Figure 3.10: Zinc and Sulphate Concentrations at GD05 d/s
Figure 3.11: Zinc and Sulphate Concentrations at Sweet Creek
Figure 3.12: Zinc and Sulphate Concentrations at Sheep Creek
Figure 3.13: Grum Creek Discharge

List of Appendices

Appendix A: Water Quality Monitoring Results
- Appendix A1 2002-2007 Waste Rock Seepage Survey Results
- Appendix A2 2003-2007 Downgradient Seepage Pathways South of Grum Dump
- Appendix A3 2005-2007 Groundwater Data

Appendix B: Conceptual Design for V15 Seepage Diversion to V2A
Appendix C: Photos

1 Introduction

As required under Water Licence QZ03-059, an Adaptive Management Plan (AMP) for the Anvil Range Mine was submitted to the Yukon Territory Water Board on June 30, 2004 (GLL, 2004). The AMP outlines the short-term mine management strategies that have been instituted to ensure environmental protection during the period leading up to the implementation of a Final Closure and Reclamation Plan.

Event #4, *"Degraded Seepage Quality from the Grum Rock Dump"*, addresses the potential for increased contaminant loadings from Grum Dump to levels which could have an adverse impact on the receiving environment in Vangorda Creek. The initial trigger for the implementation of the AMP was a sustained and statistically significant increase in concentrations of sulphate, copper or zinc in seepage from the Grum Dump.

The trigger established for sulphate was exceeded on the date of AMP implementation (July 1, 2004). In response, a plan detailing additional monitoring efforts and further investigations was developed to obtain a better understanding of hydrological and geochemical conditions downgradient of the Grum Dump, and to assess the level of environmental impact of Grum Dump loadings on Vangorda Creek. The response plan (SRK 2004) was initiated in the fall of 2004, with ongoing monitoring continuing since that time. The 2004, 2005 and 2006 activities are documented in a series of annual status reports (SRK 2005, SRK 2006, and SRK 2007).

This report provides an update on the 2007 field activities and monitoring results. The document is organized as follows:

- Section 2 summarizes the 2007 field activities that were completed as part of AMP response and other programs relevant to Grum Dump seepage (see photos Appendix C);
- Section 3 discusses the results of 2007 monitoring activities, reviews historical water quality at selected stations, and presents conclusions from the 2007 water quality monitoring;
- Section 4 presents a summary of 2007 Response Plan activities, and
- Section 5 presents recommendations for further activities.

2 Summary of 2007 Field Activities

2.1 Water Quality Monitoring

2.1.1 Reference Water Quality Stations

Monitoring of the nine Reference Water Quality Stations (RWQSs) (Figure 2.1) identified in the AMP and in subsequent follow-up work was carried out by site environmental staff or by Gartner Lee Limited (GLL) during 2007. Table 2.1 provides a description of each of these stations.

Results are discussed in Section 3.1.1.

Table 2.1: Locations of Reference Water Quality Stations

Station Name	Location	Frequency
V15	Outlet of the Tributary A sedimentation pond.	biweekly (year round)
V2	Main stem of Grum Creek, below Tributary A.	biweekly (May to Oct.)
P96-9A and BH05-9b	Adjacent to Tributary A, downgradient from V15.	semi-annual (spring/fall)
V2A	Culvert outfall of the ditch that presently diverts Grum Creek into Moose Pond.	biweekly (May to Oct.)
Moose Seep	Between Moose Pond and Vangorda Creek.	biweekly (May to Oct.)
Moose Well 2	Between Moose Pond and Vangorda Creek.	biweekly (year round)
V14	Grum Dump Toe Access Road downgradient of SRK-GD05. This station appears to have changed locations over the course of the monitoring period, and may also have been monitored on the road upgradient of Sheep Creek, and upstream of V15 at the dump toe.	semi-annual (not monitored in 2007)
V16	Ditch adjacent to the Grum Toe Access Road between V15 and Grum Creek.	semi-annual (spring/fall)

2.1.2 Waste Rock Seepage Survey

Seepage from the toe of the Grum waste rock dump has been monitored as part of the semi-annual seepage survey that has been carried out since 2002. Seepage from the southern toe of the dump is monitored at stations SRK-GD1, SRK-GD4, SRK-GD5, SRK-GD6, SRK-GD-16 and SRK-GD21 (Figure 2.1).

Results are discussed in Section 3.1.2. A broader discussion of waste rock dump seepage will be included in the 2007 Waste Rock and Seepage Monitoring Report (SRK, in progress).

2.1.3 Downgradient Pathways Survey

Selected seepage monitoring stations downgradient of the Grum waste rock dump (GD05 d/s, Sweet Creek, Sheep Creek, Moose Seep) have been monitored on a spring/ fall basis since 2003. Two additional stations were added to the program starting in 2004 (WGD01 and WTA-02). Station locations are shown in Figure 2.1.

Results are discussed in Section 3.1.3.

2.1.4 Additional Groundwater Monitoring

Five additional groundwater monitoring wells that are not included in the list of reference water quality stations were installed in 2004 and 2005. These five wells (SRK04-5A, SRK04-5B, SRK05-5C, SRK05-07, and SRK05-08) are located adjacent to the Grum Dump Toe Access Road, as shown in Figure 2.1.

Results are discussed in Section 3.1.4.

2.2 Flow Monitoring at the Grum Creek Weir

A 90° V-notch weir was installed on Grum Creek at the upstream end of the Grum Creek Diversion in September 2004. In 2005, the water level was recorded using a Thalimedes water level monitoring instrument, with a built-in data logger. Every year the Thalimedes was removed prior winter and reinstalled in time for the spring freshet. However this become difficult scheduling the replacement and it was removed in September 2005 for data recovery and over-winter storage, and was replaced in 2006 with a vented pressure transducer (model INW PT2X, manufactured by Instrumentation Northwest) with an integrated data logger that was intended to withstand winter conditions.

The data downloaded in 2007 indicated that freezing conditions had occurred around the sensor which resulted in erroneous pressure readings over the period October 27, 2006 to June 13, 2007. Once water temperatures rose above zero in mid June, 2007, readings returned to normal. However, it appeared that the snow pack had caused the transducer to shift vertically. The 2007 readings were then re-calibrated using water level and spot flow measurements collected in September 2007. The corrected results are presented and discussed in Section 3.2. In consultation with Deloitte and Touche Inc. (DTI), in 2008 SRK will undertake to reposition the sensor to minimize impact of the snow pack.

2.3 Diversion of Seepage from Station V15

In 2006, increasing concentrations of zinc were observed at the outlet of the V15 sedimentation pond upstream of Tributary A. In response to this finding, DTI installed an interim collection system to divert this seepage into an existing ditch below the V-Notch weir on Grum Creek, which routes

water from Grum Creek to Moose Pond at Station V2A. The interim system consisted of a pump and pipeline to convey water from the sedimentation pond into the existing ditch.

No water was pumped in 2006. However, DTI began pumping on January 28, 2007. They ran the pump on Mondays and Thursdays for a couple of hours each day to lower the pond level so as to avoid any spill.

This system was upgraded to a diversion ditch in August, 2007. A conceptual design for the diversion ditch is presented in Appendix B. Photos taken during the construction of the diversion ditches are presented in Appendix A of the 2007 Vangorda Geotechnical Inspection Report.

3 Results of 2007 Monitoring, Field Activities, and Data Review

3.1 Water Quality Monitoring

3.1.1 Reference Water Quality Stations

Station V15

Station V15 is located at the outlet of the Tributary A sedimentation pond, upstream of Station V2 (Figure 2.1), and has been a reliable sampling point since pond construction in 1995. Surface flow at V15 has been approximately 1/3 of the volume observed downstream at V2 in recent years. The V15 sedimentation pond is thought to be directly downgradient from the Grum sulphide cell via a groundwater pathway, and water chemistry at this location is expected to be a good indicator of the arrival and loading of oxidation products from the sulphide cell. Sulphate and total and dissolved zinc concentrations measured at V15 is shown in Figure 3.1.

Sulphate concentrations at V15 steadily increased over the 1995 through 2001 period. From 2001 through early 2004, sulphate concentrations at V15 were within a stable range (700 to 1050 mg/L). This stable period was followed by a period of increasing concentrations from around 1000 mg/L to around 2000 mg/L by June 2005, with a single high result of 2990 mg/L recorded in February 2005. Samples collected during the June 2005 through October 2006 period indicated sulphate concentrations in the range of 1600 to 2090 mg/L, and it appears that sulphate concentrations have stabilized at present. Future monitoring will be necessary to verify the observation of a stable trend.

Dissolved and total zinc concentrations at V15 were high variably from 1995 to 2002, typically in the range of 0.01 to 0.1 mg/L, with occasional values as high as 1 mg/L. This variability was the result of operational and post-operational water management, as discussed below for Station V2. Following the implementation of dump runoff control in 2002, zinc concentrations were lower and more uniform, ranging between 0.006 and 0.05 mg/L. Starting in 2006, there was a dramatic trend of increasing zinc concentrations from 0.07 mg/L in January 2006 to 0.68 mg/L in October 2006. Zinc concentrations then levelled off over the winter months and decreased to approximately 0.4 mg/L during the 2007 spring freshet. During the summer of 2007, the concentrations started to increase again, reaching 1.2 mg/L by October 2007. The pattern of increasing zinc concentrations appears to be a textbook case of breakthrough of an attenuated chemical species. Future monitoring at V15 is critical for understanding retardation factors and evolution of water chemistry downgradient of Grum Dump.

Historical pH's were in the neutral to slightly alkaline range (7.1 to 8.5) from 2000 to 2006. However, in 2007, pH's have been somewhat lower (typically between 6.7 and 7.2), with a minimum pH of 6.3 recorded in September 2007.

Station V2

Sulphate and zinc concentrations measured at Station V2 are shown in Figure 3.2.

Sulphate concentrations at V2 showed a consistent increase from the initial pre-mining period through to mid-2004, and were responsible for triggering Event #4 of the Adaptive Management Plan. Since that time, sulphate concentrations at V2 have stabilized within a seasonally-variable range of 700 to 1100 mg/L.

Total and dissolved zinc concentrations were highly variable during mining operations, and runoff and erosion from the Grum Dump led to continued variable and elevated zinc concentrations at V2 during the period from the cessation of mining through 2002. Improved runoff management since 2002 resulted in total and dissolved zinc concentrations within a much narrower range at V2. Surface flow at V2 has been visually estimated to be about 3 times the volume observed upstream at V15 in recent years, which reflects in part a contribution from seepage losses from the Grum Creek diversion. In 2007, the range of zinc concentrations at V2 was similar to that observed in 2004 through 2006, indicating that the partial diversion of flows from the V15 sedimentation pond to Moose Pond was successful in controlling zinc concentrations in the downstream environment.

Water at V2 continues to show slightly alkaline pH conditions. Other than the previously-reported sulphate trigger, were no specific thresholds exceeded in 2006 at V2.

Station V2A

Zinc and sulphate concentrations at Station V2A are shown in Figure 3.3.

Sulphate concentrations at V2A increased steadily between 1997 and 2005, and more gradually from 2005 to 2007, reaching a maximum concentration of 1000 mg/L in August 2007.

Zinc concentrations were generally within the range of 0.05 to 2 mg/L over the period of 2001 through 2006, with the highest concentrations observed in 2004 and 2005. Maximum concentrations in 2006 and 2007 were 0.36 mg/L and 0.26 mg/L respectively. These results indicate that partial diversion of the flows from Station V15 has not adversely impacted water quality in Moose Pond.

Sulphate and zinc concentrations have shown strong season patterns from 2004 through 2007, with the highest 2006 and 2007 concentrations occurring from June to August.

Water at Station V2A continues to show slightly alkaline pH conditions.

Station V14 and V16

Stations V14 and V16 have been historically monitored on a sporadic basis, from 1989 in the case of V14 and from 1995 in the case of V16. Both stations have been monitored on a more consistent basis since 2004. Sulphate and zinc data for Stations V14 and V16 are shown in Figure 3.4.

The 2007 sulphate and zinc concentrations were within previously observed ranges.

Moose Seep

Moose Seep is located below Moose Pond approximately 25 m upslope from Vangorda Creek just upstream of Grum Creek (Figure 2.1), and has been monitored since Fall 2003. Monitoring frequency increased from twice-yearly to twice-monthly in 2005 as part of the AMP Event #4 Response.

Zinc and sulphate concentrations measured at Moose Seep are shown in Figure 3.5.

Sulphate concentrations have ranged from 170 to 750 mg/L. Strong seasonal variations were evident in both 2006 and 2007, with the lowest concentrations occurring during spring freshet, and maximum concentrations occurring in the late fall.

Zinc concentrations have ranged from less than detection (0.005 mg/L) to 0.01 mg/L.

Moose Seep had neutral to slightly alkaline pH during all monitoring rounds.

Moose Well

Moose Well 2 was installed in September 2005, and has been sampled regularly since that time. Results are presented in Figure 3.5.

Sulphate concentrations have shown a cyclical pattern, with peak concentrations occurring in the late summer and fall, and minimum concentrations occurring in the early spring. The seasonal variation in sulphate concentrations was similar to the pattern observed upgradient at V2A (the point of Grum Creek discharge into Moose Pond), and support the assumption that infiltration into Moose Pond reports to Vangorda Creek via a diffuse shallow groundwater pathway.

Dissolved zinc concentrations varied from less than detection (0.005 mg/L) to 0.01 mg/L with one outlier of 0.07 mg/L. Unlike sulphate, there were no strong seasonal trends. These results suggest that there is significant attenuation along the seepage pathway between Moose Pond and Moose Well 2.

Field pHs were consistently between 7 and 8.

Station P96-9A and P96-9B/BH05-9B

Groundwater was historically monitored via one shallow (P96-9A) and one deeper piezometer (P96-9B) located adjacent to Tributary A, immediately downstream of the Grum Dump toe access road (Figure 2.1). These wells were intended to monitor the early arrival of oxidation products from the Grum sulphide cell in groundwater, in the same way that V15 was intended to monitor surface seepage. P96-9B became non-functional in 2001 and no samples have been collected from the deeper well since that time. In 2005, BH05-9B was installed to replace the damaged P96-9B.

