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June 30, 2005

Government of Yukon
Energy, Mines & Resources
Assessment and Abandoned Mines Branch K-419
Box 2703
Whitehorse, YT
Y1A 2C6

Attention: Mr. Hugh Copland, Project Manager

Dear Mr. Copland:

Re: Final Report for 2004/05 Care and Maintenance Activities, Keno Hill Property

Access Consulting Group is pleased to submit to Yukon Government, Assessment and Abandoned Mines Branch five (5) copies of the above referenced Final Report. The Report information is contained in two volumes:

**Volume I – Main Report; and
Volume II - Appendices**

Should you have any questions, please contact Access Consulting Group at (867) 668-6463.

Yours truly,
ACCESS CONSULTING GROUP

Robert L. McIntyre, R.E.T, CCEP
President, Project Manager

COPY

Yukon

Government

Department of Energy, Mines & Resources

Assessment and Abandoned Mines

Whitehorse, Yukon

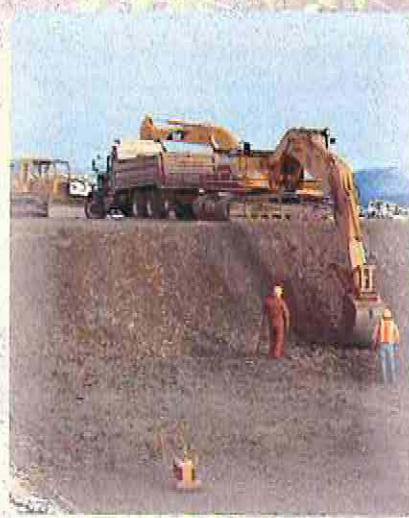
Care and Maintenance of Keno Hill Mining Property,

Keno Hill, Yukon

2004-2005 FINAL PROJECT REPORT

June 2005

VOLUME I: MAIN REPORT



Prepared by:

**EWING
TRANSPORT LTD.**

NND-DC



**NACHO NYAK DUN
DEVELOPMENT CORPORATION**



**ACCESS
CONSULTING
GROUP**

***Final Project Report for 2004/05
Care and Maintenance Activities***

***Keno Hill Mining Property
Keno Hill, Yukon***

Prepared for:

Yukon Government
Energy, Mines and Resources
Assessment and Abandoned Mines Branch

Prepared by:



Access Consulting Group

Distribution

Yukon Government	5 copies
Access Consulting Group	2 copies
Na-cho N'yak Dun Development Corp	1 copy
Na-cho N'yak Dun Lands Branch	1 copy
Ewing Transportation	1 copy

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EXECUTIVE SUMMARY

Beginning on April 1, 2004, Access Consulting Group (ACG) has provided Project and Technical Manager services to the Government of Yukon (Department of Energy, Mines and Resources), for the Care and Maintenance of the former Keno Hill Mine Site, Elsa, Yukon. Since that time, Ewing Transport Ltd. of Mayo, Yukon, has provided capable and reliable operation of the water treatment systems and other construction and maintenance services. Citizens of the First Nation of Nācho N'yak Dun (NND) fill the majority of labour positions on the project, through the NND Development Corporation (NND-DC). Together, ACG, Ewing, and the NND-DC, along with various sub-consultants and subcontractors, have been operating for the past year under contract to the Yukon Government, Type II Mines Office, Department of Energy, Mines & Resources.

The purpose of this report is to document and provide details of site operational activities and special projects that have been completed at the site in the past year. The report also provides detailed supporting technical reports, or interim status reports, on special projects undertaken at the site, some of which are stand-alone reports that have been submitted previously. Project management issues such as human resource utilization and assessment, training and capacity building functions, budgetary considerations, and other such matters, are also discussed within this report.

The objective of care and maintenance activities at the Keno Hill Properties is to minimize and/or prevent further environmental degradation caused by effluents released from various old mine workings. This is accomplished largely by the daily operation of lime addition water treatment systems existing at Galkeno 900, Galkeno 300, Silver King 100, and Bellekeno 600 adits. The Valley Tailings Facility is also treated on an as-required basis during spring and early summer. Performance monitoring (i.e. water quality testing) is undertaken by ACG on a monthly basis, with McQuesten Lake Enterprises operating as the analytical sub-consultant, using the on-site laboratory facilities for daily and weekly water quality analysis.

Overall the environmental control facilities have been operated to meet the objective of protecting downstream aquatic and terrestrial resources. However, the Galkeno 300 Adit continues to present challenges for achieving consistent performance with respect to water treatment for metals. A number of special projects and activities has been undertaken to

document site liabilities and to improve the facility's operations, to the effect of site-wide reduced environmental risk, enhanced site operations, and a fresh foundation for improved physical and environmental management of the property. Specifically, special projects were designed to:

- Mitigate emerging environmental effects (such as the initiation of a treatment system at the Galkeno 300 adit, and the collection and safe storage of hazardous materials on site);
- Enhance the performance of water treatment facilities (such as the lining of the Galkeno 900 settlement pond, and treatment improvements at Galkeno 300);
- Document the magnitude of other site environmental issues so that successful mitigation plans can be developed (such as the expanded receiving environment water quality sampling);
- Protect public and worker health and safety (such as fencing of the Shamrock J-raise open hole); and
- Minimize potential spring runoff problems (such as further rehabilitation of drainage ditches).

All of the special projects undertaken in the years 2004 and 2005 are described in this Project Report. For those projects that have already been completed, the summaries contained herein can be considered final reports. This report also provides recommendations for further work to be done on the property.

Care and maintenance activities at the Keno Hill Mining Property during the 2004/05 contract provided a total of 698 person weeks of employment, the vast majority of those person weeks being local employment for site operations through Ewing Transport Ltd.

Financial control of expenditures was successful for the contract term, with actual expenditures being 6.9% below budgeted expenditures.

1.0 INTRODUCTION

This Final Project Report for the 2004/05 contract term was prepared in order to provide detailed information on project activities related to care and maintenance of the Keno Hill Mining Property. Although some of this material has previously been submitted separately, it was felt that re-submission in this report would provide a convenient comprehensive reference document. This report also offers the opportunity to provide final reports on other completed projects, and status reports on on-going care and maintenance activities at the site.

The material comprising this report is presented in two volumes: Volume I – Main Report, and Volume II – Appendices.

1.1 BACKGROUND OF THE PROJECT

The Yukon Government (YG) declared the property abandoned on June 12, 2003 and, as of that date, assumed responsibility for the ongoing care, maintenance, and water quality of the Keno Hill mining properties (see Figure 1, "General Location Map", and Figure 2, "Keno Hill Property Location Map"). Government entered into a contribution agreement with the Nacho Nyak Dun Development Corporation (NND-DC) to provide mine site maintenance services until

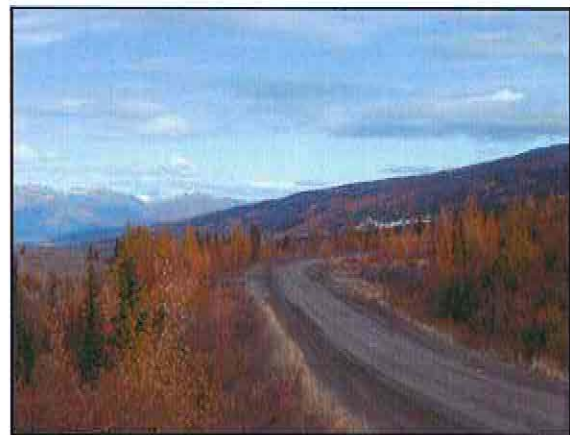


Plate 1 Silver Trail Highway #11 looking east at abandoned Elsa Townsite.

March 31, 2004. NND-DC then entered into service contracts with Access Consulting Group (ACG) to act as Technical Manager, and Ewing Transport Ltd. (Ewing) to perform the duties of Water Treatment System Operator and Site Manager. For the contract term 2004-05, ACG acted as project and technical manager under Government contract and enlisted Ewing to continue as Site Manager.

The contract scope of work included the following areas of responsibility for the NND-DC:

- Administrative services to support NND-DC and NND Lands & Resources Department (NNDL&R) for the services required under the Contract;
- Employee recruitment services including job advertisement, interviewing, hiring, providing job application forms to prospective employees and forwarding them to ACG/Ewing;

- Human resources services, including establishing and maintaining a human resource inventory and identifying worker training requirements and facilitating training opportunities;
- Community liaison - organizing and participating in Community meetings;
- NND liaison (Chief and Council, Elders, Citizens and other departments as required) including:
 - reviewing information from project management regarding site activities including weekly water quality reports, technical memos, and responding;
 - maintaining a professional interface with the Project Manager and the Team;
 - briefing Director of Lands on activities at the site;
 - synthesizing technical information and present to it to the Citizens in a format that is easily understood;
 - undertaking site visits as are necessary to maintain familiarity with environmental conditions at the site;
 - responding to queries and questions from Citizens, Chief and Council and other Departments within NND;
 - integrating NNDL&R Departmental monitoring programs with care and maintenance monitoring programs;
 - communicating any concerns and activities back to project management and make the appropriate integration; and
 - Technical Briefings to Renewable Resource Council (RRC), including reviewing activities and interfacing with the RRC regarding any concerns they may have on activities and communicating any concerns and activities back to project management and make the appropriate integration;

An initial project manager site inspection was conducted on April 14 and 15, 2004. From this site inspection a list of priorities and project recommendations was constructed and submitted to YG with information and initial site observations in memo format on April 16, 2004 (Appendix A). YG authorized routine (on-going) activities and special (one-time) projects with the aim of protecting human and environmental health and safety at the Keno Hill Property.

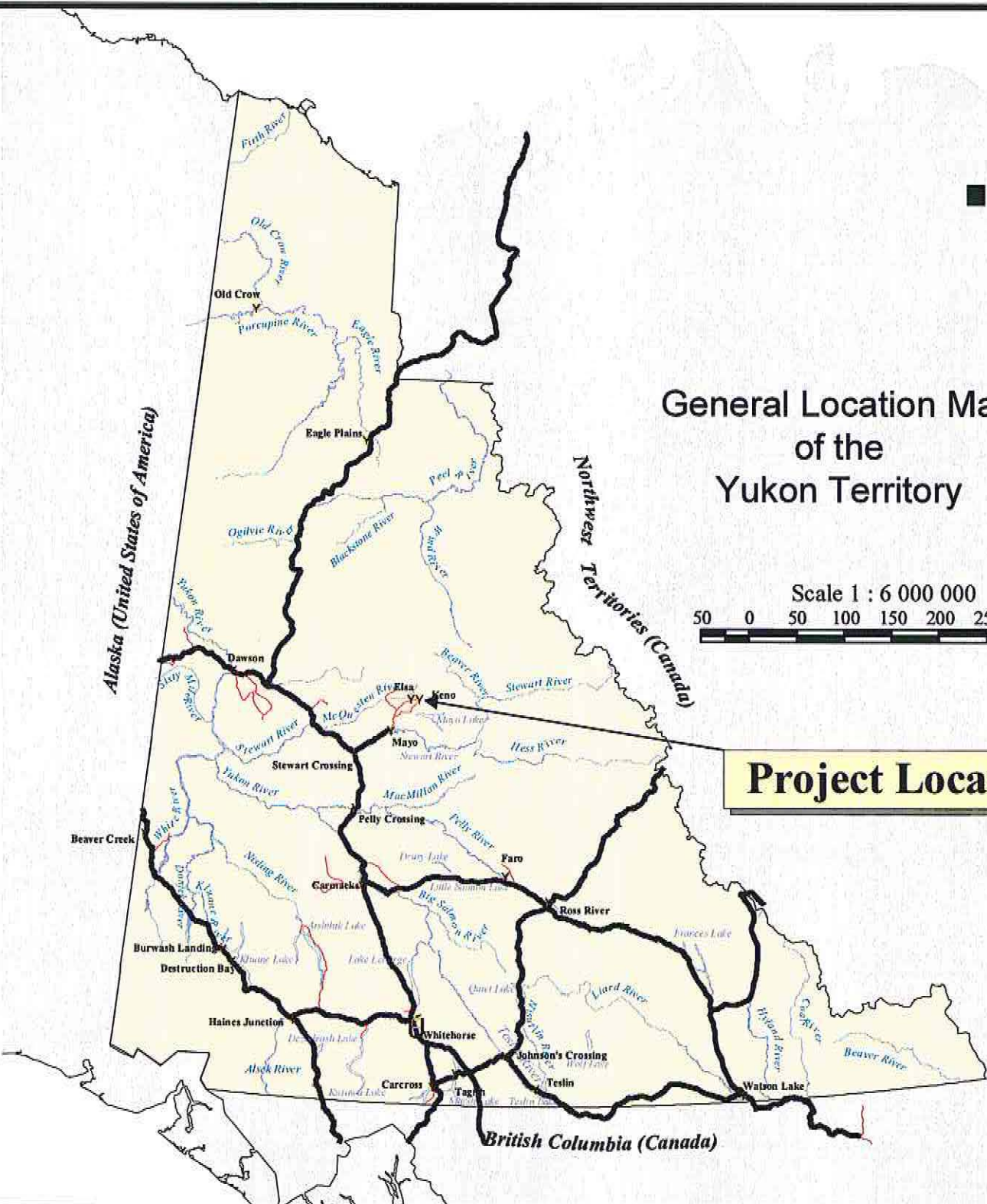
For each project that has been conducted or is still in progress, we present appropriate areas of comment, including Project Description and Rationale, Objectives, Methodology, Results Summary and/or Current Status.

General Location Map of the Yukon Territory

Scale 1 : 6 000 000

50 0 50 100 150 200 250 300km

Project Location

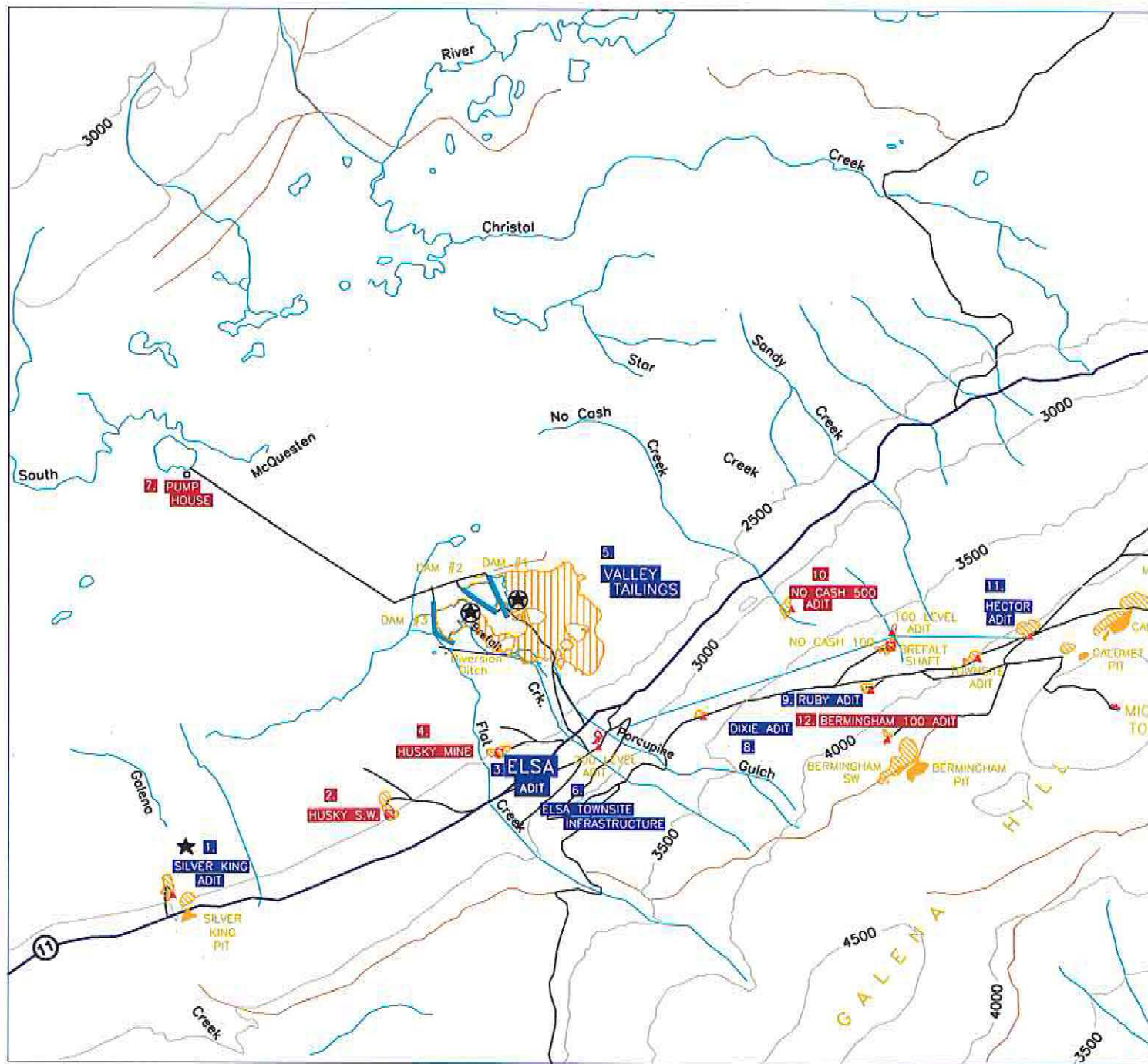


Care and Maintenance of Keno Hill Mining Property, Keno Hill, Yukon Final Project Report 2004/05



Drawn By: HD	Figure 1
Checked By: RM	Date: May 2, 2005

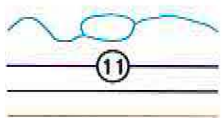
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LEGEND

Treatment Sites

- ★ Year Round
- ⊛ Seasonal



Creek, river, waterbody

Territorial Highway

Secondary road

Trail

Adit

Shaft

Routine Inspection Site
(Summer Only)

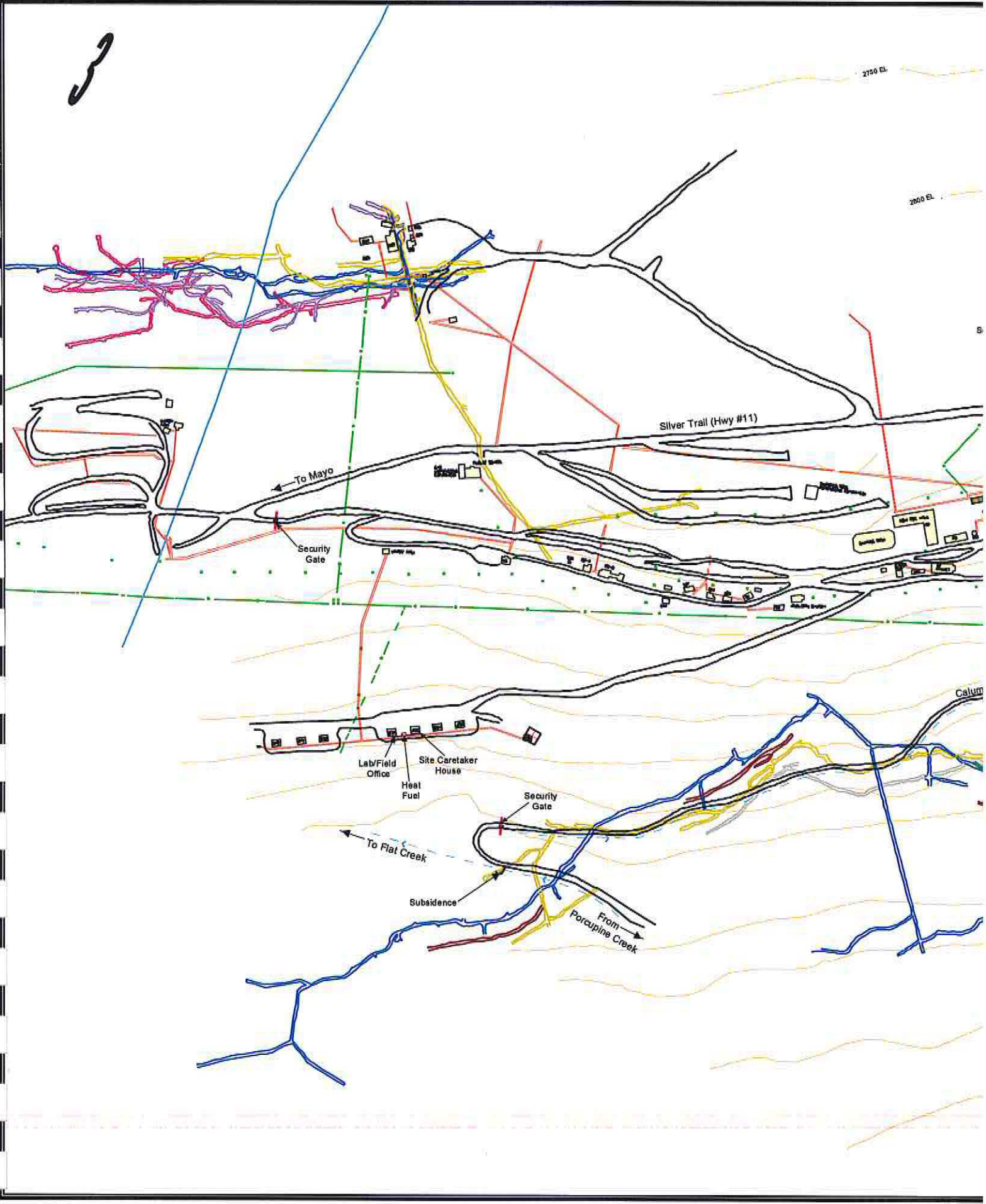
Routine Inspection Site
(Winter and Summer)



Open pit

Waste rock dump

Tailings



1.2 PROJECT TEAM

The following companies and individuals were involved in the Care and Maintenance Project during the 2004/05 contract term:

Team Member/Subcontractor	Responsibility
▪ Access Consulting Group	- Project and Technical Management.
▪ Ewing Transport Ltd.	- Site water treatment system operators, heavy equipment contractor for construction and maintenance activities.
▪ McQuesten Lake Enterprises	- Routine on-site analytical services.
▪ EBA Engineering Consultants Ltd.	- Geotechnical engineering.
▪ Laberge Environmental Services	- Environmental consulting (particularly receiving environment monitoring).
▪ Norwest Labs Inc.	- Off-site analytical services.
▪ Niels Jacobsen, P.Eng.	- Building structural integrity inspection.
▪ Dynamic Systems	- Electrical infrastructure and control systems repair and maintenance.
▪ Olsen Construction	- Shamrock "J" Raise Fencing

The following individuals have assisted in various aspects of the project and their assistance was greatly appreciated:

- Mr. Hugh Copland – Project Manager, Type II Mines, Energy, Mines and Resources, Yukon Government
- Mr. Frank Patch – Project Manager, Type II Mines, Energy, Mines and Resources, Yukon Government (Formerly Water Inspections Officer, Water Inspections Section, Department of Environment, Yukon Government)
- Mr. Anthony Polyck – Manager, Water Inspections Section, Department of Environment, Yukon Government
- Dr. Leslie Gomm – Formerly Project Manager, Assessment and Abandoned Mines Branch, Energy, Mines and Resources, Yukon Government
- Mr. Bob Truelson, Water Inspections Officer, Water Inspections, Yukon Government
- Ms. Marg Crombie - Director, Abandoned Mines and Assessment Branch, Energy, Mines and Resources, Yukon Government
- Mr. Vic Enns – Head, Pollution Abatement Division, Environmental Protection, Government of Canada
- Mr. Eric Soprovich – Pollution Abatement Officer, Environmental Protection, Government of Canada
- Mr. Roman Krska, Environment Officer, Lands and Resources Department, Yukon First Nations
- Mr. Dave Sherstone, Team Leader, Type II Mines Project, Indian and Northern Affairs

2.0 ONGOING CARE AND MAINTENANCE

2.1 WATER TREATMENT

Project Description and Rationale:

Metals-laden water discharges continually from various mine openings throughout the Keno Hill Properties, as well as the Valley Tailings Facility. The quality of this effluent fails to comply with current environmental legislation, and in order to attenuate metals levels, water treatment is required on an ongoing basis.



