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March 21, 2005 ACG File No.: YTG-04-01

Government of Yukon
Energy, Mines and Resources K-10
Mineral Management Branch
Box 2703
Whitehorse, YT Y1A 2C6

Attn: Mr. Hugh Copland, Abandoned Mines Project Manager

Re: Galkeno 300 Receiving Environment Monitoring – October/November/ December 2004

Dear Mr. Copland:

This document outlines the results from Access Consulting Group's (ACG) continued monitoring of the Galkeno 300 (G300) adit discharge and its environmental effects upon the receiving environment, namely Christal Creek and the South McQuesten River, for the months of October, November and December, 2004.

BACKGROUND

Following the identification 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 1) 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, and the results have been reported by ACG in these previous Summary Reports:

- December 2003 / January 2004
- February / March / April 2004
- May / June 2004
- July 2004
- August / September 2004

METHODOLOGY

Monthly Sampling

Consistent with previous sampling events, samples were collected over two-day periods and were analyzed for dissolved and total metals and general parameters at Norwest Labs in Vancouver. Dissolved metals samples were field filtered and all metal samples were fixed with 20% nitric acid before shipping. The analytical results for these comprehensive monthly samples are shown in Tables 1, 2 and 3 and the original results from Norwest Labs are available from ACG upon request.

Bioassay Sampling

As part of the monthly sampling regime, bioassay samples were collected at site ACG-WQ-10 (Culvert 4 on the Silver Trail Highway) and were analyzed by Integrated Resource Consultants (IRC) in Richmond, BC. This culvert has been identified as the fugitive flow primary point of crossing the Keno Highway and is the last practical sampling point for the flow prior to its entrance into Christal Creek. IRC conducted a 96-hour LT_{50} toxicity bioassay using rainbow trout (*Oncohrynchus mykiss)*. The bioassay results are shown in Tables 4, 5 and 6 and the original IRC results are shown in Attachments 1, 2, and 3.

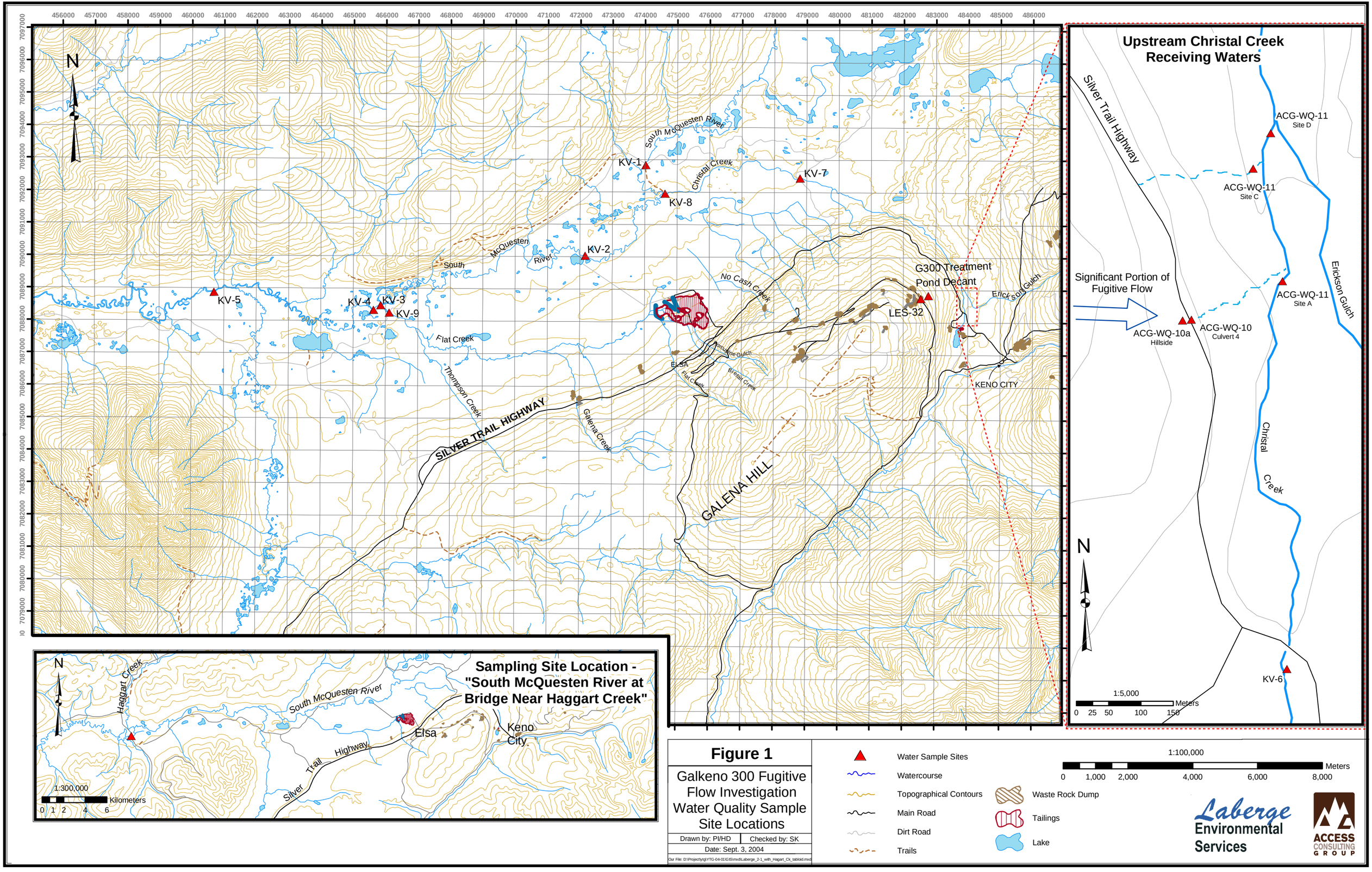


Figure 1

Galkeno 300 Fugitive Flow Investigation Water Quality Sample Site Locations

Drawn by: PI/HD	Checked by: SK
Date: Sept. 3, 2004	

Our File: D:\Projects\gjY\G-04-01\GIS\mxd\Laberge_2-1_with_Hagart_Ck_tabloid.mxd

Water Sample Sites
Watercourse
Topographical Contours
Main Road
Dirt Road
Trails
Waste Rock Dump
Tailings
Lake

1:100,000
Meters
0 1,000 2,000 4,000 6,000 8,000

Laberge Environmental Services

ACCESS CONSULTING GROUP

Weekly / Daily Sampling

Under instruction from ACG, the site operators (Ewing Transport) include eight of the more accessible monitoring sites in their weekly sampling regime, the samples from which are analyzed for total Zn content by a Perkins-Elmer Model atomic absorption spectrophotometer at the on-site laboratory in Elsa. These weekly results are displayed in Tables 7, 9 and 11 with the total Zn concentrations from the monthly samples analyzed at Norwest Labs. As a method of determining the relative precision of the on-site analytical methods and instrumentation, weekly G300 samples (shaded blue in Tables 7, 9 and 11) are split from samples collected for the monthly external analysis.

Site staff also continue to conduct daily sampling of the decant flow from the G300 treatment pond for on-site zinc analysis. These results are reported in Tables 8, 10 and 12 and displayed graphically in Figure 3, 4 and 5. Figures 6 through 8 display the Zn concentrations from all sampling events in October for three distinct areas: G300 Fugitive Flow, Christal Creek Receiving Waters and G300 Downstream Receiving Waters. Figures 9 through 11 and Figures 12 through 14 display the same results for the November and December sampling events respectively.

Flow Measurements

ACG installed an Aquastar PTX2 Pressure Transducer/Datalogger and 90^{o} V-notch weir in the G300 adit in December 2003 for the purpose of obtaining continuous adit flow discharge and water temperature readings. A Hobo Air Temperature Logger is installed in the adit near the weir as well. Data from both instruments is downloaded onto a laptop computer and discharge is calculated using a standard curve that relates pressure to discharge and standard formulae specific to the weir dimensions. Figure 15 shows adit flow discharge and temperature plots for the months of October, November and December 2004.

Results

Monthly Sampling - October

Ken Nordin, Laberge Environmental Services (LES) and Scott Keesey (ACG) conducted the October monthly sampling event on October 20 and 21, 2004 (see Attachment #4 – October Field Sampling Report). All active fugitive flow, upstream receiving water and downstream South McQuesten River receiving water sites were sampled during this sampling event. The comprehensive results for dissolved and total metal analysis are displayed below in Table 1, where concentrations that exceed the CCME guidelines for the protection of freshwater aquatic life are displayed as red value entries.

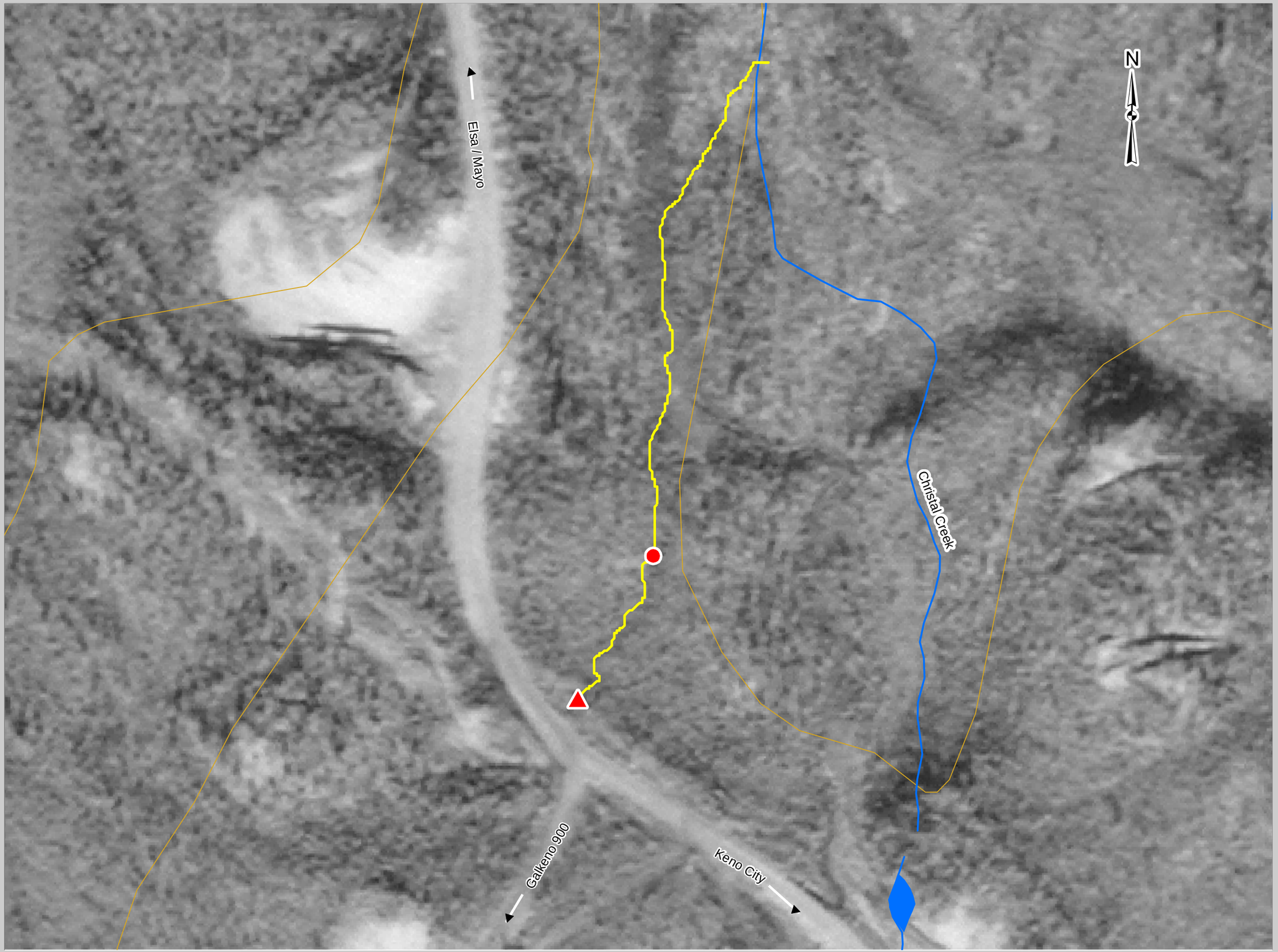
During the monthly investigation in July a surface flow was discovered joining Christal Creek between Site KV-6 and Site A from the west. Time constraints prohibited investigation of this flow in July, so it was surveyed by handheld GPS and sampled during the August event. Figure 2 delineates the flow as surveyed and shows the site where the flow was sampled in August, September and October. The flow was found to originate from a seep near the roadbed of the Silver Trail Highway, directly across from the entrance to the Galkeno 900 adit. The high field conductivity (2130 uS/cm) of this flow exceeded the conductivity of the fugitive flow at Culvert 4 at the time of the October sampling event. Field conductivity values recorded in the past, following the discovery of the surface flow that matched closely the conductivity of the fugitive flow at Culvert 4, suggested that they may have the same origin. However, consistent total zinc levels of this flow are considerably lower than the fugitive flow at both the treatment pond decant and Culvert 4 sites. This suggests that the seep is most likely natural and unconnected to the G300 flow and was therefore not sampled in the November and December sampling events.

All samples returned total cadmium levels that exceed CCME guidelines and all samples with the exception of KV 1, KV 2 and KV 5 exceeded CCME guidelines for total Zinc concentrations, results similar to all previous reporting periods. All samples except Culvert 4, Culvert 4 Hillside and Site C met CCME guidelines for

total aluminum, which indicates aluminum mobilization on the hill. The G300 adit and pond decant samples and the unidentified fugitive flow across from the G900 access road sample returned total arsenic results greater than the allowable CCME concentrations.

G300 adit and treatment pond decant samples as well as samples from Culvert 4 and the unidentified fugitive flow from across the G900 access road samples exceeded total iron CCME parameters. Sites exceeding CCME guidelines for total copper included: Culvert 4 Hillside, KV 1 and KV 7. All samples met CCME guidelines for total lead concentration except the G300 adit. Site A and KV 6 were found to exceed the total metal CCME guideline for selenium.

As part of the October monthly sampling event, a duplicate total metal sample was collected at KV-5. The blind KV-5 sample and the labeled KV-5 sample returned total metal results with excellent correlation, providing confidence in external laboratory analysis quality and consistency.



Fugitive Surface Flow near G900 Road

August and September Sampling Locations

Legend:

- Topographical Contours
- Creeks
- Fugitive Flow August 25, 2004
- August Sample Site
- September Sample Site

Air Photo NW95030-67
North West Geomatics Ltd., 1995

1:1,500

0 5 10 20 30 40 50 m

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Figure 2

Drawn by: PI, SK	Checked by:
Date: August 31, 2004	

Our File: D:\Project\ytg\YTG-04-01\GIS\mxd\G300FugitiveFlow\G300_Fugitive_Flow_Aug25_04.mxd

Table 1. Comprehensive Analytical Results for October 2004 Receiving Environment Water Quality Monitoring of Galkeno 300 Discharge