Sulphate concentrations in the shallow unconfined aquifer at P96-9A show an increasing trend over the 1996-2001 period (Figure 3.6), and then show a period of stable concentrations with seasonal variations (950 to 1700 mg/L) from 2001 through 2007. Field pHs have varied between 5.9 and 7.7 since installation, and results from 2006 and 2007 indicate that pH conditions have stabilized in the range of 6.5 to 7.0. Dissolved iron concentrations have been somewhat variable, but remained below 0.08 mg/L since 2001. Zinc concentrations have remained low (less than 0.1 mg/L), but have shown somewhat higher values in 2006 and 2007 in comparison to the 1999 through 2005 data. The increase in concentrations coincides with the increase in zinc concentrations observed in surface seepage at the upgradient station V15 in 2006, and suggests that a breakthrough in zinc concentrations may be starting in the shallow groundwater in this area.

Sulphate concentrations in the deeper confined aquifer (P96-9B), which experienced flowing artesian conditions, were between 100 and 200 mg/L from 1996 through 2001, (with one outlier of 320 mg/L), and were similar in the replacement well BH-05-09B (Figure 3.7). From 1996 through 2001, dissolved iron concentrations varied from 0.01 mg/L to 0.31 mg/L, and dissolved zinc concentrations ranged from below the detection limit of 0.01 mg/L to 0.04 mg/L. Dissolved iron values from the replacement well in 2006 and 2007 were higher, with values ranging from 0.5 to 0.7 mg/L, while dissolved zinc concentrations were at or near the detection limit in the 2006 and 2007 data.

Field pH reported ranged from 7.6 to 8.3 standard pH units, and showed no discernable trend.

3.1.2 Grum Dump Toe Seeps

SRK-GD01

SRK-GD01 is located where the main stem of Grum Creek emerges from the toe of Grum Dump (Figure 2.1). This is the largest surface flow identified at the toe of Grum Dump, and is considered to be the most important source of surface flows originating from the dump. Sulphate and zinc concentrations at SRK-GD01 are summarized in Figure 3.8. Complete results are provided in Appendix A1.

Sulphate concentrations have ranged between 1080 and 1630 mg/L over the monitoring period (2002 through 2007), with the highest observed sulphate concentration occurring in May 2006. Dissolved zinc have typically varied between 2.5 to 4 mg/L over this period, with isolated peaks of 17 and 11 mg/L recorded during the 2004 and 2005 freshet surveys, respectively.

Neutral pH conditions were observed during all sampling rounds.

SRK-GD05

Stations SRK-GD05 is located at the dump toe directly upgradient of the swale shown on Figure 1.1 as No Fork Creek, and has been monitored on a semi-annual basis since 2002. Sulphate and dissolved zinc data are summarized in Figure 3.9.

The results indicate slightly alkaline pHs during all sampling rounds. Sulphate concentrations ranged from 1080 to 1810 mg/L over the monitoring period, and appear to have stabilized within the range of 1400 to 1800 mg/L since 2004. Zinc concentrations ranged from 1.7 to 5.2 mg/L, with the highest concentrations measured in September 2005. Zinc concentrations in 2006 and 2007 were at the low end of this range.

Flows at SRK-GD05 are low compared to flows in Grum Creek, but have been observed consistently during all sampling rounds. The seepage infiltrates into the ground within a few metres of the dump toe. However, emergent seepage is observed topographically downgradient in No Fork Creek at station GD05 d/s, with seepage volumes that exceed those observed at the toe on the basis of visual observation and crude field measurements. It is inferred that subsurface flow is more significant than surface flow at SRK-GD05, and that the No Fork Creek drainage is a preferred groundwater flowpath from Grum Dump to Vangorda Creek. Sampling results from No Fork Creek are discussed in Section 3.1.3 under station GD05 d/s.

SRK-GD16

SRK-GD16 is located at the toe of Grum Dump topographically upgradient from the linear depression shown on Figure 2.1 as Sweet Creek. Flows were observed during only three of twelve sampling rounds. Results for this station are provided in Appendix A1.

The results indicate pHs ranging from 7.3 to 7.5, sulphate concentrations of 1680 to 2090 mg/L, and highly variable dissolved zinc concentrations ranging from 10.4 to 60 mg/L. The highest zinc sample was collected in May 2005, and represents the highest zinc concentration observed from any external toe seep from Grum Dump.

SRK-GD04 and SRK-GD21

SRK-GD04 and SRK-GD21 are located immediately upgradient of V15 and Tributary A (Figure 2.1) at a minor topographic low along the dump toe. Surface flows in this area were observed during only six of twelve sampling rounds, and were not observed in 2007. Results for this station are provided in Appendix A1.

3.1.3 Downgradient Pathways Survey

GD05 d/s

Station GD05 d/s is located in the topographic depression shown as No Fork Creek, downgradient from the toe seep station SRK-GD05 (Figure 2.1). This station has been monitored on a semi-annual basis since fall of 2003. Results for sulphate and zinc are shown in Figure 3.10, with complete results provided in Appendix A2.

The 2007 monitoring results were consistent with results from previous monitoring, with field pHs in the range of 6.9 to 8.0, sulphate concentrations of 972 to 1360 mg/L, and dissolved zinc

concentrations generally less than the detection limit of 0.005 mg/L. The one exception was the spring 2007 sample, which had a low, but detectable zinc concentration of 0.007 mg/L.

Sweet Creek

Sweet Creek, located downgradient of dump toe seepage station SRK-GD16, has been monitored on a semi-annual basis since September 2004. Sulphate and dissolved zinc concentrations are shown in Figure 3.11. Complete results are provided in Appendix A2.

The 2007 monitoring results were consistent with results from previous monitoring with field pHs in the range of 8.0 to 8.3, sulphate concentrations of 847 to 1260 mg/L, and dissolved zinc concentrations generally less than the detection limit of 0.005 mg/L. One exception was the spring 2007 results, which indicated a low but detectable dissolved zinc concentration of 0.006 mg/L.

Sheep Creek

Sheep Creek has been monitored on a semi-annual basis since fall 2003. Sulphate and dissolved zinc concentrations are shown in Figure 3.11. Complete results are provided in Appendix A2.

The results indicated consistently neutral to slightly alkaline pHs in all of the samples. Sulphate concentrations have increased steadily from 43 mg/L in the spring 2004 sample to 85 mg/L in the fall 2007 sample. Dissolved zinc concentrations have ranged from less than detection limit (0.005 mg/L) to 0.007 mg/L. Although no clear trends in zinc concentrations have been observed, two of the three more recent samples have had detectable levels of zinc versus only one of the preceeding six samples.

WTA02

Station WTA02 represents seepage ponded on the roadway of the Grum Dump toe access road near the upper end of Sheep Creek (Figure 2.1). This station has been monitored at least once per year since 2004. Results are provided in Appendix A2.

The 2007 monitoring results were in the range of previous results at this station, with field pHs ranging from 7.6 and 8.2, sulphate concentrations ranging from 18 to 286 mg/L, and dissolved zinc concentrations typically at or near the detection limit of 0.005 mg/L. A single outlier of 0.038 mg/L was recorded in September 2006. 2007 concentrations were 0.001 and 0.006 mg/L respectively. (It is noted that the detection limits were reduced in 2007 due to changes in the analytical methods).

The cause, and significance, of detectable zinc at this station in 2006 is not presently known. Based on topographic considerations, it appears unlikely that this location is influenced by seepage from the Grum dump.

WGD01

Station WGD01 is located above Sheep Creek west of Grum Dump (Figure 2.1). This station has been measured at least annually since 2004.

Results of the 2007 monitoring are generally consistent with those from previous years, with field pH ranging from 7.6 to 8.2, sulphate concentrations ranging from 252 to 384 mg/L, and dissolved zinc concentrations typically in the range of the detection limit (0.005 mg/L). One exception was the September 2007 results, which indicated zinc concentrations of 0.04 mg/L. Complete monitoring results are provided in Appendix A2.

3.1.4 Additional Groundwater Monitoring

Most groundwater monitoring wells downgradient of Grum Dump are Reference Water Quality Stations, and results for these stations were discussed in Section 3.1.1. The following discussion is limited to groundwater monitoring results from wells installed in 2004 and 2005. Complete results for these stations are provided in Appendix A3.

SRK04-05a and -05b

SRK04-05a and b are nested wells that were installed adjacent to Grum Creek and the Grum Dump Toe Access Road in 2004 (Figure 2.1). Flowing artesian conditions were encountered at a depth of 12.5 m. The deep monitoring well (SRK04-05a) was completed in weathered bedrock and the shallow piezometer was completed immediately below the inferred aquitard (SRK 2005). It is therefore likely that the two wells are hydraulically connected.

Samples were not collected at either of these locations in 2007 due to frozen conditions in both of these wells.

SRK05-05c

Installation of SRK05-05c was completed in August, 2005, and has been monitored annually since that time.

The 2007 results indicated sulphate concentrations of 372 mg/L and zinc concentrations of 0.012 mg/L. These were within the range previously observed at this station.

Although Grum Creek is within 10 m of SRK05-05c and is slightly topographically upgradient, the much higher sulphate and zinc concentrations in the creek (~900 mg/L sulphate and 0.1 to 0.2 mg/L Zn at V2A) suggest that the shallow groundwater at SRK05-05c has a significant component of the flow that originates from some other source that is isolated from the creek.

SRK05-07

SRK05-07 was installed in shallow bedrock on the south side of the Grum Dump Toe Access Road, downgradient of the dump toe seep location SRK-GD16 and upgradient of the Sweet Creek sample station (Figure 2.1).

2007 monitoring results indicated neutral pH conditions, sulphate concentrations in the range of 700 to 1100 mg/L, and zinc concentrations of <0.025 to 0.027 mg/L.

SRK05-08

SRK05-08 was installed in shallow bedrock on the south side of the Grum Dump Toe Access Road, at the intersection of the road and a ridge that runs perpendicular from the dump toe to Vangorda Creek (Figure 2.1).

Monitoring of results indicated sulphate concentrations ranging from 458 to 664 mg/L, and dissolved zinc concentrations ranging from 0.0088 to 0.052 mg/L. The 2007 sulphate concentrations were higher than the 2006 sulphate concentrations, but zinc concentrations were in the same range as those observed in 2006.

3.1.5 Summary of Water Quality Monitoring Results

Results of 2007 dump toe seepage surveys indicate that zinc concentrations in dump seepage may be stabilizing, with dissolved zinc concentrations at all toe seepage stations within the previously-observed ranges. In particular, zinc concentrations in Grum Creek (the largest discharge from Grum Dump) in 2006 were within the previously observed range.

The dramatic and consistent rise in dissolved zinc concentration observed at V15 in 2006 and 2007 remains noteworthy. The data appear to show a classic case of breakthrough of attenuated chemical species, and the results reviewed to date do not suggest that the breakthrough process has run its course. It is reasonable to expect to see some measure of continued increase in zinc concentrations at V15.

Despite the increase in zinc concentrations observed at Station V15, zinc concentrations at Station V2, downstream of this location, have remained very low throughout the monitoring period. Sulphate concentrations at Station V2 remain in excess of the initial trigger established in the AMP.

It appears that partial diversion of water from station V15 to station V2A via the Grum Creek diversion has been successful in controlling the amount of zinc reporting to station V2, without having a noticeable effect on concentrations at Station V2A in Grum Creek. Zinc concentrations are currently attenuated between Moose Pond and Vangorda Creek, and are not having a measurable impact on Vangorda Creek.

Downgradient monitoring stations east of V2 below Moose Pond and west of V2 near Vangorda Creek show elevated sulphate concentrations, but zinc concentrations are typically at or near

detection levels (0.005 mg/L). The monitoring data thus shows that zinc loading from Grum Dump to Vangorda Creek continues to be minimal (~5 kg/yr, as estimated from the water and load balance) and that significant attenuation is occurring along surface and shallow subsurface flowpaths.

3.2 Grum Creek Flow Monitoring

As mentioned previously, results of the 2007 flow monitoring at the Grum Creek weir were complicated by problems with the instrumentation and staff gauge over the winter months. Data from October 28, 2006 to June 12, 2007 were removed from the database due to erroneous pressure readings resulting from freezing conditions. Data from June 13, 2007 to September 12, 2007 was calibrated to match a spot flow measurement collected in September 2007.

The calibrated flows are shown in Figure 3.13.

Peak 2007 flows ranged from approximately 16 L/s during spring freshet to 3.3 L/s during the early fall, although it is noted that the true freshet peak may have been missed due to the problems with the instrumentation. Summer base flows in Grum Creek, for the period of August through September 2007, were around 2 L/s. This was similar to the results of the 2005 monitoring, and somewhat higher than results of the 2006 monitoring. At present, it is not clear whether the apparent differences in flow conditions between 2006 and 2007 are representative, or whether the differences are the result of systematic problems with the monitoring systems.

The 2007 measurements of Grum Creek discharge are somewhat lower than the estimates of runoff from the upgradient catchment that were incorporated into the water and load balance (average annual runoff at the weir (Catchments 1+2) were estimated to be 6.3 L/s, SRK 2005). The discharge data will be used to calibrate the runoff model at a later date, along with precipitation records from the station installed on the Grum Dump near toe seep station SRK-GD01, when revisions to the Grum Dump water and load balance are required.

3.3 Diversion of Seepage from Station V15

As mentioned previously, flows from the V15 sedimentation pond were pumped to the existing diversion ditch from Grum Creek to Moose pond starting in January 28, 2007 to minimize the potential for impacts to water quality at Station V2.

Upgrades to the interim seepage collection system used to divert flows from the Station V15 sedimentation pond were implemented in August, 2007, and flows were regularly diverted starting August 27, 2007.

The conceptual design for the diversion ditch is presented in Appendix B.

4 Summary and Conclusions

4.1 Final Implementation of AMP Event #4 Response Plan

The final components of the AMP Response Plan were implemented in 2005. The following summary addresses the points raised in "*Section 5: Recommendation"*, in the 2006 AMP Event #4 Status Report (SRK 2007), and the actions taken in 2007 to address these commitments.

Recommendation #1: Continue monitoring of Reference Water Quality Stations, as required under the AMP

Response actions in 2007:

- Continued monitoring all of the Reference Water Quality Stations as flow conditions permitted.
- Reviewed monitoring data and included monitoring results as part of the regular monthly report to the Water Board.

Recommendation #2: Implement transfer of water from station V15 to station V2A in 2007, via Grum Creek Diversion, as a pro-active short-term mitigation strategy to minimize potential for increased zinc concentrations at Station V2 until a final closure plan can be implemented.

Response actions in 2007:

- Initiated pumping of water from the V15 collection pond on a semi-weekly basis starting in January 2007.
- Upgraded the diversion system with an open channel ditch, and redirected flows starting in August 2007.