Plate 2 – ACG employee sampling at the Galkeno 300 treatment pond decant sampling box

The treatment system for all sites at Keno Hill consists of the mechanical application of lime slurry ($\text{CaO}_{(s)} + \text{H}_2\text{O}_{(l)}$) to the mine discharge waters. The slurry acts to raise the pH, causing zinc and other metals to precipitate out of solution, forming a solid sludge. Precipitate retention ponds are located at each treatment facility to assist metals precipitation and clarification of effluent prior to release into the receiving environment.

Water quality sampling is carried out daily (see reporting forms – Appendix B), and analytical services are provided by McQuesten Lake Enterprises, using the on-site Perkins Elmer AA machine. Table 1 outlines the overall water quality monitoring schedule at the site.

Table 1. Water Quality Monitoring Schedule

Monitoring Program		Number of Sites	Sampling Frequency ¹	Analysis Location	Analytical Parameters	Comments
1. Ongoing Water Treatment Performance		16	D/W	Onsite Lab	Zn, pH	Sampling at existing treatment sites (Galkeno 900, Galkeno 300, Silver King 100 and Bellekeno 600), plus Christal and Galena Creeks. Certain sites part of G300 Project – periodic external analysis provides QA/QC for onsite analysis
2. Galkeno 300 Receiving Waters Monitoring	Adit Treatment Project	12 - 15	M	External Lab, plus Onsite Lab	Total & Dissolved ICP Metals, NFR, pH, Condo, SO4; Bioassay	To determine compliance with Environment Canada Letter of Instruction
	Hillside Attenuation Monitoring Project	13 Piezometers 5 Lysimeters 13 Surface Water Stations	Q	External Lab	Total & Dissolved ICP Metals, NFR, pH, Condo, SO4	Monitoring network of standpipe and drivepoint piezometers, lysimeters and surface water stations installed - Fall 2003
3. Receiving Water Drainage Monitoring		35	A/Q	External Lab	Total & Dissolved ICP Metals, NFR, pH, Condo, SO4	Further discussion with YTG required to determine sites and sampling frequency
4. Old Mine Working Monitoring		11	A	External Lab	Total & Dissolved ICP Metals, NFR, pH, Condo, SO4	Further discussion with YTG required to determine sites and sampling frequency
5. Site Specific Studies - Response Monitoring	No Cash Drainage Monitoring	7	A	External Lab	Total & Dissolved ICP Metals, NFR, pH, Condo, SO4	Specific study to assess natural wetlands attenuation. Follow up monitoring to be assessed.
	Various	As required	As required	As required	As required	As required/determined by results of other monitoring programs or regulatory requirements.

1. D: Daily W: Weekly M: Monthly Q: Quarterly A: Annually

The analytical results for daily and weekly collected water samples are provided to ACG on a weekly basis. Review and evaluation of these results is conducted by the ACG team and discussed with the treatment system operators, the water-sampling technician, and the laboratory operator. These results allow the technical managers to provide the site managers with direction regarding the treatment process, (i.e. lime addition rates and pond clean-out activities.)



Plate 3 - Lab Technician at On-site Analytical Laboratory in Elsa

Weekly reports, including water quality results and discussions, are prepared by ACG for submission to the YG and for distribution to several other agencies. The distribution of the weekly water quality reports includes:

- NND, NND-DC, Chief and Council and NND Lands Directorate;
- YG, Water Resources; and
- YG, Energy, Mines & Resources.

Treatment Process General Description

In general, the treatment processes currently involves continuous lime addition to mine portal effluent water at:

- The Galkeno 900 adit;
- The Galkeno 300 adit;
- The Silver King 100 adit;
- The Bellekeno 600 adit; and
- The Valley Tailings Facility (on an as-needed basis, depending on water quality and decant situation - normally requiring treatment only during spring freshet, between May and June).

The treatment objective is to reduce zinc effluent concentrations to less than 0.50 mg/L, as required under Water Licence QZ96-001 (note: although the Licensee is not involved in the mine site at this time, the water quality discharge limits of the licence are being used by YG to guide current treatment operation as a reasonable measure of due diligence). Historic correlations between zinc concentrations and other metals (i.e. arsenic, lead and cadmium) indicate that the zinc discharge treatment objective ensures that other metals are also managed.



Plate 4 - Lime slurry mixing-tank and peristaltic delivery pump at Silver King 100 treatment site

The individual portal treatment sites (listed previously) are equipped with 2,500 litre steel tanks fitted with mixing motors to keep the lime slurry in suspension, and peristaltic metering pumps to dispense a reliable, constant flow of lime slurry to mine effluent water. Both of these slurry management and delivery mechanisms are improvements to the system by Ewing Transport Ltd., who have developed superior methodology for lime application over the course of this project.

The treated effluent at Galkeno 300 and 900 is directed through a primary settling pond before being discharged to the environment. Treated effluent at the Silver King and Bellekeno adits is directed through both primary and secondary ponds prior to release.

During winter months, heat trace and electric heaters are in continual use at all of these portals to prevent ice plug development and to allow for proper operation of the lime-addition mixing tank. Lime sludge removal from settling ponds, using an excavator in conjunction with a suction pump, is also required approximately twice a year to improve pond capacity and to maintain cost effective and functional treatment systems.

The Galkeno 300 treatment system, with only one treatment settling pond, has a sampling box on the discharge pipe, approximately 5m beyond the point of pond decant. With greater flows and lime demand, this pond requires clean-out approximately every two months.

Lime Mixing and Consumption

Lime slurry preparation, conducted within the transport garage at Elsa, involves the addition of hydrated lime (CaOH) via an auger conveyor into a slaking tank, where water is added to produce lime slurry. Water for lime slurry mixing is delivered to the transport garage via water tanker truck on a daily basis. In total, approximately 9,000 litres of slurry are mixed and delivered daily, via truck. The Galkeno 300 and 900 adits see daily delivery and the Silver King and Bellekeno lime slurry



Plate 5 - De-sludging the Galkeno 300 treatment pond

delivery takes place approximately 5 times per week. Slurry concentration is roughly 37.4 grams of lime per litre of water, equating to a consumption rate of 13 tonnes of lime per month (consumption rate rises during spring freshet in May and June, when treatment is required at the Valley Tailings). The Galkeno 300 treatment plant requires approximately 70% of the total lime consumed at the four treatment sites at Keno Hill, or approximately 9 tonnes per month.

Water Treatment Objectives

- Meet regulatory requirements of the Yukon Waters Act (specifically, S. 37 Ministers' declaration of abandonment, to prevent further environmental degradation caused by the mine workings);
- Meet legislative requirements of the Fisheries Act;
- Meet Galkeno 300 bioassay compliance targets conveyed by Environment Canada in a memorandum of December, 2003;
- Ensure spirit and intent of Water Licence QZ96-001 is adhered to; and
- Ensure proper procedures regarding protection of human health, safety and the environment are followed.

Methodology

- Operate existing water treatment systems (lime application using existing mixing facilities and application tank infrastructure) at Valley Tailings Facility (during summer months), Galkeno 900, Bellekeno 600, and Silver King 100;
- Conduct regular daily and weekly water quality sampling, on site analysis and reporting;
- Engage services of independent qualified geotechnical engineering expertise as required;
- Upgrade treatment facilities in response to geotechnical concern or treatment inefficacy;
- Construct and commission a lime application treatment system and associated monitoring/reporting activities at Galkeno 300 adit, in response to discovery of high metal discharge and subsequent metal loading of Christal Creek and South McQuesten River.

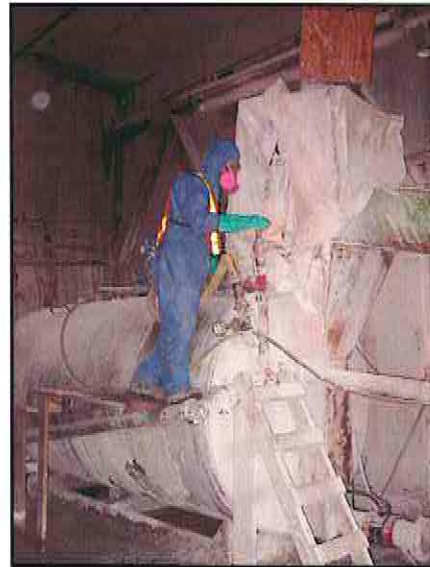


Plate 6 – Ewing Transport employee preparing lime slurry at transport garage

This includes:

- Solicitation of a professional chemical engineering/metallurgist report on treatment requirements and suggested system elements at Galkeno 300 (see Appendix C – CEMI report);
- Solicitation of a professional engineering design report to achieve CEMI report recommendations (see Appendix D – EBA report);
- Addition of Galkeno 300 treatment system to the daily/weekly water quality sampling and reporting program; and
- Design and instating of a weekly and monthly monitoring and reporting program to characterize the on-going impact of the Galkeno 300 discharge upon the Christal Creek and South McQuesten River receiving waters.

Discussion of Current Conditions and Water Quality Results:

Compliance at most treatment sites has been largely sustained over the term of their respective treatment. The majority of zinc and pH levels at three of the four routine treatment sites regularly met target levels, the only consistent exception being at the Galkeno 300 treatment

system. There, treated total zinc concentrations routinely exceeded the target level of 0.5 ppm. Periodic non-compliant zinc discharges at the remaining sites have been observed to be atypical once each system was stabilized after reinstating treatment. Results outside the target levels are usually caused by power outages, pump failures and plugged lime slurry lines, or temporary increases in adit flow rates. In these instances, the treatment systems are typically operating normally again within 24 hours. For a full water quality treatment synopsis on Galkeno 300 and 900, refer to Appendix E.

In the interest of quality control and assurance regarding the on site analysis for zinc, a lab comparison was conducted in January of 2005. Three zinc standard dilutions were analyzed both by Norwest Labs in Surry, and at the Elsa Lab by McQuesten Lake Enterprises. Table 2 displays these results. The results returned for vials 1 and 3 showed excellent analytical accuracy at the on site laboratory. The analytical staff reported that there was an insufficient volume of standard solution in vial 2, and this would explain the poor correlation between the result and known concentration for this standard.

Table 2 QA/QC Results for On Site Total Zinc Analysis

Vial Number	Known Total Zn Concentration (ppm)	Result from On Site Analysis (ppm)
1	0.200	0.200
2	5.00	6.03
3	0.442	0.450

ACG also conducted simple statistical analysis of the correlation between internal and external laboratory analytical results of samples analyzed at each lab. The graphical results are shown in Figures 4 and 5. Paired values are plotted for results of samples collected at sites on the same day, in many cases by the same sampler and split into two aliquots for separate analysis. Figure 4 shows excellent correlation (i.e. similarity) of analysis for samples under 40 ppm total Zn. Figure 5 illustrates how this correlation deteriorates significantly above 40 ppm concentration.

The high potential for variability in actual sample Zn concentration associated with the degree of iron floc presence (from Galkeno 300 samples, primarily) means that samples collected in

immediate succession of each other may vary significantly in Zn concentration. This could serve to explain poor correlation in results over 40 ppm. ACG has ordered fresh standard solutions for on site instrument calibration at all concentration ranges to further minimize potential analytical error.

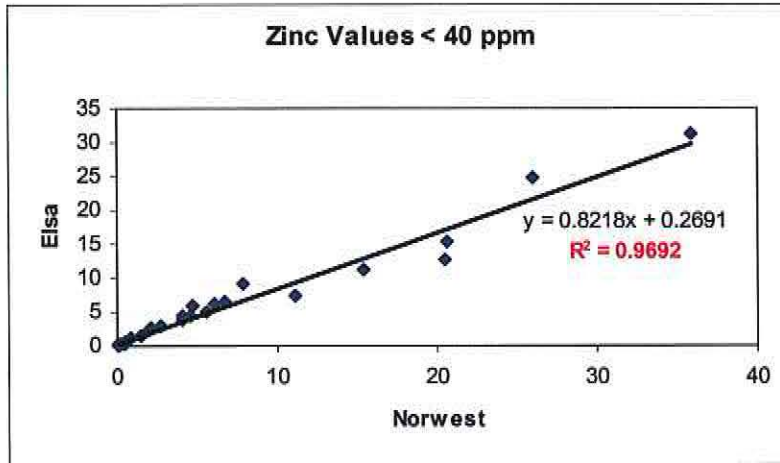


Figure 4 Regression Analysis for Zn Concentrations <40ppm - Paired Values for Norwest and Elisa Analysis

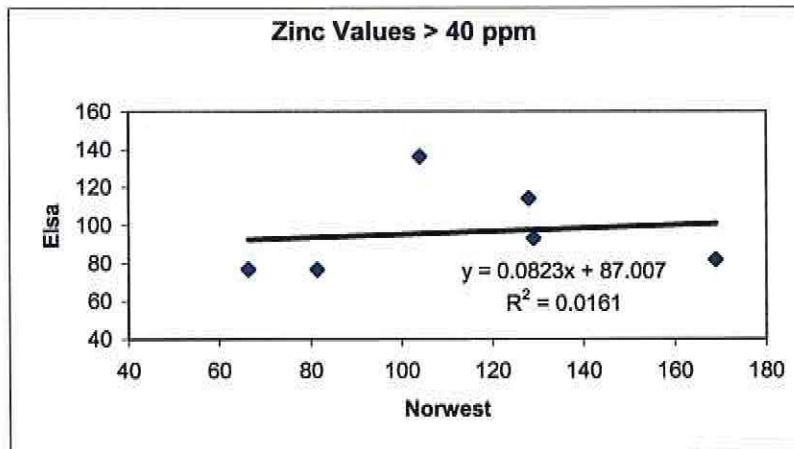


Figure 5 Regression Analysis for Zn Concentrations >40ppm - Paired Values for Norwest and Elisa Analysis

Below is a brief summary of current conditions and water quality results at each treatment site. Daily and weekly raw adit flow and treated total zinc results for the period April 1, 2004 through March 31, 2005 are graphically presented for each of the treatment sites in the following sections.

2.1.1 Silver King 100

The treatment system at Silver King has operated well, and is expected to continue being the easiest site to keep in compliance. This is attributed to low flow levels and very low zinc content in the adit discharge (see Figure 6), as well as an operational secondary settling pond that

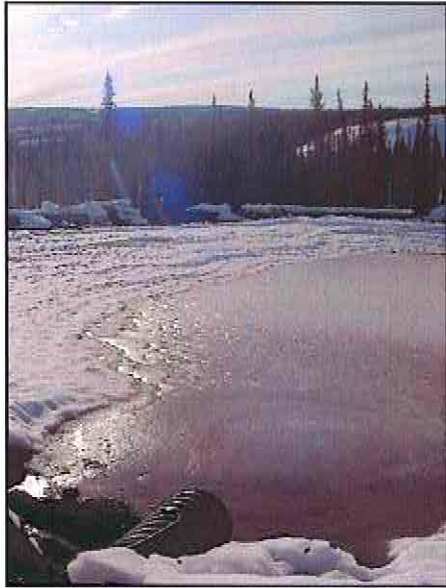
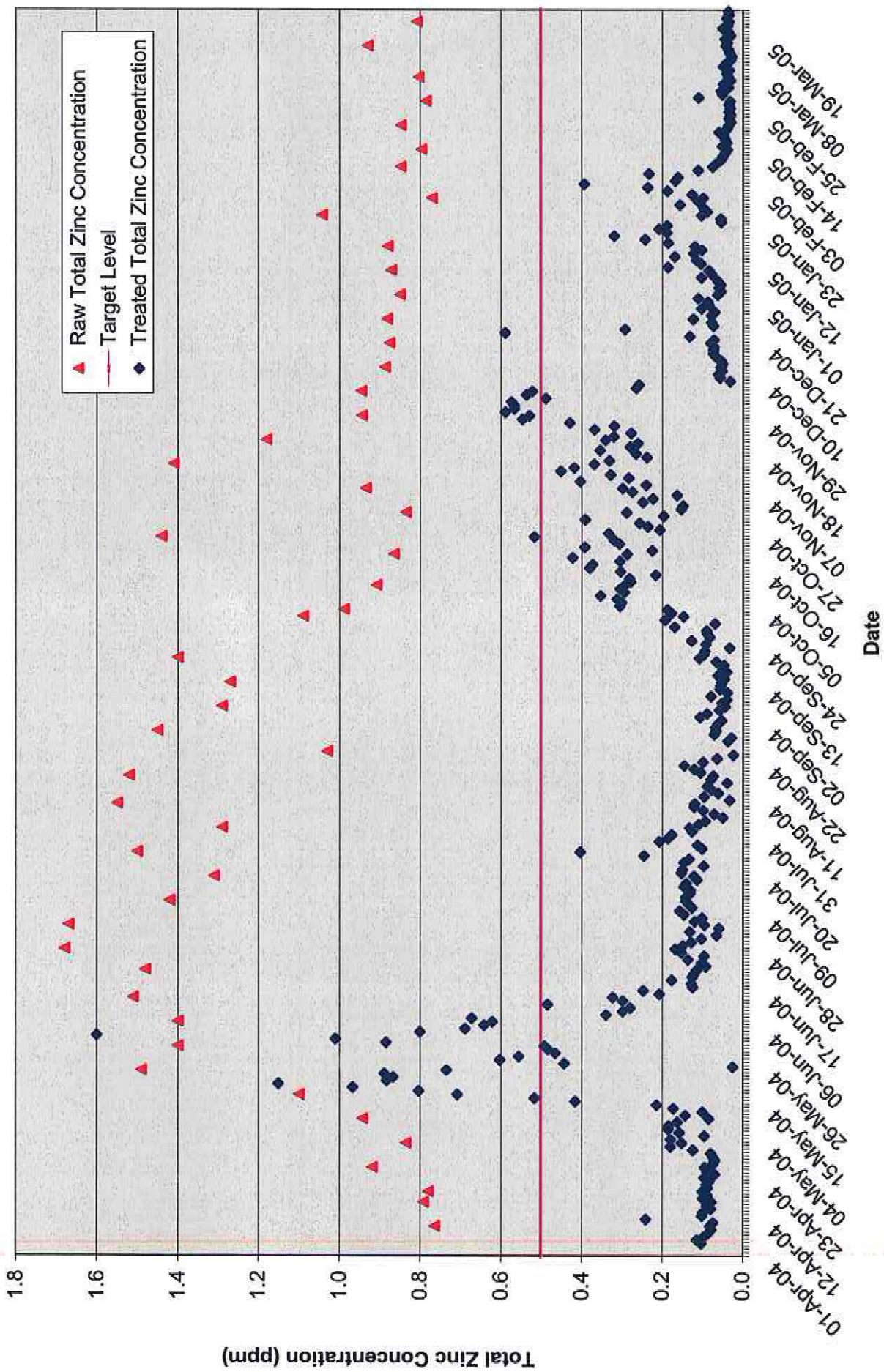


Plate 7- Silver King Treatment Pond

provides longer residency time for zinc and lime precipitation. Non-compliant zinc discharges observed in late May and early June of 2004 could be attributed to elevated flows associated with spring freshet, and an error in adjusting the lime addition rate at the adit on May 31st. Portal water flow rates at Silver King showed minor variation and were estimated using bucket/timing methods at 1.5 - 3 litres/sec. Mean untreated pH and total zinc levels were calculated at 7.5 and 1.10 ppm respectively, and the mean pH and total zinc concentrations of the treated water were 8.5 and 0.20 ppm respectively, over the contract period. The current lime slurry flow rate is 13.3 ml/sec.

Figure 6 - Silver King Adit Total Zinc Results



2.1.2 Galkeno 900

Even though the Galkeno 900 Adit treatment site continues to operate under a single settling pond system, water quality objectives have consistently been met. The only important treatment regimen changes that have been implemented recently is the incorporation of peristaltic metering pumps into slurry mixing tanks (delivering consistent and finely adjustable application of the lime slurry to the adit discharge waters), and the lining of the treatment pond with an impermeable liner.

