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FAIRBANKS GOLD MINING, INC.

FORT KNOX MINE
COMPLIANCE MONITORING PLAN

June 2008

Prepared by:

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FORT KNOX MINE
MONITORING PLAN

Submitted to:

Alaska Department of Natural Resources
Division of Mining, Land and Water
3700 Airport Way
Fairbanks, Alaska 99709

Alaska Department of Environmental Conservation
Division of Air and Water Quality
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Fairbanks, Alaska 99709-3643

and

Department of the Army
U.S. Army Engineer District, Alaska
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1 INTRODUCTION

Fairbanks Gold Mining, Inc. (FGMI), a wholly owned subsidiary of Kinross Gold U.S.A., Inc., is submitting this monitoring plan for the Fort Knox Mine to the Alaska Department of Environmental Conservation (ADEC) in accordance with AS 46.03.010 and 18 AAC 60.015. Concurrently, the plan is being submitted to the U.S. Army Corps of Engineers (COE) as required by Section 404 Permit Number 4-920574 Fish Creek 23.

The Fort Knox Mine and all operating and ancillary facilities are located on private land and legally filed and held State mining claims. The State mining claims are on land administered by Alaska Department of Natural Resources (ADNR). State Water Rights are held by FGMI for the entire upper drainage of Fish, Solo, and Last Chance creeks with the point of use identified as the water supply reservoir.

It is the goal of FGMI to operate the mine and milling processes at the Fort Knox Mine in a manner that will ensure zero discharge for the protection and enhancement of surface and groundwater quality. This monitoring plan will assist FGMI in the establishment and refinement of operating procedures to ensure the long-term protection of State of Alaska land, wildlife, and water resources. Periodic updates of the monitoring plan will coincide with regulatory changes, five-year reviews, process modifications, or anomalies noted as a result of monitoring and sampling.

This monitoring plan is a part of the comprehensive environmental and operational management system for the Fort Knox Mine. The overall project and each process component have specific management plans, which dovetail with this monitoring plan. To minimize duplication of information and rationale for specific monitoring and sampling requirements the reviewer needs to reference the following management plans**:**

- Fort Knox Project Water Resources Management Plan, March 1994;
- Fort Knox Mine Tailing Storage Facility Operation and Maintenance Manual, April, 2007;
- Fort Knox Mine Water Dam Operation and Maintenance Manual, July 2004:
- Fort Knox Project Reclamation & Closure Plan, June 2007;
- Walter Creek Heap Leach Facility Project Description, January 2006;
- Waste Management Permit for Fort Knox Mine, 2006-DB0043, July 2007;
- Fort Knox Mine Drinking Water Monitoring Plan PWSID#314093, June 2004;
- Fort Knox Water Monitoring QA/QC and Field Procedures Manual, January 2007.

Access by Federal and State regulatory personnel to the Fort Knox Mine facilities for the purpose of inspecting for reclamation, wildlife mortalities, or other appropriate compliance areas are statutory/regulatory mandates and will be adhered to by FGMI, with the request that agents contact mine security to gain access. The health and safety of FGMI employees and that of regulatory personnel is the rationale for this request. Mining is regulated under the Mine Safety and Health Administration (MSHA) and their regulations require minimum training for employees and visitors for Hazard Recognition and Safety. Visitors as well as employees must wear safety equipment, approved by MSHA. FGMI requests consideration by the regulatory agencies to conduct routine inspections during weekdays when administration and process managers are available to answer questions and, if necessary, accompany agents to different process components.

1.1 General information

1.1.1 Location

The project is located in portions of Sections 8-12, 13-17, 20-23, and 26-27, T2N, R2E, Fairbanks Meridian; and Sections 7-8 and 17-19, T2N, R3E, Fairbanks Meridian.