Recommendation #3: Collection and transfer of water to Vangorda Pit if zinc concentrations exceed acceptable levels at station V2, at Moose Seep, or at Moose Well 2.

Response actions in 2007:

- Monitored the water quality stations discussed above. Monitoring results showed that all of the drainage downgradient from the Grum Dump was fit for discharge, and that no collection and transfer of water was necessary.

Recommendation #4: Monitor potential contaminant pathways downgradient of Grum Dump at stations that are not part of the routine monitoring network

Response actions in 2007:

- Carried out May and September monitoring of Grum Dump toe seeps and previously-identified downgradient stations between Grum Dump and Vangorda Creek.

Recommendation #5: Continue monitoring and maintenance of the Grum Creek weir flow monitoring instrumentation.

Response actions in 2007:

- Retrieved monitoring data during September 2007 monitoring activities. However, freezing conditions affected the instrumentation and staff gauge, and has introduced some further uncertainty in the data.

Recommendation #6: Review monitoring data on an ongoing basis and report Reference Water Quality Station monitoring data in the regular monthly report to the Water Board

Response actions in 2007:

- DTI reported results of 2007 monitoring activities to Water Board in regular monthly report.
- Prepared this report to document 2007 response activities in detail.

Recommendation #7: Summarize the 2007 monitoring results in the AMP report prepared by GLL.

Response actions in 2007:

- Results from this report will be included in the AMP report.

5 Recommendations

The following points summarize recommendations for continued monitoring of water quality downgradient of Grum Dump, and for implementation of additional water management if zinc concentrations exceed acceptable levels.

1. Continue monitoring Reference Water Quality Stations, as required under the AMP, by site environmental staff on a twice-monthly basis.

2. Continue to divert seepage from station V15 (the sedimentation pond) to station V2A in 2008, as a pro-active short-term mitigation strategy to minimize zinc concentrations at station V2 until a final closure plan can be implemented.

3. Implement collection and transfer of water to Vangorda Pit if zinc concentrations exceed acceptable levels at station V2, at Moose Seep, or at Moose Well.

    a. In the absence of site specific water quality objectives, the discharge water quality criteria of 0.5 mg/L zinc will be used as an interim threshold for implementation of water collection activities. Surface water collection and transfer would be implemented if three consecutive samples either at Station V2, at Moose Seep, or at Moose Well 2 exceed 0.5 mg/L zinc.

    b. Once a site-specific water quality objective has been developed for Vangorda Creek, the threshold for implementation of contingency measures should be re-evaluated to ensure that loading from this flow pathway is within acceptable limits.

    c. In the event that the interim threshold is exceeded, notification will be sent to the Water Board within 30 days.

4. Continue Spring/ Fall downgradient pathway and dump toe seepage surveys.

5. Continue monitoring and maintenance of Grum Creek weir flow-monitoring instrumentation.

6. Review monitoring data on an ongoing basis. Results of the Reference Water Quality Station monitoring data should continue to be included as part of the regular monthly report to the Water Board.

7. Present 2008 monitoring results in an annual AMP Event #4 Status report to be included with the annual AMP report prepared by GLL.

This report, **"AMP Event #4 Response: 2007 Status Report"**, has been prepared by SRK Consulting (Canada) Inc.

Prepared by:

Kelly Sexsmith, P.Geo (BC)

Dylan MacGregor, GIT (BC)

Reviewed by:

Peter Healey, P.Eng.

References

Gartner Lee Limited 2004. Anvil Range Mine Adaptive Management Plan Implementation Protocol, June 25, 2004. Report # GLL 40302.

SRK Consulting 2004b. Letter to Tony Polyck, Manager: Water Inspections Section, Department of Environment, Government of Yukon, RE: AMP Event #4, Seepage Water Quality from Grum Rock Dump, Anvil Range Mine, Yukon. August 16, 2004.

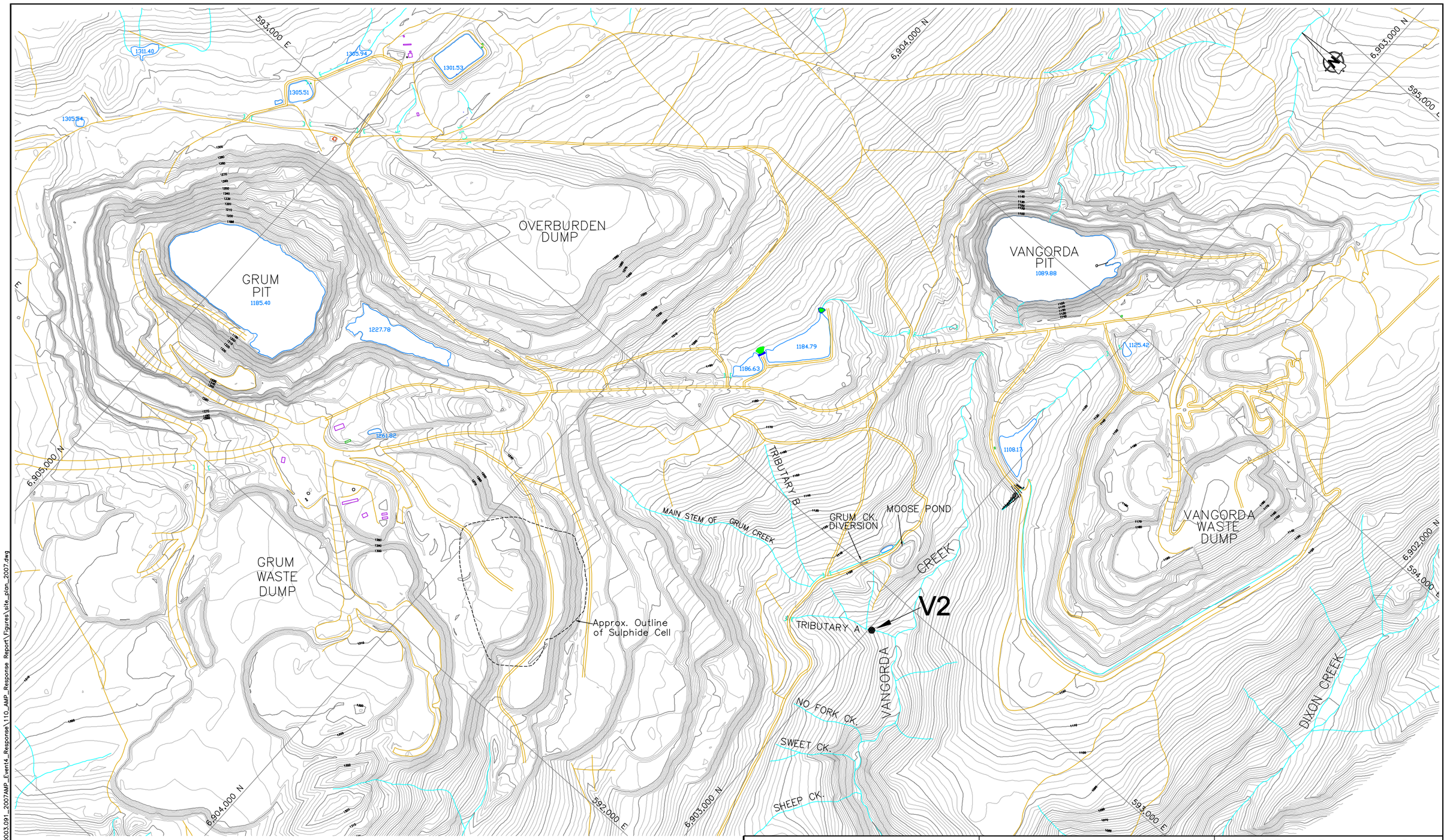
SRK Consulting 2005. AMP Event #4: Status Report. Prepared for Deloitte & Touche, May 2005.

SRK Consulting, 2006. AMP Event #4 Response: 2005 Status Report. Prepared for Deloitte & Touche, October 2006.

SRK Consulting, 2007. AMP Event #4 Response: 2006 Status Report. Prepared for Deloitte & Touche, January 2007.

SRK Consulting, in progress. 2007 Waste Rock and Seepage Monitoring Report. In preparation for Deloitte & Touche, on behalf of the Faro Mine Closure Planning Office.

Figures



Date of Photography: 2003/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

Note 1:
Sulphide cell outline from as-built drawing, Feb. 1996, as reported in Figure 1, Anvil Range Mining Corporation, May 1996.

0 100 200 300 400 500 Metres
1:10,000

SRK Consulting
Engineers and Scientists
Vancouver

SRK JOB NO.: 1CD003.091
Filename: site_plan_2007.dwg

Deloitte & Touche

Anvil Range Mining Complex

2007 AMP Event #4 Response: Status Report

Site Plan

DATE:	APPROVED:	FIGURE:
Jan. 2008	D.B.M.	1.1

J:\01_SITES\FARO\1090_1CD003.091_2007AMP_Event4_Response\110_AMP_Response Report\Figures\site_plan_2007.dwg

\\VAN-SVR0\Projects\01_SITES\FARO\1000_Deloitte_from GE_Projects\Acad-Vangorda-Grum\2006 Acad Drawings\site_plan_2006-Photo.dwg



Legend

- Reference Water Quality Stations
- Dump Toe Seeps
- Downgradient Monitoring Stations
- Groundwater Monitoring Well

Note 1:
Sulphide cell outline from as-built drawing, Feb. 1996, as reported in Figure 1, Anvil Range Mining Corporation, May 1996.