Location Description	G300 Adit	Galkeno 300 Pond Effluent	Unidentified Fugitive Flow across from G900 Access Road	Hillside Culvert #4	G300 Flow at Silver Trail Highway Culvert #4	Flow from Culvert #5 before confluence with Christal Creek	Christal Creek upstream Keno Highway	Christal Creek upstream of the flow path of Culvert #4	Christal Creek downstream Culvert #5 confluence but upstream Erickson Creek confluence	Christal Creek upstream Keno Highway	South McQuesten River upstream Christal Creek	Christal Creek at mouth	South McQuesten River at Pumphouse Pond	South McQuesten River 9km downstream Flat Creek	Blind Duplicate: South McQuesten River 9km downstream Flat Creek	Detection Limit	CCME Guidelines
Sampler	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN		
Station ID	LES-32	ACG-WQ-12		ACG-WQ-10a	ACG-WQ-10	Site C	KV.6	Site A	Site D	KV.7	KV.1	KV.8	KV.2	KV.5	KV.5		Water: Freshwater Aquatic Life
Lab	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest		
Lab Lot ID	341979-11	341979-12	341979-13	341979-2	341979-1	341979-4	341979-8	341979-3	341979-5	341979-9	341979-6	341979-10	341979-7	341979-14	341979-15		
Date	21-Oct-04	21-Oct-04	22-Oct-04	22-Oct-04	22-Oct-04	22-Oct-04	22-Oct-04	22-Oct-04	22-Oct-04	21-Oct-04	21-Oct-04	21-Oct-04	21-Oct-04	22-Oct-04	22-Oct-04		
Parameter [1]																	
Dissolved Metals (Trace)																	
Silicon	4.62	1.95		3.71	3.69	3.69	3.81	3.92	3.84	3.7	2.04	3.87	2.19	2.5		0.05	
Sulpher	324	312		288	289	283	95.8	111	120	84.6	22.1	83.1	29.1	24.1		0.05	
Aluminum	<0.005	<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	0.007	<0.005		0.005	**0.005-0.1**
Antimony	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0003	0.0003	<0.0002	0.0004	<0.0002	<0.0002		0.0002	
Arsenic	**0.0079**	**0.0098**		0.0004	0.0004	0.0005	0.0014	0.0015	0.0014	0.0018	0.001	0.0015	0.0013	0.0026		0.0002	**0.005**
Barium	0.008	0.008		0.014	0.021	0.027	0.071	0.061	0.052	0.063	0.058	0.065	0.065	0.071		0.001	
Beryllium	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.0001	
Bismuth	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		0.0005	
Boron	0.005	0.005		<0.002	<0.002	0.005	<0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.002		0.002	
Cadmium	**0.318**	**0.132**		**0.00642**	**0.0064**	**0.00623**	**0.0013**	**0.00102**	**0.00215**	**0.00304**	**0.00005**	**0.00218**	**0.00011**	**0.00014**		0.00001	**0.000017**
Chromium	<0.0005	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		0.0005	
Cobalt	0.0842	0.0292		0.0006	0.0006	0.0001	0.0002	0.0003	0.0003	0.0001	0.0002	0.0002	0.0002	0.0002		0.0001	
Copper	0.001	<0.001		0.002	0.001	**0.005**	<0.001	<0.001	<0.001	0.003	0.003	<0.001	<0.001	<0.001		0.001	**0.002-0.004**
Lead	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	0.0002	0.0005		0.0001	**0.001-0.007**
Lithium	0.027	0.028		0.007	<0.001	0.011	0.011	0.012	0.013	0.007	0.004	0.007	0.004	0.004		0.001	
Molybdenum	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	**0.073**
Nickel	**0.312**	0.0719		0.0134	0.0135	0.0141	<0.0005	0.0008	0.0013	<0.0005	0.0014	<0.0005	0.001	0.001		0.0005	**0.025-0.15**
Selenium	<0.0002	<0.0002		0.0004	0.0007	0.0005	0.0009	0.0009	0.0008	0.0008	0.0004	0.0007	0.0004	0.0004		0.0002	**0.001**
Silver	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.0001	**0.0001**
Strontium	0.202	0.408		0.501	0.513	0.535	0.23	0.277	0.304	0.27	0.209	0.279	0.208	0.21		0.001	
Thallium	0.0012	0.00108		<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005		0.00005	
Tin	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	
Titanium	0.0175	0.0177		0.0203	0.0188	0.0198	0.0068	0.008	0.0091	0.0059	0.0017	0.0058	0.0018	0.0015		0.0005	
Uranium	<0.0005	<0.0005		0.001	0.001	0.0009	0.0066	0.0058	0.0056	0.0029	0.0008	0.0031	0.0009	0.0009		0.0005	
Vanadium	0.0002	0.0001		0.0002	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002		0.0001	
Zinc	**128**	**14**		**2.33**	**2.35**	**4.34**	**0.245**	**0.218**	**0.512**	**0.608**	0.01	**0.586**	0.021	0.028		0.001	**0.03**
Total Metals (Trace)																	
Calcium	182	299	406	325	321	314	141	152	162	126	50.6	131	54.9	58.6	58.5	0.2	
Iron	**21.8**	**1.2**	**1.2**	0.2	**0.6**	0.2	0.1	0.2	<0.1	<0.1	0.2	0.1	0.1	0.2	0.2	0.1	**0.3**
Magnesium	40.1	36.8	71.3	60.3	59.7	57.4	27.5	28.5	30.8	27.8	17.1	28.6	18.1	19	18.9	0.1	
Manganese	148	124	1.36	0.628	0.695	0.014	0.292	0.365	0.286	0.127	0.049	0.231	0.074	0.076	0.073	0.005	
Potassium	0.6	0.7	2.2	<0.4	<0.4	0.5	<0.4	<0.4	<0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.4	
Silicon	4.31	1.81	4.1	3.51	3.64	3.35	3.42	3.38	3.28	3.26	1.74	3.47	1.94	2.22	2.2	0.05	
Sodium	1.5	1.6	4.6	2.9	2.8	2.3	1.7	1.8	1.9	1.7	1.9	1.7	2	2.2	2.2	0.4	
Sulphur	311	311	321	288	281	262	97.4	106	119	84.6	21.3	82.6	23.4	23.9	23.8	0.05	
Aluminum	<0.05	<0.005	<0.005	**0.111**	**0.268**	**0.143**	<0.005	0.019	0.008	0.01	0.03	<0.005	0.033	0.023	0.024	0.005	**0.005-0.1**
Antimony	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.0003	0.0004	<0.0002	0.0004	<0.0002	0.0005	<0.0002	0.0002	
Arsenic	**0.151**	**0.0156**	**0.0052**	0.0009	0.0016	0.0011	0.0022	0.0023	0.0018	0.0019	0.0012	0.0024	0.0016	0.0035	0.0035	0.0002	**0.005**
Barium	<0.01	0.008	0.012	0.017	0.023	0.025	0.067	0.06	0.059	0.057	0.056	0.061	0.064	0.076	0.075	0.001	
Beryllium	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	
Bismuth	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	
Boron	<0.02	0.006	0.004	0.002	0.002	0.002	0.002	0.003	0.002	<0.002	0.002	<0.002	0.002	0.003	0.003	0.002	
Cadmium	**0.3**	**0.137**	**0.00003**	**0.00682**	**0.00688**	**0.00632**	**0.00161**	**0.0014**	**0.00236**	**0.0031**	**0.00004**	**0.0023**	**0.00014**	**0.00014**	**0.00013**	0.00001	**0.000017**
Chromium	<0.005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	
Cobalt	0.108	0.0366	0.0026	0.0009	0.001	0.0003	0.0002	0.0004	0.0003	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	
Copper	<0.01	0.003	<0.001	**0.004**	0.003	0.002	<0.001	<0.001	<0.001	**0.004**	**0.015**	<0.001	0.001	0.003	<0.001	0.001	**0.002-0.004**
Lead	**0.0211**	0.0004	0.0002	0.0005	0.0018	0.0008	0.0014	0.0009	0.0006	0.0005	<0.0001	0.0007	0.0022	0.002	0.0019	0.0001	**0.001-0.007**
Lithium	0.026	0.035	0.04	0.008	0.008	0.013	0.013	0.014	0.014	0.008	0.005	0.008	0.005	0.005	0.005	0.001	
Molybdenum	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	**0.073**
Nickel	**0.394**	0.112	0.0247	0.0307	0.0307	0.0297	0.0083	0.0094	0.0105	0.0071	0.0063	0.0081	0.0064	0.006	0.006	0.0005	**0.025-0.15**
Selenium	<0.002	0.0003	0.0004	0.0004	0.0005	0.0005	**0.001**	**0.001**	0.0008	0.0008	0.0004	0.0008	0.0005	0.0004	0.0003	0.0002	**0.001**
Silver	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	**0.0001**
Strontium	0.242	0.502	0.817	0.568	0.573	0.577	0.248	0.3	0.33	0.277	0.225	0.293	0.225	0.231	0.226	0.001	
Thallium	0.0012	0.00111	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	
Tin	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
Titanium	0.019	0.0208	0.0227	0.0236	0.031	0.0262	0.0067	0.0079	0.0086	0.006	0.0019	0.0058	0.0023	0.002	0.0019	0.0005	
Uranium	<0.005	<0.0005	0.0045	0.0011	0.0011	0.0009	0.0065	0.0059	0.0052	0.0027	0.0009	0.003	0.0009	0.001	0.001	0.0005	
Vanadium	<0.001	0.0003	0.0001	0.0004	0.0009	0.0005	0.0006	0.0004	0.0005	0.0007	0.0005	0.003	0.0005	0.0006	0.0002	0.0001	
Zinc	**140**	**16.1**	**0.066**	**2.72**	**2.77**	**3.9**	**0.27**	**0.25**	**0.553**	**0.635**	0.013	**0.614**	0.029	0.025	0.024	0.001	**0.03**
Zirconium	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
Physical and Aggregate Properties																	
Temp. of Observed pH and EC	20.8	20.7		19.6	19.5	20	20	19.6	20.3	19.9	19.9	20.4	19.9	20.3			
Total Suspended Solids	28	11		8	40	12	<1	2	<1	<1	<1	<1	2	<1		1	
Routine Water																	
pH	6.68	7.82		7.59	7.63	7.64	7.82	7.92	7.89	7.95	8.04	7.93	8	7.99			
Electrical Conductivity (µS/cm at 25C)	1680	1690		1580	1580	1580	797	860	929	760	361	784	380	399		1	
Calcium (Dissolved)	184	284		338	337	341	146	165	180	129	53.1	129	57	50.9		0.2	
Magnesium (Dissolved)	42	38.1		60.9	60.8	61	27.2	29.9	33.1	27.6	17.4	27.6	18.1	18.5		0.1	
Sodium (Dissolved)	1.5	1.6		3	3	2.5	1.6	2.1	2	1.7	1.9	1.6	2	2		0.4	
Potassium (Dissolved)	0.4	0.5		<0.4	<0.4	0.5	<0.4	<0.4	<0.4	0.6	0.5	0.4	0.5	0.6		0.4	
Iron (Dissolved)	7.9	0.02		0.01	0.02	0.01	0.02	0.02	0.02	0.03	0.04	0.02	0.04	0.06		0.01	
Manganese (Dissolved)	161	122		0.608	0.568	<0.005	0.301	0.394	0.31	0.131	0.039	0.236	0.049	0.121		0.005	
Sulphate (SO4 Dissolved)	973	936		864	867	849	287	334	361	254	66.4	249	87.2	72.4		0.2	
Hydroxide	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		5	
Carbonate	<6	<6		<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6		6	
Bicarbonate	65	106		89	89	86	161	172	163	185	153	211	167	179		5	
P-Alkalinity (as CaCO3)	<5	<5		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		5	
T-Alkalinity (as CaCO3)	54	87		73	73	70	132	141	134	152	126	173	137	147		5	
Hardness (Dissolved as CaCO3)	633	867		1100	1090	1100	477	535	585	436	204	436	217	203			

Notes:

[1] All units are in mg/L unless otherwise indicated.

Values displayed in **red** indicate concentrations exceeding CCME Guidelines for the Protection of Freshwater Aquatic Life

Monthly Sampling – November

Ken Nordin, Laberge Environmental Services (LES) conducted the November monthly sampling event on November 29 and 30, 2004 (see Attachment #5 – Field Sampling Report). All active fugitive flow, upstream receiving water and downstream South McQuesten River receiving water sites were sampled during this sampling event. The comprehensive results for dissolved and total metal analysis are displayed in Table 2, where concentrations that exceed the CCME guidelines for the protection of freshwater aquatic life are displayed as red value entries.

All samples returned total cadmium levels that exceed CCME guidelines and all samples with the exception of the background sample KV-1 exceeded CCME guidelines for total zinc concentrations, results similar to most previous reporting periods. All samples except Site C met CCME guidelines for total aluminum. The G300 adit and Site C returned total arsenic results greater than the allowable CCME concentrations.

The G300 adit sample exceeded total iron CCME parameters. KV-1, KV-5, KV-7, Site C, Culvert 4 and G300 adit sampling locations all returned total copper concentrations exceeding CCME guidelines. All samples met CCME guidelines for total lead concentration except Site C and the G300 adit. All samples returned total silver concentrations exceeding the CCME guideline. Site C and KV 6 were found to exceed the total metal CCME guideline for selenium. While the G300 adit was the only site to exceed the CCME guideline for nickel, Site C alone exceeded CCME guidelines for molybdenum.

When comparing Site C sample results with results returned from known G300 fugitive flow site samples, it is evident that Site C has a geochemical signature contrasting with that of the identified G300 fugitive flow. For example, aluminum concentrations exceeding CCME guidelines are only observed in Site C results, as mentioned above. The Site C sample exceeded acceptable concentrations for molybdenum, while all other samples returned molybdenum results below instrument detection limits. Where analysis of total metal for the G300 adit sample returned concentration levels below detection limits for eight different metals including

chromium, selenium, molybdenum and zirconium, analysis of the Site C sample revealed the presence of all eight of these metals in concentrations greatly exceeding that of the detection limits. This geochemical evidence suggests that the flow crossing the Silver Trail Highway at Culvert #5 and sampled at Site C originates from a different source than the G300 fugitive flow.

Although many parameters analysed for the G300 adit sample were in exceedence of CCME guidelines, most of these concentrations are significantly reduced by the treatment regime, and by Culvert 4, metal concentrations approach those measured in the background sample.

As part of the November monthly sampling event, a blind duplicate total metals sample was again collected at KV-5. There was no significant variation between the blind and labeled KV-5 total metals samples, again providing a measure of external quality control for Norwest Labs analytical procedures.

Table 2. Comprehensive Analytical Results for November 2004 Receiving Environment Water Quality Monitoring of Galkeno 300 Discharge

Location Description	G300 Adit	Galkeno 300 Pond Effluent	G300 Flow at Silver Trail Highway Culvert #4	Flow from Culvert #5 before confluence with Christal Creek	Christal Creek upstream Keno Highway	Christal Creek upstream of the flow path of Culvert #4	Christal Creek downstream Culvert #5 confluence but upstream Erickson Creek confluence	Christal Creek upstream Keno Highway	South McQuesten River upstream Christal Creek	Christal Creek at mouth	South McQuesten River at Pumphouse Pond	South McQuesten River 9km downstream Flat Creek	Blind Duplicate: South McQuesten River 9km downstream Flat Creek	Detection Limit	CCME Guidelines
Sampler	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN		
Station ID	LES-32	ACG-WQ-12	ACG-WQ-10	Site C	KV.6	Site A	Site D	KV.7	KV.1	KV.8	KV.2	KV.5	KV-5		Water: Freshwater Aquatic Life
Lab	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest		
Lab Lot ID	350925-12	350925-11	350925-10	350925-8	350925-4	350925-7	350925-9	350925-5	350925-1	350925-6	350925-2	350925-3	350925-13		
Date	29-Nov-04	29-Nov-04	30-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	30-Nov-04	30-Nov-04		
Parameter [1]															
Dissolved Metals (Trace)															
Silicon	2.93	0.15	2.71	2.56	3.5	3.36	3.39	3.27	2.14	3.26	2.42	2.47		0.05	
Sulpher	253	261	274	278	93.2	104	106	78.1	24.6	77.1	26.7	24.3		0.05	
Aluminum	<0.005	0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.01		0.005	**0.005-0.1**
Antimony	<0.0002	<0.0002	0.0003	<0.0002	0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0002		0.0002	
Arsenic	0.0033	0.0002	0.0004	0.0007	0.0011	0.0013	0.0011	0.0011	0.0012	0.001	0.0012	0.0013		0.0002	**0.005**
Barium	0.007	0.007	0.013	0.023	0.069	0.062	0.06	0.055	0.062	0.054	0.069	0.043		0.001	
Beryllium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.0001	
Bismuth	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		0.0005	
Boron	0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003		0.002	
Cadmium	0.239	0.00142	0.00376	0.00189	0.00107	0.00093	0.00113	0.0007	0.00003	0.001	0.00007	0.00002		0.00001	**0.000017**
Chromium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		0.0005	
Cobalt	0.084	0.0005	0.0022	<0.0001	0.0003	0.0004	0.0003	0.0002	0.0001	<0.0001	<0.0001	0.0001		0.0001	
Copper	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001		0.001	**0.002-0.004**
Lead	<0.0001	<0.0001	0.0003	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0005		0.0001	**0.001-0.007**
Lithium	0.018	0.02	0.006	0.01	0.009	0.01	0.009	0.006	0.004	0.006	0.004	0.004		0.001	
Molybdenum	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	**0.073**
Nickel	0.303	<0.0005	0.0088	0.0128	0.0023	0.0016	0.0022	0.0007	0.0046	0.0007	0.0036	0.0027		0.0005	**0.025-0.15**
Selenium	<0.0002	<0.0002	<0.0002	0.0005	0.0009	0.0008	0.0007	0.0006	0.0004	0.0008	0.0004	0.0003		0.0002	**0.001**
Silver	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.0001	**0.0001**
Strontium	0.234	0.535	0.583	0.206	0.225	0.266	0.29	0.24	0.226	0.242	0.216	0.198		0.001	
Thallium	0.00129	0.0009	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005		0.00005	
Tin	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		0.001	
Titanium	0.0105	0.0144	0.0164	0.0154	0.0049	0.0053	0.0058	0.0034	0.0012	0.0039	0.0013	0.0016		0.0005	
Uranium	<0.0005	<0.0005	0.0022	0.0025	0.0064	0.0059	0.0058	0.0036	0.0008	0.0036	0.0009	0.001		0.0005	
Vanadium	0.0001	0.0001	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	
Zinc	134	0.005	1.92	4.86	0.256	0.216	0.371	0.282	0.021	0.357	0.037	0.014		0.001	**0.03**
Total Metals (Trace)															
Calcium	176	388	349	375	138	148	154	122	50.3	122	56	57.1	57.2	0.2	
Iron	13.3	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.1	0.2	0.1	0.2	0.2	0.3	0.1	**0.3**
Magnesium	37.6	34.8	61.5	61	25.4	25.9	27.6	24.2	17.2	24.6	17.8	17.9	17.8	0.1	
Manganese	161	38.9	0.982	0.083	0.839	0.747	0.728	0.351	0.061	0.246	0.07	0.072	0.08	0.005	
Potassium	0.6	0.6	<0.4	0.6	<0.4	0.5	0.4	0.6	0.6	<0.4	0.7	0.6	0.6	0.4	
Silicon	3.51	0.21	2.84	2.94	3.43	3.59	3.18	3.59	2.09	3.1	2.36	2.3	2.3	0.05	
Sodium	1.5	1.7	2.8	2.3	1.7	1.8	1.8	1.7	2.5	1.7	2.8	2.5	2.5	0.4	
Sulphur	286	318	291	323	95.2	104	108	79	23.9	78.3	26.2	24.9	25.3	0.05	
Aluminum	0.021	0.007	0.051	0.98	0.006	0.017	0.011	0.011	0.031	0.007	0.018	0.014	0.013	0.005	**0.005-0.1**
Antimony	0.0004	<0.0002	0.002	0.0411	0.0006	0.0002	<0.0002	<0.0002	<0.0002	0.0005	0.0002	0.0024	<0.0002	0.0002	
Arsenic	0.0802	0.0013	0.0004	0.0402	0.0016	0.002	0.0018	0.0019	0.0013	0.0021	0.0015	0.003	0.003	0.0002	**0.005**
Barium	0.01	0.007	0.015	0.219	0.071	0.064	0.063	0.06	0.066	0.056	0.072	0.081	0.083	0.001	
Beryllium	<0.0001	<0.0001	<0.0001	0.0196	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	
Bismuth	<0.0005	<0.0005	<0.0005	0.108	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	
Boron	0.002	0.006	<0.002	0.379	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	0.002	0.002	0.002	
Cadmium	0.263	0.00565	0.00402	0.00189	0.00138	0.00117	0.00147	0.00103	0.00008	0.00122	0.00013	0.00013	0.0002	0.00001	**0.000017**
Chromium	<0.0005	<0.0005	<0.0005	0.1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	
Cobalt	0.0938	0.0009	0.0025	0.0185	0.0004	0.0003	0.0004	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	
Copper	0.003	<0.001	0.002	0.193	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	0.002	0.002	0.001	**0.002-0.004**
Lead	0.011	<0.0001	0.0018	0.0198	0.0024	0.0014	0.0013	0.0006	0.0003	0.0017	0.0005	0.0018	0.0006	0.0001	**0.001-0.007**
Lithium	0.016	0.029	0.007	0.205	0.009	0.014	0.01	0.011	0.004	0.006	0.004	0.004	0.003	0.001	
Molybdenum	<0.001	<0.001	<0.001	0.22	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	**0.073**
Nickel	0.343	0.0033	0.0121	0.0979	0.0036	0.004	0.0041	0.0026	0.0054	0.0019	0.0043	0.0035	0.0035	0.0005	**0.025-0.15**
Selenium	<0.0002	<0.0002	0.0003	0.0406	0.001	0.0008	0.0009	0.0007	0.0004	0.0009	0.0005	0.0003	0.0004	0.0002	**0.001**
Silver	0.0005	0.0003	0.0005	0.0187	0.0006	0.0003	0.0005	0.0003	0.0013	0.0005	0.0008	0.0009	0.0006	0.0001	**0.0001**
Strontium	0.211	0.596	0.646	0.206	0.248	0.307	0.322	0.292	0.252	0.27	0.243	0.259	0.265	0.001	
Thallium	0.0013	0.00109	<0.00005	0.00946	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005	
Tin	<0.001	<0.001	<0.001	0.215	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
Titanium	0.0121	0.0156	0.0185	0.101	0.0065	0.0049	0.0062	0.004	0.0017	0.004	0.0016	0.0016	0.0013	0.0005	
Uranium	<0.0005	<0.0005	0.0022	0.101	0.0063	0.0056	0.0058	0.0036	0.0009	0.0035	0.001	0.001	0.001	0.0005	
Vanadium	0.0001	0.0019	0.0004	0.0193	0.0002	0.0005	0.0003	0.0005	0.0003	0.0003	0.0003	0.0005	<0.0001	0.0001	
Zinc	169	0.293	2.22	0.185	0.255	0.243	0.389	0.291	0.02	0.385	0.038	0.036	0.055	0.001	**0.03**
Zirconium	<0.001	<0.001	<0.001	0.211	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
Physical and Aggregate Properties															
Total Suspended Solids	31	26	9	<2	<2	<2	<2	<2	<2	<2	<2	<2		1	
Routine Water															
pH	6.4	8.8	7.3	7.4	7.4	7.6	7.6	8	7.8	7.8	7.7	7.7			
Electrical Conductivity (µS/cm at 25C)	1740	1750	1850	1850	835	900	960	760	410	760	440	435		1	
Calcium (Dissolved)	156	320	342	337	138	152	151	122	53	122	57.2	49.6		0.2	
Magnesium (Dissolved)	33.3	29.5	59.7	56.4	25.7	27.6	27.2	24.6	17.6	24.7	18.2	17.7		0.1	
Sodium (Dissolved)	1.4	1.5	2.9	2.1	1.8	2	1.8	1.7	2.6	1.8	3	2.6		0.4	
Potassium (Dissolved)	0.7	0.7	0.5	0.8	0.5	0.5	0.6	0.6	0.9	0.6	0.8	0.8		0.4	
Iron (Dissolved)	0.94	<0.01	<0.01	<0.01	0.03	0.03	<0.01	<0.01	0.08	0.01	0.04	0.03		0.01	
Manganese (Dissolved)	164	29.9	0.965	0.061	0.815	0.792	0.709	0.343	0.053	0.23	0.066	0.037		0.005	
Sulphate (SO4 Dissolved)	988	947	989	970	315	319	342	257	71.5	248	78.4	76.4		0.11	
Hydroxide	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5		5	
Carbonate	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6		5	
Bicarbonate	56	79	134	122	172	182	178	193	162	193	175	188		5	
T-Alkalinity (as CaCO3)	46	64	110	100	141	150	146	158	133	158	144	154		5	
Hardness (Dissolved as CaCO3)	525	919	1100	1070	451	495	490	406	205	406	218	197			

Notes:

[1] All units are in mg/L unless otherwise indicated.
Values displayed in **red** indicate concentrations exceeding CCME Guidelines for the Protection of Freshwater Aquatic Life

Monthly Sampling - December

Scott Keesey and Kevin Tweedle of Access Consulting Group (ACG) conducted the December monthly sampling event on December 16 and 17, 2004 (see Attachment #2 – Field Sampling Report). All active fugitive flow, upstream receiving water and downstream South McQuesten River receiving water sites were sampled with the exceptions of Site A and KV-5 which were not sampled due to time limitations as a result of seasonally short days.