Raw (untreated) portal water flow averaged 3.0 litres/sec (Figure 7), with an average pH of 7.6 and a mean total zinc concentration of 6.79 ppm. The current, optimum lime slurry flow rate is 13.3 ml/sec. Primary decant (treated) pH and zinc concentrations averaged 8.5 and 0.070 ppm respectively over the contract term. Total zinc concentrations for Galkeno 900 are displayed in Figure 8.

The liner installation project at the Galkeno 900 treatment pond was implemented during the week of November 14, 2004 to prevent failure of this single-pond system, in response to a leak that developed in the pond. The installation of an impermeable liner in the pond successfully stemmed the flow in the seep, and the seep has not since re-appeared. Appendix F contains EBA Engineering's full report on the Galkeno 900 Pond Liner Installation.



Plate 8 – Galkeno 900 treatment pond liner installation

Figure 7 - Water Discharge Rate and Temperature at Galkeno 900 Adit

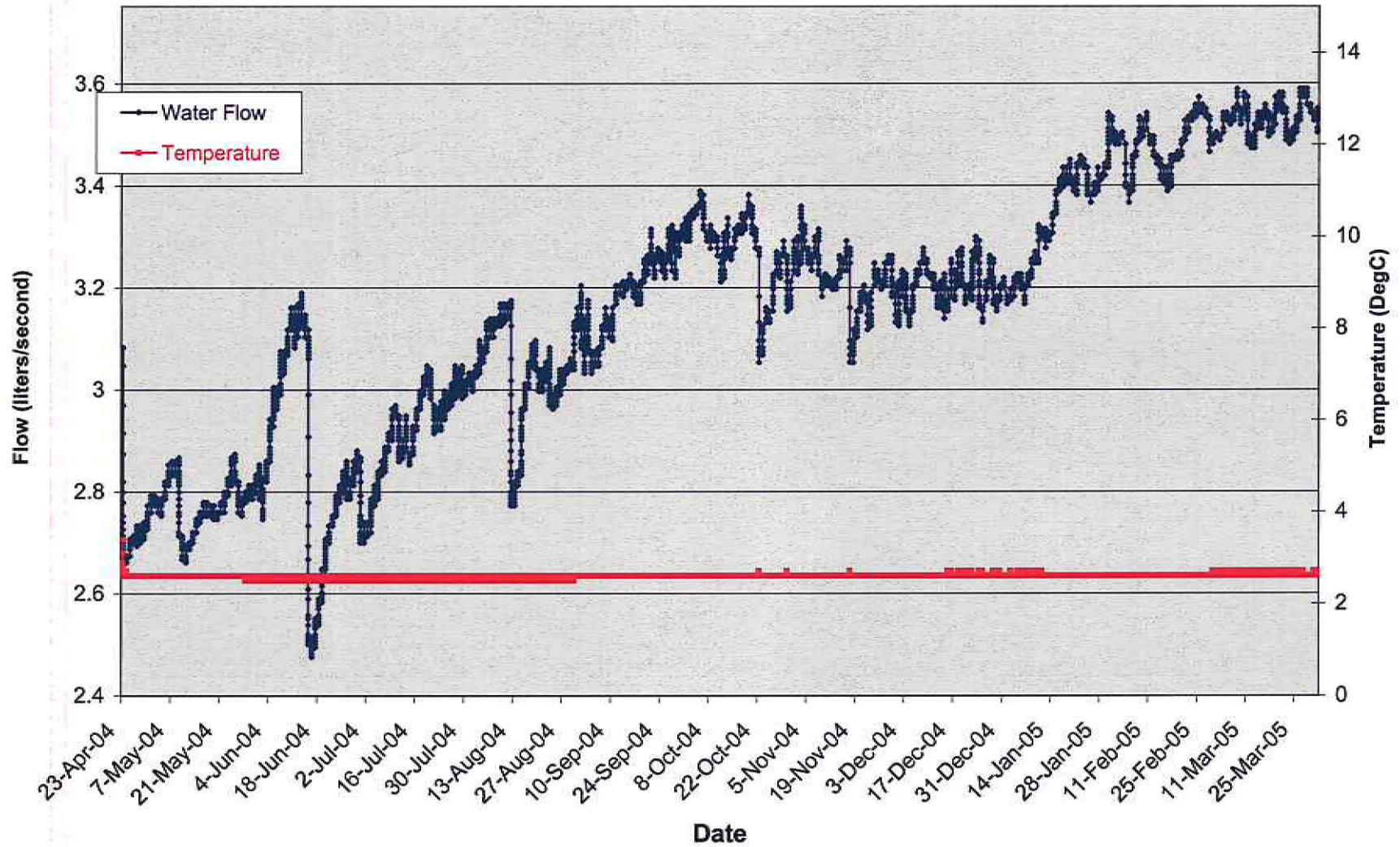
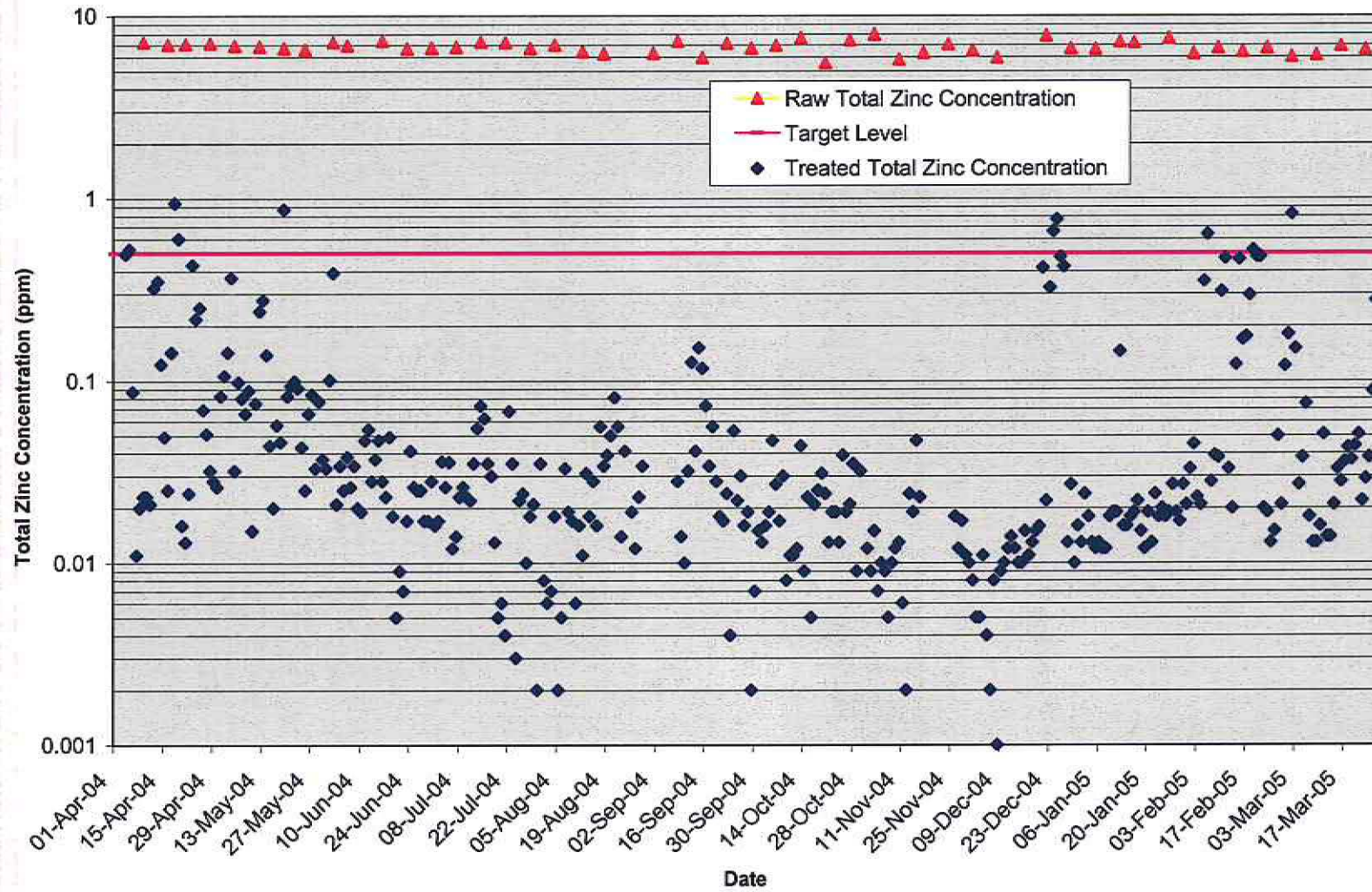


Figure 8 - Total Zinc Concentrations at Galkeno 900



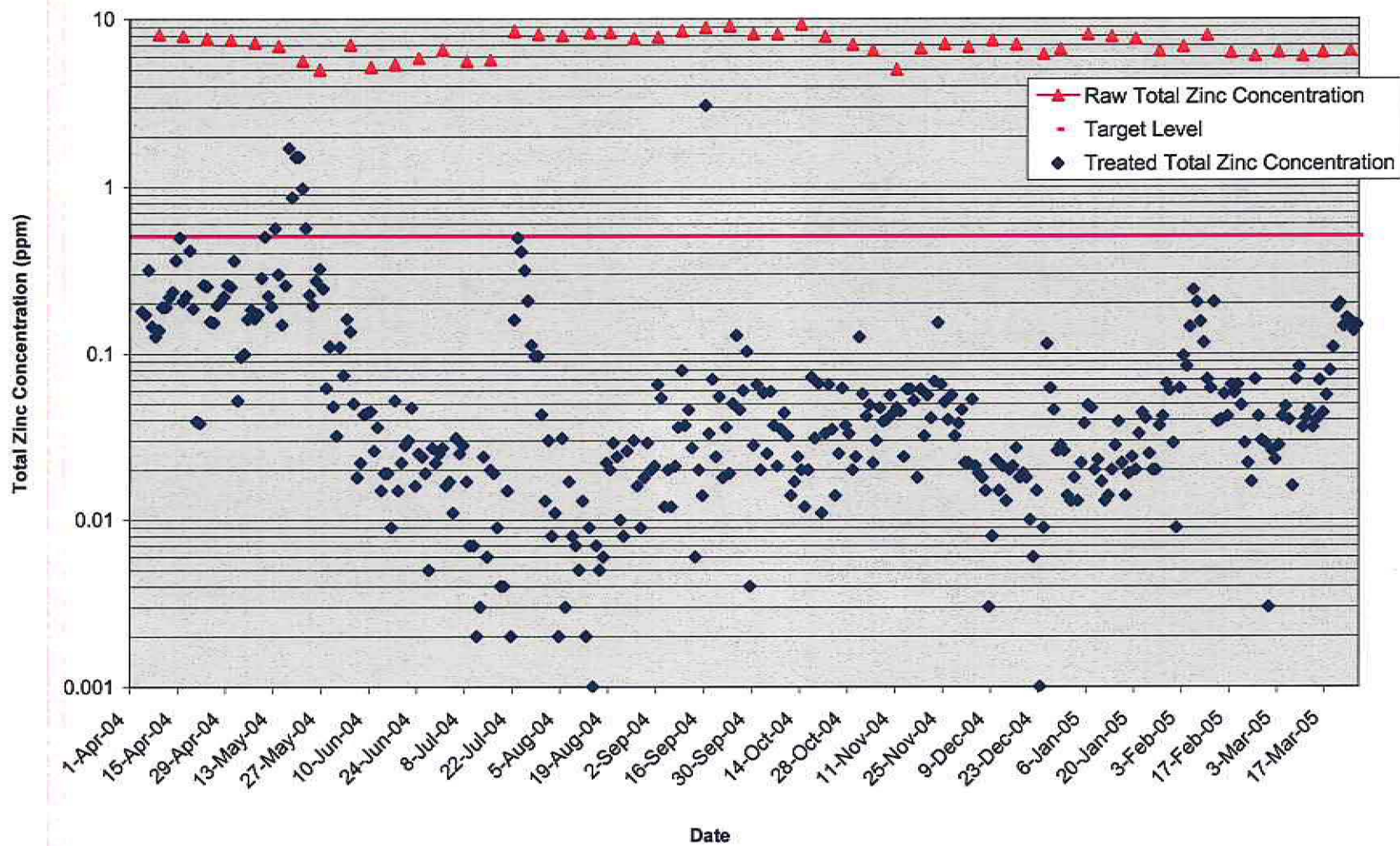
2.1.3 *Bellekeno 600*

Portal water flow at Bellekeno over the 04/05 contract term averaged at 1.5 – 2.0 litres/sec, with an average untreated pH of 8.1, and zinc levels of 7.91 ppm. The current, optimum lime slurry flow rate is 5.6 ml/sec. Effluent in the secondary pond (treated), had a mean pH of 9.3, and a mean total zinc concentration of 0.10 ppm. Figure 9 shows the treated and raw total zinc concentrations at the Bellekeno 600 treatment site for the 2004/05 term.

Monitoring of the water quality of the Bellekeno 600 seep, located at the toe of the waste rock storage area (WRSA), has shown a continuation of elevated zinc concentrations -despite the treatment of adit discharge waters at the 600 portal. Historic sampling at this location has indicated high zinc-content water seeping from the WRSA. It is presumed that the occurrence of elevated zinc concentrations at the seep are the result of zinc being leached into the water from the waste rock material in which the adit landing, facilities, and treatment ponds are constructed. It has been known for some time by regulatory authorities and ACG that the treatment ponds at Bellekeno 600 are not completely impermeable, and in fact the secondary treatment pond here does not actively decant treated water at the spillway built into the northwest end of the pond.

In recognition of the poor seep water quality, ACG has discussed this issue with site operators and implemented an increase of lime addition in an interim method of increasing the buffering capacity of the treated discharge en route to the seep point. The current monitoring and reporting regime (which includes monitoring of zinc concentrations of the untreated adit water, the treated pond water, and the seep) will be maintained for the time being, and discussions with the appropriate regulatory authorities will continue, with aim to identify and evaluate new approaches to addressing the seep discharge.

Figure 9 - Total Zinc Concentrations at Bellekeno 600



2.1.4 *Galkeno 300*

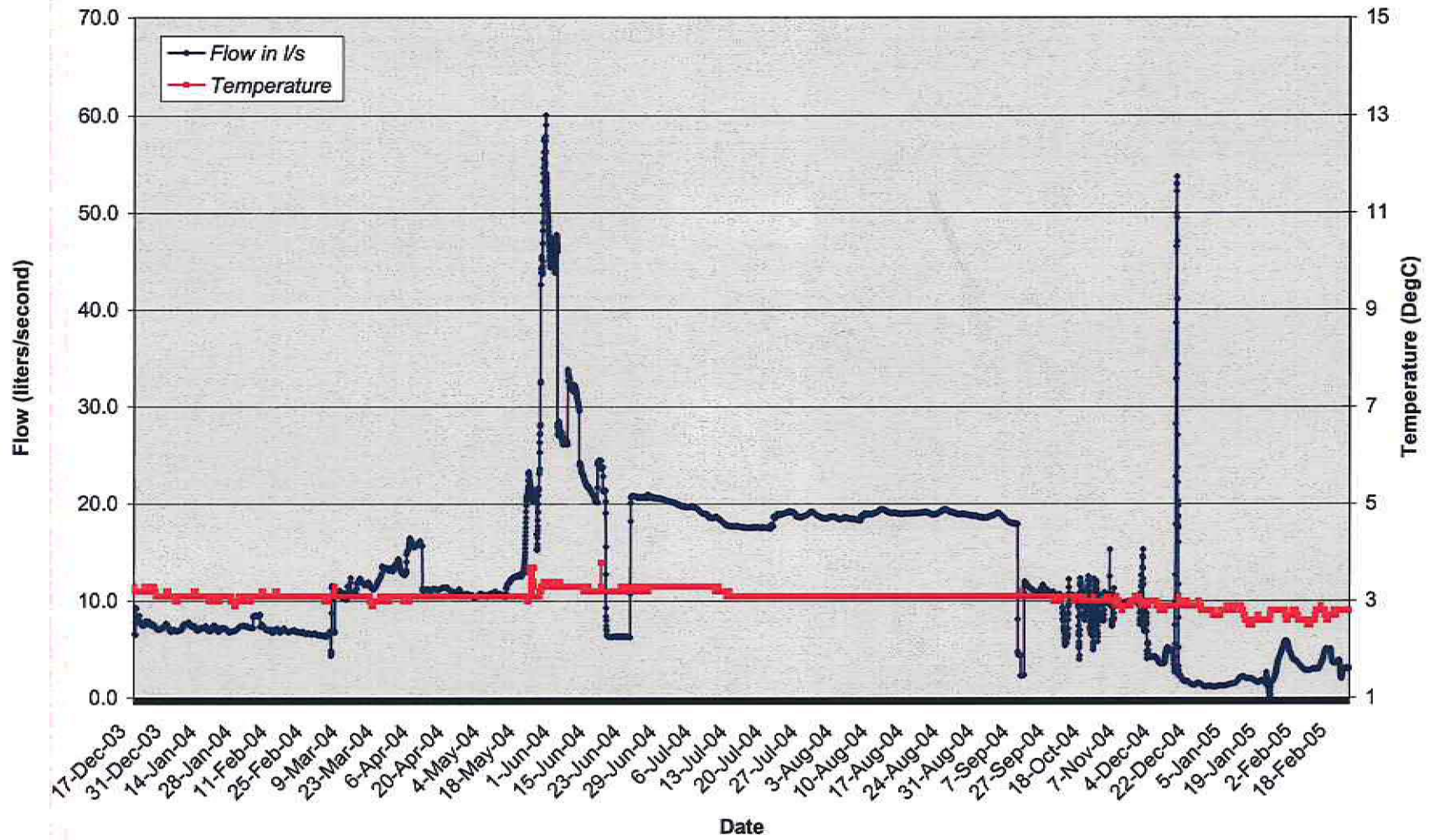
The Galkeno 300 treatment system currently consumes a vast majority of the lime used on the property in order to maintain water quality objectives. This is due to the higher portal water discharge rate (along with significant fluctuations in flow), and significantly higher total aqueous zinc concentrations than any of the other flow treatment sites. Portal water flow averaged 15.2 litres/sec (Figure 10), with an average untreated pH of 7.3, and a mean total zinc concentration of 107 ppm. Average primary decant (treated) pH and total zinc concentrations were 8.6 and 41.9 ppm respectively. The trends for raw and treated water total zinc concentrations are displayed in Figure 13 and discussed further in Section 2.1.4.3. The current, optimum lime slurry flow rate at the Galkeno 300 treatment site is 100.0 ml/sec.

Given the extensive resource requirements of G300 relative to the other treatment sites at the Keno Hill property, further detail regarding the construction, operation, optimization, and monitoring of the treatment system at Galkeno 300 is included in the following project descriptions.



Plate 9 – Installation of Galkeno 300 Settling Pond

Figure 10 - Water Discharge Rate and Temperature at Galkeno 300 Adit



2.1.4.1 G300 Treatment System and Settling Pond Construction and Operation

The report *Operations and Maintenance of Environmental Control Facilities, Keno Hill Yukon, Galkeno 300 Adit Drainage Treatment Study* (Appendix C), by Canadian Environmental and Metallurgical Inc., (January 2004) was commissioned by YG for use in designing a treatment system for the Galkeno 300 portal discharge. A single lined settling pond was constructed near the adit opening in the winter of 2003/04, under short term planning constraints (as dictated by the uncertain ownership scenario of the property).



Plate 10 - Installation of pipe from Galkeno 300 adit to treatment pond

Although it was anticipated that the system would be replaced by July of 2004, it continues to be in use, and requires clean out on an approximately 6-8 week cycle. Lime particulates and other precipitate matter is common in primary settling pond samples, and when the system nears capacity, total zinc levels spike to near untreated discharge levels.

A skid-mounted portable treatment shed is located at the portal site, and powered by an 11-kilowatt generator. A peristaltic metering pump, operating at approximately 37% of capacity, delivers a constant flow rate of 100 ml/second from the 9,000-liter slurry tank. This tank is refilled daily via trucked lime slurry from Elsa.

Treatment System Optimization Activities at Galkeno 300

As designed, the treatment system works effectively for approximately a five-week period. ACG sites the following shortcomings of the system that keep it from achieving longer periods of treatment efficacy:

- Shorter than necessary retention time for hydroxide settling;

- Poor mixing of discharge waters and lime slurry; and
- The inhibition of proper hydroxide precipitation due to insufficient air sparging and the presence of a suspended iron colloidal substance in the settling pond.

In response to these treatment inhibitors, a number of treatment optimization measures were initiated or constructed at the Galkeno 300 site:

- Two geo-textile baffle curtains were installed in the pond during the June 2004 pond clean-out. The baffles provided a more circuitous route for the water in the treatment pond to follow, essentially increasing the pond water retention time;
- A windmill driven foot pump was installed onsite to provide greater air introduction to the treated water immediately upon entering the treatment pond. This system also reduced the draw on the generated power-supply at the site;
- Both the treatment shed and the lime slurry addition point were re-located in December 2004. The shed was moved to just outside the adit entrance, and the lime slurry pipe was routed into the adit. A mixing box was constructed to facilitate mixing of the adit discharge flow and the lime slurry, which is applied to the flow immediately before the mixing box.



Plate 11 - Baffles installed in Galkeno 300 Settling Pond

Currently, the G300 treatment system continues to operate efficiently for only short periods of time, despite the best efforts of the technical and site managers. Also, the treatment pond requires frequent and costly sludge removal to return the system to successful operation when the treatment capacity has been reached. Although the flow from the treatment system is now consistently passing toxicology analysis at the compliance point, it is still felt that a system analysis by a chemical engineer or metallurgical/lime treatment specialist may yield cost-effective treatment optimization options that would produce significantly more reliable water quality results.