1.1.2 Corporate information

Business Name: Fairbanks Gold Mining, Inc.
Address: P.O. Box 73726
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Telephone: (907) 488-4653
General Manager: Larry Radford Vice President and General Manager

Fairbanks Gold Mining, Inc. is a wholly owned subsidiary of

Kinross Gold U.S.A., Inc.
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1.1.3 Designated contact person for regulatory issues

Name: Delbert Parr
Title: Environmental Manager
Telephone: (907) 490-2207

1.2 Site description

The Fort Knox Mine is an open pit gold mine on the north flank of Gilmore Dome about 15 miles northeast of Fairbanks, Alaska (Figure 1.1). Using conventional open pit mining and milling technology and operating year-around, 40,000 to 45,000 tons of ore per day are being processed, producing approximately 300,000 to 350,000 ounces of gold per year.

Access to the site is via the Steese Highway, Fish Creek Road, and an access road. Fish Creek and its tributaries drain the project area. In the beneficiation procedures, the gold ore is crushed, ground, and then processed as slurry in a mill adjacent to the mine. The gold is extracted in tanks containing a cyanide solution that dissolves the gold. Next the gold is captured by activated carbon, then stripped from the carbon and recovered from solution by electrolysis. Once the gold is removed, the remaining slurry goes to the thickener that recovers a majority of the cyanide, other reagents, and heated water before the tailing slurry is released to the Tailing Storage Facility (TSF). The cyanide concentration in the tailing is maintained within permit limits using the INCO process when necessary. The INCO process combines ammonium bisulfate and copper sulfate with air, in an agitated tank, to destroy the cyanide. Typically, maintaining the cyanide concentration in discharged tailing material does not require the use of the INCO process, but is controlled by the recovery of cyanide solution and the addition of freshwater to the thickened tailing. Tailing is piped to the TSF from the mill and deposited in the TSF sub-aerially using multiple discharge points. The valley fill heap leach covering 315 acres will be located in the upper end of the Walter Creek drainage upstream from the tailing impoundment. The heap leach pad has an ultimate capacity of 161 million tons.

Ore for the heap leach will consist of run-of-mine rock from the Fort Knox Pit and various stockpiles. The ore is characterized by relatively high permeability that will promote solution flow and drainage for rapid rinsing at closure. In-heap storage of process solution and storm water will be accomplished by constructing an embankment in the downstream toe of the heap. The pregnant solution from the heap is piped to a Carbon-in-Columns plant that captures the gold. The carbon is then processed through existing facilities in the mill.

Tailings are deposited in a 1,556-acre impoundment. The tailing dam is an earth-filled structure designed to hold all process water from the mill, as well as surface runoff water. The dam is designed and maintained to contain the 100-year, 24-hour storm event in addition to the average 30-day spring breakup. The water in the impoundment is intended to contain levels of certain contaminants above drinking and/or aquatic water standards. Contaminant levels will be maintained below toxic levels for avian and terrestrial wildlife species. Impoundment water is not discharged but is recycled to the mill for reuse in the beneficiation process of the gold ore.

In November 2006, FGMI discovered a small seep just below the downstream toe of the dam on the south abutment. Since that time, FGMI has taken numerous steps to explore and address this issue, in conjunction with state and federal agencies. From the time the seep was discovered until the update of this report, extensive sampling has indicated that no process water has escaped FGMI's containment system. Down-gradient groundwater and wetland areas continue to be free from cyanide.

To ensure zero discharge, a seepage control system located at the toe of the dam collects subsurface flow and returns it to the tailing impoundment. A series of twelve groundwater interceptor wells (designated as IW-1, IW-2, IW-3, IW-4, IW-5, IW-6, IW-7, IW-8, IW-11, MW-1, MW-3, and 401) are located down gradient of the seepage control system. These wells collect a combination of groundwater and seepage. Production is pumped to the tailing seepage sump and subsequently to the tailing impoundment. Four additional groundwater monitoring wells are installed downstream of the interceptor wells to monitor water quality. They are designated as MW-5, MW-6, MW-7, and MW-8.