The comprehensive results for dissolved and total metal analysis are displayed in Table 1, where concentrations that exceed the CCME guidelines for the protection of freshwater aquatic life are displayed as red value entries. Laboratory results were reported by Norwest Labs for this reporting period not in mg/L (ppm) as usual, but in ***ug/L or part per billion (ppb)*** , and are displayed as such in Table 3, except where otherwise noted.

All samples returned total zinc and cadmium levels that exceed CCME guidelines, as observed in previous reporting periods. The G300 adit and pond decant samples returned total arsenic results greater than the allowable CCME concentrations. The G300 adit and treatment pond decant samples returned the only total lead results exceeding CCME guidelines, while samples collected at Culvert 4 and KV-8 returned the only total copper results exceeding CCME guidelines. All samples returned total silver, selenium and nickel concentrations meeting the CCME guideline.

As part of the December monthly sampling event blind duplicate samples were collected at KV-1 (total metals) and KV-7 (dissolved metals). Total metals results were returned with excellent correlation between labeled and blind KV-1 samples. However, the duplicate dissolved metal samples collected at KV-7 revealed a significant discrepancy in dissolved iron concentrations. As this blind duplicate was diluted by 20 times for analysis, this anomalous result in the blind duplicate may be a result of laboratory dilution procedures or mathematical extrapolation, or may actually reflect iron contamination of the duplicate sample.

Also, a series of travel blank samples including a de-ionized (DI) water sample, a preserved de-ionized water sample, and a preserved and field filtered DI water sample were sent for analysis as a means to determine if any contamination is occurring to water samples as a result of current field filtration, handling and sample preservation equipment and protocols. The straight DI travel blank returned negligible total metal results, as did the preserved DI sample. The 2 and 4 ppb zinc results in the two samples are well within analytical error ranges, and are well below levels that would significantly impact other results.

The field filtered travel blank (diluted 50 times for analysis) returned only silicon and sulfur concentrations above detection levels (4 and 10 ppm respectively). These concentrations are negligible, and neither is regulated by CCME criteria. These results provide some confidence that the filtering equipment and protocols used for the sampling events are not compromising the results. Future preserved duplicate samples will be sent with separate aliquots for pH and conductivity analysis to eliminate the need to dilute the sample.

Monthly Sampling Conclusion

Generally, the treatment regime at Galkeno 300 is successful at reducing the metal load of the adit discharge waters, but the treatment pond is consistently being overwhelmed by a red floc substance that does not settle effectively and is complexing with metals, preventing their precipitation in the pond. Although the previous sections have discussed metal concentrations at the G300 adit and at the treatment pond decant in the context of the CCME criteria for the protection of aquatic life, these criteria do not apply to discharge flows before their confluence with natural water bodies. Thus, the values of greatest concern are those of the fugitive flow measured immediately preceding its entry into Christal Creek, i.e. at Culvert 4, and at sites further downstream.

Table 3. Comprehensive Analytical Results for December 2004 Receiving Environment Water Quality Monitoring of Galkeno 300 Discharge

Location Description	G300 Adit	Galkeno 300 Pond Effluent	G300 Flow at Silver Trail Highway Culvert #4	Flow from Culvert #5 before confluence with Christal Creek	Christal Creek upstream Keno Highway	Christal Creek downstream Culvert #5 confluence but upstream Erickson Creek confluence	Christal Creek upstream Keno Highway	Blind Duplicate (Dissolved Metals) from Christal Creek upstream Keno Highway	South McQuesten River upstream Christal Creek	Blind Duplicate (Total Metals) from South McQuesten River upstream Christal Creek	Christal Creek at mouth	South McQuesten River at Pumphouse Pond	Travel Blank D.I.	Travel Blank Preserved	Travel Blank Filtered	Detection Limit	CCME Guidelines
Sampler	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK	SK		
Station ID	LES-32	ACG-WQ-12	ACG-WQ-10	Site C	KV.6	Site D	KV.7	KV.7	KV.1	KV.1	KV.8	KV.2	De- ionized	De- ionized	De- ionized		
Lab	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest	Norwest		
Lab Lot ID	354300-6	354300-7	354300-8	354300-9	354300-3	354300-10	354300-4	354300-12	354300-1	354300-11	354300-5	354300-2	354300-13	354300-14	354300-15		
Date	16-Dec-05	16-Dec-05	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04	17-Dec-04		Water: Freshwater Aquatic Life
Parameter [1]																	
Dissolved Metals (Trace)								20x Dilution							50x Dilution		
Iron	18900	<10	<10	<10	33	28	12	400	88		13	78			<500	10	300
Manganese	169000	36200	23	8	1140	920	370	410	54		245	70			<200	5	
Silicon (mg/L)	4.75	0.25	3.66	3.28	4.26	4.05	3.81	4	2.72		4.05	3			4	0.05	
Sulfur (mg/L)	321	310	300	296	102	119	86.7	97.4	24.6		92.4	28.6			10	0.05	
Aluminum	<5	<5	<5	<5	<5	<5	<5	<100	<5		<5	<5			<200	5	5-100
Antimony	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<4	<0.2		0.3	<0.2			<10	0.2	
Arsenic	57.1	0.3	0.4	0.6	1.2	1.2	1.3	<4	1.3		1.3	1.5			<10	0.2	5
Barium	8	8	12	22	73	61	60	62	72		63	81			<50	1	
Beryllium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<0.1		<0.1	<0.1			<5	0.1	
Bismuth	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5		<0.5	<0.5			<20	0.5	
Boron	<2	<2	<2	<2	<2	<2	<2	<40	<2		<2	<2			<100	2	
Cadmium	222	2.63	4.73	4.76	0.95	0.96	0.7	0.78	0.07		1.05	0.29			<0.5	0.01	0.017
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<10	<0.5		<0.5	<0.5			<25	0.5	
Cobalt	71.7	1.3	0.1	0.1	0.5	0.5	0.2	<2	<0.1		0.1	<0.1			<5	0.1	
Copper	<1	<1	1	<1	<1	<1	<1	<20	1		4	1			<50	1	2-4
Lead	0.2	0.3	0.2	0.2	0.6	0.3	0.2	<2	0.3		0.7	0.3			<5	0.1	1-7
Molybdenum	<1	<1	<1	<1	<1	<1	<1	<20	<1		<1	<1			<50	1	73
Nickel	268	3.7	10.1	12.2	4	3.7	2.3	<10	4.8		2.1	4			<25	0.5	25-150
Selenium	<0.2	<0.2	<0.2	0.2	0.8	0.5	0.6	<4	0.3		0.7	0.3			<10	0.2	1
Silver	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<0.1		<0.1	<0.1			<5	0.1	0.1
Strontium	199	508	560	577	245	290	271	293	230		292	233			<50	1	
Thallium	1.28	1.07	<0.05	<0.05	<0.05	<0.05	<0.05	<1	<0.05		<0.05	<0.05			<2	0.05	
Tin	<1	<1	<1	<1	<1	<1	<1	<20	<1		<1	<1			<50	1	
Titanium	11	14.1	14.8	15.6	5.7	7.2	4.8	<10	1.4		5.4	1.7			<20	0.5	
Uranium	<0.5	<0.5	1.8	1.9	6.8	5.6	3.9	<10	0.9		3.9	1			<20	0.5	
Vanadium	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<2	0.1		0.1	0.2			<5	0.1	
Zinc	149000	366	2030	3390	214	322	250	314	21		322	42			<50	1	30
Zirconium	<1	<1	<1	<1	<1	<1	<1	<20	<1		<1	<1			<50	1	
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1			<0.1	0.1	
Total Metals (Trace)																	
Sulfur (mg/L)	332	320	330	320	105	130	90.5		26.5	25.9	88.1	29.5	0.2	0.17		0.05	
Mercury	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		0.2	
Antimony	0.6	0.3	<0.2	<0.2	<0.2	0.2	<0.2		<0.2	<0.2	0.4	<0.2	<0.2	<0.2		0.2	
Arsenic	47.5	22.2	1	0.9	2	2	1.5		1.6	1.5	2.6	1.6	<0.2	<0.2		0.2	5
Barium	8	9	17	25	73	65	59		73	70	57	81	<1	<1		1	
Beryllium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		0.1	
Boron	<2	3	<2	<2	<2	<2	<2		3	2	3	3	<2	<2		2	
Cadmium	226	32.8	5.32	5.18	1.14	1.26	0.85		0.09	0.07	1.17	0.28	<0.01	<0.01		0.01	0.017
Chromium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	<0.5	0.8	<0.5	<0.5	<0.5		0.5	
Cobalt	26.6	11.6	0.5	0.2	0.6	0.6	0.2		0.1	0.1	0.2	<0.1	<0.1	<0.1		0.1	
Copper	<1	<1	4	2	<1	<1	<1		2	1	7	1	<1	<1		1	2-4
Lead	18.2	10	1.8	0.4	4.2	2.1	0.4		0.3	0.5	5.8	0.4	0.3	0.1		0.1	1-7
Molybdenum	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1	<1	<1	<1		1	73
Nickel	99.2	39.4	12.4	15.2	5.6	5	3.6		7	5.4	3	5.7	<0.5	<0.5		0.5	25-150
Selenium	<0.2	<0.2	<0.2	0.3	0.6	0.6	0.7		0.3	<0.2	0.7	0.4	<0.2	<0.2		0.2	1
Silver	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		0.1	0.1
Thallium	1.29	1.12	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		0.05	
Titanium	4	17.6	20.5	19.1	6.3	7.8	5.1		1.9	1.8	6.4	1.9	<0.5	<0.5		0.5	
Uranium	0.5	<0.5	2	2	7	6.2	4.1		0.9	0.9	3.7	1.1	<0.5	<0.5		0.5	
Zinc	116000	14000	2370	4160	237	427	275		31	23	362	46	2	4		1	30
Physical and Aggregate Properties																	
Temp. of Observed pH and EC (°C)	21.1	21.3	21	21.8	21.2	22.2	22		21.2		21.4	20.9					
Total Suspended Solids	23	53	37	4	1	2	1		<1		1	2				1	
Routine Water (mg/L)																	
pH	6.76	7.56	7.54	7.52	7.7	7.81	7.99	-	7.85		7.95	7.92					
Electrical Conductivity (µS/cm at 25 C)	1690	1670	1720	1740	839	953	776	-	400		766	443				1	
Hardness (mg/L)	643	1070	1180	1130	486	570	444		228	223	440	246	<0.9	<0.9	<0.9		
Calcium (Dissolved)	185	348	334	327	144	158	130	141	55.1		138	62.6			<10	0.2	
Magnesium (Dissolved)	40.1	33.9	62.3	54.8	26.8	28.8	26.4	-	18.5		28.3	19.8				0.1	
Sodium (Dissolved)	1.6	1.8	2.8	2.1	1.8	1.8	1.7	<8	2.8		2.2	2.7			<20	0.4	
Sulfate (SO4) (Dissolved)	964	930	899	888	307	357	260	-	73.9		277	86				0.4	
Hydroxide	<5	<5	<5	<5	<5	<5	<5	-	<5		<5	<5				0.01	
Carbonate	<6	<6	<6	<6	<6	<6	<6	-	<6		<6	<6				0.005	
Bicarbonate	74	86	126	108	182	180	178	-	167		195	182				0.2	
P-Alkalinity (as CaCO3)	<5	<5	<5	<5	<5	<5	<5	-	<5		<5	<5				5	
T-Alkalinity (as CaCO3)	61	71	103	89	150	148	146	-	137		160	150				6	
Hardness (Dissolved as CaCO3)	627	1010	1090	1040	469	512	433	474	214		461	238			<40	5	
Salinity (as NaCl in g/L)	0.004	0.004	0.007	0.005	0.004	0.005	0.004	<0.02	0.007		0.006	0.007			<0.05	5	
Salinity (as NaCl in g/L)	0.004	0.004	0.007	0.055	0.007	0.005	0.004	-	0.006	0.007	0.006	0.008	<0.001	<0.001		5	

Notes:

[1] All units are in mg/L unless otherwise indicated.

Values displayed in **red** indicate concentrations exceeding CCME Guidelines for the Protection of Freshwater Aquatic Life

Bioassay Sampling - October

Bioassay sample results from a water sample collected on November 5 – sample 0411062 – from Culvert 4 fugitive flow are shown below in Table 4.

Table 4. 96-Hour Rainbow Trout Bioassay Results from Fugitive Flow Samples at Culvert 4

Date	LT_{50} in Hours	Mortality after 96 Hours (%)	Designation
November 5	>96	0	Non-toxic

***Note: October 22 bioassay sample expired due to transportation error**

The bioassay revealed ***non-toxicity to rainbow trout***, with a 0% mortality rate after 96 hours in the undiluted sample and an LT_{50} of >96 hours.

Bioassay Sampling -November

Bioassay sample results from a water sample collected November 30 – sample 0412018 – from Culvert 4 fugitive flow are shown below in Table 5.

Table 5. 96-Hour Rainbow Trout Bioassay Results from Fugitive Flow Samples at Culvert 4

Date	LT_{50} in Hours	Mortality after 96 Hours (%)	Designation
November 30	>96	0	Non-toxic

The bioassay revealed ***non-toxicity to rainbow trout***, with a 0% mortality rate after 96 hours in the undiluted sample and an LT_{50} of >96 hours. This result corresponds to total Zn concentrations of 1.94 mg/L (internal analysis) and 2.22 mg/L (external analysis for samples taken immediately preceding collection of the bioassay sample at the same location.

Bioassay Sampling - December

Bioassay sample results from a water sample collected December 17 – sample 0412118 – from Culvert 4 fugitive flow are shown below in Table 6.

Table 6. 96-Hour Rainbow Trout Bioassay Results from Fugitive Flow Samples at Culvert 4

Date	LT_{50} in Hours	Mortality after 96 Hours (%)	Designation
December 17	>96	0	Non-toxic

The bioassay revealed ***non-toxicity to rainbow trout***, with a 0% mortality rate after 96 hours in the undiluted sample and an LT_{50} of >96 hours. This result corresponds to total Zn concentrations of 3.34 mg/L (internal analysis) and 2.37 mg/L for samples taken immediately preceding collection of the bioassay sample at the same location.

Summary of Bioassay Sampling

In summary, results from October, November and December bioassay samples collected as part of the monthly sampling regime all revealed ***non-toxicity to rainbow trout.***

Weekly/Daily Sampling - October

Total Zn concentrations from samples collected weekly at eight relatively accessible sites in October are shown in Table 8 shaded in blue. Also included in Table 8 are total Zn results from external Norwest Labs analysis as part of the monthly sampling event. These results are further discussed in the section entitled ***Total Aqueous Zinc - October***.

Daily sampling of the Galkeno 300 treatment pond decant by site caretaking staff continues to contribute to characterization of the treatment pond efficacy and the subsequent quality of the effluent being discharged. Table 7 and Figure 3 display the total Zn concentrations as analyzed by atomic absorption spectrophotometry at the internal laboratory in Elsa.