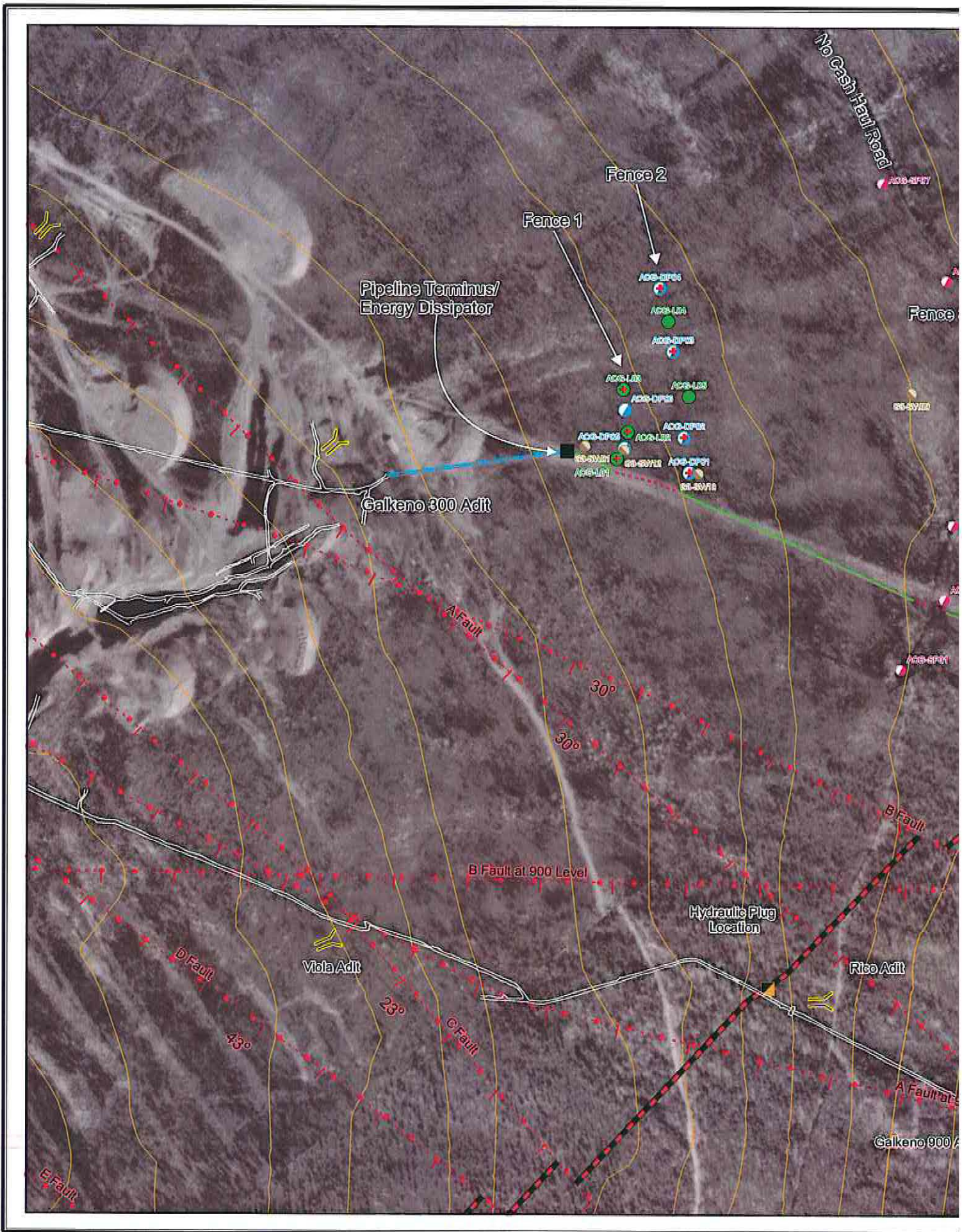
2.1.4.2 G300 Groundwater Monitoring Network

Drawing inspiration from D. MacGregor's research on the metals attenuation capacity of natural soils on Galena Hill below the Galkeno 300 Adit¹, a sampling program was devised in 2003, to provide more insight into the matter. With funding from the Mining Environment Research Group (MERG), a number of drive point piezometers, lysimeters, and standpipe piezometers were installed along the flow path that Galkeno 300 effluent was anticipated to follow after flow redirection. The sample stations were arranged into three 'fences' in a perpendicular-linear fashion, so that samples could be collected at various points down hydraulic gradient flow.

Environmental baseline soil and water sampling was undertaken prior redirection of the Galkeno 300 flow path into the discharge area. Starting in October 2003 (post flow redirection), monthly sampling was to be carried out for six consecutive months. However, the sampling schedule could not be followed due to poor sampling conditions in the winter months.

Figure 11 on the following page shows the locations of the monitoring fences and wells with respect to the Galkeno 300 treatment site. Appendix H contains figures showing the results for the sampling efforts to date at the three monitoring fences. The following discussion is intended as a summary of the monitoring program including the June 2004 sampling results. The findings from the sampling events in 2003 have been reported to MERG in ACG's report *Examination of Natural Attenuation in Aqueous Solution by Soils in Northern Environments* (March 2004).

¹ MacGregor, D. (2002) *Natural Attenuation of Aqueous Zinc in Shallow Soils Over Permafrost Downslope of Galkeno 300 Mine Adit, United Keno Hill Mines, Central Yukon*. Masters of Applied Science Thesis Submission, University of British Columbia.



The overall objective of this project is to track the subsurface flow escaping from the Galkeno 300 Adit, and to document the natural attenuation process within local soils to gain insight into the applicability of this method as a northern mine wastewater treatment technology.

The original goals of this project included the following:

- Evaluate baseline geotechnical and soil conditions, soil and vegetation metals levels and establish monitoring points down gradient of the G300 Adit;
- Set up an effluent distribution system to soil renovation area;
- Conduct sampling program (soil, vegetation, and metals levels); and
- Assess and report on attenuation capacity of local soils.

By and large, the original project objectives have been followed. However, once YG resumed ownership of the site on June 11, 2003, some of the original project objectives could not be pursued. The modified goals of the site soil attenuation research project were as follows:

- Document baseline soil and groundwater metals levels and establish monitoring stations down gradient of the Galkeno 300 Adit;
- Construct a controlled effluent distribution system to a soil renovation area;
- Conduct sampling program (soils and water metals levels); and
- Document the apparent attenuation capacity of local soils.

Sampling events occurred both before and after the redirection of the Galkeno 300 flow path. Baseline soil and water samples were collected on July 17th of 2003, from Galena Hill below the G300 Adit, and again on September 17 and 25, 2003, at the newly installed monitoring stations (prior to G300 effluent flow redirection). Post redirection water sampling occurred on October 16 and November 28, 2003, with a subsequent sampling event on June 18 in 2004. Due to insufficient levels of water for sampling found at a majority of the sampling stations during winter months, the original plan to sample on a monthly basis was deemed impractical and therefore terminated.

Soil samples were analysed for total metals and particle sizes, while water samples were analysed for total metals, dissolved metals, and physical and aggregate properties. Zinc, cadmium, and iron were found in significant concentrations at many of the sites.

Table 3 Total Metals Concentration Observed in Ground Water Samples Collected from Lysimeters below Galkeno 300 Treated Effluent Discharge

Location Description	Lysimeter 2 - Fence 1	Lysimeter 3 - Fence 1	Lysimeter 4 - Fence 2
Station ID	ACG-L2	ACG-L3	ACG-L4
Date	18-Jun-04	18-Jun-04	18-Jun-04
Total Metals (mg/L)			
Zinc	28.2	5.09	0.3
Cadmium	0.0581	0.026	0.00188
Iron	0.2	0.1	0.1

At all sites, a trend of decreasing metals concentration was observed with increasing distance down the hillside and away from the adit, as demonstrated by Table 3, above. A second trend apparent in the figures is a general increase in metals concentrations over time. This increase is understandable, as metals-rich water from the G300 Adit continues to flow through the area, and can be seen in Table 4. The trend of decreasing concentrations down hydraulic gradient look promising - however, it is important to keep in mind that too few sampling events have occurred, and with such temporal irregularity, that no accurate statistical correlations or conclusions can be made with respect to soil metal attenuation capacities.

Table 4 Parameters of Interest Measured in Ground Water Samples from Piezometers in Fences 1, 2 and 3 below Galkeno 300 Treated Effluent Discharge

Sample Location	Date	Total Zinc (mg/L)	Total Copper (mg/L)	Total Lead (mg/L)	Total Arsenic (mg/L)	pH (pH units)
Fence 1						
ACG-DP5	17-Sep-03	82.6	<0.006	0.07	<0.06	-
	16-Oct-03	142.00	0.402	2.65	0.3	-
	28-Nov-03	1620	17.0	93.2	4	6.7
	18-Jun-04	66	0.118	0.528	0.014	6.070
ACH-DP6	17-Sep-03	13.5	0.031	0.16	0.08	-
	25-Sep-03	100	1.26	4.71	2.76	-
	16-Oct-03	274	7.18	27.3	15.5	-
Fence 2						
ACG-DP1	17-Sep-03	85.8	0.553	0.87	0.91	-
	25-Sep-03	85.5	0.523	1.04	1.35	-
	16-Oct-03	115	0.540	1.05	1.54	-
	28-Nov-03	1730	7.20	11.3	14	7
	18-Jun-04	238	0.709	1.120	1.340	7.34
ACG-DP2	17-Sep-03	82.9	2.48	6.09	3.64	-
	25-Sep-03	27.9	0.390	0.98	0.66	-
	16-Oct-03	48.2	0.018	0.19	<0.06	-
ACG-DP3	17-Sep-03	2.46	0.308	0.43	0.8	-
	25-Sep-03	13.2	0.427	0.6	1.18	-
ACG-DP4	17-Sep-03	31.4	2.29	21	3.65	-
Fence 3						
ACG-SP1	25-Sep-03	48.5	5.72	2.39	2.83	6.34
	16-Oct-03	3.46	0.296	0.48	0.18	6.44
ACG-SP2	17-Sep-03	37.3	<0.006	0.08	<0.06	-
	25-Sep-03	33.9	0.119	<0.06	<0.06	-
	16-Oct-03	25.7	<0.006	<0.06	<0.06	6.21
	18-Jun-04	37.4	0.024	0.0447	0.021	-
ACG-SP3	25-Sep-03	7.77	0.665	1.13	0.41	6.19
	16-Oct-03	16.5	1.48	0.81	0.8	6.58
	18-Jun-04	14.2	0.938	0.714	<0.004	6.87
ACG-SP4	16-Oct-03	1.29	0.340	0.24	0.35	7.16
	18-Jun-04	1.24	0.348	0.331	0.313	7.42
ACG-SP5	17-Sep-03	6.4	0.133	0.2	0.2	-
	25-Sep-03	2.46	0.023	<0.06	<0.06	7.2
	16-Oct-03	29.4	<0.006	<0.06	<0.06	6.61
	18-Jun-04	7.24	0.022	0.0473	0.0346	7.12
ACG-SP7	25-Sep-03	0.78	0.219	0.31	0.33	6.15

Note: The two November, 2003 samples have been included (ACG-DP5 and ACG-DP1) in the above table. Note the elevated concentrations of nearly every parameter measured, due to turbidity of collected samples

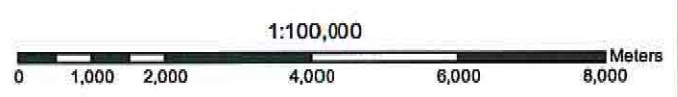
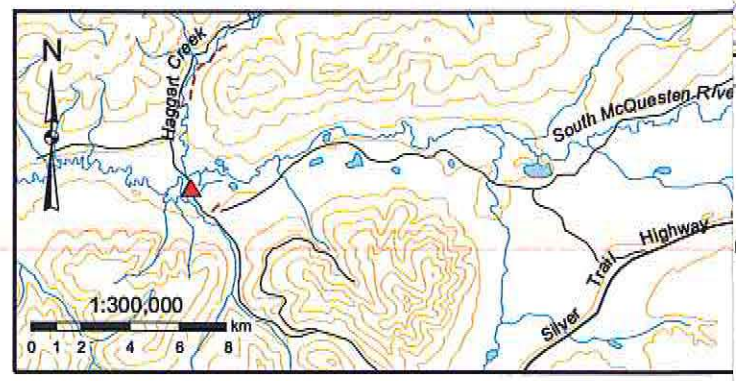
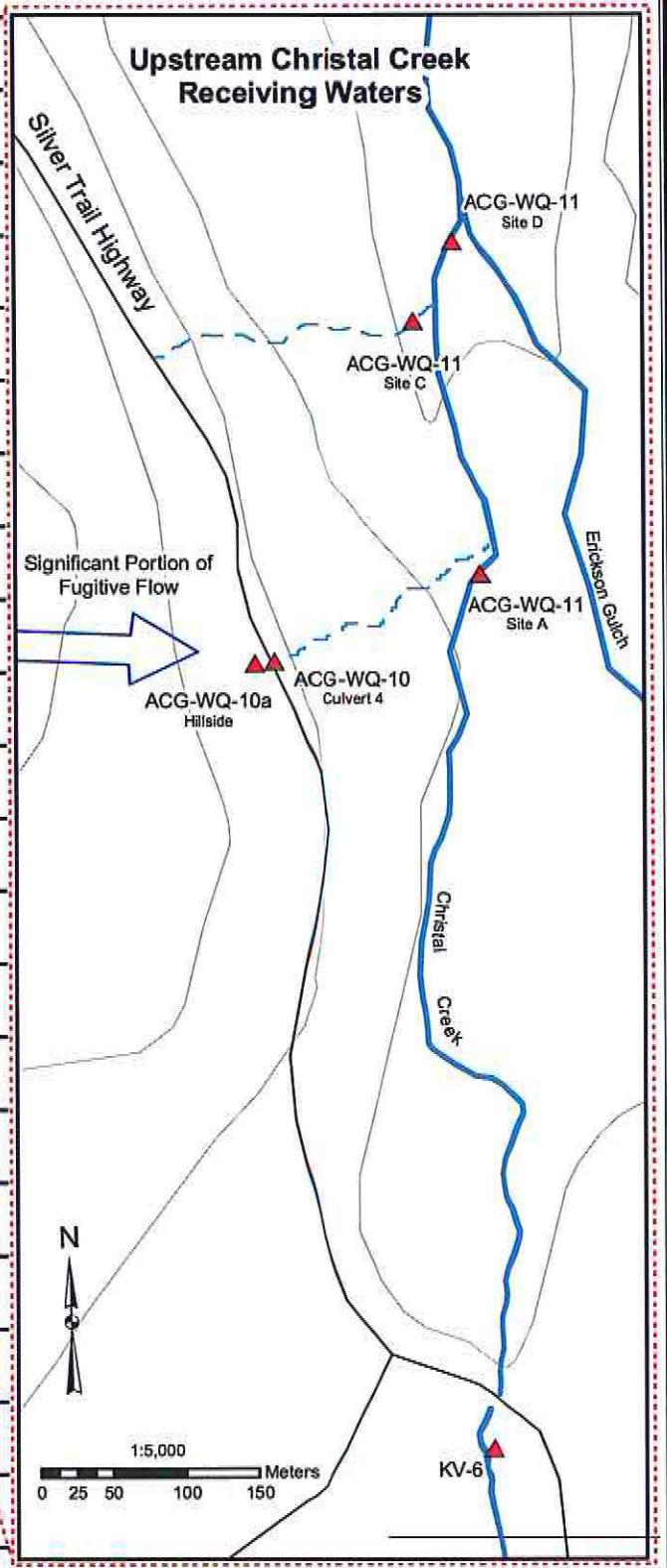
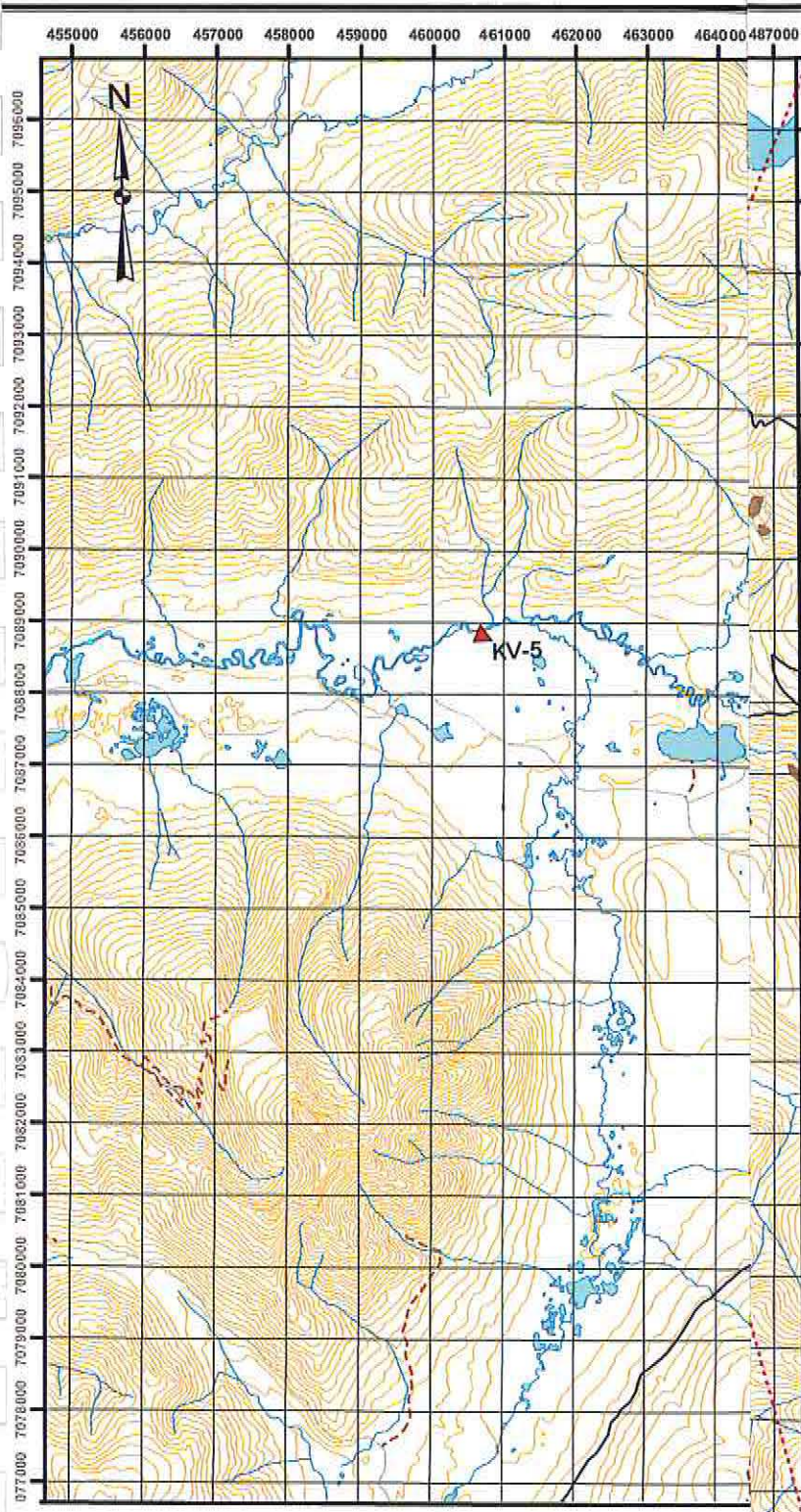
Sampling at the Groundwater Fences will continue twice yearly (June and September) as long as the present G300 treatment regime continues to operate and produce an effluent that is discharged along the same flow path on Galena Hill.

2.1.4.3 Galkeno 300 Fugitive Flow Receiving Environment Water Quality Monitoring

Following the identification by ACG of measurable impacts in Christal Creek from the fugitive Galkeno 300 flow, monthly and weekly sampling events at the identified G300 Fugitive Flow Investigation sites (Figure 12) have been conducted with the purpose of monitoring and characterizing the flow distribution and receiving water quality. This monitoring program provides essential feedback regarding the efficacy of the adit discharge water treatment system, with a view towards making treatment regimen changes if necessary. These investigations have occurred since December 2003.

Methodology for this monitoring project includes the following:

- Identify a network of fugitive flow and receiving environment sampling sites, where possible using existing sites for data comparison (see Figure 12);
- Standardize sampling site numbering system (Table 5);
- Conduct sampling on daily, weekly, and monthly basis at designated fugitive flow sites
- Send samples to Norwest Labs in Surrey BC for total and dissolved metals and routine parameter analysis;
- Obtain continuous flow measurements and temperature readings from the G300 adit via an Aquastar PTX2 Pressure Transducer/Datalogger and 90° V-notch weir (initial weir installed December 2003);
- Collect monthly bioassay at site ACG-WQ-10 (Culvert 4 on the Silver Trail Highway);
- Send bioassay samples to Integrated Resource Consultants (IRC) in Richmond, BC, to conduct a 96-hour LT₅₀ toxicity bioassay using rainbow trout (*Oncorhynchus mykiss*); and
- Report to YG on the findings of the monthly investigations (Appendix G) and combine the findings with data from daily and weekly sampling regimens to recommend and implement treatment regime changes aimed at optimizing the system.