A fresh water supply reservoir is located on Fish Creek three miles below the tailing dam. Fresh water is supplied from the reservoir to the mill for mixing reagents, gland water, and make-up water for the milling process when necessary.

1.3 Objectives

Baseline monitoring for the Fort Knox Mine was started in 1989 and continued throughout the permitting process. The objective of baseline monitoring was to collect data that described the pre-mining surface water and groundwater quality in the project area. These data were used to determine the potential impacts caused by development and operation of the Fort Knox Mine. Construction of the mine commenced in the spring of 1995 and the first bar of ore was poured in December 1996. Compliance monitoring was initiated on November 14, 1996 when mill operations commenced. The objective of compliance monitoring is to ensure that the Fort Knox Mine operates within permit limitations minimizing impact to the environment.

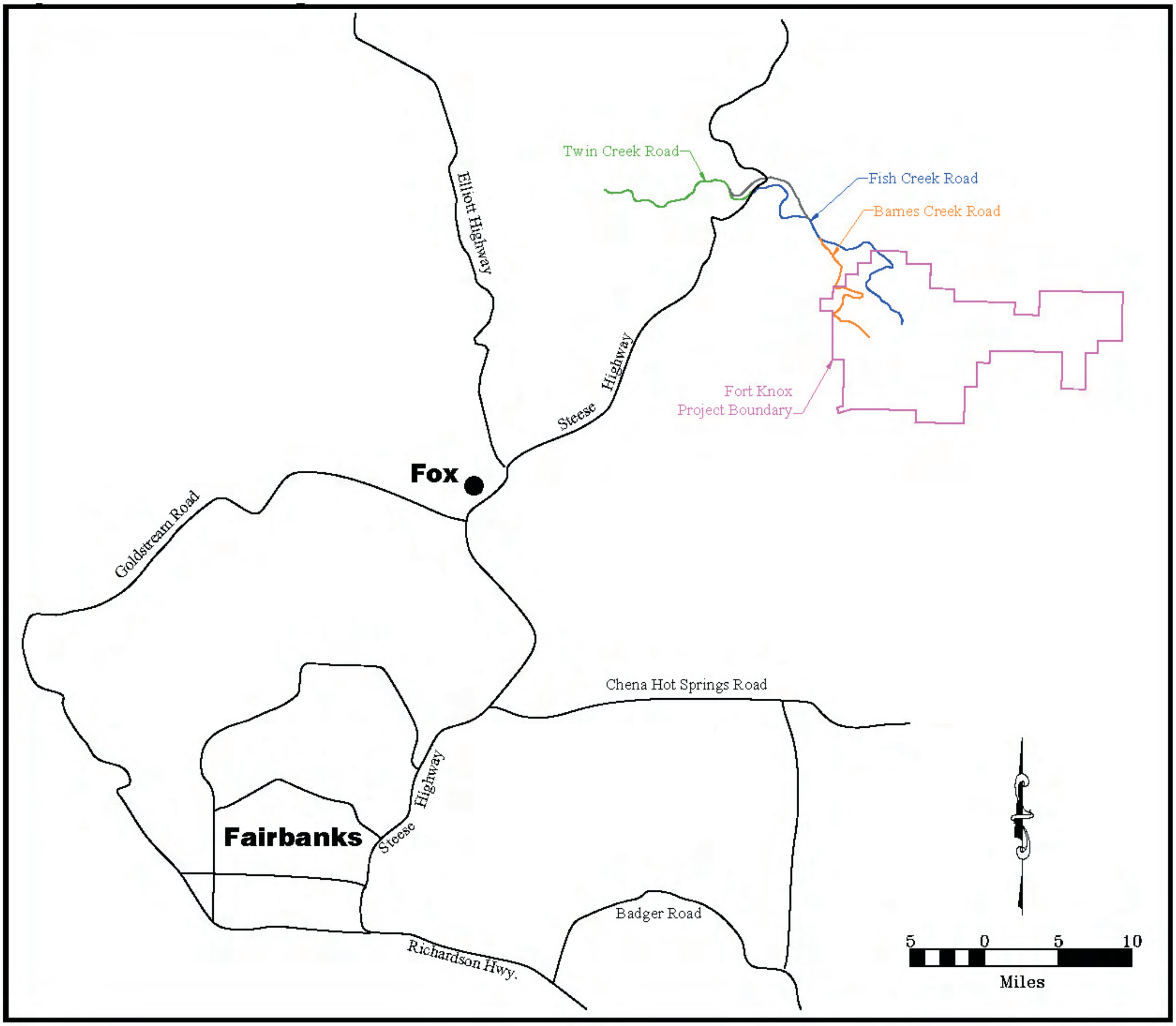

Figure 1.1: Site Location Map

2 REGULATORY FRAMEWORK

This monitoring plan has been developed to meet the requirements of Title 18 Chapters 60 and 70 of the Alaska Administrative Code (AAC). Specifically, this document follows the guidelines set forth in Article 7 of 18.AAC.60; Monitoring and Corrective Action Requirements (Title 18 Chapter 60 Section 800-860) with the objective of meeting the requirements of 18 AAC 70.

Fort Knox operates the TSF under the Waste Management Permit # 2006-DB0043. The permit is subject to the surface water and groundwater monitoring requirements of 18.AAC.60.810 and 18.AAC.60.825, respectively. A summary of the relevant portions of these regulations is provided below.

2.1 Surface water monitoring

Per 18.AAC.60.810(a-g), the surface water monitoring program reflects the following requirements:

- 18.AAC.60.810(b) The points of compliance have been chosen so that highest concentrations of hazardous constituents migrating off the facility will be detected and so that interference from sources of pollution unrelated to the facility's waste management operations will be minimized.
- The criteria of 18.AAC.60.825(c) specifically applicable to surface water including;
    - 4(B) the volume and physical and chemical characteristics of the leachate;