Table 7. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, October 2004

Date	Total Zn Concentration	Date	Total Zn Concentration	Date	Total Zn Concentration
1-Oct-04	6.21	11-Oct-04	5.91	21-Oct-04	11.5
2-Oct-04	4.73	12-Oct-04	4.42	22-Oct-04	6.77
3-Oct-04	6.56	13-Oct-04	8.54	23-Oct-04	28.7
4-Oct-04	13.3	14-Oct-04	2.93	24-Oct-04	19.3
5-Oct-04	7.62	15-Oct-04	2.88	25-Oct-04	33.7
6-Oct-04	12.2	16-Oct-04	3.18	26-Oct-04	64.2
7-Oct-04	5.54	17-Oct-04	3.18	27-Oct-04	97.1
8-Oct-04	4.32	18-Oct-04	4.79	28-Oct-04	37.1
9-Oct-04	5.88	19-Oct-04	3.19	29-Oct-04	72
10-Oct-04	4.6	20-Oct-04	2.54	30-Oct-04	120
				31-Oct-04	39.8

Table 8. Total Aqueous Zinc Concentrations in Receiving Environment Sampling Sites for G300 Adit Discharge, October 2004

(Internal and External Analysis)

		Total Zinc Concentration (mg/L)																CCME Guideline for the Protection of Aquatic Life (Total Zinc in mg/L)
Lab		Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Norwest	Internal	Norwest	Internal	Internal	Internal	
Sample Location	**Station ID**	2-Oct-04	6-Oct-04	7-Oct-04	8-Oct-04	9-Oct-04	10-Oct-04	11-Oct-04	13-Oct-04	16-Oct-04	20-Oct-04	21-Oct-04	22-Oct-04	22-Oct-04	23-Oct-04	27-Oct-04	28-Oct-04	
Galkeno 300 Raw Untreated Adit	**LES-32**		121						125		87.9	140				108		
Galkeno 300 Pond Decant	**ACG-WQ-12**		12.2						8.54		2.54	16.1				97.1		
Hillside Culvert #4														2.72				
Galkeno 300 Flow at Silver Trail Highway Culvert #4	**ACG-WQ-10**			3.24					3.57				**2.17**	2.77		3.04		
Galkeno 300 Flow from Highway Culvert #5, 1 m u/s of Entry to Christal Creek	**ACG-WQ-11 Site C**						5.16		4.39		2.86			3.9			4.03	
Christal Creek U/S of Keno Road	**KV-6**				0.282				0.230		0.215			0.27			0.197	
Unidentified Fugitive flow across from Galkeno 900 Access Road	**n/a**													0.066				**0.030**
Christal Creek 600 m d/s of Keno Road	**ACG-WQ-11 Site A**					0.25			0.272		0.189			0.25			0.193	
Christal Creek 825 m d/s of Keno Road	**ACG-WQ-11 Site D**							0.466	0.465		0.481			0.553			0.422	
Christal Creek at Hanson Lk. Rd.	**KV-7**	0.31				0.314				0.291		0.635			0.3		0.313	
Christal Creek at Mouth	**KV-8**											0.614						
South McQuesten River 9km d/s Flat Creek	**KV-5**													0.025				
S. McQuesten River Near Pumphouse	**KV-2**											0.029						
Background: S. McQuesten River u/s of Christal Creek.	**KV-1**											0.013						

Sites and readings shaded blue are part of regular weekly sampling regime

Figure 3. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, October 2004

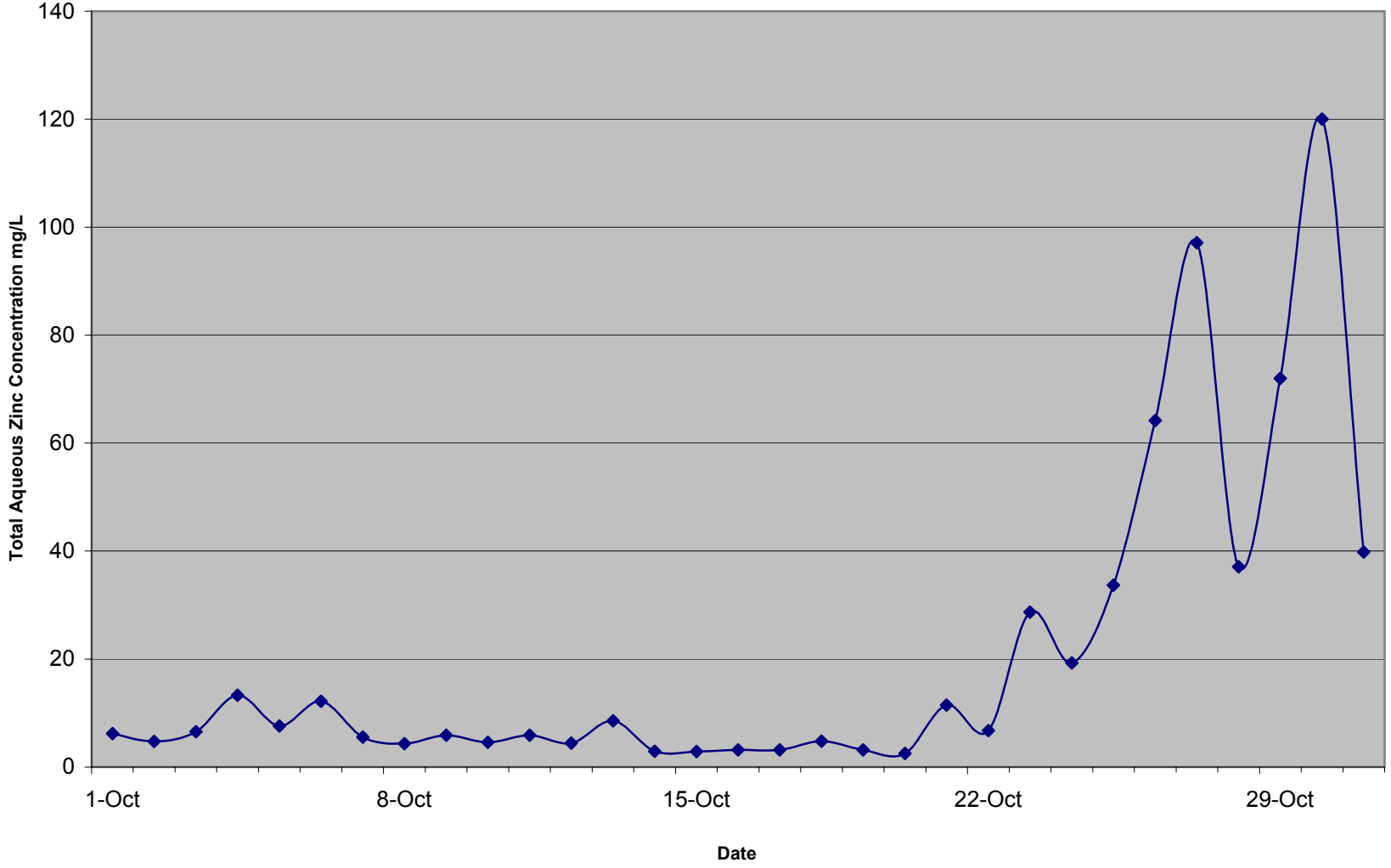


Figure 3 shows total Zn concentrations that are moderated below 10 mg/L for the first three weeks of the month. October 21 is the beginning of highly variable readings and generally decreased treatment efficacy that persist for the duration of the monthly reporting period, with values ranging from 6.77 to 120 mg/L. Original design of the treatment system provided 24 hours of water retention. This may not be adequate for the settling and precipitation of zinc hydroxides. October 23 appears to represent the point at which the treatment system retention time again falls below the required period for proper settling and precipitation.

Weekly/Daily Sampling – November

Total Zn concentrations from samples collected weekly at the sites are shown in Table 9 shaded in blue. Also included in Table 9 are total Zn results from external Norwest Labs analysis as part of the monthly sampling event. These results are further discussed in the section entitled ***Total Aqueous Zinc – November.***

Results from daily sampling of the Galkeno 300 treatment pond decant by site caretaking staff as analyzed by atomic absorption spectrophotometry at the internal laboratory in Elsa are shown in Table 9 and Figure 4.

Table 9. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, November 2004

Date	Total Zn Concentration	Date	Total Zn Concentration	Date	Total Zn Concentration
1-Nov	76.3	11-Nov	58.3	21-Nov	54.0
2-Nov	42.2	12-Nov	74.9	22-Nov	74.0
3-Nov	82.9	13-Nov	38.0	23-Nov	73.0
4-Nov	140	14-Nov	44.8	24-Nov	N/S
5-Nov	58.4	15-Nov	69.5	25-Nov	N/S
6-Nov	69.2	16-Nov	69.2	26-Nov	0.432
7-Nov	78.1	17-Nov	86.8	27-Nov	0.332
8-Nov	81.2	18-Nov	94.0	28-Nov	0.344
9-Nov	55.0	19-Nov	54.0	29-Nov	0.309
10-Nov	102	20-Nov	27.5	30-Nov	0.324

Table 10. Total Aqueous Zinc Concentrations in Receiving Environment Sampling Sites for G300 Adit Discharge, November 2004

(Internal and External Analysis)

		Total Zinc Concentration (mg/L)													CCME Guideline for the Protection of Aquatic Life (Total Zinc in mg/L)
Lab		Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Norwest	
Sample Location	**Station ID**	3-Nov-04	4-Nov-04	10-Nov-04	12-Nov-04	17-Nov-04	24-Nov-04	25-Nov-04	26-Nov-04	27-Nov-04	28-Nov-04	29-Nov-04	29-Nov-04	29-Nov-04	
Galkeno 300 Raw Untreated Adit	**LES-32**	98.6		77.1		75.6	70.5						81.6	169	
Galkeno 300 Pond Decant	**ACG-WQ-12**	82.9		102		86.8							0.309	0.293	
Galkeno 300 Flow at Silver Trail Highway Culvert #4	**ACG-WQ-10**	3.44			2.26	2.04		2.11					1.94	2.22	
Christal Creek U/S of Keno Road	**KV-6**		0.166	0.336		0.259			0.269				0.241	0.255	
Christal Creek 600 m d/s of Keno Road	**ACG-WQ-11 Site A**		0.175	0.276		0.203				0.231			0.236	0.243	
Galkeno 300 Flow from Highway Culvert #5, 1 m u/s of Entry to Christal Creek	**ACG-WQ-11 Site C**		3.26	4.72		6.90					7.25		4.30	0.185	
Christal Creek 825 m d/s of Keno Road	**ACG-WQ-11 Site D**		0.367	0.444		0.697						0.481	0.375	0.389	**0.030**
Christal Creek at Hanson Lk. Rd.	**KV-7**		0.267		0.343	0.394	0.789						0.315	0.291	
Christal Creek at Mouth	**KV-8**													0.385	
South McQuesten River 9km d/s Flat Creek	**KV-5**													0.036	
S. McQuesten River Near Pumphouse	**KV-2**													0.038	
Background: S. McQuesten River u/s of Christal Creek.	**KV-1**													0.02	

Sites and readings shaded blue are part of regular weekly sampling regime

Figure 4. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, November 2004

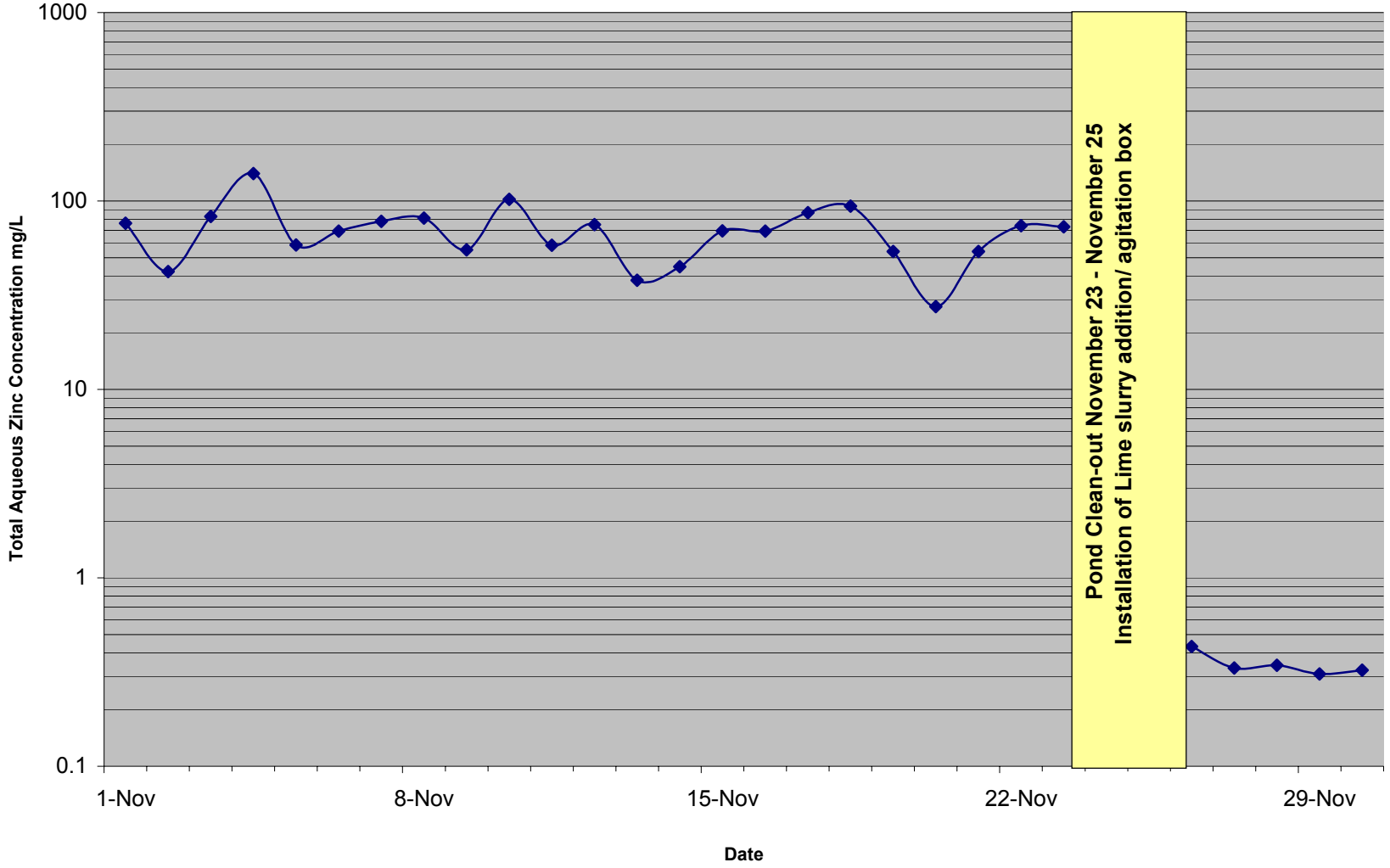


Figure 4 shows highly variable readings and generally poor treatment efficacy before clean out activities occurred on November 24 and 25, with total zinc concentrations ranging form 27.5 to 140 mg/L. During the clean out period the lime treatment shack was relocated to just outside the adit door, and the lime slurry addition hose was re-routed to a new the application point at the weir inside the adit. Also, a lime addition/ agitation box was constructed and placed inside the G300 adit to promote more thorough mixing before entering the pipe leading to the treatment pond (Plates 1- 3). Total zinc concentrations were very encouraging following the clean out and modification activities with values ranging from 0.309 to 0.432 mg/L.

Plate 1 *New lime slurry application point at weir in G300 adit.*

Plate 2 *Lime slurry application point and mixing box in G300 adit.*

Plate 3 *New mixing box for G300 adit flow (immediately below weir).*

Weekly/Daily Sampling – December

Total Zn concentrations from samples collected weekly are shown in Table 12 shaded in blue. Also included in Table 12 are total Zn results from external Norwest Labs analysis as part of the monthly sampling event. These results are also further discussed in the section entitled ***Total Aqueous Zinc – December.***

Table 11 and Figure 5 display the total Zn concentrations of the daily samples collected at the G300 pond decant as analyzed by atomic absorption spectrophotometry at the internal laboratory in Elsa.

Table 11. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, December 2004

Date	Total Zn Concentration	Date	Total Zn Concentration	Date	Total Zn Concentration
1-Dec-04	0.534	11-Dec-04	0.261	21-Dec-04	37.6
2-Dec-04	1.29	12-Dec-04	0.249	22-Dec-04	73.3
3-Dec-04	0.726	13-Dec-04	0.255	23-Dec-04	86.3
4-Dec-04	0.297	14-Dec-04	0.623	24-Dec-04	54.7
5-Dec-04	0.313	15-Dec-04	5.65	25-Dec-04	66.9
6-Dec-04	0.287	16-Dec-04	20.8	26-Dec-04	71.8
7-Dec-04	0.415	17-Dec-04	0.557	27-Dec-04	56.6
8-Dec-04	0.242	18-Dec-04	8.11	28-Dec-04	58.3
9-Dec-04	0.428	19-Dec-04	22.5	29-Dec-04	66.7
10-Dec-04	0.218	20-Dec-04	20.5	30-Dec-04	106
				31-Dec-04	114

Table 12. Total Aqueous Zinc Concentrations in Receiving Environment Sampling Sites for G300 Adit Discharge, December 2004

(Internal and External Analysis)

		Total Zinc Concentration (mg/L)							CCME Guideline for the Protection of Aquatic Life (Total Zinc in mg/L)
Lab		**Internal**	**Internal**	**Norwest**	**Internal**	**Norwest**	**Internal**	**Internal**	
Sample Location	**Station ID**	**8-Dec-05**	**16-Dec-04**	**16-Dec-04**	**17-Dec-04**	**17-Dec-04**	**22-Dec-04**	**29-Dec-04**	
Galkeno 300 Raw Untreated Adit	**LES-32**	70.8	82.0	116			106.3	83.9	
Galkeno 300 Pond Decant	**ACG-WQ-12**	0.242	12.2	14			73.3	66.7	
Galkeno 300 Flow at Silver Trail Highway Culvert #4	**ACG-WQ-10**	2.56			3.34	2.37	3.57	2.20	
Christal Creek U/S of Keno Road	**KV-6**	0.185			0.214	0.237	0.210	0.178	
Christal Creek 600 m d/s of Keno Road	**ACG-WQ-11 Site A**	0.198					0.236	0.177	
Galkeno 300 Flow from Highway Culvert #5, 1 m u/s of Entry to Christal Creek	**ACG-WQ-11 Site C**	3.97			4.01	4.16	4.70	3.36	**0.030**
Christal Creek 825 m d/s of Keno Road	**ACG-WQ-11 Site D**	0.347			0.345	0.427	0.346	0.301	
Christal Creek at Hanson Lk. Rd.	**KV-7**	0.247			0.252	0.275	0.249	0.215	
Christal Creek at Mouth	**KV-8**					0.362			
S. McQuesten River Near Pumphouse	**KV-2**					0.046			
Background: S. McQuesten River u/s of Christal Creek.	**KV-1**					0.031			

Sites and readings shaded blue are part of regular weekly sampling regime

Figure 5. Daily Results for Total Aqueous Zinc Concentrations in Galkeno 300 Treatment Pond Decant, December 2004

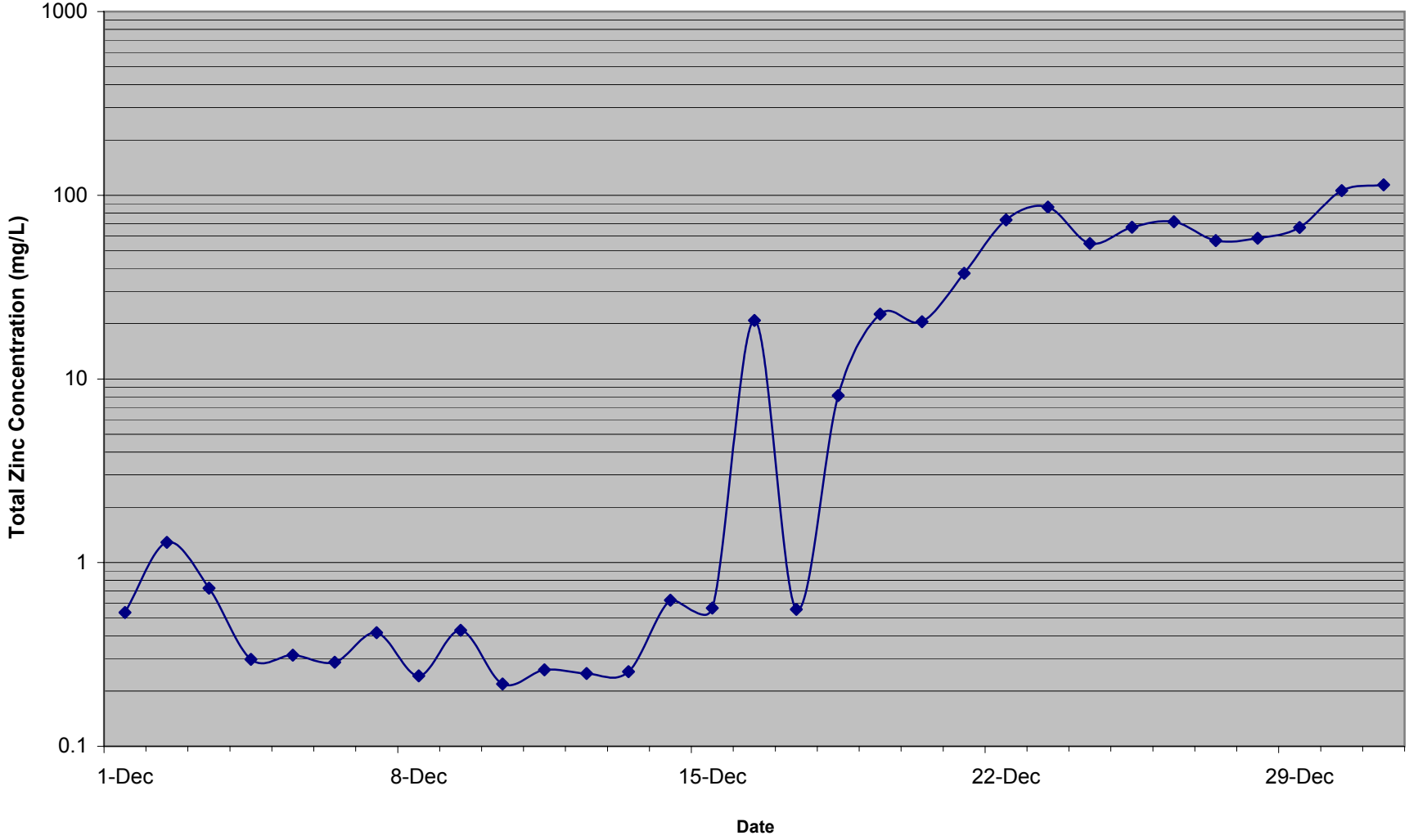


Figure 5 shows total Zn concentrations that were encouraging for the first half of the month. December 15 marks the point at which a major decrease in treatment efficacy begins and persists for the duration of the monthly reporting period. Observations by ACG staff on December 16 of the decant pond identified slackening of the baffle curtains below the surface of the pond allowing the flow to short-circuit the baffles, significantly reducing the retention time in the pond. Site caretakers have been unable to tighten the baffle supports due to ice build-up. December decant total Zn values ranged from 0.218 to 114 mg/L.