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Table 5. Revised Receiving Water Site Numbers and Descriptions – August 2004

New Site #	Old UKHM #	UKHM #	LES #	ACG #	Site Location Description
KV-1	S-21	UK1	1		South McQuesten River upstream Christal Creek
KV-2	S-10	UK2	2		South McQuesten River at Pumphouse Pond
KV-3		UK3	3		South McQuesten River upstream Flat Creek
KV-4	S-11	UK3	4		South McQuesten River 300 m downstream Flat Creek
KV-5			5		South McQuesten River 9 km downstream Flat Creek
KV-6	S-18	UK6	6	ACG-WQ-05	Christal Creek upstream Keno Highway
KV-7	S-19	UK7	7		Christal Creek at Hanson Lake Road Crossing
KV-8		UK8	7B		Christal Creek at mouth
KV-9	S-9	UK9	9		Flat Creek at mouth
KV-37		UK11	37		Lightning Creek upstream Hope Gulch
KV-38					Lightning Creek upstream Thunder Gulch
KV-41		UK12	41		Lightning Creek at Keno City Road Crossing

Proposed Revisions to Adit/Decant Sampling Site Numbers

New Site #	Old UKHM #	UKHM #	LES #	ACG #	Site Location Description
KV-27		27	32		Galkeno 300 Adit
KV-28				ACG-WQ-12	Galkeno 300 Treatment Pond Decant
KV-31	S-5		31		Galkeno 900 Adit
KV-32		20	31B		Galkeno 900 Treatment Pond Decant
KV-39			48		Hope Gulch
KV-40					Charity Gulch
KV-42	S-12	18	39		Bellekeno 600 Adit
KV-43			39A		Bellekeno 600 Treatment Pond Decant
KV-44		18A	39B		Bellekeno 600 Seep
KV-45	S-8	19	40		Onek Adit
KV-10				ACG-WQ-08a	Valley Tailings Pond #1 Decant
KV-11				ACG-WQ-08b	Valley Tailings Pond #2 Decant
KV-12	S-1	13	72	ACG-WQ-08c	Valley Tailings Pond #3 Decant
KV-13	S-13	14	12		Silver King Adit
KV-14			12A		Silver King Treatment Pond #2 Decant
KV-15					South McQuesten River at Bridge below Haggart Creek

The following figures display total zinc analytical results from the monthly monitoring program. The results are discussed in the context of three distinct areas:

- **Galena Hill:** Raw Adit Water, Treated Effluent from Pond Decant and Culvert 4 Sites;
- **Christal Creek Receiving Waters:** KV-6, Sites A and D, KV-7 and KV-8; and
- **South McQuesten River Receiving Waters:** KV-1, KV-2, KV-5 and Haggart Creek Sites.

Galena Hill

Figure 13 combines the daily, weekly and monthly sampling results from all monitoring programs to provide a complete picture of the raw adit and treated effluent total zinc concentrations for the entire contract period. As evidenced by this figure, treatment at the site rarely achieved a treated effluent with total zinc concentrations below the traditional target value of 0.5 ppm. Treatment pond clean out activities were increasingly effective over the contract term at reducing the total zinc concentrations in the treated effluent and increasing the efficacy duration.

Figure 14 illustrates total zinc concentrations at Culvert 4 on the Silver Trail Highway from the monthly and weekly sampling events. This figure shows how the metal load represented by total zinc levels at this location does not correlate well with concentrations in the treated effluent discharge. This is further evidence that there are natural attenuation processes on Galena Hill that, over the course of the monitoring period between February 2004 and March 2005, are becoming increasingly more effective at reducing the metal load of the effluent water along its Galena Hill flow path.

Christal Creek Receiving Waters

Figure 15 charts the baseline concentrations of total zinc in Christal Creek upstream of the Galkeno 300 fugitive flow influence. The alternating effects of dilution of these concentrations

by natural flows and metal load augmenting from the Galkeno 300 flow and other natural sources from Galena Hill is illustrated in Figure 16 and Figure 17.

Further along Christal Creek, the further effects of dilution in Christal Creek are seen as much reduced total zinc loads at KV-7 and at the mouth of Christal Creek (KV-8). Figure 18 and Figure 19 chart the results for the sampling events at these two sites.

South McQuesten River Receiving Waters

Figure 20 shows the background South McQuesten River total zinc concentrations at site KV-1. The August result for this site is suspect, not being in line with those concentrations normally seen at this site. Figure 21 and Figure 22 chart the total zinc concentrations at the sites along the South McQuesten River below the influence of Galkeno 300 flow via Christal Creek. Of note is that at both sites since June 2004, the total zinc concentrations have almost exclusively been below the Canadian Council of the Ministers of the Environment (CCME) standard for the protection of aquatic life (0.1 ppm).



Plate 12 – Sampling water quality on the South McQuesten River

Figure 13 - Total Zinc Concentrations at Galkeno 300 (Raw Adit and Treated Effluent) from April 1, 2004 - March 26, 2005

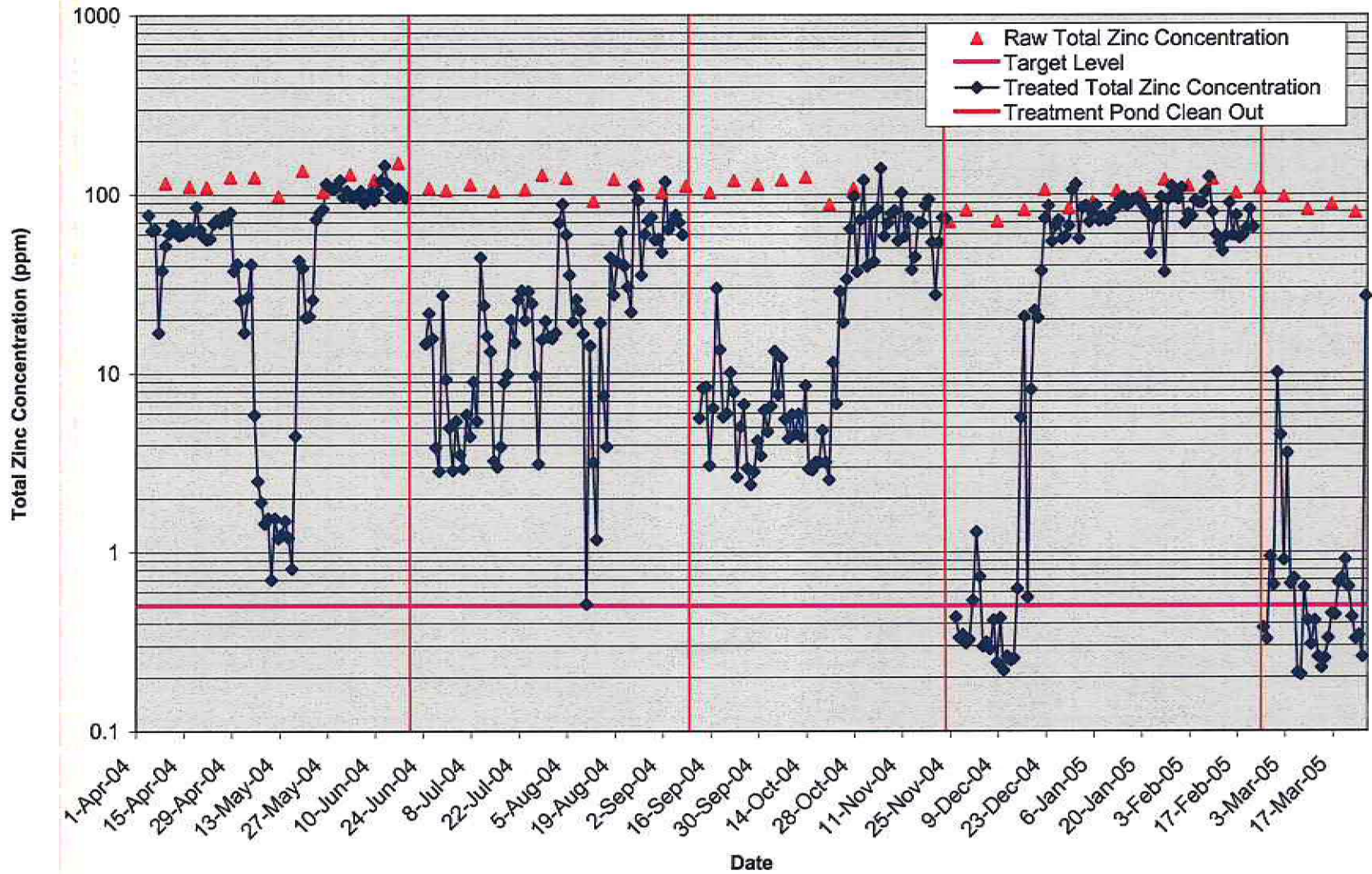


Figure 14 - Weekly Total Zn Concentration For Galkeno 300 Flow at Silver Trail Highway Culvert #4 (ACG-WQ-10) and Hillside Near Culvert #4 (ACG-WQ-10a)

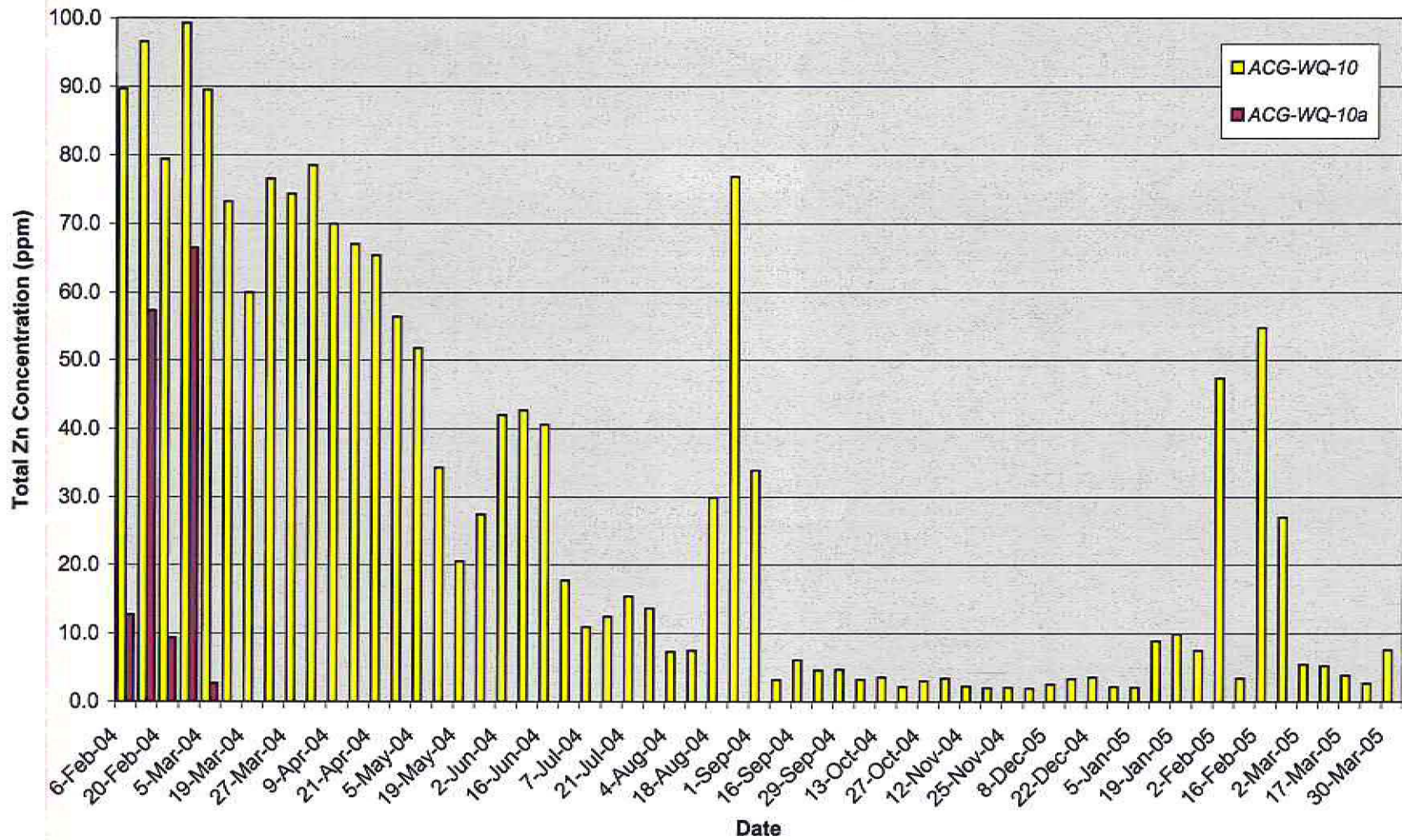


Figure 15 - Weekly Total Zn Concentration For Christal Creek u/s of Keno Road (KV-6)

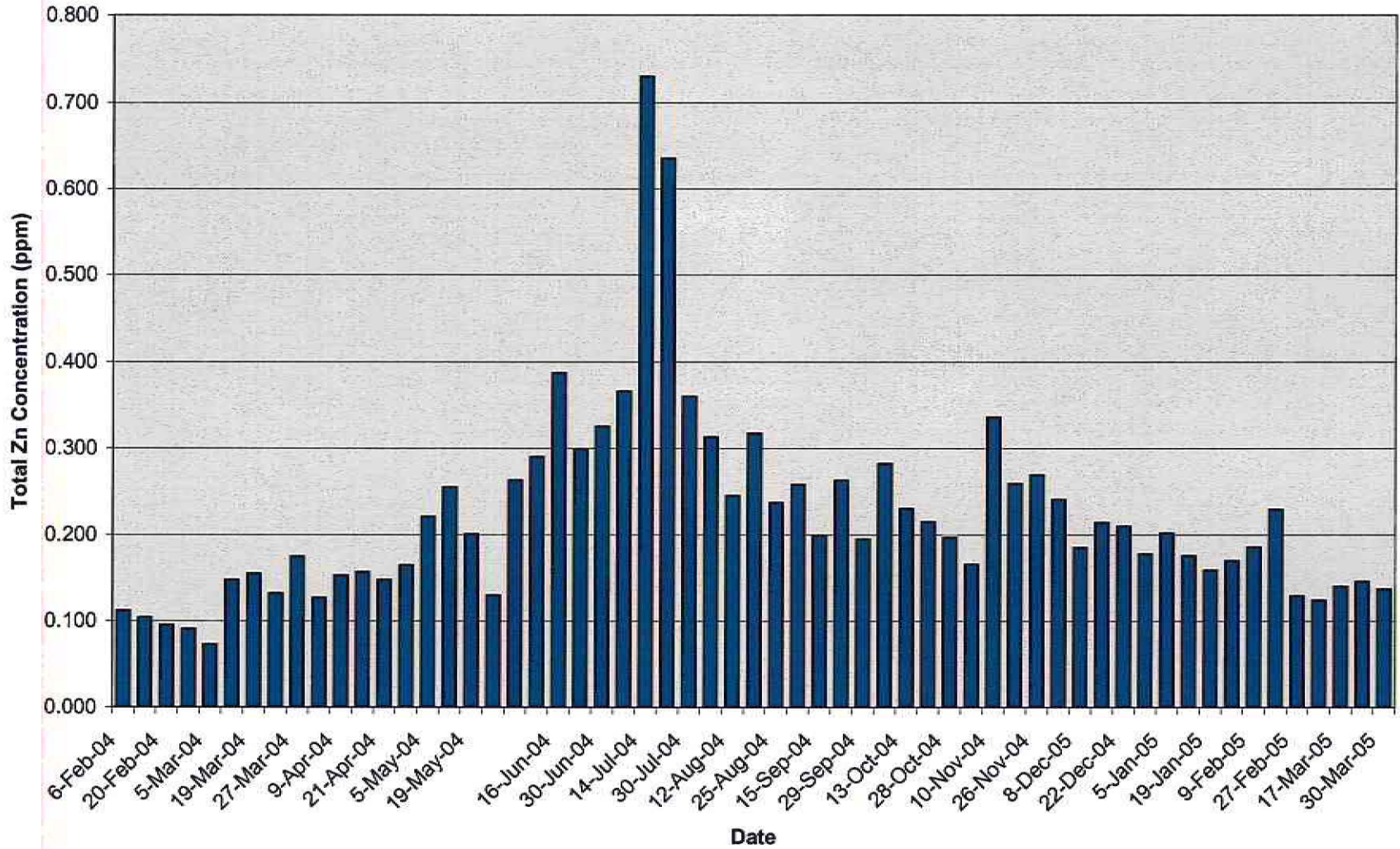


Figure 16 - Weekly Total Zn Concentration For Christal Creek 600m Downstream of Keno Road (ACG-WQ-11, Site A)

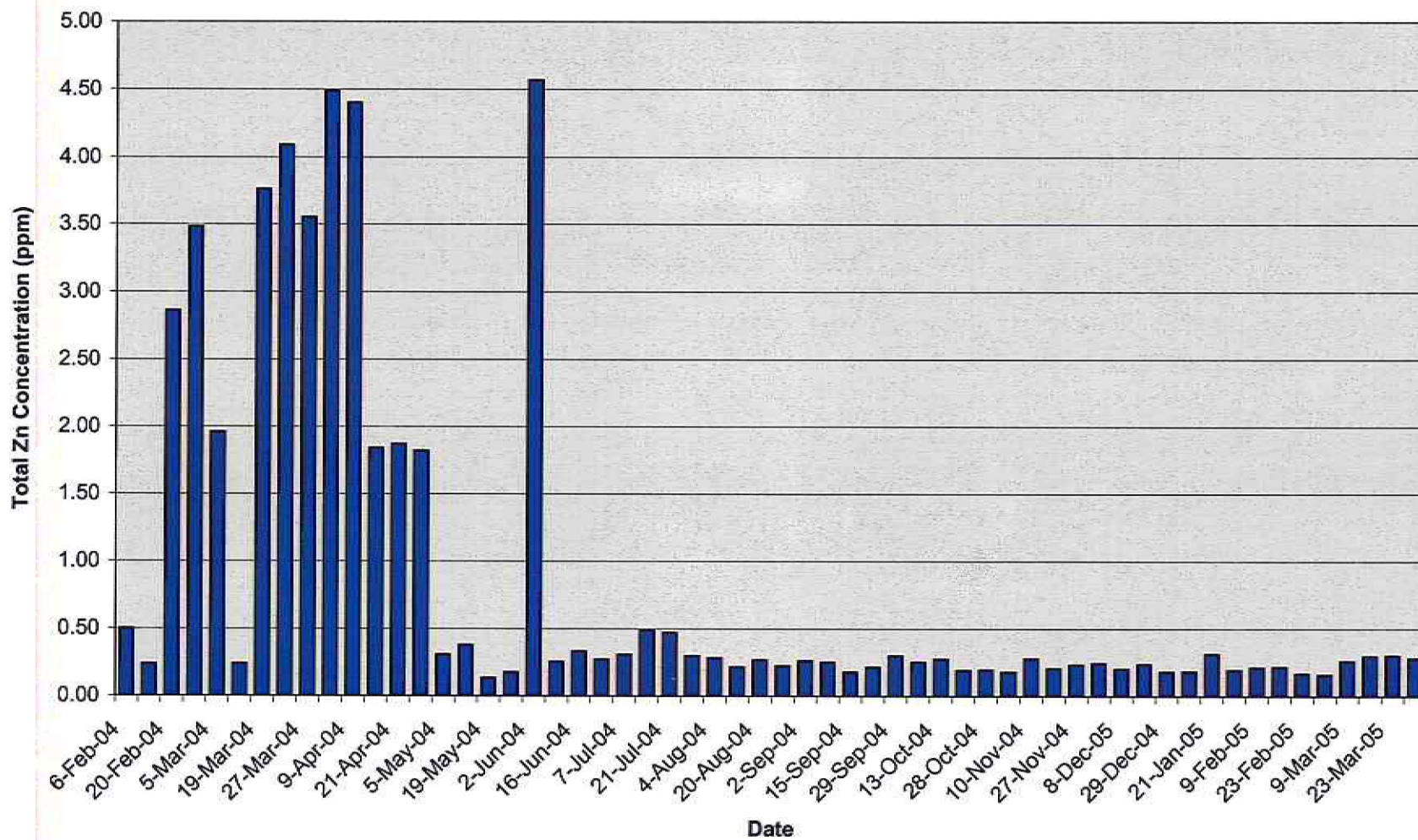


Figure 17 - Weekly Total Zn Concentration For Christal Creek 826 meters Downstream of Keno Road (ACG-WQ-11, Site D)

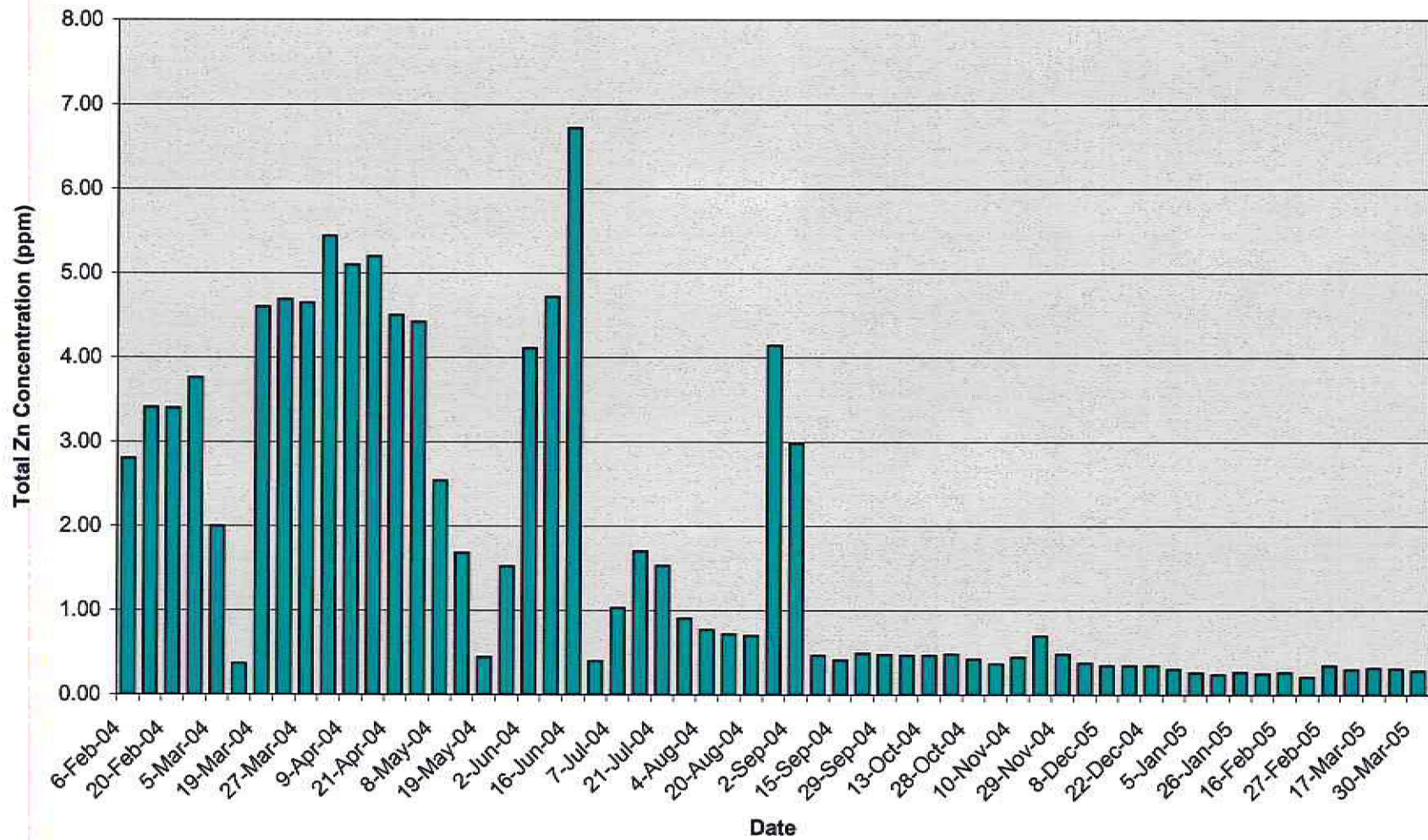


Figure 18 - Weekly Total Zn Concentration For Christal Creek at Hanson Lake Road (KV-7)