    - 4(F) the existing quality of the groundwater, including other sources of pollution and their cumulative effects on the groundwater, and whether the groundwater is used or might reasonably be expected to be used for drinking water;
- 18.AAC.60.810(d) Monitoring parameters have been selected that are indicative of the type of hazardous constituents associated with the type of waste handled at the facility.

The surface water monitoring program reflects these regulations in the following manner:

- The compliance points are located to ensure detection of changes in water quality and minimize the influence of historical mining activities.
- A set of indicator parameters has been established that reflects the composition of the decant water in the TSF.

- A compliance monitoring and reporting program based on indicator parameters has been defined to reflect the composition of the decant water and site-specific background water quality.
- Tolerance intervals have been established for selected parameters to identify if statistically significant increases occur over background conditions.

2.2 Groundwater monitoring

The groundwater monitoring program reflects the following components of 18 AAC 60 and 18 AAC 70:

- 18.AAC.60.825(a-e) The monitoring system has been designed to meet the requirements in terms of location, design, local hydrogeologic conditions, facility design, the ability to detect potential releases and local physiographic constraints.
- 18.AAC.60.825(a1B) Sampling at other wells will provide an indication of background groundwater quality that is at least as representative as that provided by upgradient wells.
- 18.AAC.60.825(c) Has established relevant points of compliance which reflect local hydrogeologic conditions, the volume and physical and chemical characteristics of the leachate (i.e., decant water), the existing quality of the groundwater, including other sources of pollution and their cumulative effects on the groundwater, and whether the groundwater is used or might reasonably be expected to be used for drinking water.
- 18.AAC 60.830 A compliance monitoring and reporting program based on indicator parameters has been defined to reflect the composition of the decant water and site-specific background water quality.