Total Aqueous Zinc - October

As total Zn is generally a good indicator of metal concentrations in adit water, this parameter is the focus of discussion to assess downstream effects of the adit discharge. Figures 6, 7 and 8 display the total Zn results for the weekly and monthly sampling programs in three distinct areas: G300 Fugitive Flow, Christal Creek Receiving Waters and Downstream Receiving Waters. These figures combine results from both internal and external (cross-hatched bars) analysis and comparison of results from both laboratories for October 21 and 22 serves as a measure of QA/QC for the internal laboratory. Generally there is very good correlation between laboratory results. External analysis at Norwest Labs includes QA/QC measures that are reported with the original results and are available from ACG upon request.

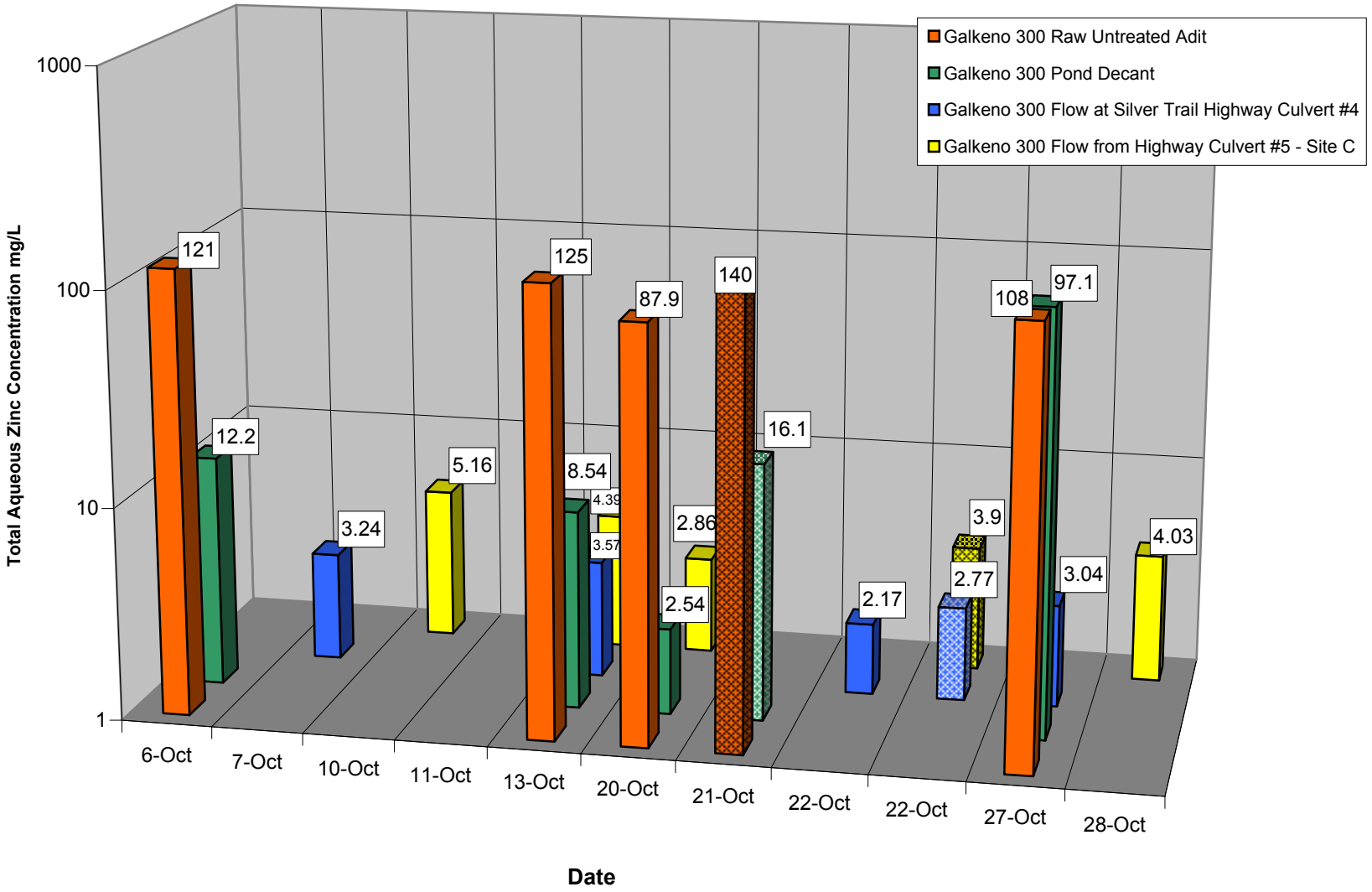
Figure 6 reveals inconsistent variations in the total Zn concentrations at the Culvert 4 site compared with the concentrations at the treatment pond decant. There still appears to be an attenuating/moderating effect on the fugitive flow with respect to total Zn concentrations while moving down Galena Hill.

Figure 7 displays total Zn concentrations in the Christal Creek receiving water sites. Upstream influences on Christal Creek (i.e. Mackeno tailings and Galkeno 900 decant flow/seeps) that are not related to the G300 flow are again observable at Site KV-6. These concentrations are still visible downstream at Site A above the major influence of the G300 fugitive flow. At this site the total Zn level on October 13 was

greater than the upstream concentration as was observed September 29th of the previous reporting period. This anomalous reading may be a result of the contribution of the fugitive flow from the new seep, despite the low total Zn concentration of the seep from the sample collected on October 22. However, this site has not been sampled frequently enough to determine potential variations in Zn concentrations. Also noteworthy is the elevated total Zn concentrations observed from external (Norwest) analysis of the Site KV-7 on October 21. Total Zinc concentrations returned from this site exceeded total Zn concentrations at Site D returned from internal analysis October 20 and external analysis October 22. This sample may either have been contaminated during sampling, or is actually representative of a temporary spike in zinc concentrations in Christal Creek.

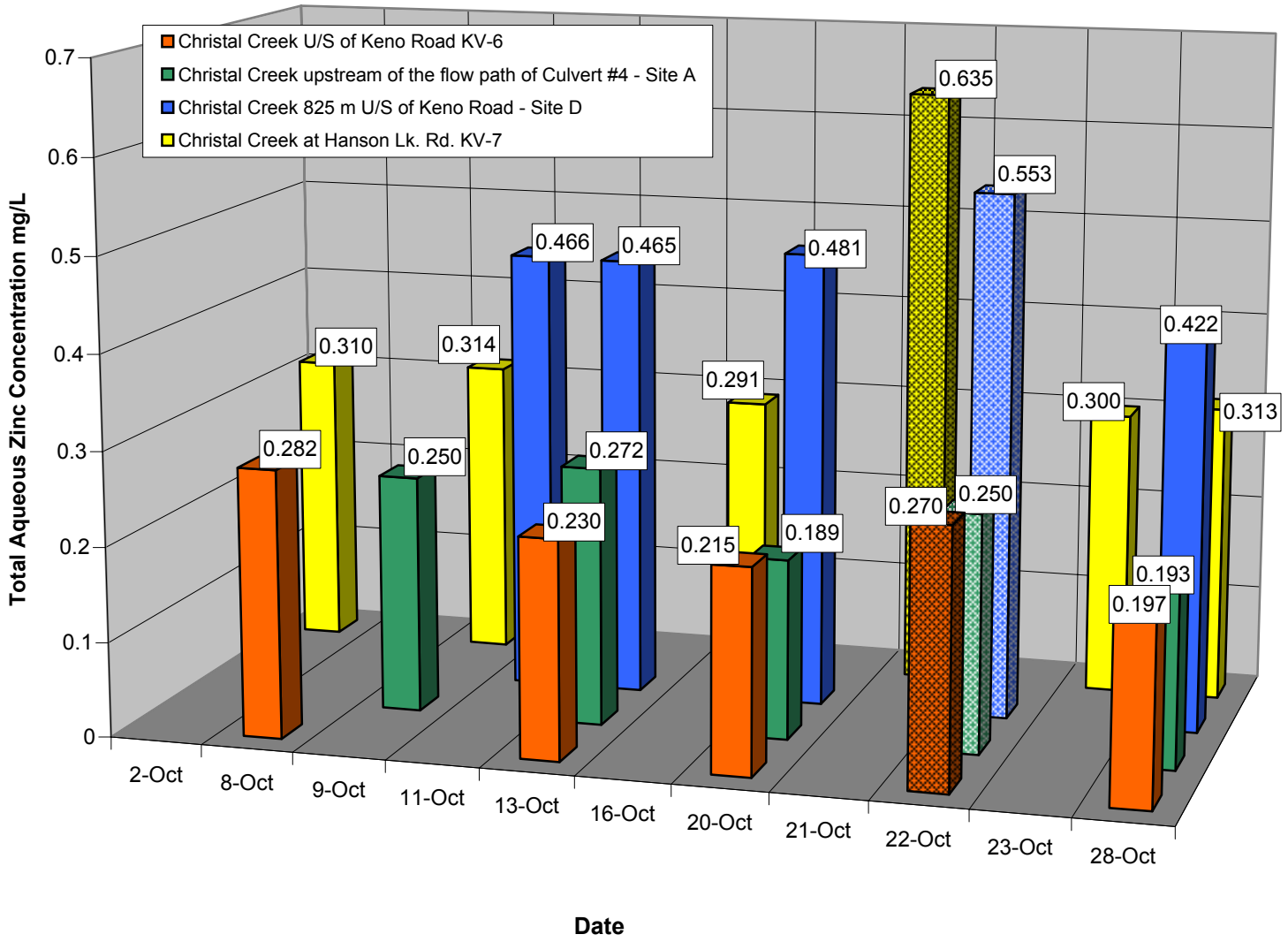
The total Zn concentrations for the downstream receiving waters are displayed in Figure 8. The predictable trend of attenuation in total Zn concentrations moving downstream in the receiving waters of lower Christal Creek and the South McQuesten River is distinguishable in this figure. Of note as well in this figure is that the total aqueous zinc concentration at the background site KV-1 was below the CCME guideline for the protection of aquatic life, and the input from Christal Creek is more than an order of magnitude higher than this background reading for total Zn. Downstream in the South McQuesten River at Pumphouse Pond (KV-2) and KV-5, total Zn concentrations met the CCME parameter.

Figure 6. Total Aqueous Zn Levels for G300 Fugitive Flow Monitoring Sites, October 2004 (Internal Analysis at On-Site Laboratory)



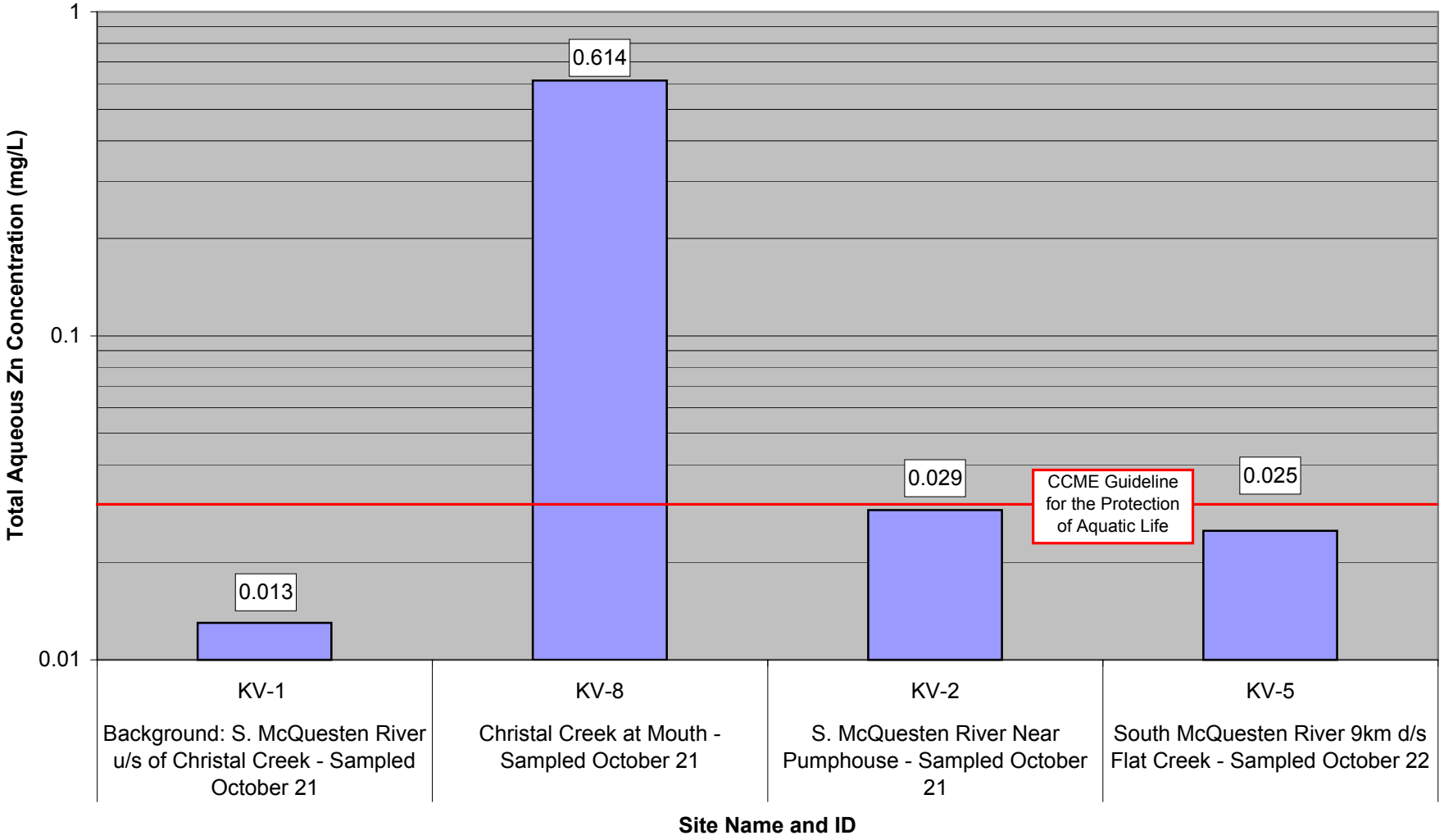
Note: Hatching indicates Norwest Labs external analysis

Figure 7. Total Aqueous Zinc Concentrations for Christal Creek Receiving Water Sites, October 2004 (Internal & External Analysis)



Note: Hatching indicates Norwest Labs external analysis

Figure 8. Total Aqueous Zn Levels in G300 Fugitive Flow Downstream Receiving Waters - October 21 and 22, 2004 (External Analysis at Norwest Labs)



Total Aqueous Zinc - November

Figures 9, 10 and 11 display the total Zn results for the weekly and monthly sampling programs in three distinct areas: G300 Fugitive Flow, Christal Creek Receiving Waters and Downstream Receiving Waters. Generally there is still very good correlation between internal and external analysis.