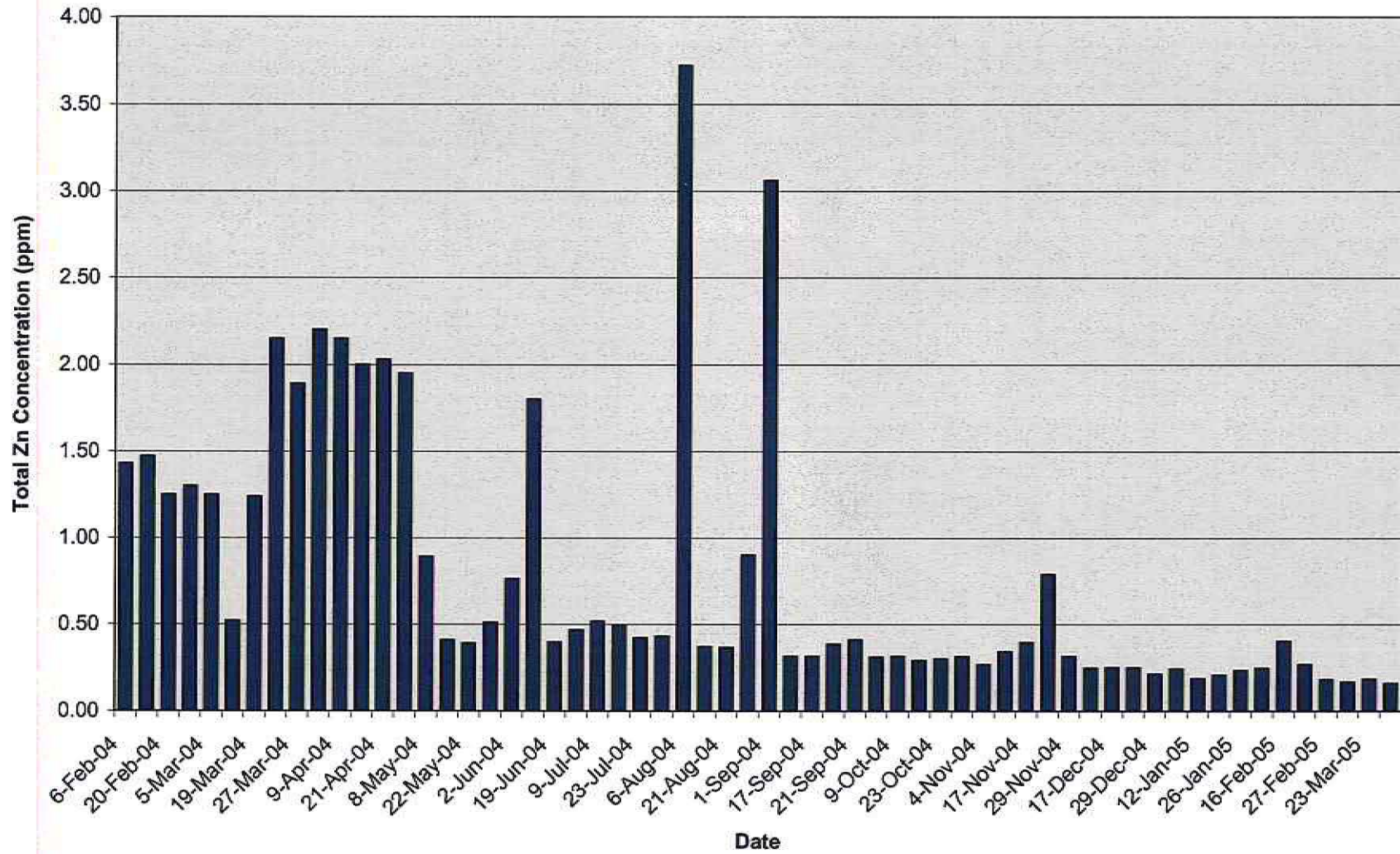


Figure 19 - Monthly Total Zn Concentration For Christal Creek at Mouth (KV-8)

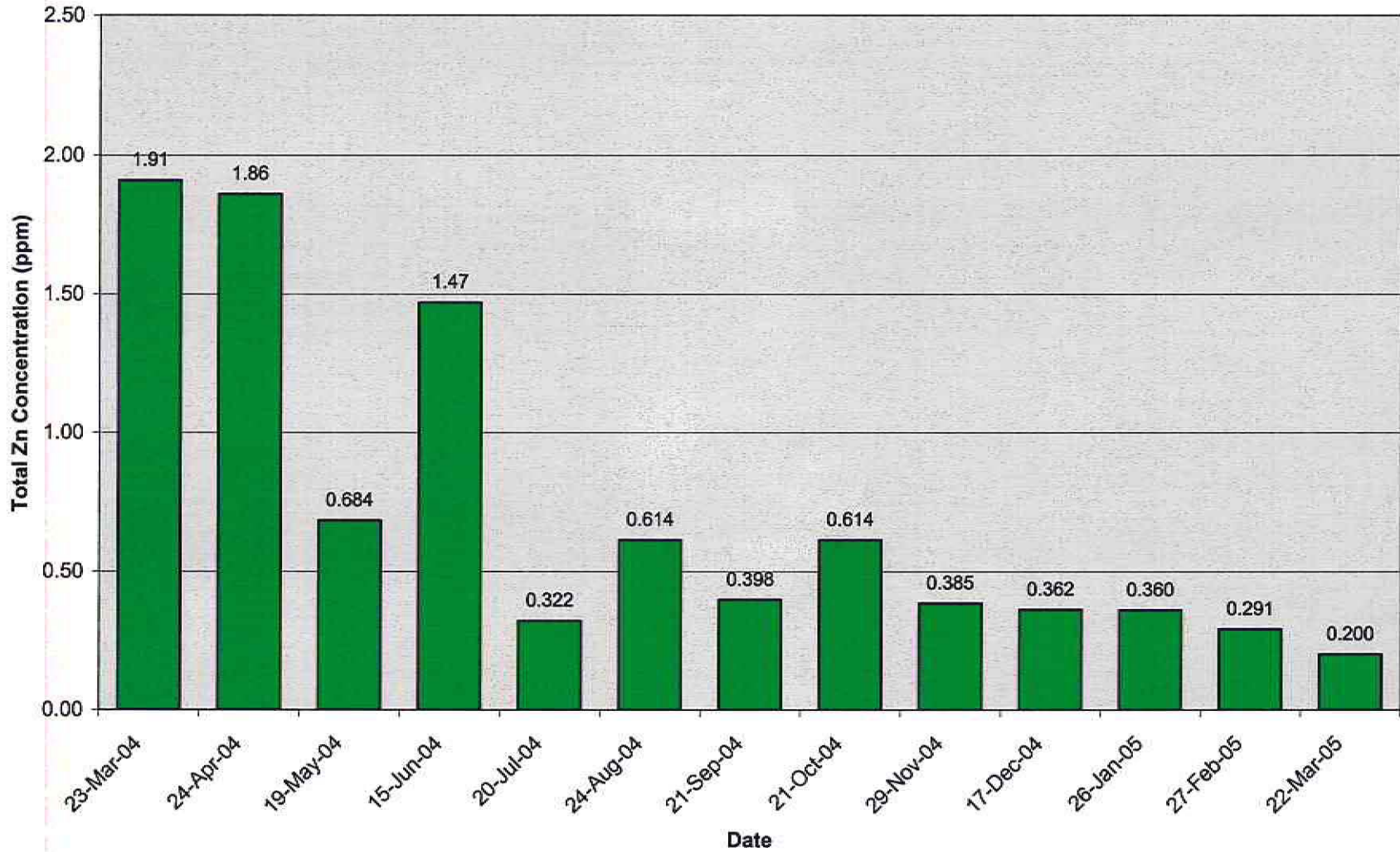


Figure 20 - Monthly Total Zn Concentration For South McQuesten River Upstream of Christal Creek (KV-1)

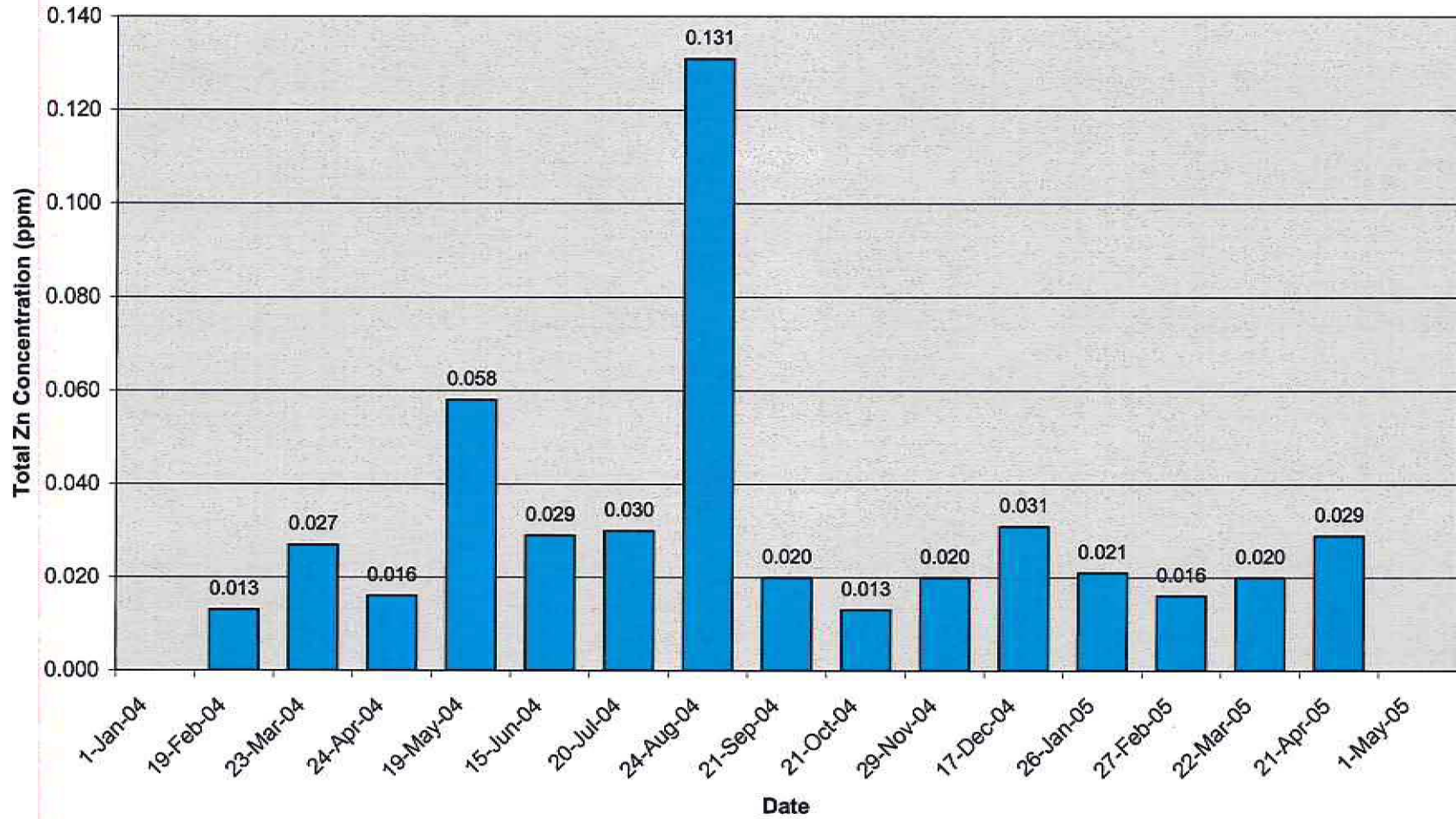
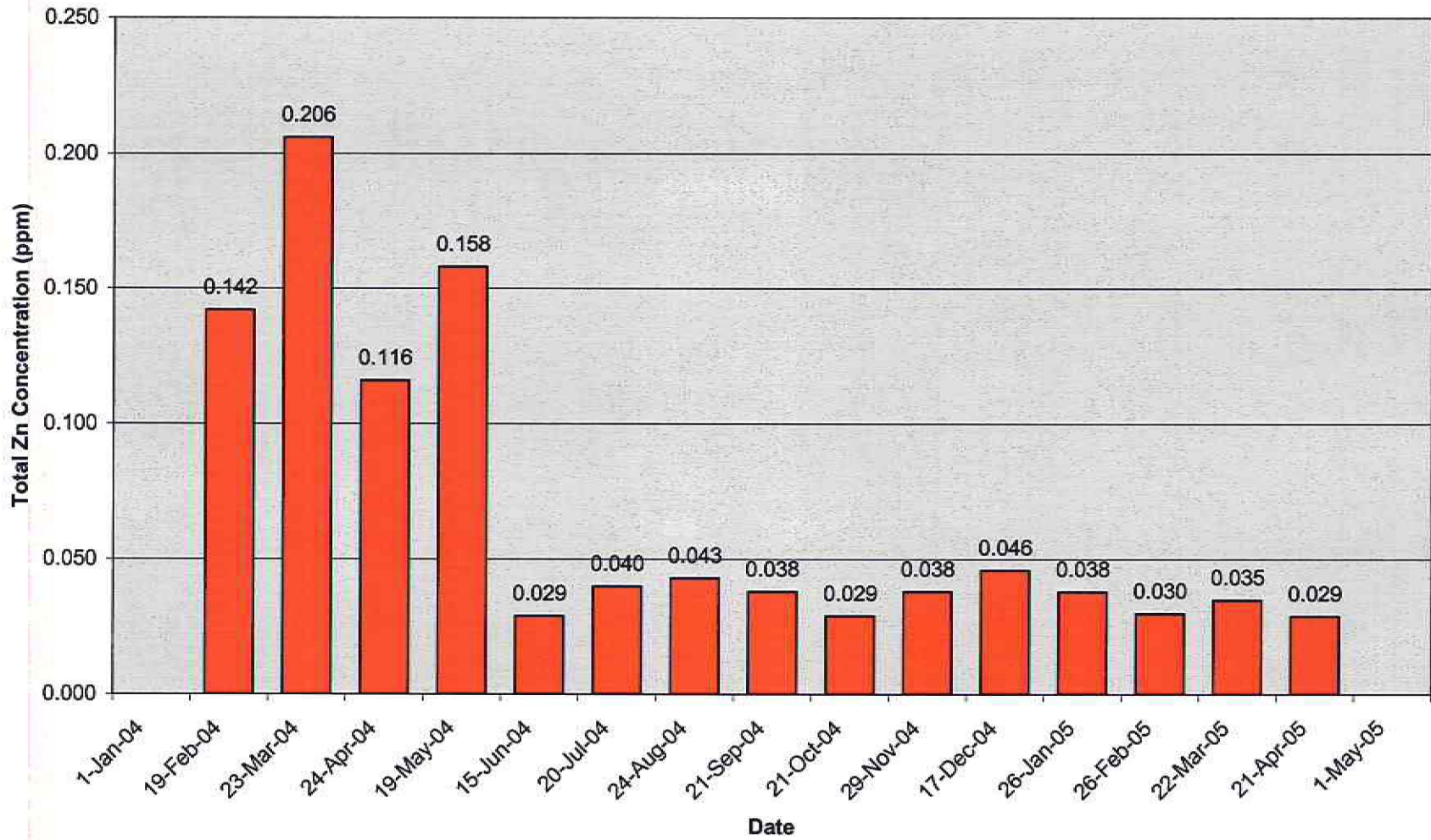
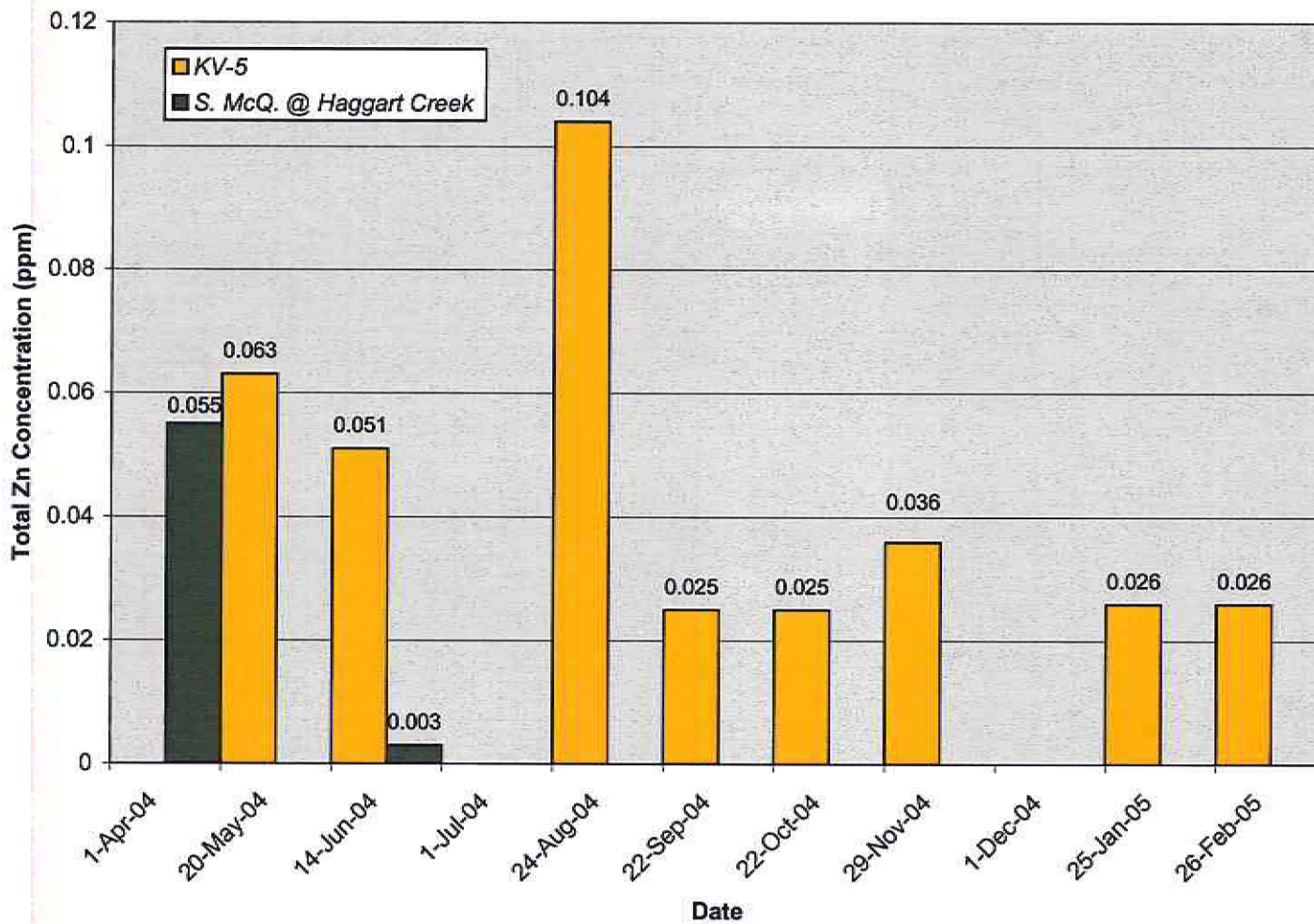


Figure 21 - Monthly Total Zn Concentration For South McQuesten River near Pumphouse Pond (KV-2)



**Figure 22 - Monthly Total Zn Concentrations For Downstream South McQuesten River Sites:
Haggart Creek and 9km Downstream of Flat Creek (KV-5)**



Summary

The monthly sampling program continues to provide ACG with valuable feedback regarding the efficacy of the Galkeno 300 treatment system and how it affects the water downstream. As evidenced by the results of the fugitive flow and receiving water quality sampling events, the Galkeno 300 adit flow continues to contribute to the metal loading of both the Christal Creek and South McQuesten River receiving waters, although this loading is reduced in the winter months as freeze/thaw mechanisms appear to precipitate much of the metal load out of the fugitive flow before its confluence with Christal Creek. Some re-mobilization of these metals during spring freshet was observed, but not to the degree expected.

The fugitive flow from the Galkeno 300 treatment system is not, however, the only contributor of metals to Christal Creek and the South McQuesten River. In addition to the background Zn levels in Christal Creek and the hillside flow through Culvert 5 (sampled at Site C) evidenced by previous sampling results, other natural sources of water (i.e. Erickson Gulch, whose headwaters originate in areas with documented aqueous metals concentrations) may also contribute.

Various treatment system modifications have realized temporary improvements in decant and receiving water quality. Further assessment and modifications to the G300 treatment system are required however to improve Zn levels in the treatment decant and to reduce metal loading to Christal Creek and downstream receiving waters. Timely and rapid pond clean out remains the primary means of keeping the treatment system at Galkeno 300 operating properly.