0 50 100 150 200 250 300 Metres

Scale 1:5000

Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

SRK Consulting
Engineers and Scientists
Vancouver

SRK JOB NO.: 1CD003.091

FILENAME: site_plan_2006-Photo.dwg

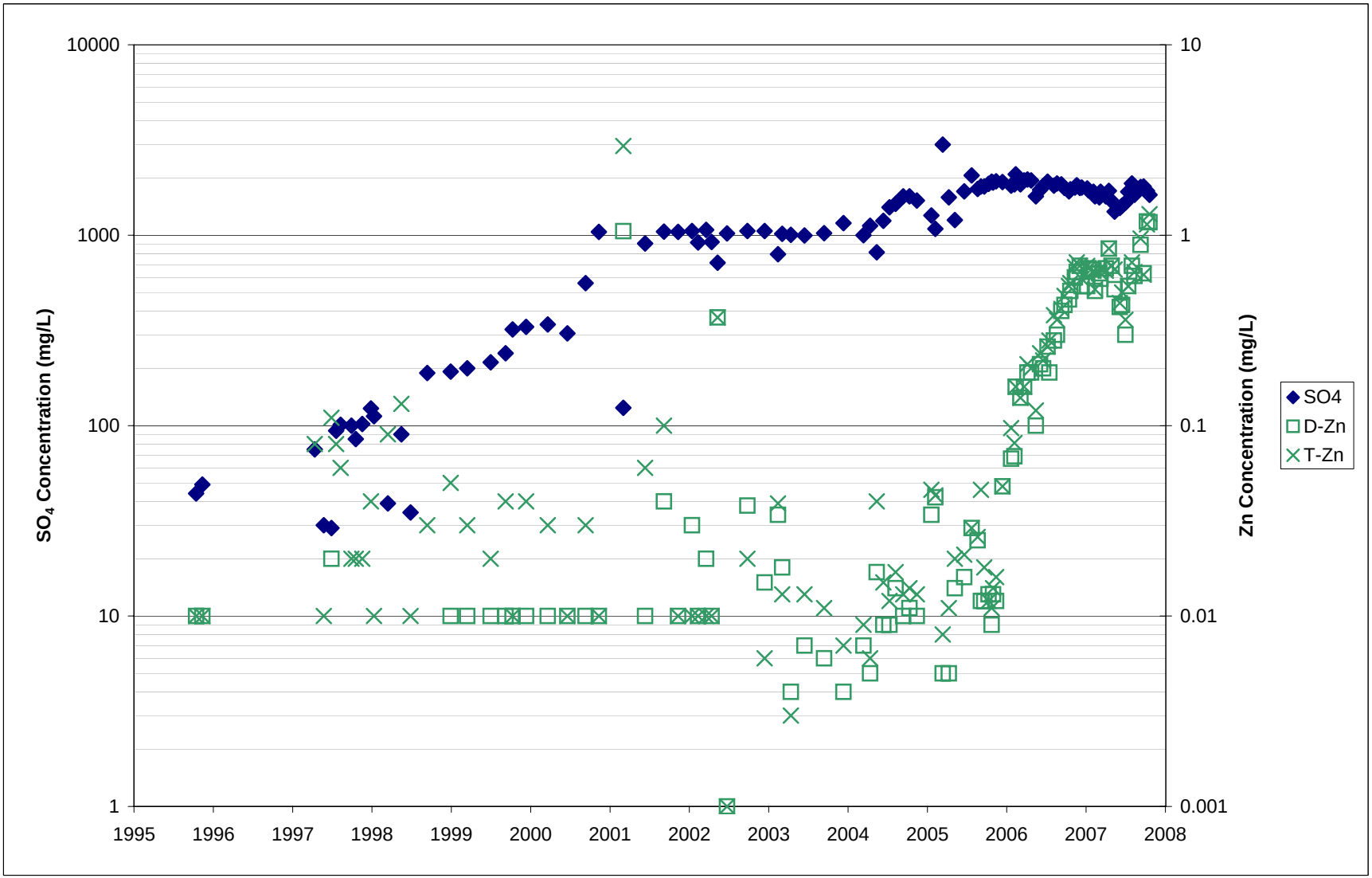
Deloitte & Touche

Anvil Range Mining Complex

2007 AMP Event #4 Response: Status Report

2007 Borehole and Water Sampling Stations

DATE:	APPROVED:	FIGURE:
Jan. 2008	D.B.M.	2.1



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

SRK Consulting
Engineers and Scientists
VANCOUVER

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

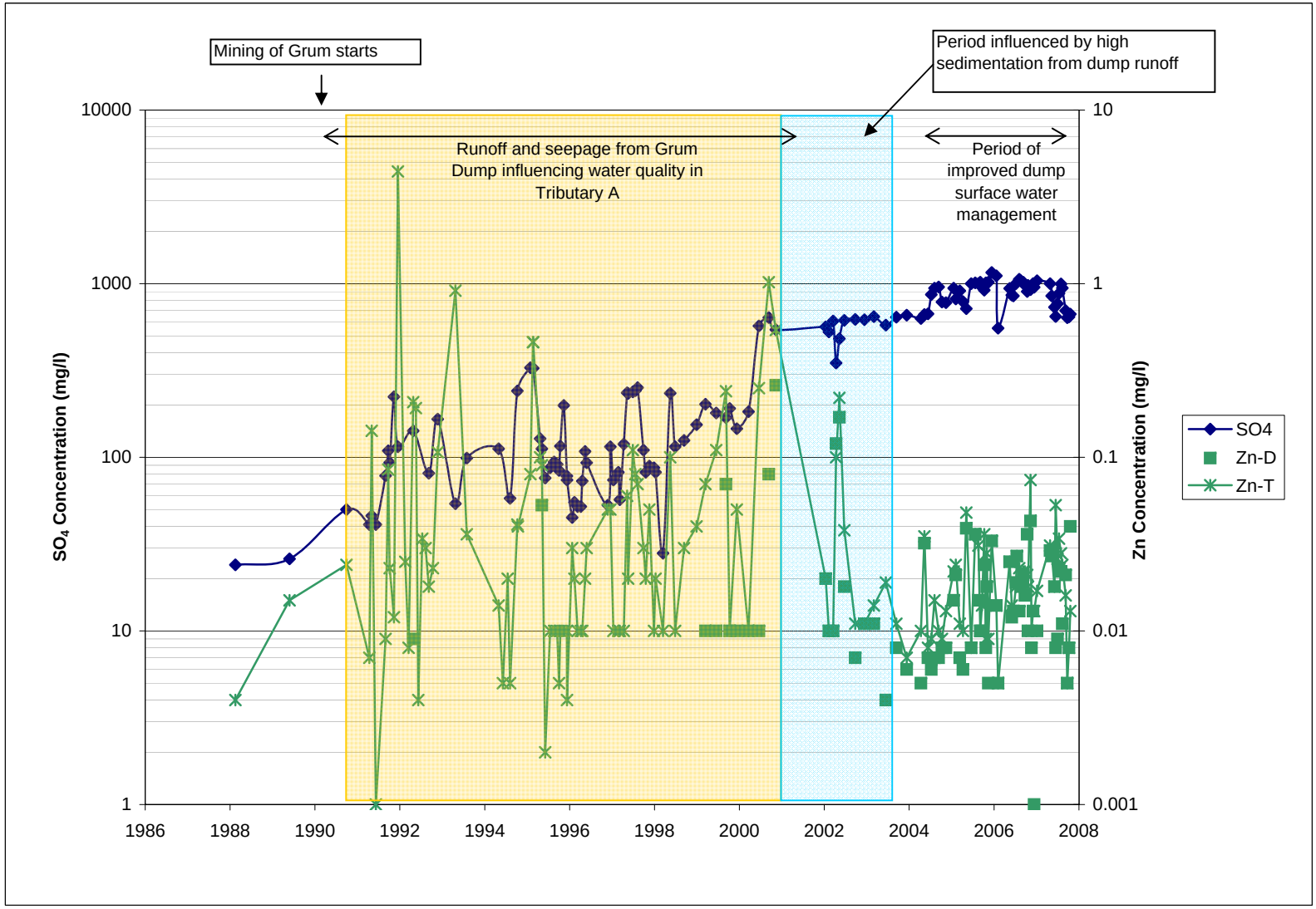
Deloitte & Touche

Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

Zinc and Sulphate Concentrations at V15

Date:	Approved:	Figure:
January 2008	KSS	**3.1**



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

SRK Consulting
Engineers and Scientists
VANCOUVER

Deloitte & Touche

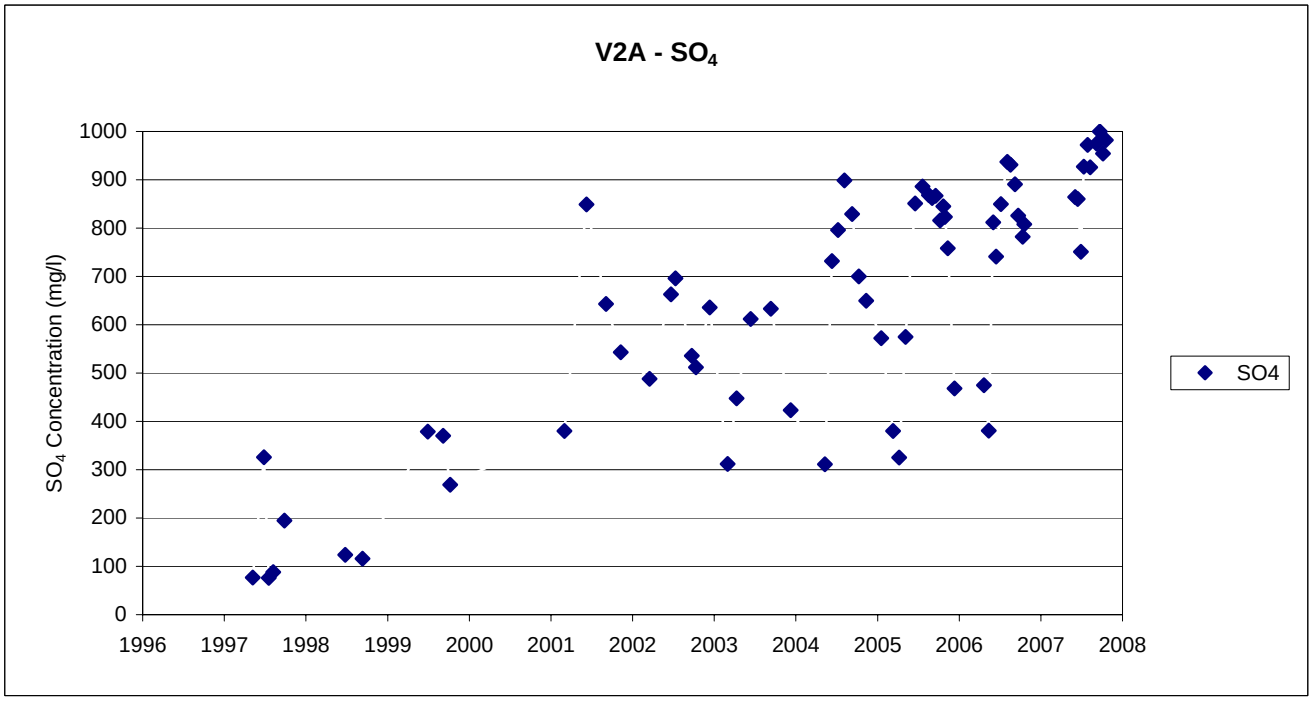
2007 AMP Event #4 Response: Status Report

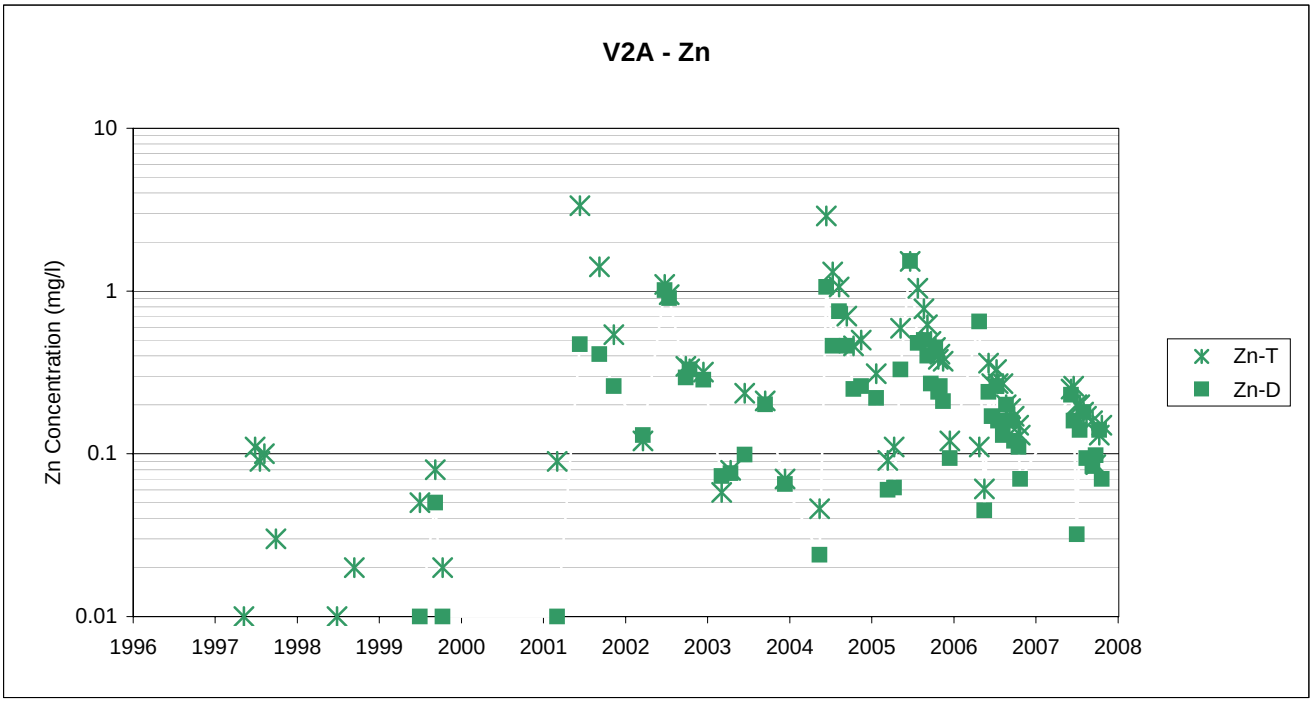
Zinc and Sulphate Concentrations at V2

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

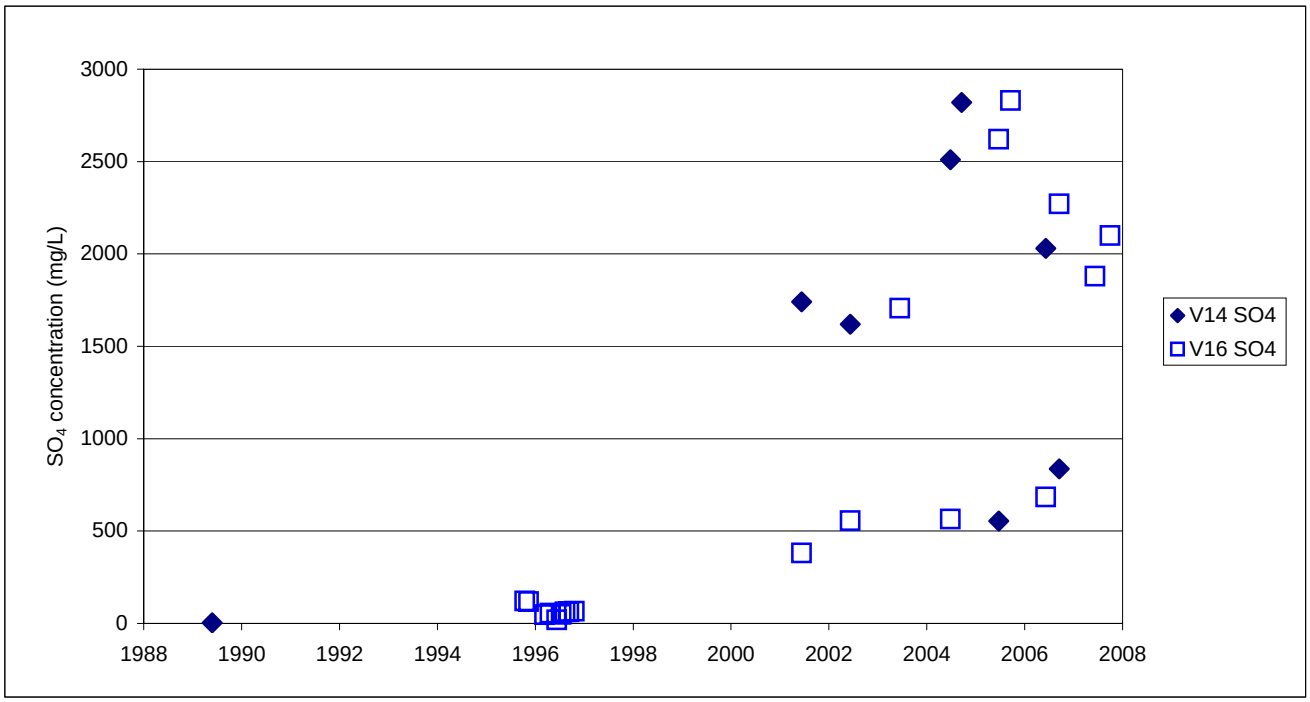
Date:	Approved:	Figure:
January 2008	KSS	**3.2**