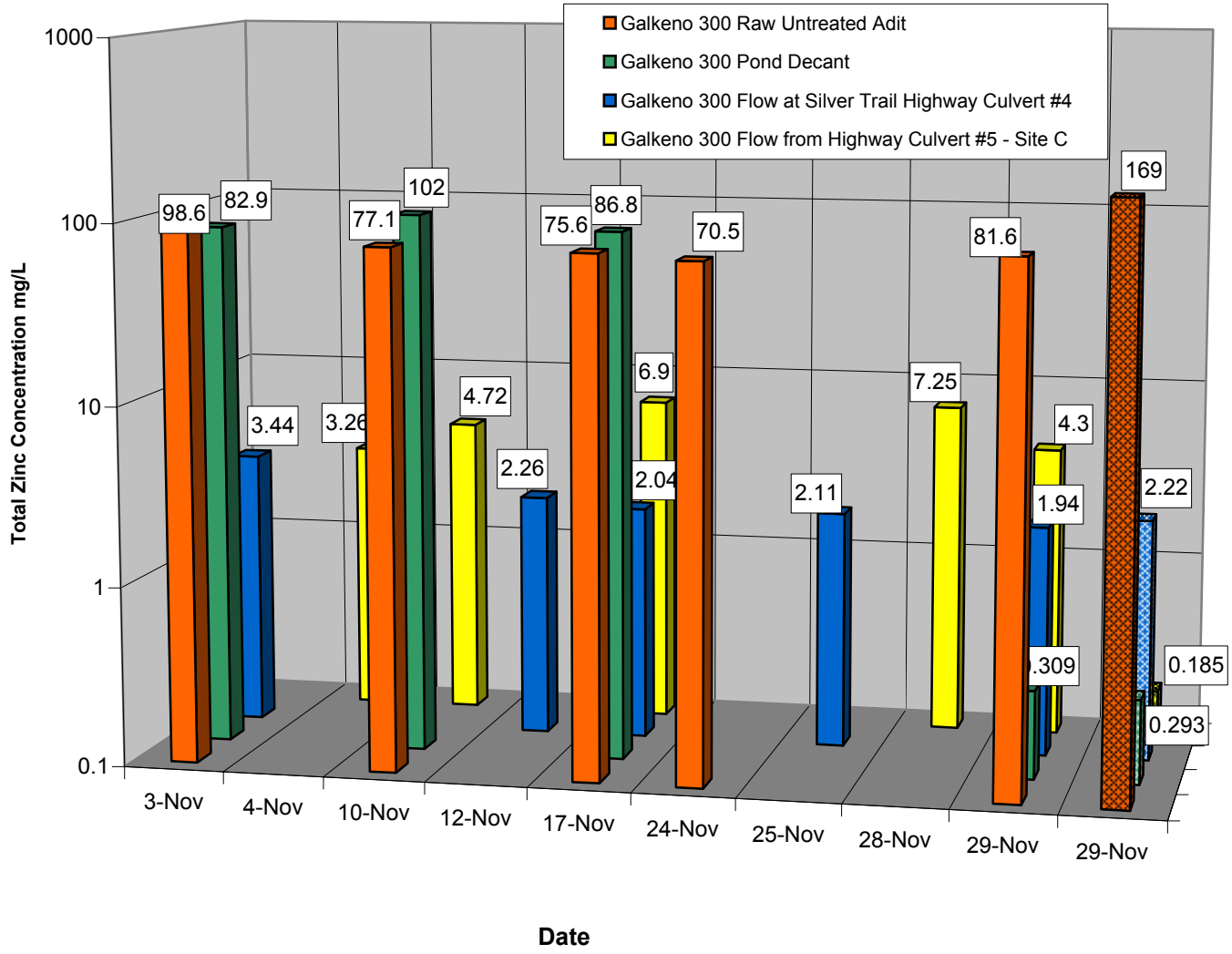
Figure 9 illustrates the change in treatment efficacy where total zinc concentrations decanting from the treatment pond are greatly reduced following clean out activities on the 24th and 25th of the month. Also seen in Figure 9 is the significantly lower total Zn level at Culvert 4 compared with the treatment pond effluent before clean out activities. Unknown mechanisms continue to sequester zinc on the side of Galena Hill. Very low flow was observed at Culvert 4 during the monthly field event, suggesting that the entire fugitive flow is not passing through Culvert 4, and that flow migration is likely occurring on the hill. Following pond clean out activities, the low total zinc concentrations observed in the pond effluent were not reflected by a significant reduction in concentrations at Culvert 4. In fact, concentrations at Culvert 4 were ***higher*** than those of the decant flow. This is suggestive of a natural flow with an elevated zinc concentration at Culvert 4 and could explain some geochemical differences between the decant flow and Culvert 4 in previous analyses.

Figure 10 displays total Zn concentrations in the Christal Creek receiving water sites. As with the Culvert 4 observations noted above, high concentrations at the treatment pond decant in the first part of the month did not translate into accordingly high levels downstream, with exception of the November 24 reading at KV-7, and there are negligible reductions in concentrations at sites D and KV-7 following the treatment pond clean out.

The total Zn concentrations for the downstream receiving waters are displayed in Figure 11. The predictable trend of attenuation in total Zn concentrations moving downstream in the receiving waters of lower Christal Creek and the South McQuesten River is again distinguishable in this figure. The input from Christal Creek remains more than an order of magnitude higher than the background reading for total Zn, the effect of which is still discernable downstream in the South

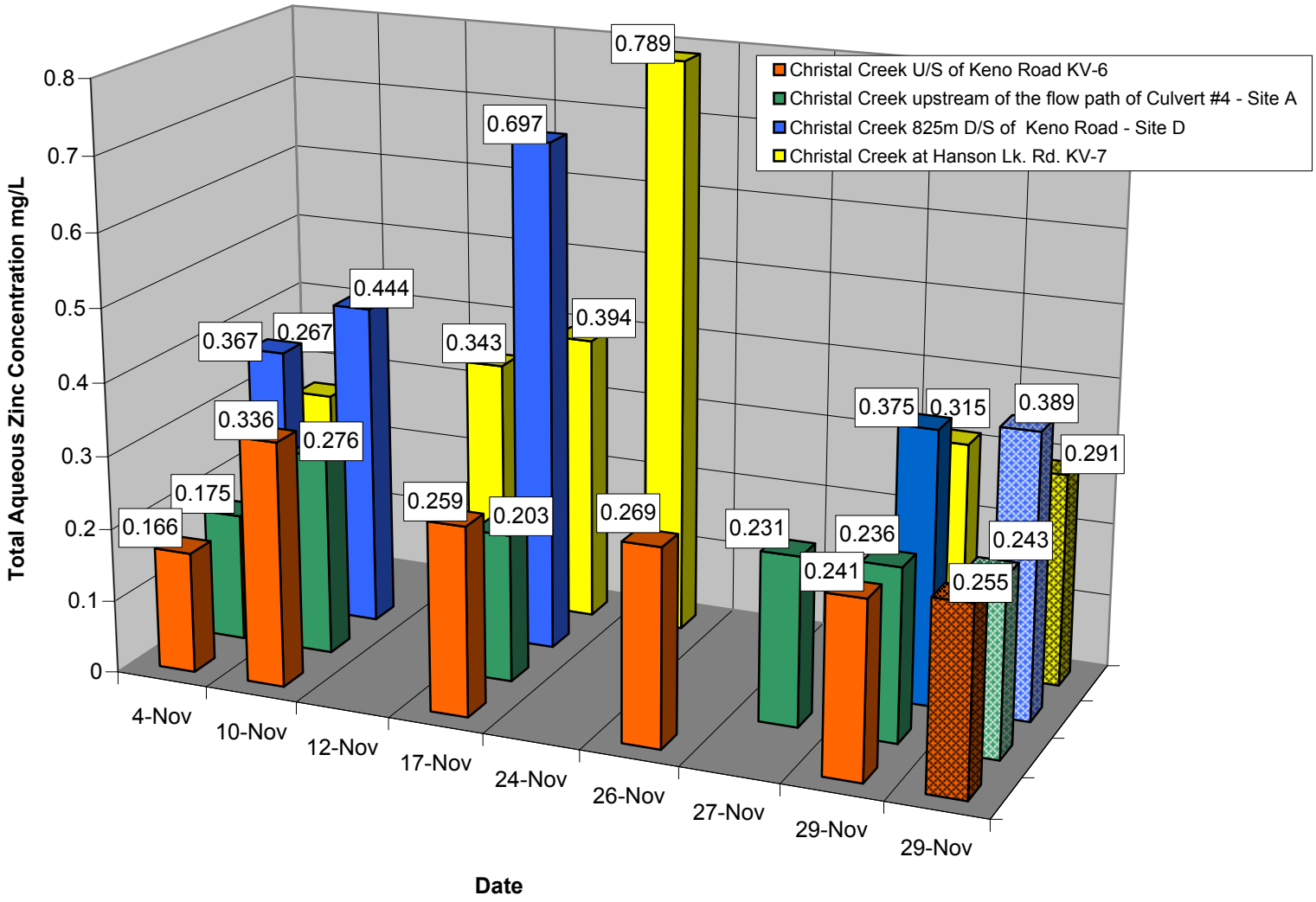
McQuesten River at Pumphouse Pond (KV-2) and south of the Flat Creek confluence (KV-5) as a total Zn concentration that slightly exceeds the CCME criteria for the protection of aquatic life.

Figure 9. Total Aqueous Zn Levels for G300 Fugitive Flow Monitoring Sites, November 2004 (Internal Analysis at On-Site Laboratory)



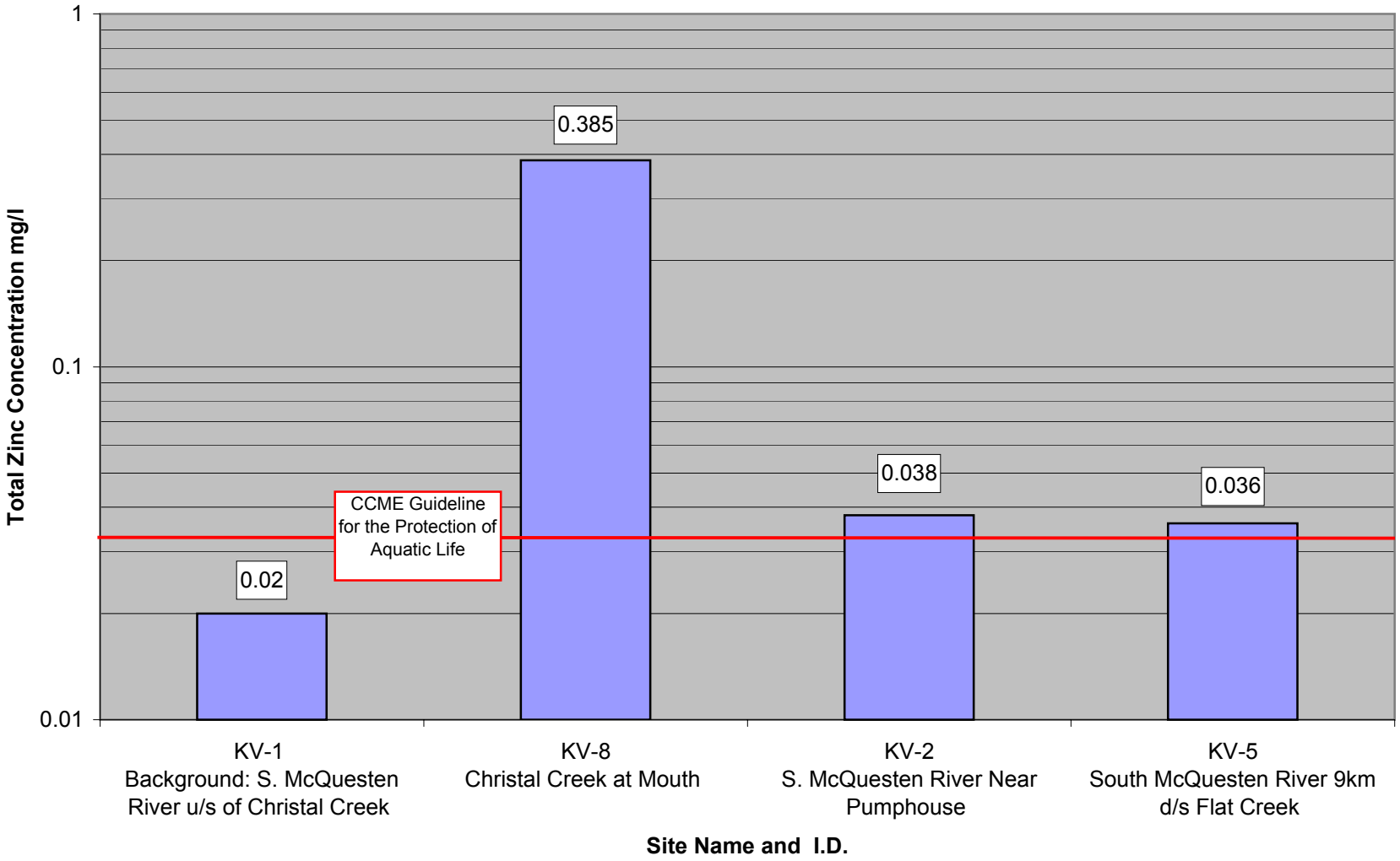
Note: Hatching indicates Norwest Labs external

Figure 10. Total Aqueous Zinc Concentrations for Christal Creek Receiving Water Sites, November 2004 (Internal & External Analysis)



Note: Hatching indicates Norwest Labs external analysis

Figure 11. Total Aqueous Zn Levels in G300 Fugitive Flow Downstream Receiving Waters - November 29, 2004 (External Analysis at Norwest Labs)



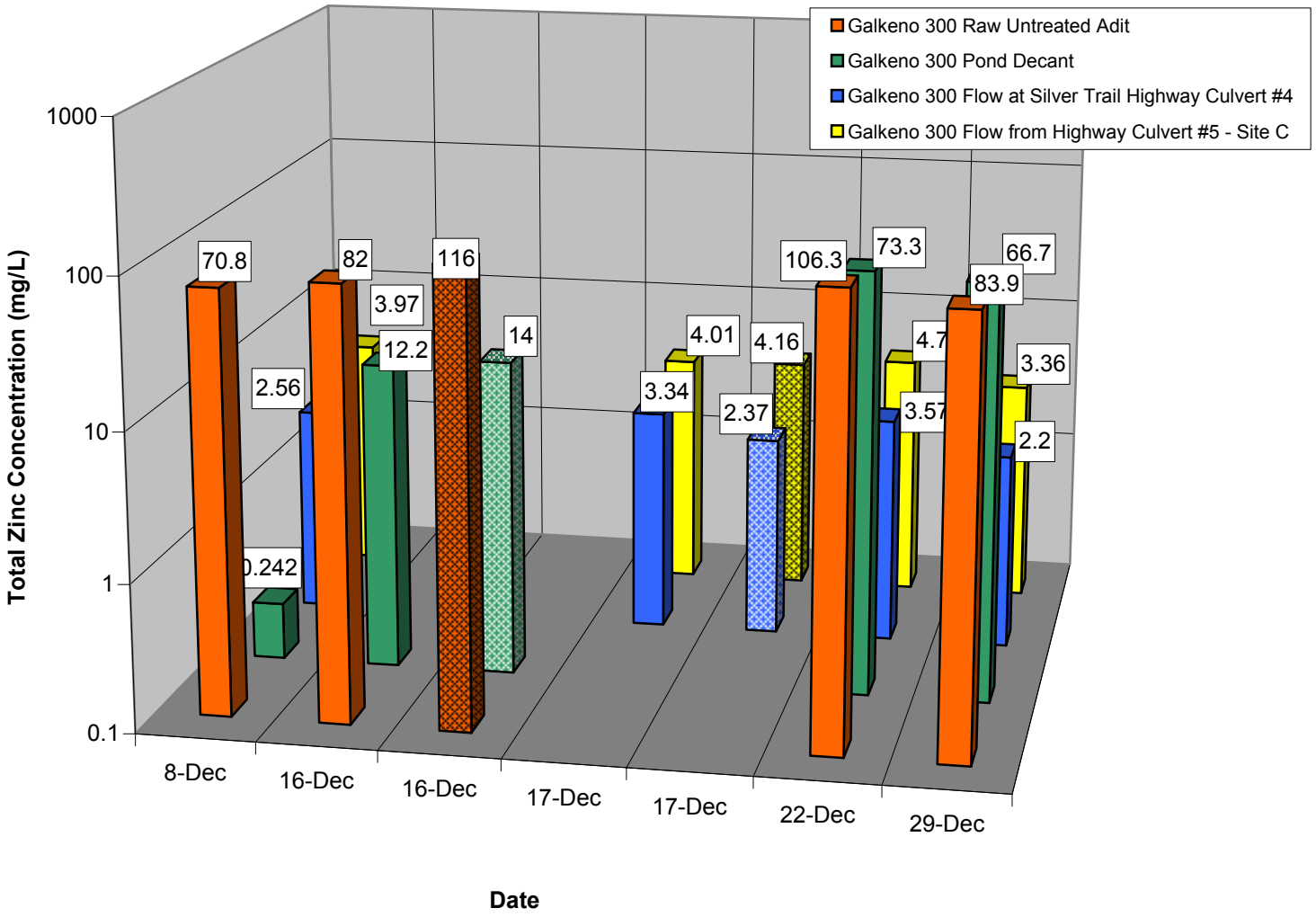
Total Aqueous Zinc - December

Figure 12 illustrates the decrease in treatment pond efficacy observed through weekly sampling of the pond effluent as well as the low degree variation in total Zn concentrations at Culvert 4. Rising treatment pond effluent zinc concentrations observed midway through the month did not result in correspondingly elevated zinc concentrations in the Culvert 4 flow, again suggesting that metals are being sequestered on the hillside between the decant and the Silver Trail Highway.

Figure 13 displays total Zn concentrations in the Christal Creek receiving water sites. The internal analytical results of the Christal Creek receiving waters are closely matched with the external results for December 17 sampling. High concentrations at the treatment pond decant in the second half of the month did not translate into accordingly higher levels at the downstream sites illustrated in this figure, a scenario also noted in the November sampling results.

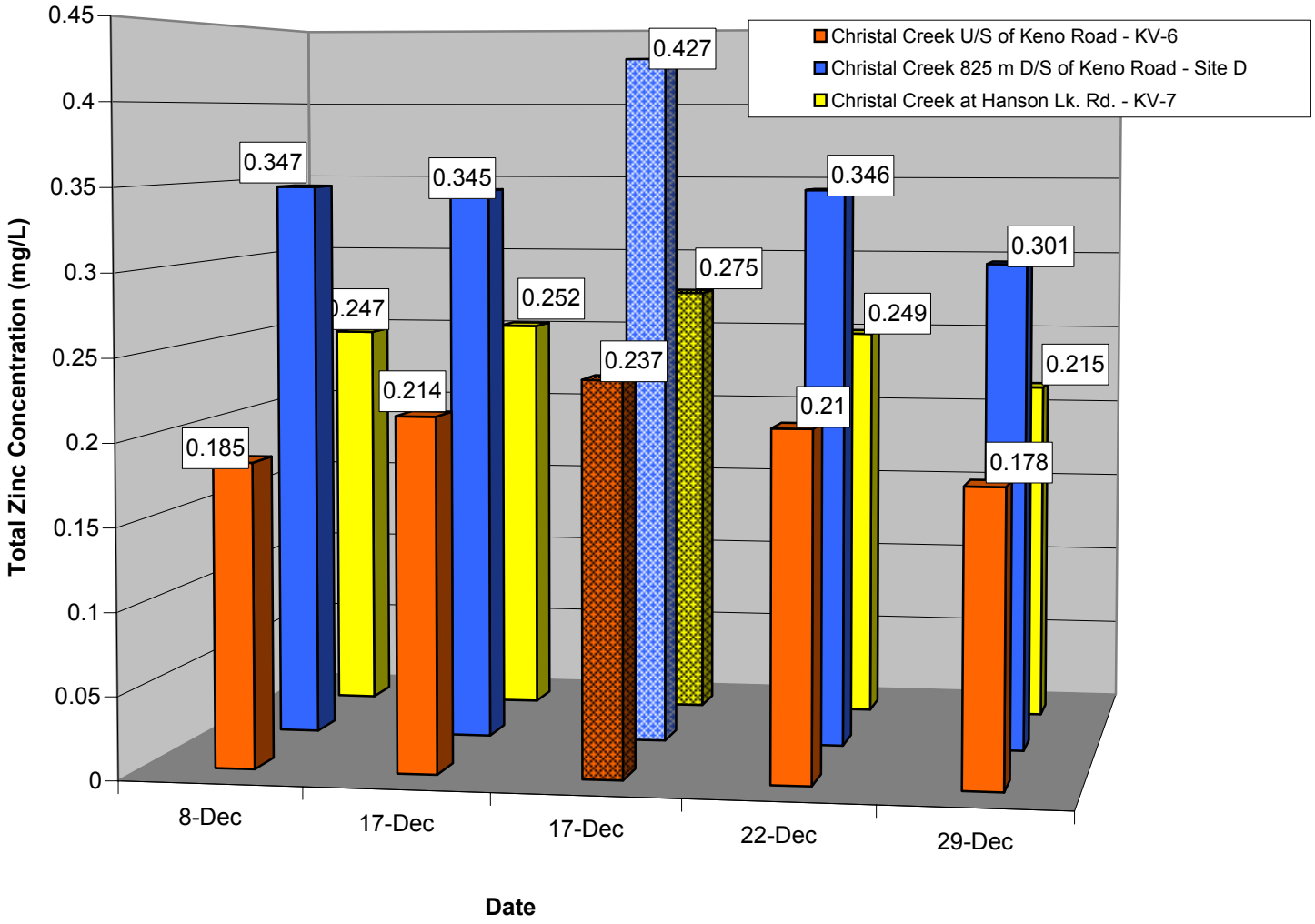
The total Zn concentrations for the downstream receiving waters are displayed in Figure 14. The effect of the input of elevated Zn concentrations from Christal Creek is discernable downstream in the South McQuesten River at Pumphouse Pond (KV-2) as a total Zn concentration that exceeds the CCME parameter to a greater degree than KV-1, which only slightly exceeds CCME guidelines for the protection of aquatic life.