Similar to the surface water monitoring program the groundwater monitoring program reflects these regulations in the following manner:

- The compliance wells are located to ensure detection of changes in water quality and minimize the influence of historical mining activities.
- A set of indicator parameters has been established that reflects the composition of the decant water in the TSF.
- Appropriate tolerance levels have been established for parameters to appropriately reflect background conditions and allow detection of statistically significant increases.
- A compliance program and indicator parameters have been defined to reflect the composition of the decant water and site-specific background water quality.

For both surface water and groundwater, the indicator parameters have been selected to provide definitive evidence if the TSF ceases to function as a zero discharge facility. They reflect parameters which are relatively conservative and at significantly higher concentrations in the decant relative to ambient downgradient water.

2.3 Background conditions

Before depositing any waste in the TSF, Fort Knox collected baseline water quality data in the Fish Creek Drainage from 1989 through 1995. In the area downstream of the TSF which was disturbed before 1989 by placer mining, the baseline period identified several parameters in both surface and groundwater with concentrations exceeding Alaska Water

Quality Standards. ADEC recognizes and acknowledges that concentrations of iron and manganese were elevated within the Fish Creek drainage after placer mining and before Fort Knox operations. Appendix A presents an analysis of the baseline data.

Due to their elevated concentrations below the TSF prior to mine operations, iron and manganese were specifically excluded from the suite of parameters chosen to indicate seepage and compliance with the mine’s zero discharge requirement. This is consistent with the need to minimize the interference of conditions unrelated to the mining operation relative to the effectiveness of the monitoring plan.

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3 MONITORING NETWORK

3.1 Mill and tailing facilities process fluids

Process fluids are any liquids including meteoric waters, which are intentionally or unintentionally introduced into any portion of the beneficiation process. All process fluids are controlled under the fluid management system, which consist of the following components:

- Mill/heap leach/process recovery plant including but not limited to all existing tanks, basins, sumps, pumps and piping necessary to interconnect the components that contain process fluid within this plant.
- Tailing impoundment, the main embankment (all phased lifts), tailing discharge lines, seepage collection within the main embankment, and the recycling system to return all seepage flows to the tailing basin.
- Interceptor wells to recover seepage that bypasses the reclaim system in the embankment toe and groundwater.
- Monitoring wells down gradient to assure interceptor system is performing as designed.

The process fluid monitoring network includes the following:

- Tailing at Mill (post cyanide detox)
- Tailing Liquor (filtrate)
- Tailing Solids
- Tailing Decant Solution
- Tailing Seepage Reclaim
- Interceptor Wells (IW-1, IW-2, IW-3, IW-4, IW-5, IW-6, IW-7, IW-8, IW-11, MW-1, MW-3, and 401)
- Compliance Monitoring Wells (MW-5, MW-6, MW-7, and MW-8)

The location for these points is illustrated on Figure 3.1 (Note tailing solids and liquor are sampled in the plant).

3.2 Heap leach process fluids

The *Walter Creek Heap Leach Facility Project Description* (FGMI, 2006b*)* has a complete description of the various process components associated with the heap leach. Please refer to this document for more in-depth explanations of the heap and ancillary facilities.

The Walter Creek Valley Heap Leach Facility monitoring network includes:

- heap water to the TSF
  i) leak detection monitoring in the Leachate Collection and Recovery System (LCRS) and Process Component Monitoring System (PCMS) sumps,
- the heap underdrain monitoring wells at the base platform, the bench of the in-heap storage pond embankment, and the crest of the in-heap storage pond embankment,
- monitoring wells including the old batch plant well.

3.3 Developed wetlands and water supply reservoir

The monitoring network employed for the developed wetlands and water supply reservoir includes:

- Lower developed wetlands
- Upper developed wetlands
- Water supply reservoir
- Surface water below the Water Supply Reservoir (Freshwater Seepage)

Figure 3.1 illustrates the locations of these monitoring points.