Compliance of the treatment system is determined by a toxicity assessment of samples of the fugitive flow collected at Culvert 4 on the Silver Trail Highway. The assessment is a 96-hour bioassay at full concentration with rainbow trout (*Onchorynchus mykiss*) to determine the lethal time for 50% of the fish test population (LT50). This location is immediately prior to the fugitive flow reporting to the aquatic receiving environment of Christal Creek.

Table 6 below summarizes the results of the bioassay sampling since initiation in February of 2004.

Table 6 96-hour bioassay results by month for sampling at Culvert 4.

Month	96 hour LT_{50} (hours)	Pass / Fail
February 04	4	Fail
March 04	2	Fail
April 04	8	Fail
May 04	6	Fail
June 04	15	Fail
July 04	>96	Pass
August 04	11	Fail
September 04	>96	Pass
October 04	>96	Pass
November 04	>96	Pass
December 04	>96	Pass
January 05	>96	Pass
February 05	>96	Pass
March 05	>96	Pass

These results reflect the trend in total zinc concentrations observed in the flow at Culvert 4 in Figure 14. Combined, these results would indicate that Galkeno 300 treated effluent with total zinc concentrations of approximately 25 ppm or lower at the Culvert 4 location is non-toxic to aquatic life. Daily and weekly monitoring at the Christal Creek receiving water sites will continue with monthly monitoring in the Christal Creek and South McQuesten River downstream receiving waters.

2.1.4.4 Keno Valley Receiving Environment Monitoring

During the summer months of 2004 and the low-flow period of 2005, Laberge Environmental Services (LES) conducted a sampling program of the fugitive flow and receiving waters of Galkeno 300 effluent. This was a continuation of the program started the previous summer, with the goal of further enhancing understanding of the path of G300 waters and effect of those waters on local streams and rivers. LES's full report is included in Appendix I.

Laberge, working at times with ACG, performed the following activities during the 2004/05 contract term:

- Collecting water quality samples from various sties during open water and low flow conditions;
- Conducting spot flow measurements at all water quality sites;
- Installing a new sensor/data logger at Christal Creek, KV-7, to maintain a continuous record;
- Installing two new sensor/data loggers at KV-9, Flat Creek upstream of the S. McQuesten River, and at KV-41, Lightning Creek at Keno, to record stream flow variation and allow for more confident study area hydrologic modeling; and
- Collecting stream sediment samples from each site during the open water season.



Plate 13 – Measuring stream flow parameters at KV-9

From the data gathered, it is concluded that the treated effluent flowing from the G300 treatment pond is still having an effect on Christal Creek and the South McQuesten River. CCME guidelines for aqueous zinc were exceeded at the downstream sites in both the total and dissolved phases. However, the upstream site KV-1 also exceeded the guideline in July 2004 (total sample only), suggesting input of metals-laden water from a source other than G300. When viewed in its entirety, the data set appears to present a trend towards declining metals concentrations in the receiving waters. It should be noted that there have been periodic spikes in metals concentrations over this time period, particularly at the sites close to Galkeno 300. Overall, concentrations were considerably lower back in August 2003 prior to the fugitive flow of Galkeno 300 creating any impacts.

The sensors and data loggers installed in July 2004 are successfully collecting data, allowing discharge curves to be developed for KV-7, Christal Creek upstream Hanson Road, KV-9, Flat Creek upstream South McQuesten River and KV-41, Lightning Creek upstream Keno bridge. Preliminary rating curves will become refined with more measurements. Hopefully, the hydrometric data will contribute to a more reliable mass balance and water quality model over time. The sediment quality appears to have improved significantly over time at the receiving sites. However, this trend can only be verified through repeat sampling.

2.1.5 Valley Tailings Facility

During spring freshet (normally observed between late April and late May), the Valley Tailings Facility typically sees an increase in water retention. Site work (maintenance of existing ditching and diversions) was completed in late 2003 to assist in redirecting freshet and meteoric flows away from the tailings impoundments, and it was observed during the 2004 freshet that less water reached the tailings area, reducing the lime treatment requirements at the Valley Tailings Facility. These diversions have also reduced the geotechnical stress on the tailings dams and helped to decrease the potential for non-compliant water discharges from the facility, which has been required historically when elevated pond water levels threaten the integrity of the dam structures.



Plate 14 – Valley Tailings Facility from Galena Hill

Active discharge of Tailings Pond No.3 was initiated on June 2nd, 2004 once the concentration of zinc in the pond water was consistently observed to be below 0.5 ppm. Lime addition to Ponds 2 and 3 was initiated several weeks prior to the first decanting of the pond to ensure compliance for release of the pond contents.

Twice daily sampling and staff gauge readings were conducted, and analytical staff analyzed and reported results for the VTF water on a daily basis. Water from the Pond No.3 decant ceased in July with the end of spring freshet, but was decanted again several times throughout the summer when high rainfalls raised the level of the tailings ponds. All decanting stopped for the year on August 10, 2004, when water levels dropped considerably until the next spring. From June 2 to August 10, 2004, the period in which the Tailings Pond No. 3 was decanting, the average pH and total zinc concentrations of the discharge were 8.9 and 0.09 ppm respectively.

Figure 23 - Total Zn Concentrations at Valley Tailings Facility, Spring 2004

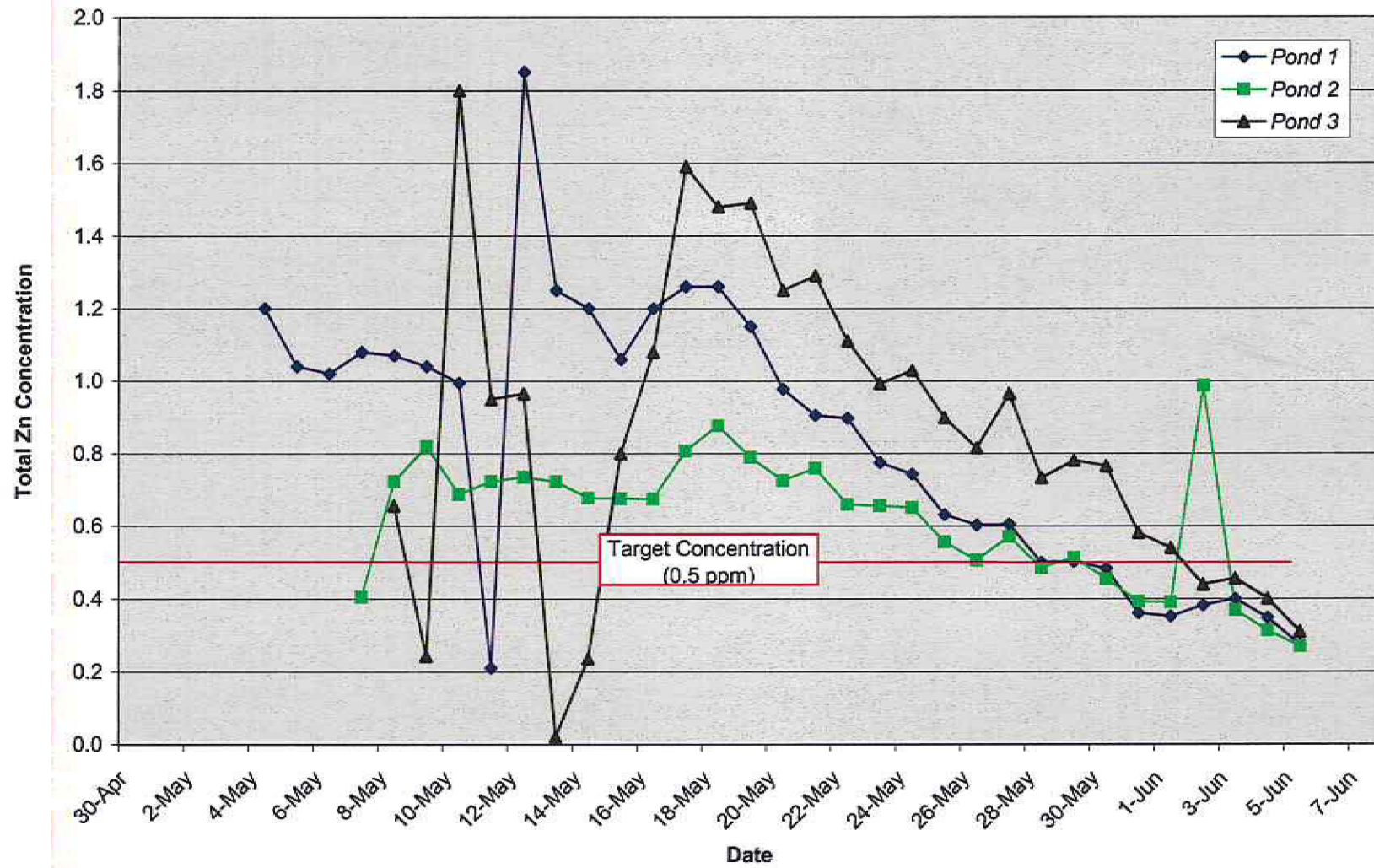
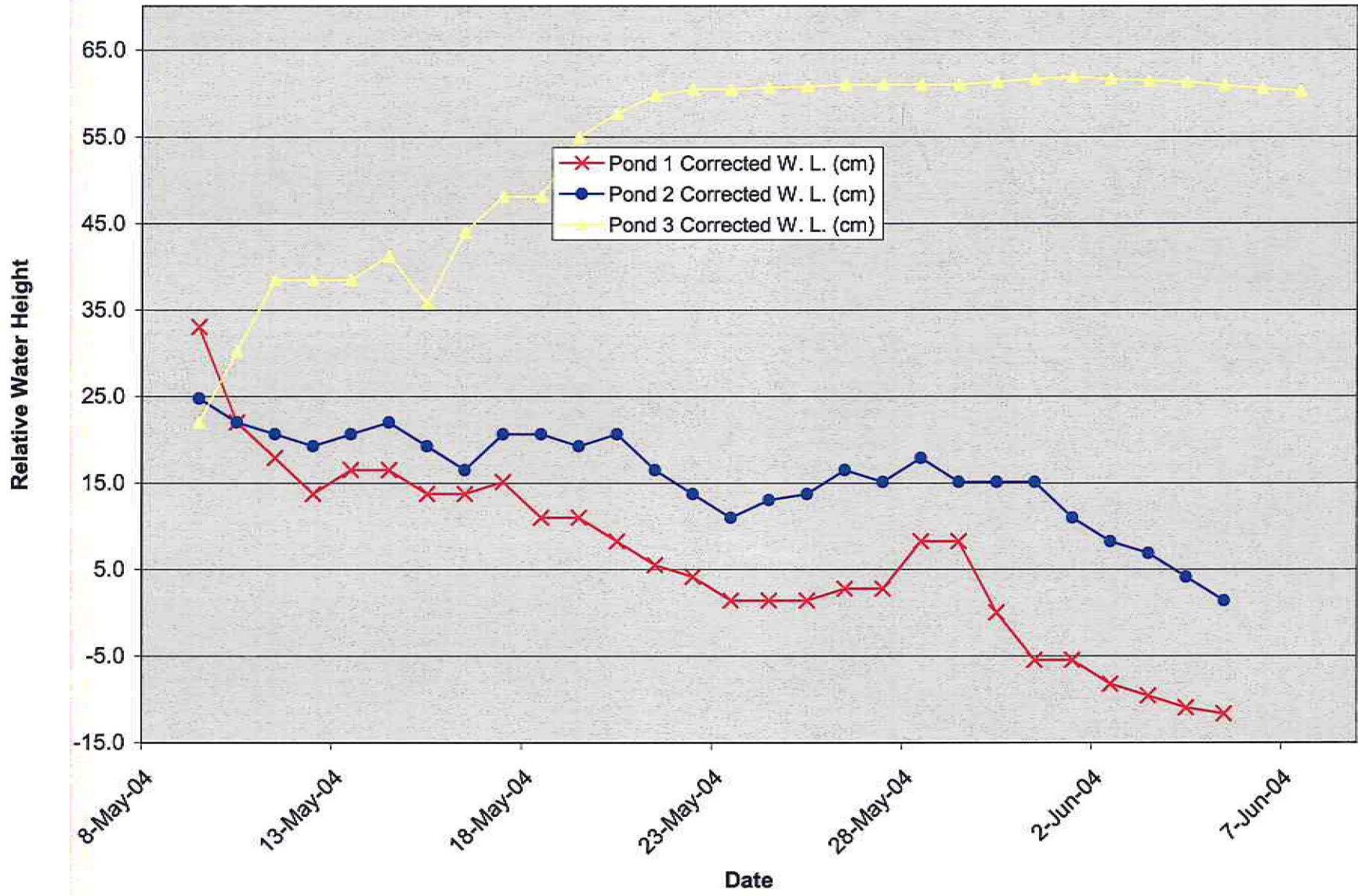


Figure 24 - Water Levels At Valley Tailings Facility, Spring 2004



2.2 *SITE CARETAKING AND INSPECTIONS*

Project Description and Rationale:

The Keno Hill Properties are located immediately adjacent to an all-season public highway (Highway #11, the Silver Trail). The properties are within a short drive of the town of Mayo, and surround the town of Keno City. Uncontrolled access to the mine sites on the property would pose a risk to the public. Because of open holes, compromised buildings, and hazardous chemicals (to name a few), most sites were made off-limits to the public during ACG's tenure as site technical managers in 2003. Safety fences and gates were erected, doors were re-keyed and locked, and warning signs installed.

The successful maintenance of site security and mitigation of environmental health and public safety risks requires a constant presence on site with an associated regular inspection regime. Ewing Transport operates a rotating security guard/caretaker schedule on a 24-hour per day, seven-day per week basis. Locked gates, secured buildings and mine portals, and fencing/warning signs at open holes are patrolled on a regular basis when the Site Caretaker



Plate 15 - Newly installed security fence surrounding partially-collapsed Shamrock 'J' Raise structure

completes a visual inspection of over twenty sites in the open (spring/summer/fall) season and 10 sites in the winter season (Figure 2). Regular inspections of the sites document the condition of – and note any changes in – site security and public safety measures, water flow, dams and ponds, infrastructure, etc. (see Table 7, "Open Season Property Site Inspection Form" and Table 8, "Winter Condition Property Site Inspection Form".)

Any reports of changes in physical status of any part of the site are subject to a follow-up investigation by ACG professional personnel, and by the Yukon Government Project Manager, if the situation warrants.

While there is no practical way of collecting comparative statistics to report on the efficiency of these measures, it is nevertheless felt that there has been a substantial reduction in theft, vandalism, and unauthorized/unsafe public access to the site. A number of vacationers and passers-by expressed frustration to site staff at not being able to access sites that they had previously entered and explored.

Table 7 - Property Site Inspection Form

	Site Name and Number																				
	Silver King Adit	Husky S.W.	Elaa Adit	Husky Mine	Valley Tailings	Elaa Townsite Infrastructure	Pump House	Dobie Adit	Ruby Adit	No Cash 500 Adit	Hector Adit	Birmingham 100 Adit	Gabano 300	Galkeno 500	Onak 400 Adit	Bellekeno 100 Adit	Bellekeno 600 Adit	Kene 700 Adit	Shamrock "J" Raise	Lucky Queen Adit	Wernecke Camp
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A) Site Security & Public Safety																					
1) Are access points secure? - doors, gates, windows, fencing, etc.	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
2) Are gates locked?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3) Are there any new holes?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
4) Has hole changed?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
5) Checked signage?																					
B) Water																					
1) Is there any water flow?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
2) Is there a noticeable change in flow (since last inspection)?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3) Do you observe an ice plug?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
C) Dams and Ponds																					
1) Is there any seepage along downstream side of structure?	Y N				Y N									Y N				Y N			
2) Checked culvers/decants (free of blockages, damage, etc)?	Y N				Y N									Y N				Y N			
4) Water depth on gauge (in metres)?																					
4) Is there evidence of up-welling downstream?	Y N				Y N									Y N				Y N			
5) Are there any new slumps, cracks, etc.?	Y N				Y N									Y N				Y N			
D) Infrastructure																					
1) Are there any damaged power poles/wires?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
2) Is there evidence of forced entry to any structure?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3) Is there any new damage to building(s)?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
4) Checked tank(s) for fuel (leakage/buff)?																					
E) Other																					
1) Pictures taken?	Y N	Y N	Y N	Y N	Y N		Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
2) Date and Time of Inspection (am/pm)																					
3) Inspector to initial upon completion.																					

Note: Please Provide Comments/Concerns/Observed Changes On Opposite Page, if Necessary.



Operation and Maintenance - Environmental Control Facilities, Keno Hill, Yukon

Table 8 - Property Site Inspection Form - WINTER CONDITIONS

Inspection Conducted the Week of: _____

	Site Name and Number																					
	Silver King Adit		Elas Adit		Valley Tailings		Cisa Townsite Infrastructure		Dobie Adit		Ruby Adit		Hector Adit		Galkano 300		Galkano 302		Creek 400 Adit		Bellefleur 600 Adit	
	1	2	3	4	5	6	7	8	9	10	11											
A) Site Security & Public Safety																						
1) Are access points secure? <small>- doors, gates, windows, fencing, etc.</small>	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
2) Are gates locked?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
3) Are there any new holes?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
5) Checked signage?																						
B) Water																						
1) Is there any water flow?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
2) Is there a noticeable change in flow (since last inspection)?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
3) Do you observe an ice plug?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
C) Dams and Ponds																						
1) Is there any seepage along downstream side of structure?	Y	N			Y	N											Y	N			Y	N
2) Checked culverts/dacams (free of blockages, damage, etc)?	Y	N			Y	N											Y	N			Y	N
3) Is there evidence of up-welling downstream?	Y	N			Y	N											Y	N			Y	N
4) Are there any new slumps, cracks, etc.?	Y	N			Y	N											Y	N			Y	N
D) Infrastructure																						
1) Are there any NEW damaged power poles/lines?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
2) Is there evidence of forced entry to any structure?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
3) Is there any new damage to building(s)?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
E) Other																						
1) Pictures taken?	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
2) Date of inspection.																						
3) Inspector to initial upon completion.																						

Note: Please Provide Comments/Concerns/Observed Changes, if Necessary:



At least two personnel are trained as Site Caretakers, and occupy the on-site housing on a rotational basis so that one Caretaker is active at any given time. The site caretaker makes daily property-wide tours during the summer and fall seasons to cover the period when tourists and hunters are known to frequent the area. During the winter months, water treatment operation crews are on site during all daylight hours throughout the areas of the property that are accessible by vehicle (i.e. upper mine roads are not maintained during the winter months). The site caretaker is on site during winter months to respond to any power outages by starting on site generators to prevent freezing/failure of water treatment systems.

Objectives:

- Protect public safety;
- Ensure protection of valuable assets; and
- Observe, document and report any newly emerging environmental or public health and safety issues.

Methodology:

- Conduct regular weekly site visits to all seasonally appropriate sites;
- Complete property site inspection form checklist and forward to Whitehorse ACG office;
- Complete weekly reports to Yukon Government Project Manager;
- Ensure all gates locked, signs posted, and any new developments reported as soon as possible;
- Respond to reported changes in site conditions of significant importance; and
- Report any significant developments/changes to Yukon Government.

Current Status:

- The project is ongoing. During the winter months, the site caretaker is responsible for initiating and maintaining emergency backup electrical power generation during power outages and assisting the site operators and technical management staff as necessary.

2.3 INFRASTRUCTURE MAINTENANCE

Project Description and Rationale:

Maintenance of facilities related to routine water treatment and general site infrastructure are frequently required at the site. Safe operating conditions for staff and the protection of the general public's health and safety in the vicinity of the Keno Hill Mining Properties are reliant upon this periodic maintenance.

Objectives:

- Maintain safe operating conditions for site staff and visitors,
- Protect the public health and safety of residents and visitors in the vicinity of the Keno Hill Properties.

Methodology:

This maintenance is generally undertaken by the site managers, Ewing Transport, but occasional activities are administered directly by ACG or are sub-contracted to qualified professionals. Notable maintenance activities undertaken during the 2004/05 contract are listed below, organized by the company responsible for undertaking the specific activity:

Access Consulting Group:

- Preparation of reporting area for Ewing water sampling staff;
- Repairs to lab and field gear room; and
- Design of weirs and installation/maintenance of flow monitoring instrumentation at Galkeno 300 and Galkeno 900 adits.

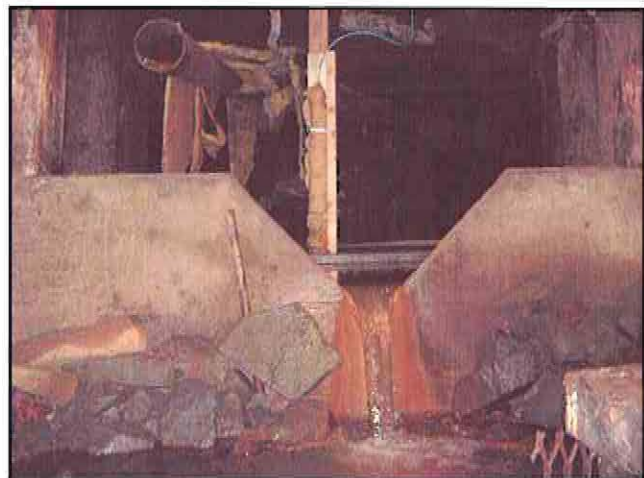


Plate 16 – V-notch weir for flow measurements in Galkeno 300 adit

Ewing Transport:

- Dam #2 emergency repairs at north end slumped section on south end;
- Well shack at Flat Creek and water line to transport;
- Re-roof geology office;
- Re-tin roof at house #239;
- New K700 adit inspection door;
- Re-hung transport sliding door;
- Re-built access road to Galkeno 300;
- Rip-Rap below dump;
- Replaced selected culverts around Elsa Town site;
- Lucky Queen superstructure removed to prevent collapse;
- New doors, chain and lock at Bellekeno;
- Cleaned up machine shop and geological office;
- Site clean up;
- New Gate at Silver King;
- Galkeno 300 road safety markers;
- Cleaned out culverts and marked culverts and associated roads for ploughing throughout the town site;
- Hand-cleaned Flat Creek ditch;
- Carpentry Shop clean up;
- Fuel berm storage at Framing Mill;
- Grading, ditching on road to VTF;
- Repairs to all town site roads;
- Cut down wires from unsafe poles;
- Live power cable marked – out and signed;
- New telephone line installed at transport;
- Site garbage clean up;
- Cleaned up and fixed door on Quonset hut at Galkeno 300;



Plate 17 - Ewing Transport equipment clearing Calumet Drive

- Developed new sludge disposal site at Sime waste rock dump;
- Brushed out roads at No Cash;
- Installed water quality site signage;
- Brushed out Christal Creek water quality sample trails;
- Cleaned up debris in adits;
- Constructed Galkeno 900 interceptor ditch;
- Installed Sludge fence at Galkeno 900 for liner install project;
- De-sludged of all ponds as required;
- Had WCB inspection and complied with directions – safety covers, lime tanks and emergency lights;
- Cleaned up and installed windows in transport garage/crew lunch room; and
- Electrical panel housing installation at Onek.