Figure 12. Total Aqueous Zn Levels for G300 Fugitive Flow Monitoring Sites, December 2004 (Internal Analysis at On-Site Laboratory)



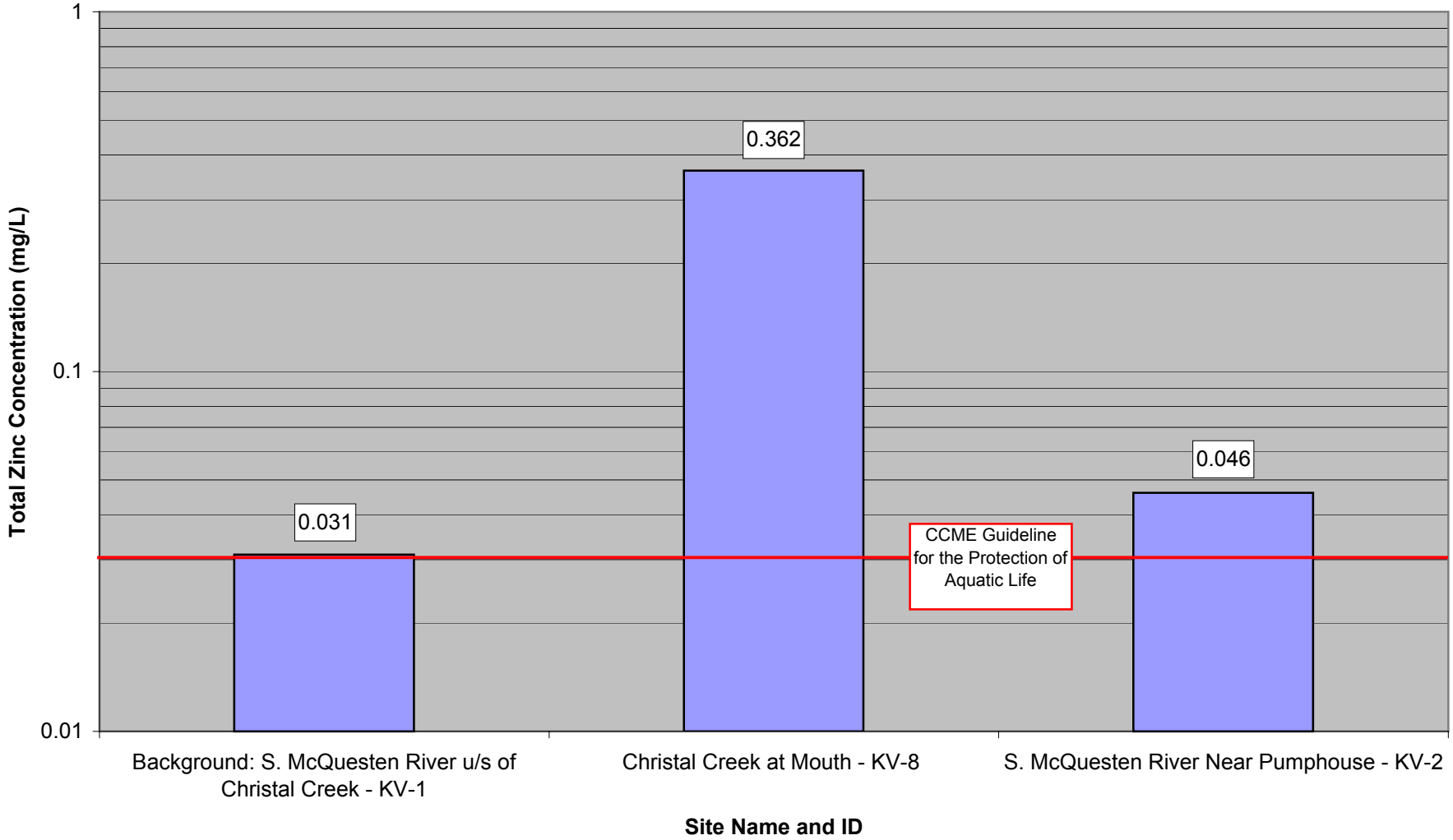
Note: Hatching indicates Norwest Labs external analysis

Figure 13. Total Aqueous Zinc Concentrations for Christal Creek Receiving Water Sites, December 2004 (Internal & External Analysis)



Note: Hatching indicates Norwest Labs external analysis

Figure 14. Total Aqueous Zn Levels in G300 Fugitive Flow Downstream Receiving Waters - December 17, 2004 (External Analysis at Norwest Labs)



Summary of Total Aqueous Zinc Analysis

Analysis of samples collected between the G300 adit and treatment system and the furthest downstream receiving waters indicate that during late fall and winter months, the receiving water are not undergoing metal-loading to the degree documented during the open season, independent of variations in treatment pond decant concentrations. Unknown mechanisms are moderating the impact of elevated metal concentrations from the G300 treatment system by sequestering significant concentrations of metals prior to the fugitive flow entering the receiving water system. It would also appear that there is either a natural base flow with zinc concentrations originating on Galena Hill and flowing through Culvert 4, or in the process of flowing down Galena Hill in winter conditions, the fugitive flow (with a static carrying capacity for suspended zinc) is either precipitating or mobilizing zinc to meet the equilibrium concentration being observed at Culvert 4.

Flow Measurements - October

Figure 15 on the following page shows the G300 adit flow discharge and air and water temperatures measured in the adit for the entire reporting period. Flow discharge has a base rate of approximately 10 L/s between October 1 and November 22, with periodic oscillations ranging from 4 to 16 L/s. This cause of this variation cannot be definitively identified, but shifting and collapsing of the aging mine workings around the flow source could temporarily increase or decrease the rate of flow in the adit, and this is considered the most likely explanation.

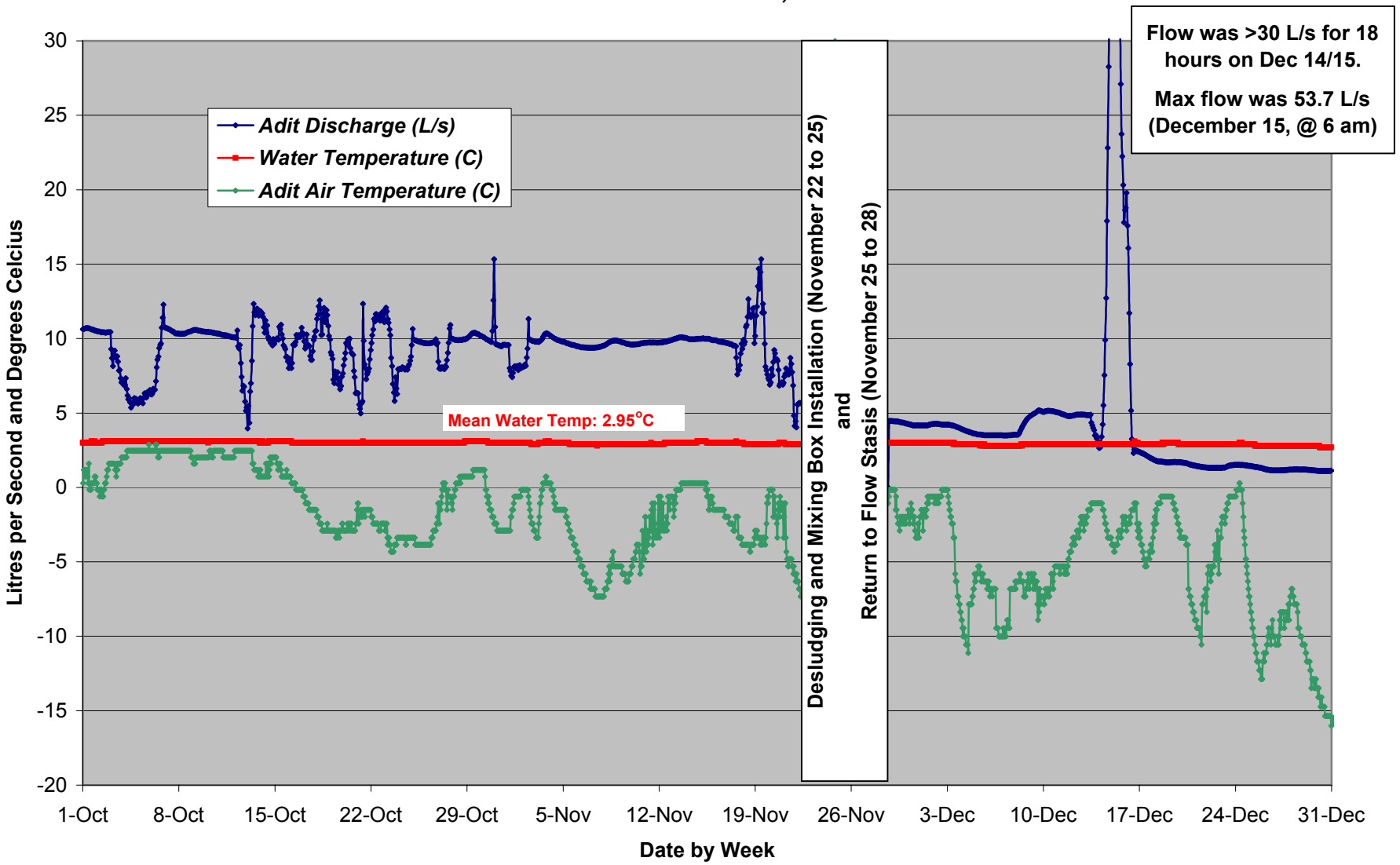
Desludging and lime addition modifications necessitated breaching of the weir in the adit with the adit discharge subsequently circumventing the treatment pond temporarily, as with previous desludging activities. The new modifications were brought online on November 25, and the flow regime required approximately 3 days to stabilize. The installation of the mixing box below the v-notch weir has compromised the integrity of the flow pattern through the notch and thus has reduced the reliability of the flow measurement data, which depends upon an unencumbered cascade through a sharp crested notch, neither of which are now in place. The flow data collected since the desludging activities should therefore be considered with a lower degree of confidence.

The most notable flow occurrence during this period is visible on Figure 15 as a marked 48-hour spike and subsidence of the flow rate on December 14 and 15. Peaking at 53.7 L/s, this ***apparent*** spike returns to a very stable base flow very rapidly and is thus indicative of a temporary blockage of the flow through the weir. Hydrologic connection with the surface has been suspected as the source for such spikes in the adit flow during freshet melting in the spring, but with outdoor air temperatures between –8 and –15 ^{o}C on December 12-15, there is no reason to suspect that surface melt might be the cause of this apparent spike. The other possible explanation is that an additional underground source temporarily joined the base flow normally seen in the adit.

Water temperatures remained very stable, averaging 2.95 ^{o}C for the reporting period. The air temperature in the adit was sub-zero for the majority of the reporting period,

even after the mixing box installation in late November when a single-bulb light source was installed in the adit. This raised the mean air temperature (as evidenced by the 8 ^{o}C rise over the installation period), but temperatures still dropped below –15 ^{o}C at the end of the reporting period when exterior air temperatures were consistently at or below –40 ^{o}C.

Figure 15. Galkeno 300 Adit Discharge and Water Temperature for October 1 - December 31, 2004



CONCLUSION

The combination of daily, weekly and monthly sampling programs continues to provide YG with valuable feedback regarding the efficacy of the Galkeno 300 treatment system. As evidenced by the results of the fugitive flow and receiving water quality sampling events, the G300 adit flow continues to contribute to the metal loading of both the Christal Creek and South McQuesten River receiving waters, but not to the degree documented during the open season. Despite maximum pond decant Zn concentrations being similar across the seasons there is a markedly reduced maximum Zn concentration in the flow as sampled and analyzed at Culvert 4 in the winter months. Sub-zero temperatures may be in effecting the precipitation of metals out of solution/suspension on Galena Hill. This may present the potential for a significant ***first flush*** of metals into the receiving environment during the coming freshet event, but a further investigation of the hillside and flow regime is necessary to further assess this potential.

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, the results from this reporting period indicate that there might be more natural sources on Galena Hill contributing to the metal loading of these receiving waters.

In response to previous results from this monitoring program, the following treatment system improvements have been implemented:

- Installation of a larger peristaltic pump
- Increased lime dosage
- Installation of flow baffles to increase retention time
- Installation of a windmill for air sparging
- Increased frequency of pond clean out

These modifications have realized temporary improvements in decant and receiving water quality, and the reconfiguring of the lime slurry addition system in November

resulted in the most encouraging decant water quality results to date with this system. The post-cleaning efficacy period of the system was also observed to last roughly 50% longer than documented after the previous effort, however this may be a result of lower flow rates in late November and early December compared with September of 2004.

Further assessment and modifications to the G300 treatment system are required 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. The ambient air temperature, however, restricts this measure in the winter season, as cost effective and efficient de-sludging cannot be conducted below –15^{o}C.

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. An investigation of the hillside flow regime will be conducted before spring freshet to assess the potential of a ***pulse*** release of metals into Christal Creek. Further sampling targeted at exploring the relationship between total and dissolved metals in the fugitive flow is planned.

Should you have any questions regarding this report, please contact the undersigned at 668-6463.

Respectfully submitted,

ACCESS CONSULTING GROUP
A registered trade name for Access Mining Consultants Ltd.

Prepared by:

T. Scott Keesey, B.Sc.
Environmental Scientist

Reviewed by:

Robert L. McIntyre,
R.E.T.,CCEP, Senior Engineering Technologist

Cc.

Heather Saggers, A/President, NND-DC
Brad Finnson, Water Inspection Officer, YG, Department of Environment
Roman Krska, NND Lands Directorate
Vic Enns, Environment Canada

LIST OF ATTACHMENTS

Attachment 1. Integrated Resource Consultants Bioassay Results for October 2004 Sampling at Culvert 4

Attachment 2. Integrated Resource Consultants Bioassay Results for November 2004 Sampling at Culvert 4

Attachment 3. Integrated Resource Consultants Bioassay Results for December 2004 Sampling at Culvert 4

Attachment 4. LES Field Sampling Report for October 2004 monthly sampling event

Attachment 5. LES Field Sampling Report for November 2004 monthly sampling event

Attachment 6. ACG Field Sampling Report for December 2004 monthly sampling event

Galkeno 300 Receiving Environment Monitoring

Attachment 1

Integrated Resource Consultants Bioassay Results for October 2004 Sampling at Culvert 4

Integrated Resource Consultants Inc.

Suite 160, 14480 River Road
Richmond, BC, Canada V6V 1L4
Tel. 604-278-7714 • Fax 604-278-7741
www.ircintegratedresource.com
FILE:ACCESS/0411062.RTT

DATE: 17 November 2004

TO: Dan Cornett
Access Consulting Group
#3 Calcite Business Centre
151 Industrial Road
Whitehorse, Yukon
Y1A 2V3

REPORT ON: RAINBOW TROUT BIOASSAY RESULTS

SAMPLE DESCRIPTION:

IRC Sample ID No.:	0411062
Sample Name:	**G300 Fugitive Flow-Culvert #4**
Date collected:	5 November 2004
Date, time received:	7 November 2004; 1500 hrs.
Collection Method:	Grab
Amount, Container:	2 x 10 litre plastic containers
Physical description:	Clear colourless liquid
Date, time tested:	8 November 2004; 1445 hrs.

RAINBOW TROUT 96 HR RESULTS:
The 96 hour LT_{50} was greater than 96 hours.
0% trout mortality in undiluted sample

The LT_{50} is defined as the median lethal time or the time at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an LC_{50} in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the IRC laboratory "Standard Operating Procedure for Rainbow Trout Holding and Testing" RTver5. This procedure follows the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" EPS 1/RM/13, Second Edition – December 2000. Test volume was 17 litres with 10 fish in each test vessel. Aeration was by forced air, through glass pipettes at a rate of approximately 6.5 ± 1ml/L/min. The sample was not pH adjusted or filtered prior to testing.

The initial dissolved oxygen level was 10.9 mg/L at 15.0°C, the conductivity was 1701µS/cm and the initial pH was 7.5. After pre-aerating the sample for 120 minutes, the dissolved oxygen level was 10.4 mg/L. Although the dissolved oxygen level was greater than 100% saturation the maximum pre-aeration time had been reached so the test was initiated at this time. The test set up technician was AH.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Marian Zazzi
Laboratory Supervisor
b129.1
enclosure

Galkeno 300 Receiving Environment Monitoring

Attachment 2

Integrated Resource Consultants Bioassay Results for November 2004 Sampling at Culvert 4

IRC
Integrated Resource Consultants Inc.

Suite 160, 14480 River Road
Richmond, BC, Canada V6V 1L4
Tel. 604-278-7714 • Fax 604-278-7741
www.ircintegratedresource.com
FILE:ACCESS/0412018.RTT

DATE: 13 December 2004

TO: Dan Cornett
Access Consulting Group
#3 Calcite Business Centre
151 Industrial Road
Whitehorse, Yukon
Y1A 2V3

REPORT ON: RAINBOW TROUT BIOASSAY RESULTS

SAMPLE DESCRIPTION:

IRC Sample ID No.:	0412018
Sample Name:	**Culvert #4**
Date collected:	30 November 2004
Date, time received:	2 December 2004; 1535 hrs.
Collection Method:	Grab
Amount, Container:	2 x 10 litre plastic containers
Physical description:	Clear colourless liquid
Date, time tested:	3 December 2004; 1555 hrs.

RAINBOW TROUT 96 HR RESULTS:
The 96 hour LT_{50} was greater than 96 hours.
0% trout mortality in undiluted sample

The LT_{50} is defined as the median lethal time or the time at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an LC_{50} in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the IRC laboratory "Standard Operating Procedure for Rainbow Trout Holding and Testing" RTver5. This procedure follows the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" EPS 1/RM/13, Second Edition – December 2000. Test volume was 15 litres with 10 fish in each test vessel. Aeration was by forced air, through glass pipettes at a rate of approximately 6.5 ± 1ml/L/min. The sample was not pH adjusted or filtered prior to testing.