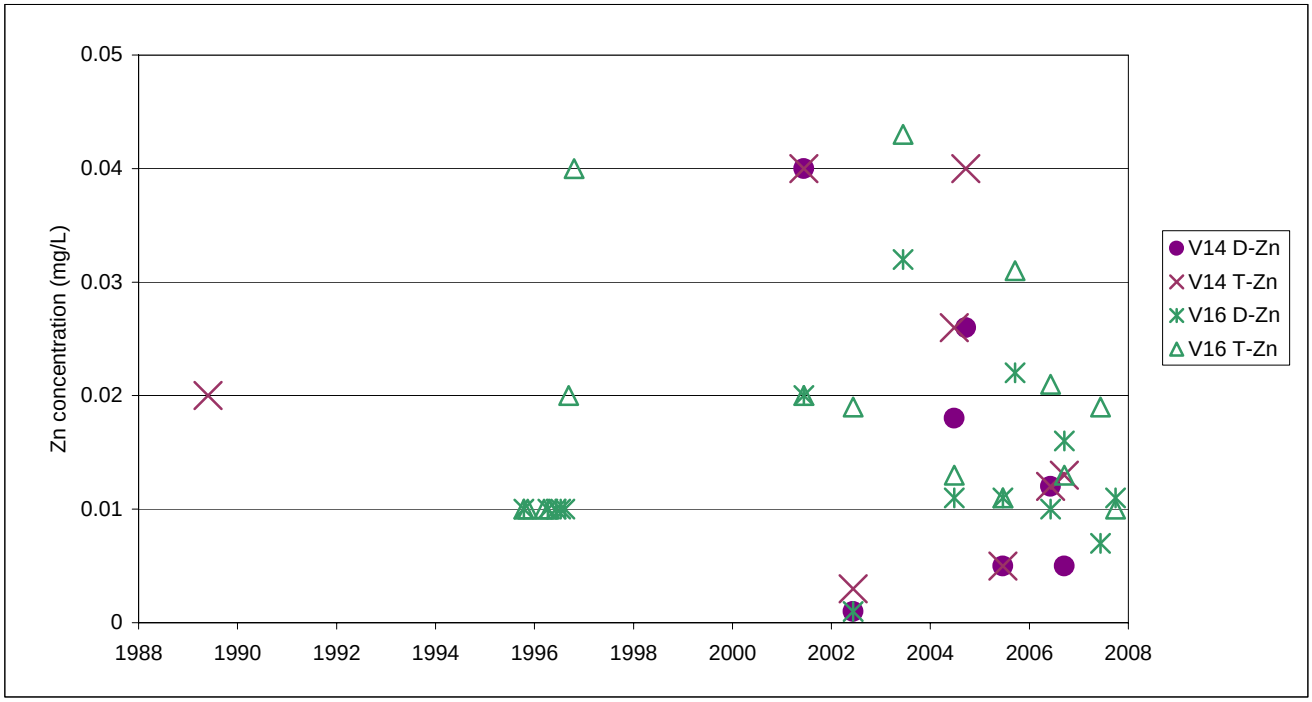




Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

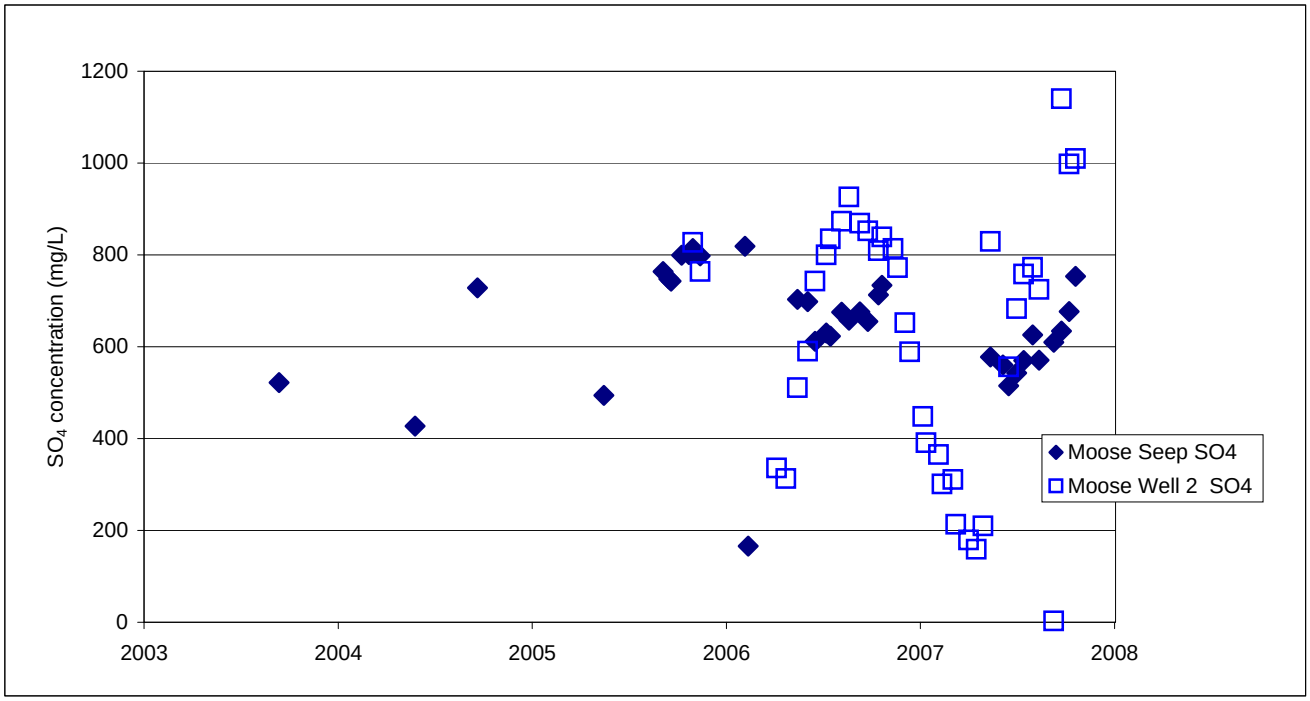
SRK Consulting Engineers and Scientists VANCOUVER	Deloitte & Touche	2007 AMP Event #4 Response: Status Report
		Zinc and Sulphate Concentrations at V2A
Job No: 1CD003.091 File: 2007 AMP Water Quality Figures_20070116.xls	Faro Mine Complex	Date: January 2008 / Approved: KSS / Figure: **3.3**

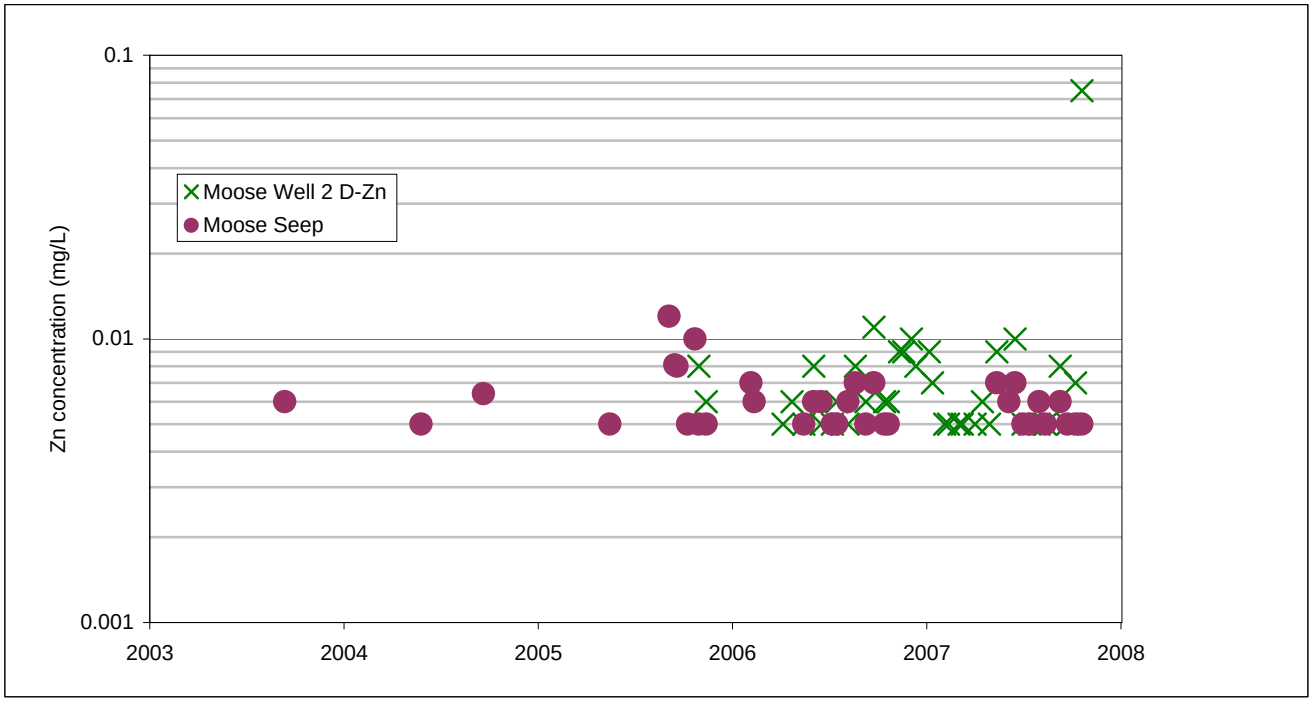




Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

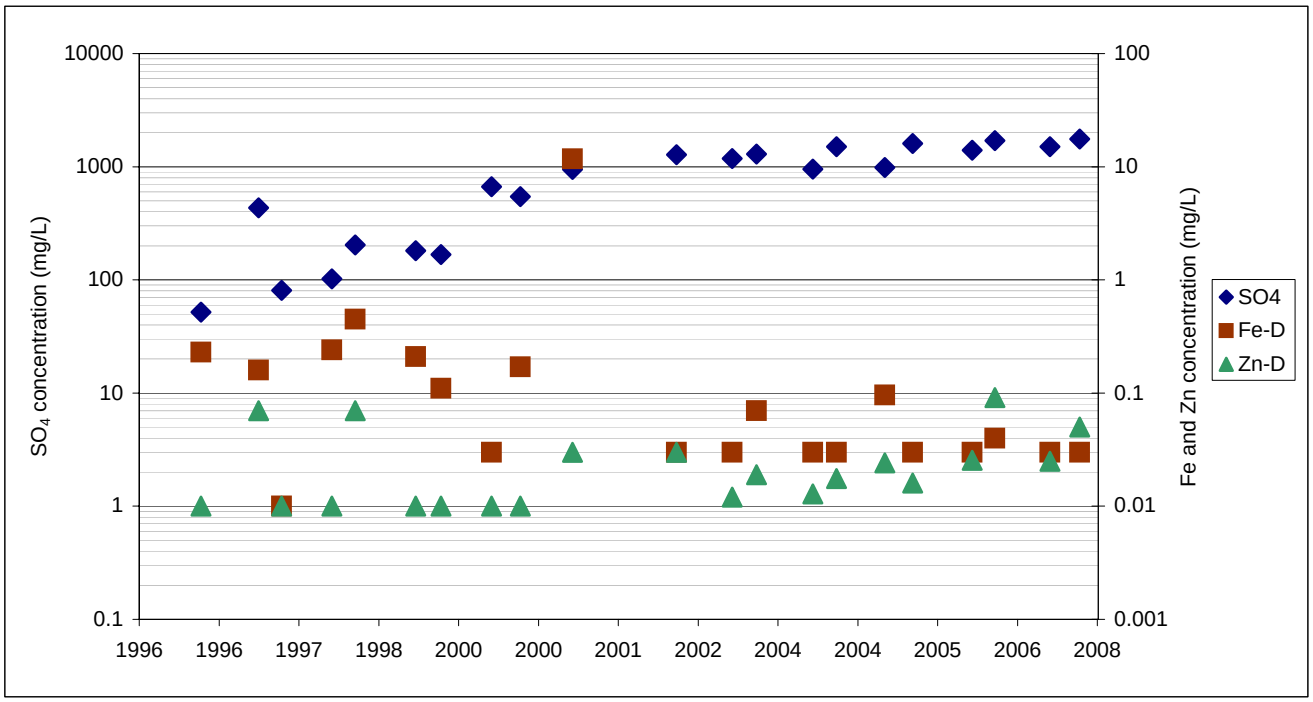
SRK Consulting Engineers and Scientists VANCOUVER	Deloitte & Touche	2007 AMP Event #4 Response: Status Report
		Zinc and Sulphate Concentrations at V14 and V16
Job No: 1CD003.091 File: 2007 AMP Water Quality Figures_20070116.xls	Faro Mine Complex	Date: January 2008 / Approved: KSS / Figure: **3.4**