Subcontractors:

- New electrical and heat trace installed at Onek adit (Dynamic Systems, Whitehorse); and
- Shamrock "J" Raise - Fencing of collapsing infrastructure (Olsen Construction, Whitehorse).

Current Status:

This is an ongoing project at the site, and project /site managers continue to assess and respond to threats to continued safe operating conditions on the site.

3.0 SPECIAL PROJECTS

3.1 *GALKENO 300 UNDERGROUND INVESTIGATION*

Project Description:

As the Galkeno 300 adit discharge effluent has water quantity and quality that presents challenges with respect to conventional lime treatment at the location of the Galkeno 300 adit, this project investigated the potential solution of re-directing the Galkeno 300 discharge through the existing network of underground mine workings and the porous geological formation known as the Sime Vein. If this were successful, all water presently discharging at G300 would end up at Galkeno 900. See Appendix J for ACG's full report on this investigation.

Objectives:

The purpose of this investigation was to confirm or refute the possibility of this approach, and to attempt to ascertain the source of the water that currently discharges from Galkeno 300.

Methodology:

On June 16, 2004, D. Cornett & R. McIntyre, of ACG, conducted an underground inspection of the G300 adit to attempt to ascertain the possibilities for underground redirection of the adit discharge. M. Phillips and B. Dunn, formerly of UKHM, had indicated the possibility of redirecting the flow into the Sime workings, which would cause the water to flow down along the Sime vein to the Galkeno 900 adit level.

ACG contacted Main Street Mining and asked them to conduct an inspection in order to prepare a quote for building an underground dam to redirect the water over to the Sime workings/Sime vein. G. Turner of Main Street went into the adit and prepared a quote, which was submitted under separate cover to YG. During this inspection, he indicated that the workings were essentially safe for walking in, taking care to not disturb rotted overhead timbers.



Plate 18 – Collapsed timbers in underground workings of G300 level

Safety precautions for the inspection included: personal monitor four-gas detector (monitoring levels of Lower Explosive Limits, CO, Hydrogen Sulphide, and, importantly, Oxygen), portable O₂ cylinder, scaling bars for frequent testing of timbers and hanging wall/back, hip chain, and underground plan and section maps. An experienced underground miner (J. Beckley) was stationed at the adit entrance with a radio, in case of emergency. Subsequently, R. McIntyre returned to the G300 Adit,

accompanied by H. Melancon (an experienced underground miner) to inspect adit safety condition. This inspection verified that the adit would require some retrofitting work before any workers are expected to work in the adit.

Current Status:

The construction of an underground dam is still being considered by YG Type II Mines. In the meantime, operation of the portable treatment plant and settling pond is ongoing, with improvements constantly being implemented to achieve renovation success. Monitoring results from monthly Christal Creek network continue to indicate poor water quality reaching the receiving environment, although bioassay toxicity assessments continue to pass at the Culvert 4 sampling location.

3.2 PCB EQUIPMENT ASSESSMENT AND CONSOLIDATION

Below is only a brief summary of PCB-related activities on the Keno Hill Properties. For the full report, please see Appendix K.

Project Description:

PCBs are industrial chemicals that were synthesized and commercialized in North America beginning in the late 1920's, and were used for a wide range of electrical, heating, and other applications. It was discovered a few decades later that PCBs accumulate in living tissues and can be very harmful to organisms exposed to them; their production was ceased in the 1970's. Although purchase of products containing PCBs has long since been made illegal in Canada, owners of previously acquired PCBs were allowed to continue using their equipment.

In 2003, ACG, on behalf of YG and the NND-DC, conducted a PCB inventory and assessment. This entailed going over all existing electrical equipment (transformers, capacitors, ballasts, switchgear and other material), and documenting the stability of equipment and presence of PCBs (Elsa Property PCB Inventory and Assessment Report). The inventory was requested by CEPA inspectors to ascertain compliance with PCB regulations.

Environment Canada also requested that measures be developed and implemented to safely store PCB contaminated equipment in accordance with federal regulations. In the summer of 2004, ACG and Ewing Transport consolidated known electrical equipment containing PCBs into secure storage areas to bring the inventory and storage conditions of the PCB equipment on the Keno Hill Property into full compliance with Environment Canada CEPA legislation.

Objectives:

- Determine presence of PCBs in electrical equipment throughout property;
- Develop measures to safely store PCB-containing materials on site until their eventual disposal;
- Relocate all PCB equipment to designated storage areas; and

- Implement monitoring system to ensure all equipment is kept in compliance and is not threat to the environment or living organisms.

Methodology:

- Submit an inventory and assessment report to Environment Canada, with a commitment from YG's Type II (Abandoned) Mines Office to developing a storage/disposal plan for PCB equipment on site;
- Develop a work plan to direct site activities in 2004 targeted at bringing the site PCB equipment into compliance with CEPA storage regulations;
- Confirm de-energized status of all areas on the Keno Hill Properties where further testing or removal/re-location of electrical equipment was anticipated;
- Screen, sample, and analyse previously inaccessible equipment; and
- Collect oil samples from stored electrical equipment in the Valley Tailings Storage Facility for PCB analysis.

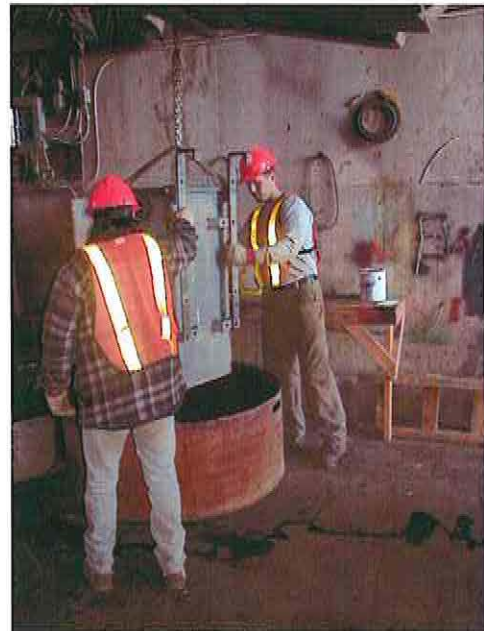


Plate 19 – Ewing employees placing PCB-contaminated electrical equipment in secondary containment

Relocation activities consisted of:

- The selection and preparation of storage locations for regulated and non-regulated equipment. Transport garage #11 was chosen for the Elsa Regulated Equipment Storage Location (PCB Storage Site B) due to its central location, easy access and large access doors, structural integrity and for the potential to ensure secure storage within. The framing yard (Transformer Site C) was selected for the storage of most unregulated electrical equipment, as unregulated equipment had been consolidated at this location previously (ACG, 2003) and is still located there.

- Relocation of electrical equipment from outlying locations to the appropriate storage area in Elsa. Outlying areas with electrical equipment requiring relocation included:
 - Keno 700;
 - Husky Substation;
 - Ruby Adit; and
 - Valley Tailings Facility and Pumphouse Road.
- Relocation of electrical equipment from various sites in and around the Elsa townsite to the appropriate storage area.



Plate 20 - Transformers being transported to storage area

Ewing Transportation conducted relocation of the equipment to designated storage areas. Their project labourers (including NND members) were previously trained in spill contingency and safe hazardous material transportation and handling methods for the Hazardous Material Consolidation Project. Spill containment and clean-up materials were on hand during all transformer handling activities.

Transformers were inspected for leaks or loose components, and if determined to be of sound integrity were lifted into a trailer-mounted temporary containment vessel and transported to the appropriate storage area. Regulated equipment was placed in secondary containment and each was given a label from Environment Canada that indicated both the presence of PCB contamination and its total PCB concentration.

Three regulated transformers were not transported to the regulated storage location and were located at the Boiler House Substation (PCB Storage Site C). These transformers could not be moved without being first drained of oil. ACG and Ewing provided YG and Environment Canada with a plan to contain the units in place and cover from the elements as required by Environment Canada PCB Storage Regulations. This plan was executed by ACG and Ewing, with NDNFN citizen J. Germaine of Ewing Transportation acting as project manager.

Mr. Germaine proposed the methodology to YG, compiled materials and machinery requirements, managed most of the project execution and informed ACG regarding the project progress and completion.

An inventory of the contents of each PCB storage site were added to ACG's Keno Hill PCB Fire and Emergency Response Plan, and all storage sites are inspected by ACG monthly with inspection details documented in site logbooks.

Current Status:

All electrical materials identified by ACG containing regulated concentrations of PCB's are currently stored in compliance with Environment Canada PCB regulations. YG has issued a request for proposal from qualified contractors to remove and dispose of the regulated PCB equipment, with these activities planned to be undertaken in the summer of 2005.

3.3 HAZARDOUS MATERIAL ASSESSMENT AND CONSOLIDATION

Project Description:

A large quantity of hazardous chemicals accrued throughout the Keno Hill Properties when the mines were in operation, little of which was properly stored for disuse. The chemicals include those used in the milling processes, de-scaling agents for water systems and boiler operations, hydrocarbon-based fuels and lubricants and small volumes of chemicals used in laboratory assays.

In the spring of 2004, ACG proposed a workplan and budget to conduct an inventory and consolidation activities of the hazardous materials on the property. The aim of the workplan was to produce comprehensive inventory information that could be used to manage the risk of adverse environmental effects and to maintain a high level of public safety. Following these activities, ACG worked with Ewing Transport, NND DC and others to effect the consolidation and safe storage of all hazardous Materials (HazMat) located throughout the Keno Hill

Properties. ACG's full report on this project accompanies this Final Project Report as Appendix L.

Objectives:

- Compile and inventory materials of a hazardous nature;
- Consolidate and store the materials in compliance with applicable regulations and accepted protocols;
- Bring the site into and maintain compliance with environmental and workplace health and safety legislation and regulations in a cost effective manner;
- Compile an inventory of hazardous materials on the Keno Hill Property;
- Determine and report on the physical stability of vessels and containers,
- Ascertain hazardous chemical material storage requirements;
- Develop and implement a cost-effective collection, storage and containment strategy; and
- Report findings.

Methodology:

The identification and consolidation of hazardous materials on the Keno Hill Property were completed in five stages:

- Review and compilation of previously documented hazardous material information on the Keno Hill Property and discussions with site caretakers and historic operators possessing historical knowledge of site operations and associated hazardous material use;
- Comprehensive hazardous material site investigation of



Plate 21 – Ewing employees moving waste hydrocarbon drums to bermed storage area

Keno Hill Property;

- *Workplace Hazardous Materials Information Systems (WHMIS) and Transportation of Dangerous Goods (TDG) Training* for ACG staff and NND laborers, involved in the handling of hazardous materials;
- Preparation of a hazardous materials inventory and identified hazardous materials information research, including health risks, reactivity, transportation/storage considerations and spill response for materials identified on the Keno Hill Property; and
- Consolidation and storage of hazardous materials at storage sites.

ACG compiled an inventory of all known hazardous chemicals throughout the Keno Hill Properties and assigned ID codes to each item and recorded their location and suspected contents, volumes, material state, and comments on container integrity and investigators' concerns.

With the inventory completed, ACG and Ewing/NNDFN employees attended WHMIS and TDG training sessions in Mayo, team members were outfitted with appropriate Personal Protection Equipment (PPE), and all safety precautions were taken as advised by N. Prasad of the Yukon Worker's Compensation Health and Safety Board. ACG prepared a *Health and Safety and Emergency Response Plan* for project team members, and ACG Project Manager S. Keesey conducted a half-day project orientation and safety session in Elsa before consolidation activities took place.

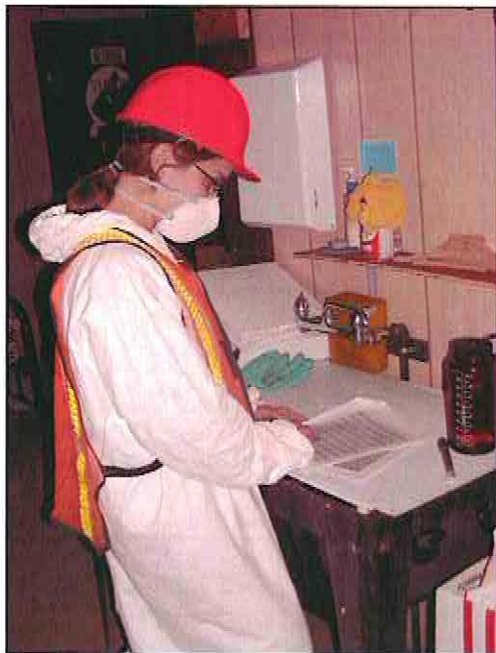


Plate 22 - ACG employee preparing to pack waste laboratory chemicals

Over a two-week period, storage sites for hazardous materials were prepared, and all accessible hazardous materials on the properties were collected and relocated. When possible, substances in compromised containers were re-packaged, and special wastes were stored in accordance with Environment Canada's *User's Guide to the Preparation and Handling of Labpacks*. Ewing Transport, adhering to Yukon Environment Act Special Waste Regulations, prepared bermed and lined storage area for hydrocarbon materials.

Research into the properties of the inventoried assay lab chemicals revealed the highly volatile nature of one container of picric acid (trinitrophenol). The RCMP was contacted regarding this substance and

on June 28, 2004, S. Keesey of ACG accompanied the RCMP Explosives Disposal Unit (EDU) to the site. The container was relocated from the storage area by the EDU and detonated remotely.

Current Status:

The hazardous material consolidation was finalized at the site by conducting activities at the storage areas in preparation of contractor removal and disposal services in the summer of 2005. These activities were aimed at providing clear direction and access to the storage sites for the chosen contractor with minimal assistance of YG or ACG. These activities included:

- clearing access and egress routes to the storage sites and materials of debris or obstacles;
- designing and posting a clear and visible signage system for the site that corresponds with project mapping;

- Plate 19 - Transformers being transported to storage area preparing the storage areas for the interim time preceding disposal, such that the storage sites are in compliance with Yukon Environment Act, *Special Waste Regulations*; and
- providing YG with comprehensive site maps and hazardous material inventories in hard copy and digital formats.



Plate 23 – Ewing employees and RCMP members at site during picric acid detonation activities

4.0 HUMAN RESOURCES

The following table illustrates the Human Resource breakdown for the contract Year of Care and Maintenance Activities at the Keno Hill Property. A full Human Resources Survey is attached as Appendix L.

Table 9 - Human Resources (person Weeks) by Company and Project Component

Project Component	ACG	Ewing Transport (includes NND-FN labour for Water Treatment & Special Projects)	NND-DC
Project Management	19	22	-
Technical Management	108	5	23
Water Treatment and Supporting Maintenance	-	333	-
Special Projects	8	26	-
Caretaking/Site Inspection	2	69	-
Administrative/Contract Management	24	9	50
Totals	161	464	73

* Note: These totals are based on 8-hour workdays and 40-hour workweeks.

5.0 FINANCIAL PERFORMANCE

Project budget and variance reporting on a bi-monthly basis was successful in maintaining proper controls over expenditures during the year. The contract total budget was \$2,524,872 and invoicing for the year totalled \$2,362,206 – representing a variance of 6.4% under budget. The budgetary surplus is mainly due to unused contingency costs. Special Project costs totalled an additional \$364,329.

6.0 RECOMMENDATIONS

ACG, through its familiarity with the site in general and with environmental issues in particular, has identified areas in the care and maintenance regime that either require further attention beyond regularly scheduled/conducted activities, or could benefit from further data acquisition. ACG hereby recommends that YG consider funding the following activities:

- **Investigation Into Water Treatment System Optimization** – the present water treatment system (Silver King, Valley Tailings, Galkeno 900, Bellekeno and in particular Galkeno 300) was designed as a short-term, temporary measure in the early 1990's while more permanent solutions to the metal-rich mine effluent problem were developed. Although we have instituted improvements to the in-tank slurry mixing and application technology (which have shown measurable improvement), the overall system could benefit from a professional metallurgical assessment. Problems with the current treatment system include a high cost of operation, concerns over structural integrity of secondary ponds, and sludge management. This is particularly the case for Galkeno 300. These problems may be resulting in unnecessarily high operating and maintenance costs associated with maintaining a system that was not designed for long-term use.

Recommendation: Engage a water treatment process metallurgical specialist to assess the treatment systems and to provide recommendations for system optimization.

- **Galkeno Hill Groundwater Sampling** – sampling of the groundwater at the monitoring fences on Galena Hill down-gradient of Galkeno 300 adit should continue on a twice-annual schedule to further characterize the geochemical structure of the G300 treated effluent flow in the subsurface. Results from this sampling will provide further insight into the potential for attenuation of the metal load in the effluent by the shallow soils, with the treatment system having operated for over 14 months.

Recommendation: Continue groundwater monitoring program on Galena Hill.

- **Lead Isotope Analysis of Galkeno 300 and Silver King 100 Flows** – discussions with P. Roach of DIAND have identified the potential for using lead isotope analysis to identify geochemical 'fingerprints' of specific flow sources and then to determine the relative inputs

of these sources into aquatic receiving environments. This may be specifically helpful in determining what contaminant sources are contributing to the metal loading of Christal Creek, Galena Creek, Flat Creek and the South McQuesten River, and possibly also to what relative degree these sources are impacting the aquatic receiving environments. This sampling could be conducted in concert with the ongoing monthly Galkeno 300 Receiving Environment Monitoring Program.

Recommendation: Develop lead isotope sampling program for site.

- ***Bioassay Sampling of Silver King and Bellekeno Discharges*** – analysis of the toxicity of these raw discharges result in the potential for YG to scale back or discontinue treatment at these sites, thereby reducing site care and maintenance expenditures considerably.

Recommendation: Collect bioassay samples at Silver King and Bellekeno

- ***Continuation/Expansion of the Keno Valley Receiving Environment Monitoring Program*** – continued twice annual collection of water quality and quantity data at the existing sampling locations will provide data sets that are comparable with past years, and trend analysis can begin. Water quality and quantity analysis provides only a portion of the total picture of receiving environment health. It is recommended that the following components be added to this monitoring program:

- ***Old Adit Drainage Sampling Program*** – conducted sporadically in the past, ACG recommends that this program be re-instated on an annual basis as a source assessment of adit flows. As evidenced by the Galkeno 300 flow, these discharges have the potential to exhibit drastically different water quality and quantity characteristics temporally. Key sites include No Cash 500, Ruby, Birmingham and Keno 700.
- ***Benthic Macroinvertebrate Sampling*** – invertebrate population parameter analysis provides a robust indication of aquatic habitat health. Bio-assessment through aquatic invertebrate sampling can specifically determine if metal loading is impacting the aquatic receiving environment, and can be reflective of impacts to secondary production (i.e. food source for fish populations) and reliant trophic levels.
- ***Fisheries Assessment*** – an assessment of fish populations in Christal Creek, Flat Creek and the confluence of the South McQuesten River would provide

definitive information regarding the current impact of mining related activities from the Keno Hill sites on the primary aquatic resource of concern. Presently, compliance for the Galkeno 300 treatment system is measured by way of fish bioassay. Current fisheries population information in the receiving waters would provide a valuable cross-reference for the recent bioassay results. This program would provide a meaningful and valuable training/work opportunity for NND citizens.

Combined with the continued monitoring of the G300 receiving environment, information collected through these programs would give managers a comprehensive understanding of the extent, magnitude and sources of impacts to the aquatic receiving environment.

Recommendation: Expand and continue receiving environment monitoring in the Keno Valley.

- **Employee Training - Capacity Building** – the Keno Hill project is well suited to providing valuable on-the-job training to citizens who could then take the new skills and experience to future work opportunities. Specific opportunities would be in fisheries assessment work, water sample collection and custody, small maintenance project management, and laboratory procedures and analysis.
- **PCB and Hazardous Materials Disposal** – With consolidation and storage activities completed, it is recommended that YG proceed with selection of a qualified contractor to conduct the removal and disposal of the materials from the site.
- **Surface Liabilities/Safety Hazards** – Further clean up and removal of environmental disturbances and safety hazards such as dilapidated buildings, disused telegraph wire, power lines, scrap metal, etc.
- **GIS Database** – NND Lands Branch currently has in-house competency in GIS database preparation and analysis. While ACG has a significant amount of digital data for the site, the environmental information for the Keno Hill properties has never been compiled into a useable GIS.

- **Water Quality Database** – The preparation of a comprehensive, searchable database of water quality data linked to the GIS Database would be beneficial to future operators and potential purchasers.



7.0 SUMMARY

The Care and Maintenance of Keno Hill, Yukon, has successfully mitigated most environmental impacts from mine drainages, protected public safety, worker health and safety, and protected valuable assets of the site.

Site water treatment facilities continue to be improved and optimized to provide for effective water treatment. Other projects have been initiated to continue to meet the objectives of proper environmental management and reducing the magnitude of environmental risks at the site. Significant steps have been taken to understand and reduce the environment liabilities at the site. Particular attention has also been given to ensuring worker health and safety and providing training and capacity building opportunities for NND citizens.

We believe that the team of ACG, Ewing Transport and NND-DC is ensuring that the Yukon Government is meeting expectations regarding the management of environmental liabilities at the Keno Hill property.