The initial dissolved oxygen level was 11.1 mg/L at 14.5°C, the conductivity was 1818µS/cm and the initial pH was 7.4. After pre-aerating the sample for 120 minutes, the dissolved oxygen level was 10.6 mg/L. Although the dissolved oxygen level was greater than 100% saturation the maximum pre-aeration time had been reached so the test was initiated at this time. The test set up technician was AH.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Marian Zazzi
Laboratory Supervisor
b129.1
enclosure

Galkeno 300 Receiving Environment Monitoring

Attachment 3

Integrated Resource Consultants Bioassay Results for December 2004 Sampling at Culvert 4

IRC
Integrated Resource Consultants Inc.

Suite 160, 14480 River Road
Richmond, BC, Canada V6V 1L4
Tel. 604-278-7714 • Fax 604-278-7741
www.ircintegratedresource.com
FILE:ACCESS/0412118.RTT

DATE: 23 December 2004

TO: Dan Cornett
Access Consulting Group
#3 Calcite Business Centre
151 Industrial Road
Whitehorse, Yukon
Y1A 2V3

REPORT ON: RAINBOW TROUT BIOASSAY RESULTS

SAMPLE DESCRIPTION:

IRC Sample ID No.:	0412118
Sample Name:	**Galkeno 300 Flow**
Date collected:	17 December 2004
Date, time received:	18 December 2004; 1340 hrs.
Collection Method:	Grab
Amount, Container:	2 x 10 litre plastic containers
Physical description:	Clear pale green liquid with brown solids
Date, time tested:	19 December 2004; 1130 hrs.

RAINBOW TROUT 96 HR RESULTS:
The 96 hour LT_{50} was greater than 96 hours.
0% trout mortality in undiluted sample

The LT_{50} is defined as the median lethal time or the time at which there is 50% fish mortality. Results are calculated using the method described by Stephan (Methods for calculating an LC_{50} in: Aquatic Toxicology and Hazard Evaluation, American Society for Testing and Materials, 1977).

The method used for this test was as per the IRC laboratory "Standard Operating Procedure for Rainbow Trout Holding and Testing" RTver5. This procedure follows the "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" EPS 1/RM/13, Second Edition – December 2000. Test volume was 10 litres with 10 fish in each test vessel. Aeration was by forced air, through glass pipettes at a rate of approximately 6.5 ± 1ml/L/min. The sample was not pH adjusted or filtered prior to testing.

The initial dissolved oxygen level was 10.7 mg/L at 15.0°C, the conductivity was 1756µS/cm and the initial pH was 7.3. After pre-aerating the sample for 60 minutes, the dissolved oxygen level was 10.1 mg/L. As the dissolved oxygen level was greater than 70% saturation and less than 100% saturation the test was initiated at this time. The test set up technician was JB.

Please call should you have any questions.

IRC Integrated Resource Consultants Inc.

Marian Zazzi
Laboratory Supervisor
b129.1
enclosure

Galkeno 300 Receiving Environment Monitoring

Attachment 4

LES Field Sampling Report for October Monthly Sampling Event

Memorandum

To: Scott Keesey, Access Consulting Group November 5, 2004

Dan Cornett, Access Consulting Group

From: Ken Nordin, Laberge Environmental Services

Re: Galkeno 300 Receiving Water Fugitive Flow Investigation Sampling Event of October 21 and 22, 2004

The following is a brief summary of the receiving water and fugitive flow sampling event at Elsa– Keno, which was carried out on October 21 and 22, 2004. All samples were collected by Scott Keesey or Ken Nordin.

The sample kit was prepared by Ken Nordin from LES supplies. General parameters were collected in clean new one liter plastic bottles. Total metals samples were collected in 100 ml acid washed bottles and preserved with nitric acid. Samples were field filtered with 0.45 micron filters using 60 mL syringes and later preserved at the lab house. Insulated or plain new disposable plastic gloves were used for sample collection. All containers were rinsed at least 3 times in the sample waters.

In Situ measurements of conductivity were made with an Orion instruments model 126 meter. Field pH was measured in the field with an Accumet field pH meter, calibrated on the morning of use.

The waster samples and bioassay sample were shipped by Air North on October 23rd. Area streams were presenting low flows and were ice covered in most places.

Please call if you have any questions about this report.

Ken Nordin, AScT CCEP

1 BACKGROUND

Laberge Environmental Services (LES) was engaged by Access Consulting Group (ACG) on February 10, 2004 to assist in a monthly expanded investigation of fugitive flow from the Galkeno 300 adit. These sampling events are part of a larger project to characterize the flow distribution, quality, and migration of metals laden water draining from the Galkeno 300 adit. On March 11, 2004 a lime treatment system was commissioned to treat the adit discharge at its source so as to prevent migration of metals to Christal Creek, or to the South McQuesten River. This memo summarizes the field data collected during the sampling event of October 21 and 22, 2004.

The sites sampled during the October 2004 sampling event were as follows:

Galkeno 300 Receiving Water Sample Sites	
Site #	**Site Description**
	Galkeno 300 treatment pond effluent (sampled by ACG)
	Galkeno 300 adit flow in portal
Culvert #4	Galkeno 300 fugitive flow at Culvert #4
Hillside Flow *Into* Culvert #4	(Sample taken from hillside before flow reports to culvert.)
ACG-WQ-5 (KV_6)	Christal Creek u/s of Keno Hwy and the diversion ditch
Site A	Christal Creek u/s of the flow path of Culvert #4 (sampled by Germy Germaine)
Site C (ACG-WQ-11)	Fugitive Flow from just u/s with confluence with Christal Creek
Site D	Christal Creek d/s Culvert #5 flow but u/s Erickson Cr
KV8 (LES #7B)	Christal Creek @ mouth
KV 7 (LES #7)	Christal Creek u/s Hanson Lake Road Crossing
KV1 (LES #1)	South McQuesten River u/s Christal Creek
KV2 (LES #2)	South McQuesten River at Pump House
KV5 (LES#5)	South McQuesten 9 km D/S confluence with Flat Creek.

2 RESULTS

Ken Nordin met Scott Keesey in Elsa on October 21st. Scott and Ken then attended to the South McQuesten River and lower Christal Creek sites KV_1, KV_8, KV_7, and KV_2. (Scott collected the G300 samples earlier). On October 22nd, the rest of the sample sites were completed (Culvert #4, flow below G900 road, Christal sites A, C, and D, and KV_6). Samples were then preserved and prepared for shipping at the lab house. The site KV_5 was then visited before the crew returned to Whitehorse.

Scott shipped the water samples and bioassay from Whitehorse on October 22.

Grab sampling was done throughout. Discharge measurements were done using the LES metering kit and by volumetric at Culvert #4.

In Situ measurements follow. Digital images from the October sampling have been sent to Scott Keesey as individual .jpeg files.

In Situ Measurements Oct. 21/22, 2004

	pH	Cond. uS/cm	Temp. C	Discharge M3/s
G300 Pond Effluent	nm	nm	nm	nm
G300 Adit Flow	nm	nm	nm	nm
Culvert #4	7.5	1584	-0.2	1.61[b] L/sec
Hillside flow Into Culvert #4	7.71	1753	-0.1	nm
ACG-WQ-5 (KV_6)	8.12	887	-0.2	nm
Fugitive Flow (seep) across from G900 road	7.31	2130	0.4	Nm (approx 5 L/sec)
Site A	8.13	965	-0.3	nm
Site C (ACG-WQ-11)	8.31	1749	-0.3	nm
Site D	8.11	1039	0.2	nm
KV8 (LES #7B)	7.72	884	0.7	nm
KV7 (LES #7)	7.29	849	-0.1	0.104[s]
KV1 (LES #1)	7.3	390	0.1	nm
KV2 (LES #2)	7.72	412	-0.1	2.64[s]
KV5 (LES#5)	8.45	449	-0.2	nm

Note: [b] volumetric using calibrated bucket average 3 trials

[s] salt slug injection

Galkeno 300 Receiving Environment Monitoring

Attachment 5

LES Field Sampling Report for November Monthly Sampling Event

Laberge ENVIRONMENTAL SERVICES

Memorandum

To: Scott Keesey, Access Consulting Group — December 1, 2004

Dan Cornett, Access Consulting Group

From: Ken Nordin, Laberge Environmental Services

Re: Galkeno 300 Receiving Water Quality Fugitive Flow Investigation Sampling Event of November 26 to 30, 2004

The following is a brief summary of the receiving water and fugitive flow sampling event at Elsa– Keno, which was carried out on November 29 and 30, 2004. All samples were collected by Ken Nordin except for G300 Adit and Pond Decant, which were collected by Jeremy Germaine.

The sample kit was prepared by Ken Nordin from LES supplies. General parameters were collected in clean new one liter plastic bottles. Total metals samples were collected in 100 ml acid washed bottles and preserved with nitric acid. Dissolved metals samples were field filtered with 0.45 micron filters using 60 mL syringes and preserved at the lab house. Insulated or plain new disposable plastic gloves were used for sample collection. All containers were rinsed at least 3 times in the sample waters.

In Situ measurements of conductivity were made with an Orion instruments model 126 meter. Field pH was measured in the field with an Accumet field pH meter, calibrated on the morning of use.

The waster samples and bioassay sample were shipped by Air North on December 1st. Site access was by snowmobile. There was about 18" of snow in the valleys and about 24" around Keno Hill. Simon Mervyn of the NND assisted with his snowmobile and truck.

Please call if you have any questions about this report.

Laberge Environmental Services
Ken Nordin, AScT CCEP

1 BACKGROUND

Laberge Environmental Services (LES) was engaged by Access Consulting Group (ACG) on February 10, 2004 to assist in a monthly expanded investigation of receiving water quality related to fugitive flow from the Galkeno 300 adit. These sampling events are part of continuing efforts to characterize the flow distribution, quality, and migration of metals laden water draining from the Galkeno 300 adit. A lime treatment system has been operating since March 11, 2004. Receiving water sampling has been conducted monthly while sites closer to the adit are sampled on a daily and weekly basis and analyzed at the lab in Elsa. This memo summarizes the field data collected during the sampling event of November 29 and 30, 2004.

The sites sampled during the November 2004 sampling event were as follows:

Galkeno 300 Receiving Water Quality Sample Sites November 2004	
Site #	**Site Description**
	Galkeno 300 treatment pond effluent (sampled by ACG)
	Galkeno 300 adit flow in portal
Culvert #4	Galkeno 300 fugitive flow at Culvert #4 (Note that flow was sampled at the upstream end of the culvert, as it was hard to find on the downstream side of the road.)
ACG-WQ-5 (KV_6)	Christal Creek u/s of Keno Hwy and the diversion ditch
Site A	Christal Creek u/s of the flow path of Culvert #4 (sampled by Germy Germaine)
Site C (ACG-WQ-11)	Fugitive Flow from just u/s with confluence with Christal Creek
Site D	Christal Creek d/s Culvert #5 flow but u/s Erickson Cr
KV_8 (LES #7B)	Christal Creek @ mouth
KV_7 (LES #7)	Christal Creek u/s Hanson Lake Road Crossing
KV_1 (LES #1)	South McQuesten River u/s Christal Creek
KV_2 (LES #2)	South McQuesten River at Pump House
KV_5 (LES#5)	South McQuesten 9 km D/S confluence with Flat Creek. (Note that a blind duplicate sample for total metals was collected at this site)

2 RESULTS

Ken Nordin traveled to Elsa on November 28th, 2004 and stayed at the Lab house. Ken met Simon Mervyn at the gate on November 29th. Ken and Simon met Jeremy Germaine at the Transport and gave him sample containers for G300 Adit and pond, then attended to the South McQuesten River and lower Christal Creek sites KV_1, KV_8, KV_7, and KV_2 with Simon breaking trail with his snowmobile. Then sample sites along Christal creek were sampled; sites A, C, and D, and KV_6 before dark. Samples were then preserved and prepared for shipping at the lab house. Note that split samples were collected for analysis in the Elsa lab. These were preserved with Nitric, labeled with field pH and left in the fridge.

On November 30, Ken sampled Culvert #4, and met Simon at the South McQuesten River Road, sampled site KV_5 and returned to Whitehorse.

Ken prepared and shipped the samples by Air North on December 1st. The AWBs were 287 00222526 and 287 00222515. Custody forms were E 193785 for water and W 51473 for bioassay (the bioassay sample was shipped directly to IRC).

Grab sampling was done throughout. Only one detailed discharge measurement (KV_7) was done because conditions were not conducive elsewhere.

In Situ measurements follow. Labeled digital images from the November sampling have been sent to Scott Keesey as individual .jpeg files.

In Situ Measurements Nov. 29/30, 2004

	pH	Cond. uS/cm	Temp. C	Discharge M3/s	Split sample For Elsa	comment
G300 Pond Effluent	8.6	1572	nm	nm	yes	Sampled by J.Germaine
G300 Adit Flow	nm	nm	nm	nm	yes	Sampled by J.Germaine
Culvert #4	7.10	1924	+0.4	<1 L/sec	no	Discharge diminished from October – hard to find downstream
ACG-WQ-5 (KV_6)	8.12	887	-0.2	nm	yes	Sampled open lead
Site A	7.20	950	+0.1	nm	yes	
Site C (ACG-WQ-11)	6.52	1936	-0.3	nm	yes	No change from October
Site D	7.25	950	-0.1	nm	yes	Developing deep hole , lots of ice cover (same as last winter)
KV8 (LES #7B)	7.21	789	-0.1	nm	yes	Would have been nice if they'd cut trail *all* the way in…
KV7 (LES #7)	7.31	812	-0.2	0.102[s]	no	Sampled upstream of bridge in open lead
KV1 (LES #1)	7.10	431	0.1	nm	no	Drilled through 4" ice near LB,
KV2 (LES #2)	6.90	463	-0.2	nm	no	Drilled sample hole 2" ice
KV5 (LES#5)	7.40	474	-0.2	nm	no	Sampled open lead near LB

Note: [s] salt slug injection

Galkeno 300 Receiving Environment Monitoring

Attachment 6

ACG Field Sampling Report for December Monthly Sampling Event

ACCESS CONSULTING GROUP

Memorandum

To: Dan Cornett, Rob McIntyre, Scott Keesey. December 21, 2004

From: Kevin Tweedle

Re: Galkeno 300 Receiving Water Quality Fugitive Flow Investigation Sampling Event of December 16-17, 2004

The following is a brief summary of the receiving water and fugitive flow sampling event at Keno Hill, which was carried out on December 16 and 17, 2004. All samples were collected by Scott Keesey and Kevin Tweedle of Access Consulting Group (ACG).

The sample kit was prepared by Scott Keesey from ACG supplies. General parameters were collected in clean new one liter plastic bottles. Total metals samples were collected in 100 ml acid washed bottles and preserved with nitric acid. Dissolved metals samples were field filtered with 0.45 micron filters using 60 mL syringes and preserved at the Elsa lab house. Insulated or plain new disposable plastic gloves were used for sample collection and field filtration. All containers were rinsed at least 3 times in the sample waters prior to sample collection.

In-situ measurements of conductivity were made with an Orion instruments model 126 meter. Field pH and water temperature was measured in the field with an Accumet field pH meter, calibrated on the morning of use.

The water samples and bioassay sample were shipped by Air North on December 18th. Site access was by snowmobile rented from Lister's Rentals in Whitehorse. There was a heavy snow-pack (approx 1 m) in the area, with air temperatures around -20 C.

Please ask if you have any questions about this report.

Access Consulting Group
Kevin Tweedle, Environmental Technician

1 BACKGROUND

Laberge Environmental Services (LES) was engaged by Access Consulting Group (ACG) on February 10, 2004 to assist in a monthly expanded investigation of receiving water quality related to fugitive flow from the Galkeno 300 adit. In the event that LES is unavailable, as was the case this month, ACG staff conducted the monthly sampling event in place of LES. These sampling events are part of continuing efforts to characterize the flow distribution, quality, and migration of metals laden water draining from the Galkeno 300 adit. A lime treatment system has been operating since March 11, 2004. Receiving water sampling has been conducted monthly while sites closer to the adit are sampled on a daily and weekly basis and analyzed at the lab in Elsa. This memo summarizes the field data collected during the sampling event of December 16 and 17, 2004.

The sites sampled during the December 2004 sampling event were as follows:

Galkeno 300 Receiving Water Quality Sample Sites November 2004	
Site #	**Site Description**
	Galkeno 300 treatment pond effluent
	Galkeno 300 adit flow in portal
Culvert #4	Galkeno 300 fugitive flow at Culvert #4
ACG-WQ-5 (KV_6)	Christal Creek u/s of Keno Hwy and the diversion ditch
Site C (ACG-WQ-11)	Flow from Culvert #5 just u/s with confluence with Christal Creek
Site D	Christal Creek d/s Culvert #5 flow but u/s Erickson Cr
KV_8 (LES #7B)	Christal Creek @ mouth
KV_7 (LES #7)	Christal Creek u/s Hanson Lake Road Crossing
KV_1 (LES #1)	South McQuesten River u/s Christal Creek
KV_2 (LES #2)	South McQuesten River at Pump House

2 RESULTS

Scott Keesey and Kevin Tweedle traveled to Elsa on the morning of December 16th, 2004 and arrived 12:45 pm. Scott and Kevin met Jeremy Germaine and Grant Ewing at the Transport and gave them a new pH meter and probes, then traveled to the G300 adit to inspect the new lime addition/ agitation box and the weir inside the adit. Construction of a new v- notch weir is proposed for the G300 adit to achieve adit flow discharge readings of higher accuracy, as the inspection of the existing weir revealed inefficiencies. The G300 adit and pond decant were sampled before dark and sample bottles were stored in the Elsa lab refrigerator. The remaining Christal Creek and South Mcquesten sampling sites were sampled on December 17th with the exception of KV. 5 and Site A, which were not sampled due to time constraints. Samples were then preserved and prepared for shipping at the lab house. Note that split samples were collected for analysis in the Elsa lab. These were preserved with Nitric, labeled with field pH and left in the fridge.

Scott prepared and shipped the samples by Air North on December 18th. Custody forms were E 194918 for water and IRC ID#0412118 for bioassay (the bioassay sample was shipped directly to IRC).

Grab sampling was done throughout. Discharge measurements were not done because conditions were not conducive.

In Situ measurements follow. Digital images from the December sampling have been labeled and are saved as individual .jpeg files.

In Situ Measurements Dec. 16/17, 2004

	pH	Cond. uS/cm	Temp. C	Discharge M3/s	Split sample For Elsa	comment
G300 Pond Effluent	9.1	1650	0.2	nm	Yes	Water flowing over baffles – no retention
G300 Adit Flow	6.0	1800	2.9	nm	Yes	
Culvert #4	7.4	1440	0.8	nm	Yes	
ACG-WQ-5 (KV_6)	6.9	800	0.3	nm	Yes	
Site A	nm	nm	nm	nm	No	Didn't have time to sample
Site C (ACG-WQ-11)	7.13	1510	0.5	nm	Yes	
Site D	7.1	880	0.3	nm	Yes	
KV8 (LES #7B)	7.24	660	0.0	nm	Yes	
KV7 (LES #7)	7.31	720	0.3	nm	Yes	
KV1 (LES #1)	6.95	400	0.5	nm	Yes	Glaciated
KV2 (LES #2)	7.7	460	0.2	nm	Yes	
KV5 (LES#5)	nm	nm	nm	nm	No	Didn't have time to sample