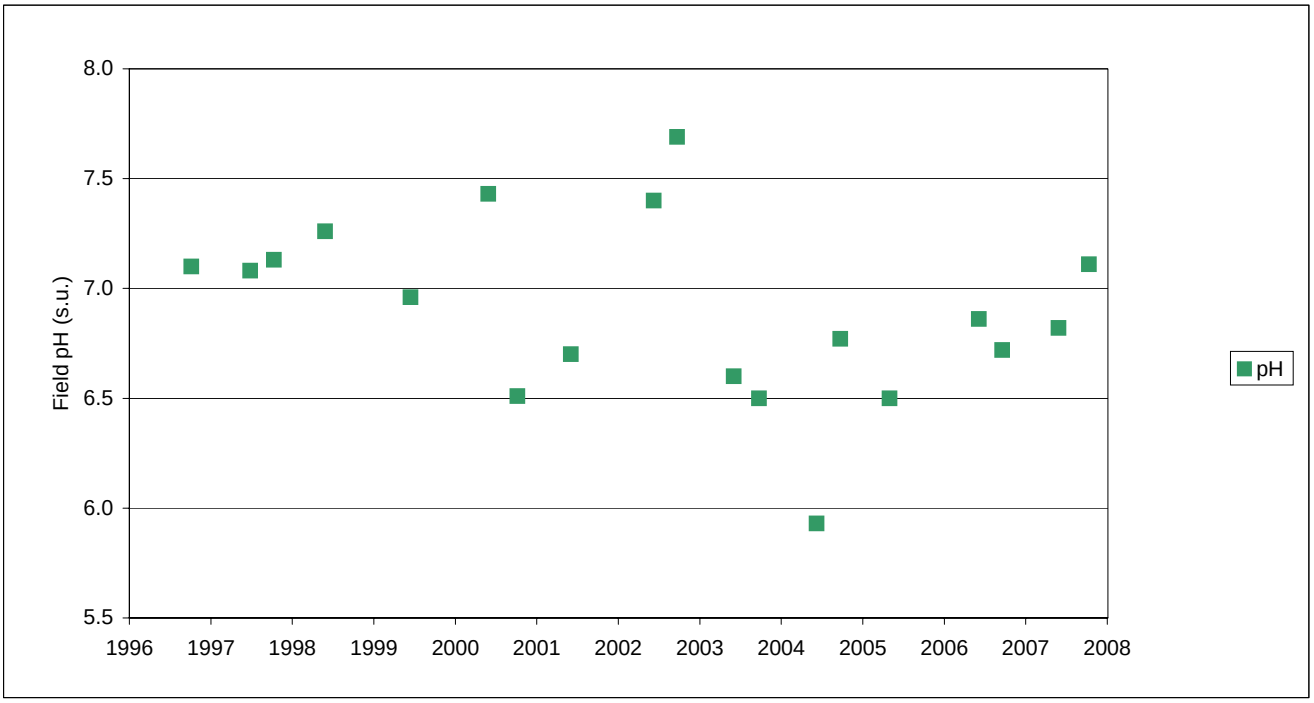




Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

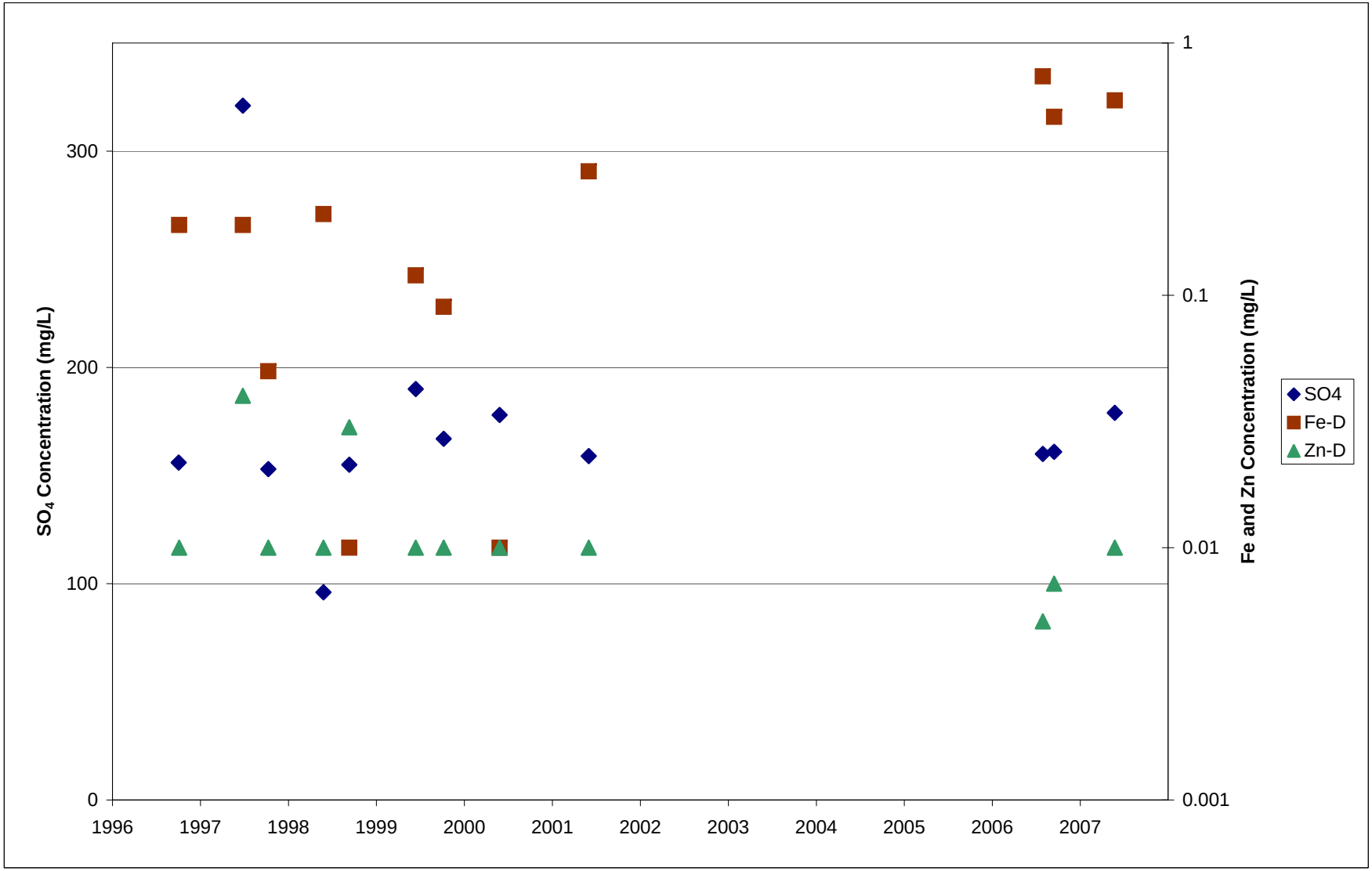
SRK Consulting Engineers and Scientists VANCOUVER	Deloitte & Touche	2007 AMP Event #4 Response: Status Report
		Zinc and Sulphate Concentrations at Moose Seep and Moose Well
Job No: 1CD003.091 File: 2007 AMP Water Quality Figures_20070116.xls	Faro Mine Complex	Date: January 2008 / Approved: KSS / Figure: **3.5**





Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

SRK Consulting Engineers and Scientists VANCOUVER	Deloitte & Touche	2007 AMP Event #4 Response: Status Report
		Zinc and Sulphate Concentrations and Field pH at P96-9a
Job No: 1CD003.091 File: 2007 AMP Water Quality Figures_20070116.xls	Faro Mine Complex	Date: January 2008 | Approved: KSS | Figure: **3.6**



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

SRK Consulting
Engineers and Scientists
VANCOUVER

Deloitte & Touche

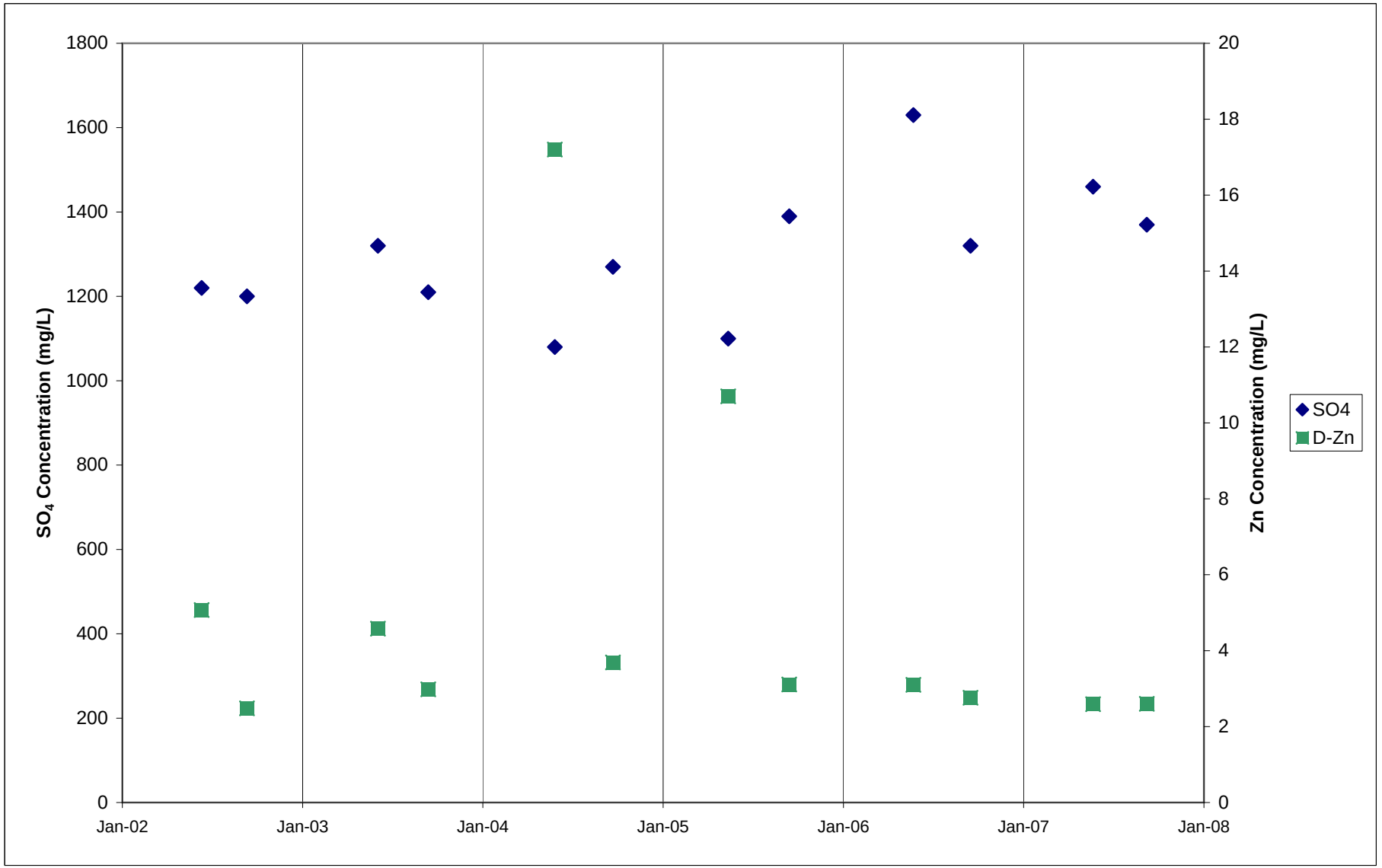
2007 AMP Event #4 Response: Status Report

Zinc, Iron, and Sulphate Concentrations at P96-9B/BH05-9b

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:	Approved:	Figure:
January 2008	KSS	**3.7**



SRK Consulting
Engineers and Scientists
VANCOUVER

Deloitte & Touche

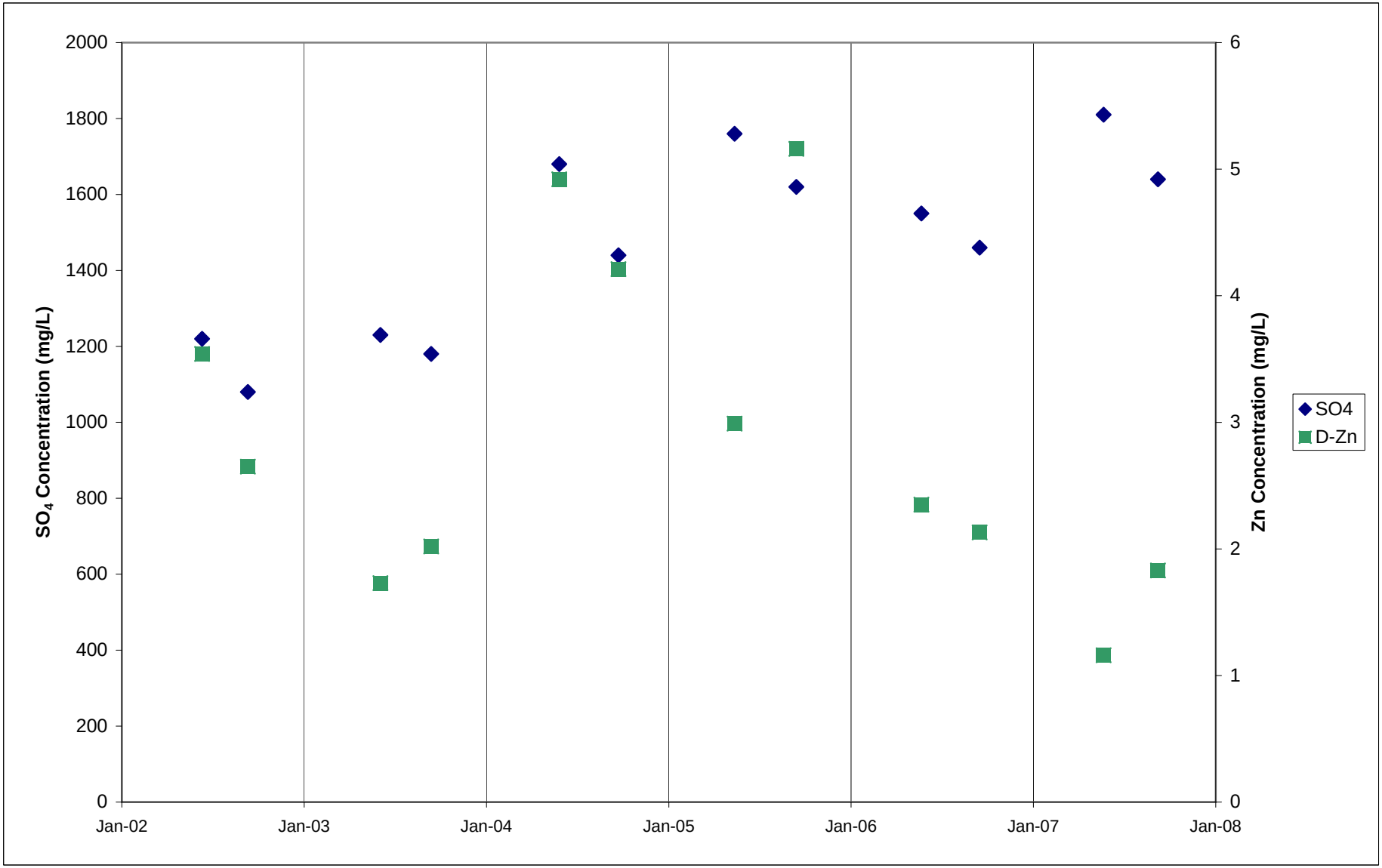
2007 AMP Event #4 Response:
Status Report

Zinc and Sulphate Concentrations at SRK-GD01

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:	Approved:	Figure:
January 2008	KSS	**3.8**



SRK Consulting
Engineers and Scientists
VANCOUVER

Deloitte & Touche

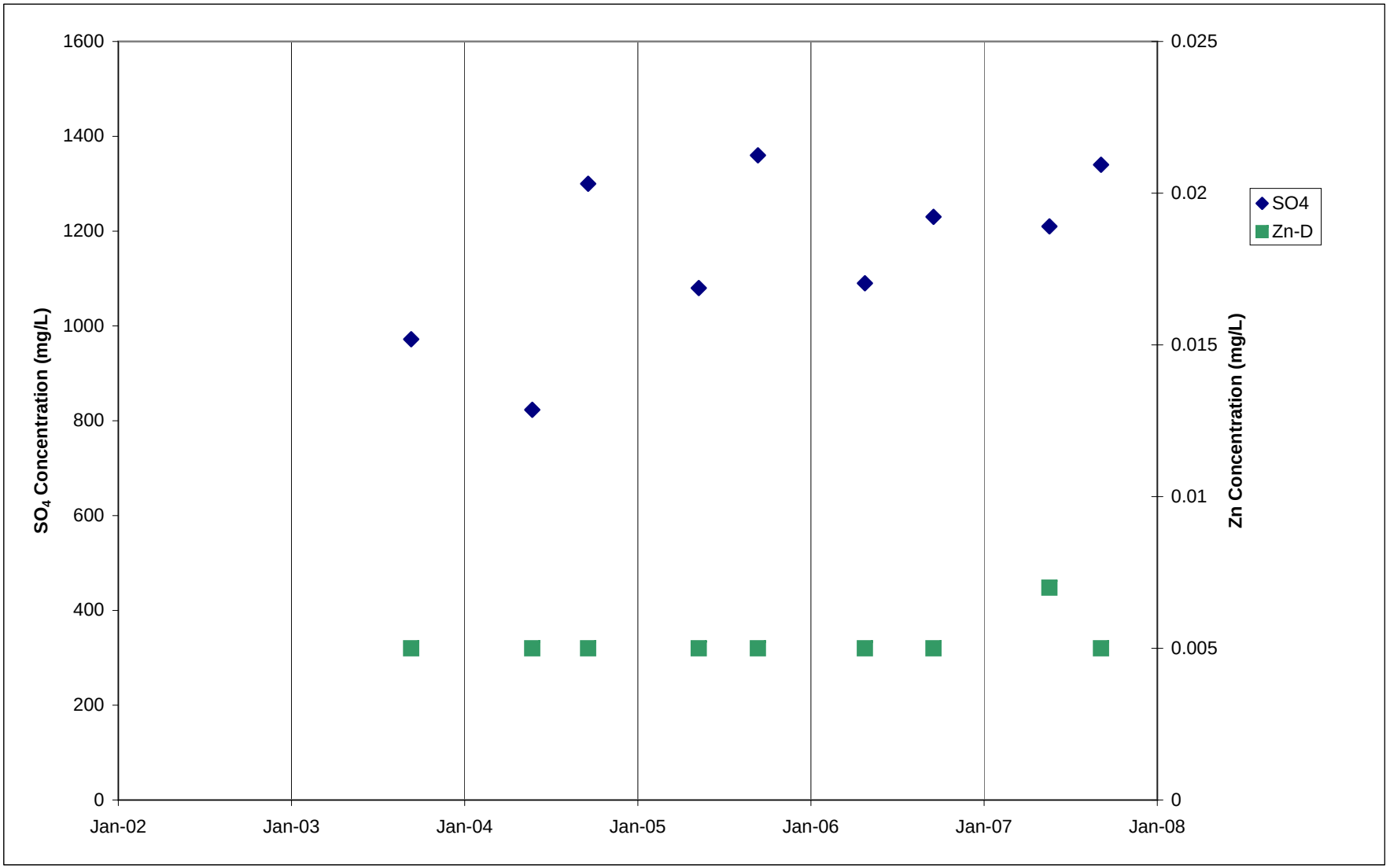
2007 AMP Event #4 Response: Status Report

Zinc and Sulphate Concentrations at SRK-GD05

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:	Approved:	Figure:
January 2008	KSS	**3.9**



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn

SRK Consulting
Engineers and Scientists
VANCOUVER

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

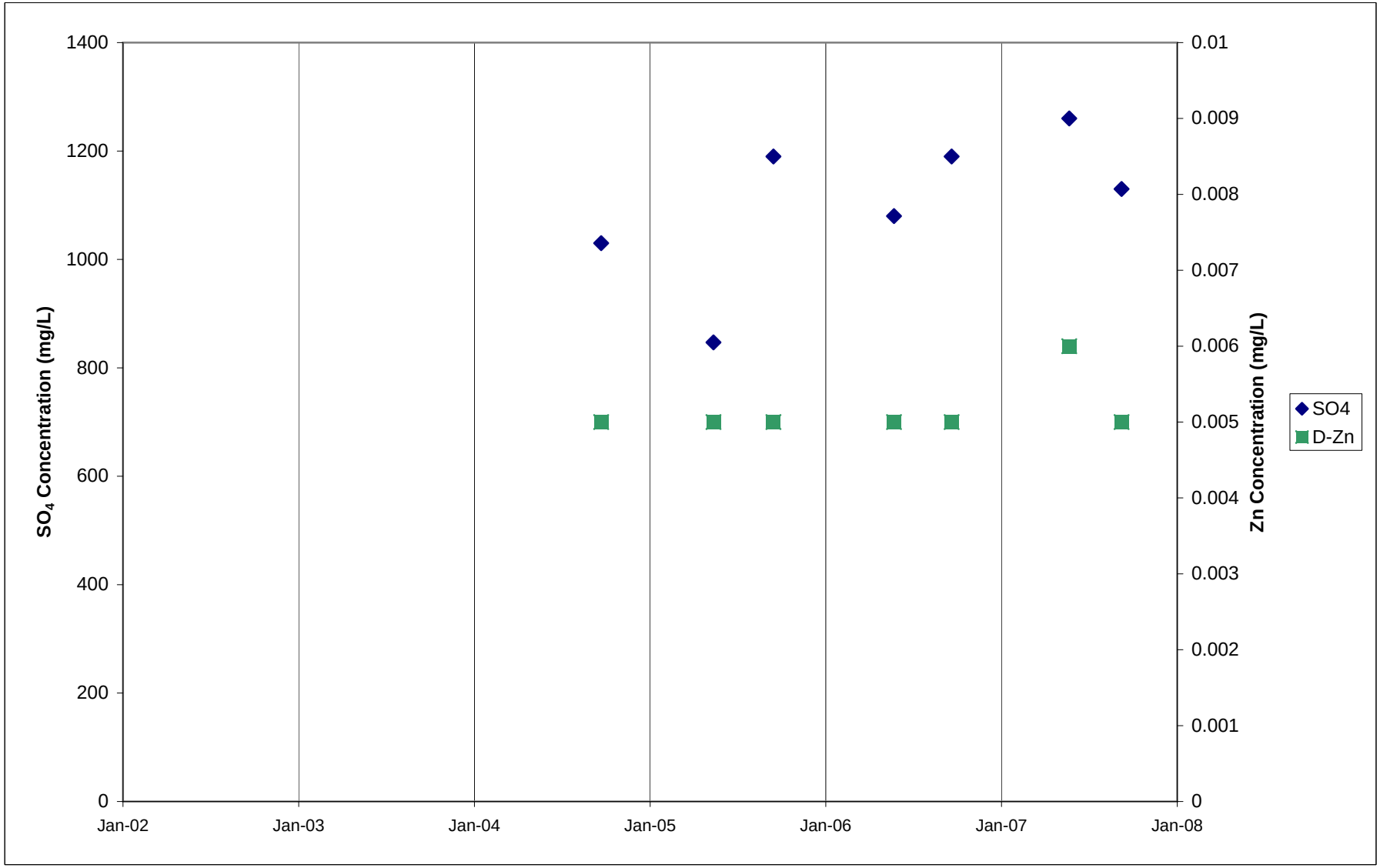
Deloitte & Touche

Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

Zinc and Sulphate Concentrations at SRK-GD05 d/s

Date:	Approved:	Figure:
January 2008	KSS	**3.10**



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn

SRK Consulting
Engineers and Scientists
VANCOUVER

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

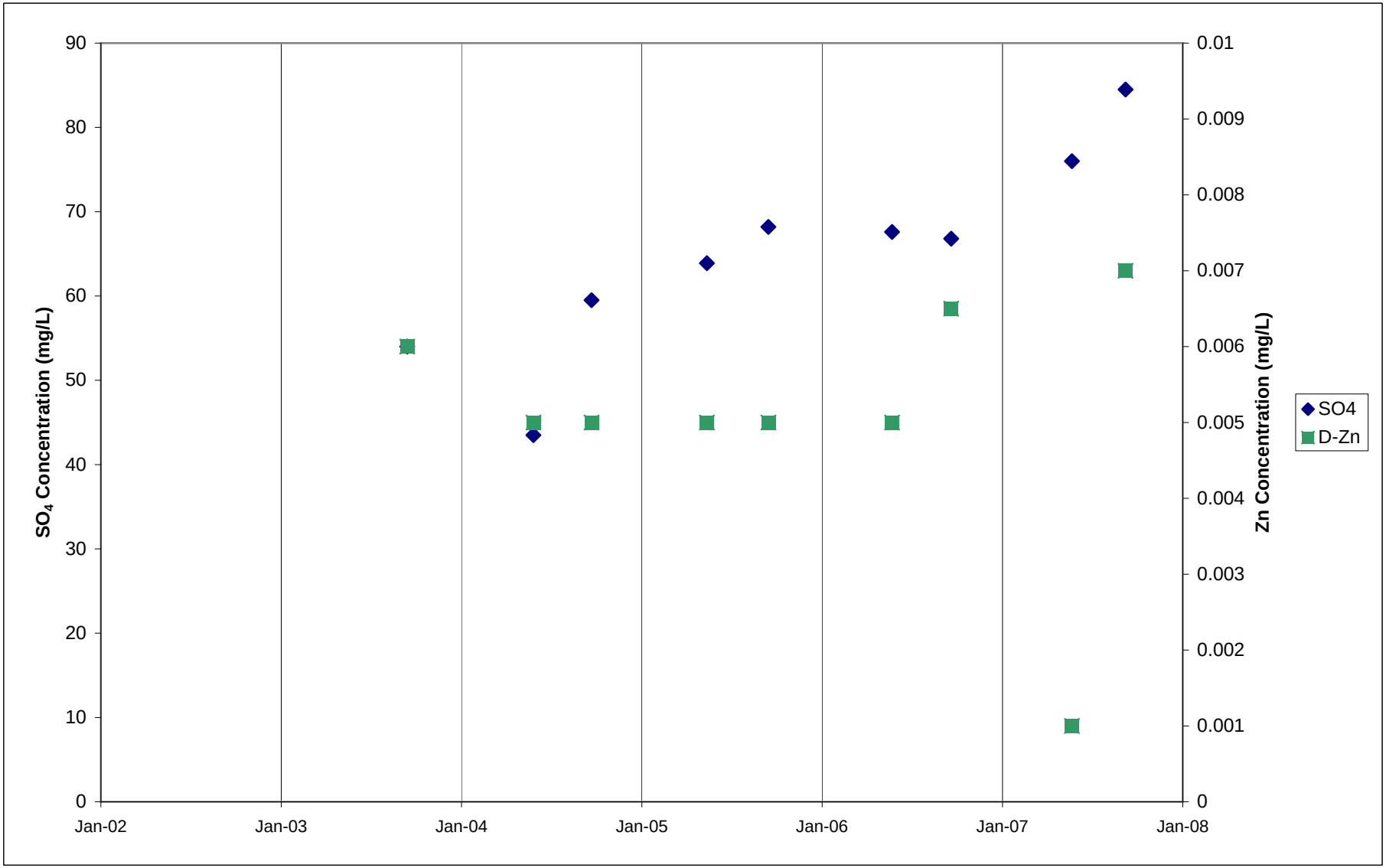
Deloitte & Touche

Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

Zinc and Sulphate Concentrations at Sweet Creek

Date:	Approved:	Figure:
January 2008	KSS	**3.11**



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn

SRK Consulting
Engineers and Scientists
VANCOUVER

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Deloitte & Touche

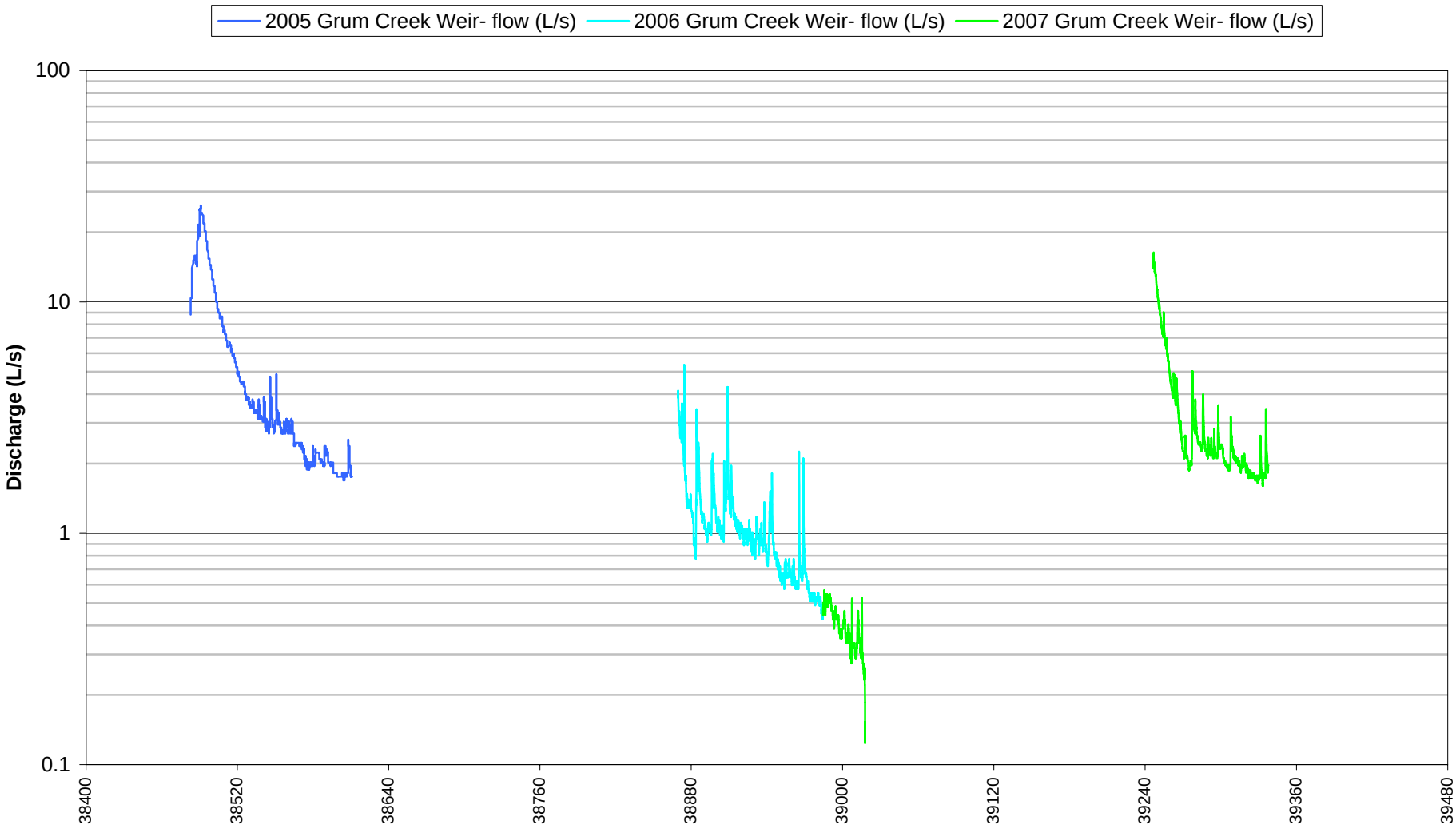
Faro Mine Complex

2007 AMP Event #4 Response: Status Report

Zinc and Sulphate Concentrations at Sheep Creek

Date:	Approved:	Figure:
January 2008	KSS	**3.12**

Grum Creek Weir
2005-2007 Flow Monitoring Results



SRK Consulting
Engineers and Scientists
VANCOUVER

Deloitte & Touche

2007 AMP Event #4 Response:
Status Report

Grum Creek Discharge

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:	Approved:	Figure:
January 2008	KSS	**3.13**

Appendices

Appendix A
Water Quality Monitoring Results

Appendix A1
2002-2007 Waste Rock Seepage Survey Results

| | | Field Parameters | | | | | Physical Tests | | Dissolved Anions | | | | Dissolved Metals | | | | |

Appendix A2

2003-2007 Downgradient Seepage Pathways South of Grum Dump

Appendix A2: Water Quality of Downgradient Seepage Pathways South of Grum Dump

| Sample ID | Date Sampled | Field Parameters | | | | | Physical Tests | | Dissolved Anions | | | | Dissolved Metals | | | | |

Appendix A3
2005-2007 Groundwater Data

STATION	DATE	Field Parameters			Physical Tests			Anions		Dissolved Metals																										
		pH	Cond	Temp	pH	Cond	Hardness	Alk-T	SO4-D	Ag	Al	As	Ba	B	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg	K	Li	Mg	Mn	Mo	Na	Ni	Pb	Sb	Se	Sn	Ti	Tl	U	V	Zn
		s.u.	uS/cm	oC		µS/cm	meq/L	meq/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SRK04-5A	25-Sep-04				8.34	459	198	140	108	<0.000050	<0.010	0.0079	0.046	<0.10	<0.0050	54.2	50	0	0	<0.0010	0.272	0		<0.050	15.3	0.063	0.0186	17.7	<0.0050	<0.0010	0.00068	<0.0010		<0.050	0	0.00489	<0.030	0.0081
SRK-04-ARTA	9-May-05				7.96	449	172	154	89.8	<0.000050	<0.010	0.0121	0.032	<0.10	<0.0050	47.5	50	0	0	<0.0010	0.701		n/a	<0.050	13	0.08	0.0179	13.2	<0.0050	<0.0010	0	<0.0010	n/a	<0.050	0	0.00114	<0.030	0.0105
SRK04-5A	7-Jun-06	8	434.9	3.9		448	197	144	98.4	< 0.00002	0.012	0.0126	0.056	< 0.1	< 0.001	53.8	2.4E-05	< 0.0003	< 0.001	< 0.001	1.27	0.00002	< 2	0.0078	15.3	0.0887	0.0199	19.5	< 0.001	0.00138	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00117	< 0.03	0.053
SRK04-5A	19-Sep-06	7.9	418	4.5		439	212	149	94.9	< 0.00002	0.0075	0.00822	0.038	< 0.1	< 0.001	56.7	0.00001	< 0.0003	< 0.001	< 0.001	0.744	0.00002	< 2	0.0106	17	0.0487	0.0178	19.1	< 0.001	< 0.0005	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00216	< 0.03	0.0064
SRK04-5B	25-Sep-04				8.31	450	185	138	100	<0.000050	<0.010	0.012	0.058	<0.10	<0.0050	51.1	50	0	0	<0.0010	0.316	0		<0.050	14.1	0.069	0.0236	18.6	<0.0050	<0.0010	0.00088	<0.0010		<0.050	0	0.00727	<0.030	0.0154
SRK-04-ARTB	9-May-05				8.08	435	172	153	85.3	<0.000050	<0.010	0.0169	0.049	<0.10	<0.0050	47.6	50	0	0	<0.0010	0.479		n/a	<0.050	12.9	0.08	0.0204	15.8	<0.0050	<0.0010	50	<0.0010	n/a	<0.050	0	0.00201	<0.030	0.0066
SRK04-5B	7-Jun-06	7.75	219.8	4.8		430	206	140	89	< 0.00002	< 0.005	0.00593	0.031	< 0.1	< 0.001	55.5	2.1E-05	0.00033	< 0.001	< 0.001	1.42	0.00002	< 2	0.0101	16.3	0.0536	0.0174	18.6	< 0.001	0.00064	< 0.0005	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00142	< 0.03	0.402
SRK04-5B	19-Sep-06	7.88	418	3.6		465	219	144	109	< 0.00002	0.0071	0.0148	0.083	< 0.1	< 0.001	58.6	2.2E-05	< 0.0003	< 0.001	< 0.001	0.205	0.00002	< 2	0.0095	17.5	0.0811	0.0231	24.2	< 0.001	< 0.0005	0.00076	< 0.001	< 0.0005	< 0.01	< 0.0002	0.00318	< 0.03	0.0062
SRK05-5c	22-Nov-05				7.51	651	n/a	187	173	<0.010	<0.20	<0.20	0.091	<0.10	<0.0050	78.6	<0.010	<0.010	<0.010	<0.010	0.055		<2.0	<0.010	26.8	1.05	<0.030	16.8	<0.050	<0.050	<0.20	<0.20	<0.030	<0.010	<0.20	n/a	<0.030	<0.0050	
SRK05-05C	21-Sep-06	6.81	1175	5.9		1040	591	240	387	< 0.0001	< 0.02	0.0053	0.17	< 0.1	< 0.005	143	< 0.0001	0.0037	< 0.001	< 0.002	1.24	< 0.0002		< 0.05	56.7	3.97	0.0123	<=> 13.6	< 0.01	< 0.002	< 0.001	< 0.002		< 0.05	< 0.0004	0.00337	< 0.03	0.0195
SRK05-05C	12-Oct-07	7.64	915	2.3		1080	664	218	372	< 0.00004	< 0.01	0.0079	0.146	< 0.1	< 0.002	156	9.5E-05	0.00231	< 0.002	< 0.002	0.775	0.00002	2.1	< 0.01	66.7	2.41	0.0139	14.7	0.0053	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.00543	< 0.002	0.012
SRK05-06	8-Jun-06	7.61	1453	4.3		1260	790	246	450	< 0.0001	< 0.025	< 0.0025	0.044	< 0.1	< 0.005	163	0.00008	< 0.0015	< 0.005	< 0.005	< 0.03	0.00002	2.1	< 0.025	92.9	0.0504	< 0.005	7	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0157	< 0.03	0.131
SRK05-06	19-Sep-06	7.48	1531	8.4						< 0.0001	< 0.025	< 0.0025	0.055	< 0.1	< 0.005	226	0.00043	< 0.0015	< 0.005	0.0092	< 0.03	0.00002	3.5	< 0.025	124	0.0316	< 0.005	10	< 0.005	0.0041	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0253	< 0.03	0.055
SRK05-06	30-May-07	7.67	1142	2.3		1050	764	224	444	< 0.00004	< 0.01	< 0.001	< 0.02	< 0.1	< 0.002	165	0.00018	< 0.0006	< 0.002	0.0029	0.392	0.00002	< 2	< 0.01	85.4	0.00357	< 0.002	6.3	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.016	< 0.03	< 0.017
SRK05-06	12-Oct-07	8.15	1766	2.5		2030	1385	352	916	< 0.0001	< 0.025	< 0.0025	0.049	< 0.1	< 0.005	276	0.00027	< 0.0015	< 0.005	< 0.005	< 0.03	0.00002	3.6	< 0.025	169	0.0035	< 0.005	10.5	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0319	< 0.005	0.0173
SRK05-07	19-Sep-06	6.71	2580	6.2		2560	1784	765	1080	< 0.0001	0.033	0.0266	0.141	< 0.1	< 0.005	340	0.00008	0.0146	< 0.005	< 0.005	1.82	0.00002	3.2	< 0.025	227	1.15	0.0188	13.4	0.0715	< 0.0025	0.0032	< 0.005	< 0.0025	< 0.01	< 0.001	0.016	< 0.03	< 0.025
SRK05-07	30-May-07					1600	1338	532	706	< 0.0001	0.059	0.0073	0.126	< 0.1	< 0.005	290	0.00008	0.0077	< 0.005	< 0.005	0.575	0.00002	3.5	< 0.025	149	0.421	0.0102	7.5	0.0936	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0142	< 0.03	< 0.025
SRK05-07	12-Oct-07	7.38	2250	1.8		2680	1929	735	1080	< 0.0002	< 0.05	< 0.005	0.074	< 0.1	< 0.01	408	0.0003	0.0097	< 0.01	< 0.01	< 0.03	0.00002	3.6	< 0.05	221	0.692	< 0.01	10.6	0.147	< 0.005	< 0.005	< 0.01	< 0.005	< 0.01	< 0.002	0.0157	< 0.01	0.0269
SRK05-08	7-Jun-06	7.04	876	4.5		1510	917	500	458	< 0.00004	0.016	< 0.001	0.057	< 0.1	< 0.002	194	4.2E-05	0.00128	< 0.002	< 0.002	< 0.03	0.00002	< 2	0.011	105	0.0161	< 0.002	7.4	< 0.002	< 0.001	< 0.001	< 0.002	< 0.001	< 0.01	< 0.0004	0.0132	< 0.03	0.0092
SRK05-08	19-Sep-06	7.3	1501	5.2		1600	974	516	494	< 0.0001	< 0.025	< 0.0025	0.032	< 0.1	< 0.005	212	0.00008	< 0.0015	< 0.005	< 0.005	< 0.03	0.00002	< 2	< 0.025	108	0.0198	< 0.005	7.2	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0143	< 0.03	0.052
SRK05-08	30-May-07	7.09	1779	2.9		1540	1126	514	634	< 0.0001	< 0.025	< 0.0025	0.028	< 0.1	< 0.005	243	0.00008	< 0.0015	< 0.005	< 0.005	< 0.03	0.00002	< 2	< 0.025	126	0.003	< 0.005	7.5	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0174	< 0.03	< 0.025
SRK05-08	12-Oct-07	7.5	1755	2		1980	1347	558	664	< 0.0001	< 0.025	< 0.0025	< 0.02	< 0.1	< 0.005	282	0.00008	< 0.0015	< 0.005	< 0.005	< 0.03	0.00002	< 2	< 0.025	156	0.0017	< 0.005	8.9	< 0.005	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.01	< 0.001	0.0181	< 0.005	0.0088

Appendix B
Conceptual Design for V15 Seepage Diversion to V2A

SRK Consulting (Canada) Inc.
Suite 2200 – 1066 West Hastings Street
Vancouver, B.C. V6E 3X2
Canada

vancouver@srk.com
www.srk.com

Tel: 604.681.4196
Fax: 604.687.5532

Technical Memo

To:	Dana Haggar, Deloitte and Touche	**Date:**	July 13, 2007
cc:	Glen Craig, Deloitte and Touche	**From:**	Peter Healey P.Eng
Subject:	**Conceptual Design for V-15 Seepage Diversion to V2A**	**Project #:**	1CD003.091

1 Introduction

SRK Consulting (Canada) Inc. (SRK) has prepared this technical memorandum as a follow-up to a letter sent to Yukon Territorial Government (YTG Water Resources Branch) dated January 2007 regarding short-term measures to mitigate increased zinc levels that periodically occur at V-15. SRK understands from the letter that YTG supports the proposal to divert seepage entering the V-15 pond to the existing ditch that carries flow from the Grum Creek V notch weir to V2A (see Figure 1).

As discussed below, last year Deloitte and Touche (DT) installed an interim measure to mitigate the increase in zinc levels. However, it was felt that a more manageable system is required that would remain in place until the final reclamation measures are implemented.

This technical memorandum provides recommendations for the construction of a lined open channel diversion from the V-15 sediment pond to the existing ditch below the V-notch weir on Grum Creek. SRK's observations and the recommendations in the following sections are based on a recent inspection of the site, which was carried out during SRK's 2007 Annual Geotechnical inspection of the Vangorda Plateau mine site.

1.1 Observations

As shown on Photo 1, DT has built a soil berm around the southern perimeter of the pond to restrict outflow to V2. A small gas powered pump has been installed in the pond to periodically divert the seepage to V2A via the existing ditch below the V-Notch weir on Grum Creek (Photo 2). It was also noted that a small ditch located below the groundwater wells (SRK 04-5A/B and 05-5C) collects seepage from the catchment above the wells and directs the flow over to the existing Grum Creek ditch below the weir (Photo 3). A survey completed by DT on Wednesday June 20, 2007 confirmed that there is sufficient grade for the proposed ditch.

1.2 Design Concept

The objective of the proposed ditch would be to divert any seepage that currently enters the existing sediment collection pond over to the existing ditch below the Grum Creek V-Notch weir. The ditch would be lined with a bentonite Geomembrane (GCL) to limit leakage and would have a trapezoidal configuration with sideslopes no steeper than 1.5:1 (H:V). The existing sediment collection pond would be retained to collect any sediment.

Ground preparation for the ditch would involve clearing and grubbing the area along the proposed alignment shown on Figure 1. Earthworks would involve a cut and fill operation to provide a stable foundation for the ditch. The existing bank along the road would be moved out to establish a

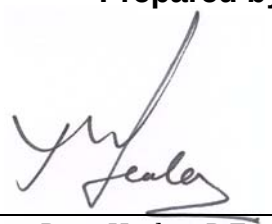
compacted berm with a sideslope no steeper than 1.5 to 1. All fill would be compacted with a suitably sized mechanical compactor prior to excavation of the ditch.

1.3 Recommendations

The final grade of the ditch should be no less than one (1) percent. The depth of the ditch from the finished base to the top of the sideslopes should be 1m minimum. The alignment of the ditch must avoid any impact on the existing groundwater wells. While SRK recognizes that construction of the ditch will be field fit, the invert of the ditch at the outlet from the sediment pond should be established to ensure sufficient storage capacity to allow for any sediment to settle.

SRK also recommends that a compacted 30cm soil cover be placed over the GCL.

Prepared by



Peter Healey, P.Eng.

Figures



Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

0 10 20 30 40 50 60 70 80 90 100m
Scale 1:1500

SRK Consulting
Engineers and Scientists
Vancouver

SRK JOB NO.: 1CD003.091

Acad-Vangorda-Grum\Acad-2006\ site_plan_2006-Photo.dwg

Deloitte & Touche

Anvil Range Mining Complex

V15 Seepage Diversion Ditch

Site Location Map

DATE:	APPROVED:	FIGURE:
June 2007	PMH	1

Photos



Photo 1: V-15 Sedimentation Pond looking east towards location of V-notch weir on Grum Creek.



Photo 2: V-notch weir on Grum Creek.



Photo 3: Seepage collection ditch below groundwater wells.



Photo 4: Bank along proposed ditch alignment.

Appendix C
Photos



Photo C-1: pH monitoring during seep survey at Grum.



Photo C-2: Field pH, temperature, redox, conductivity and flow readings.



Photo C-3: View of Grum Creek below V-notch Weir.



Photo C-4: V-notch weir and staff gauge on Grum Creek.



Photo C-5: View of Grum Creek below V-notch weir at confluence with diversion ditch from V-15.



Photo C-6: Seepage flow in V-15 diversion ditch and confluence with Grum Creek.