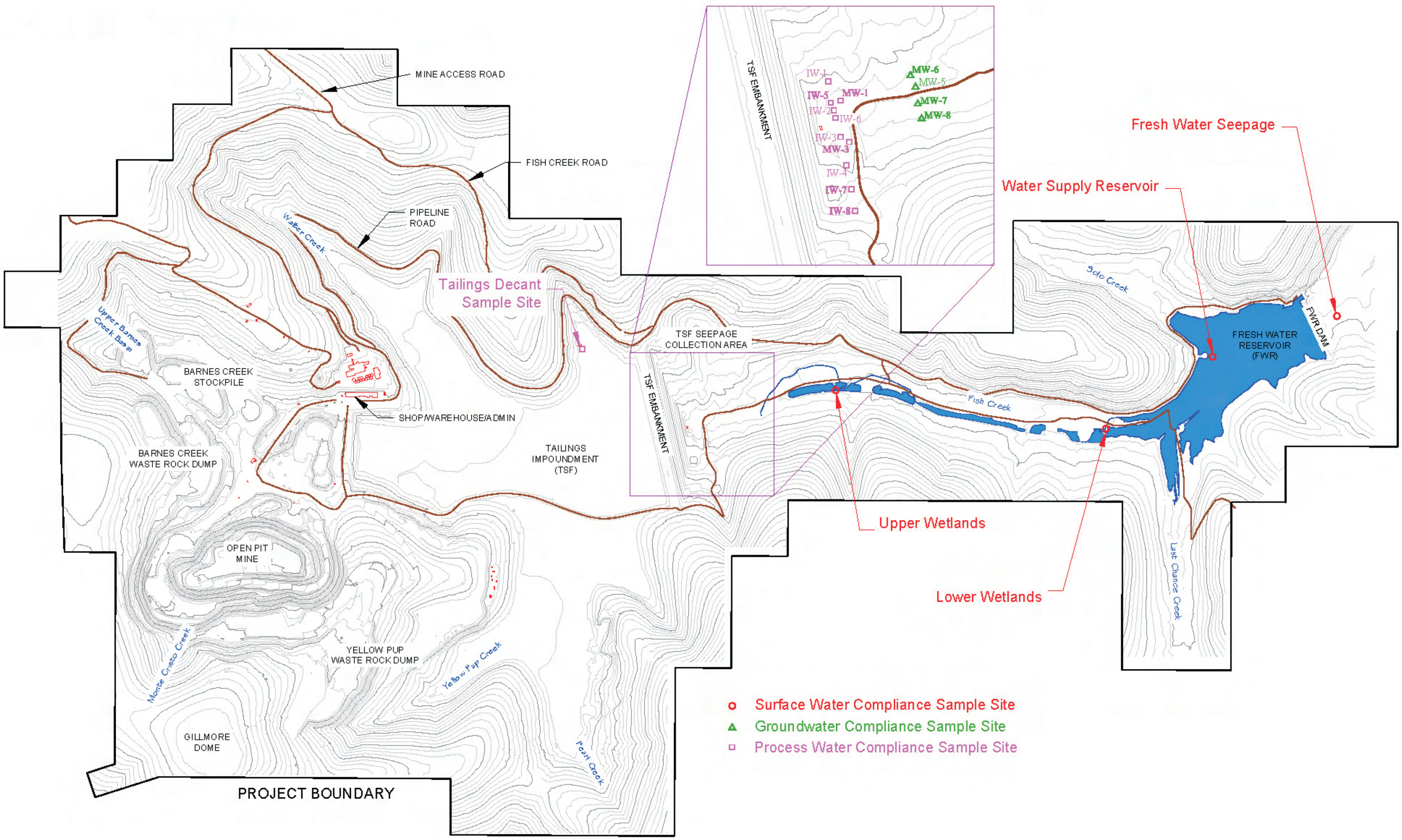

Figure 3.1: Compliance Monitoring Locations

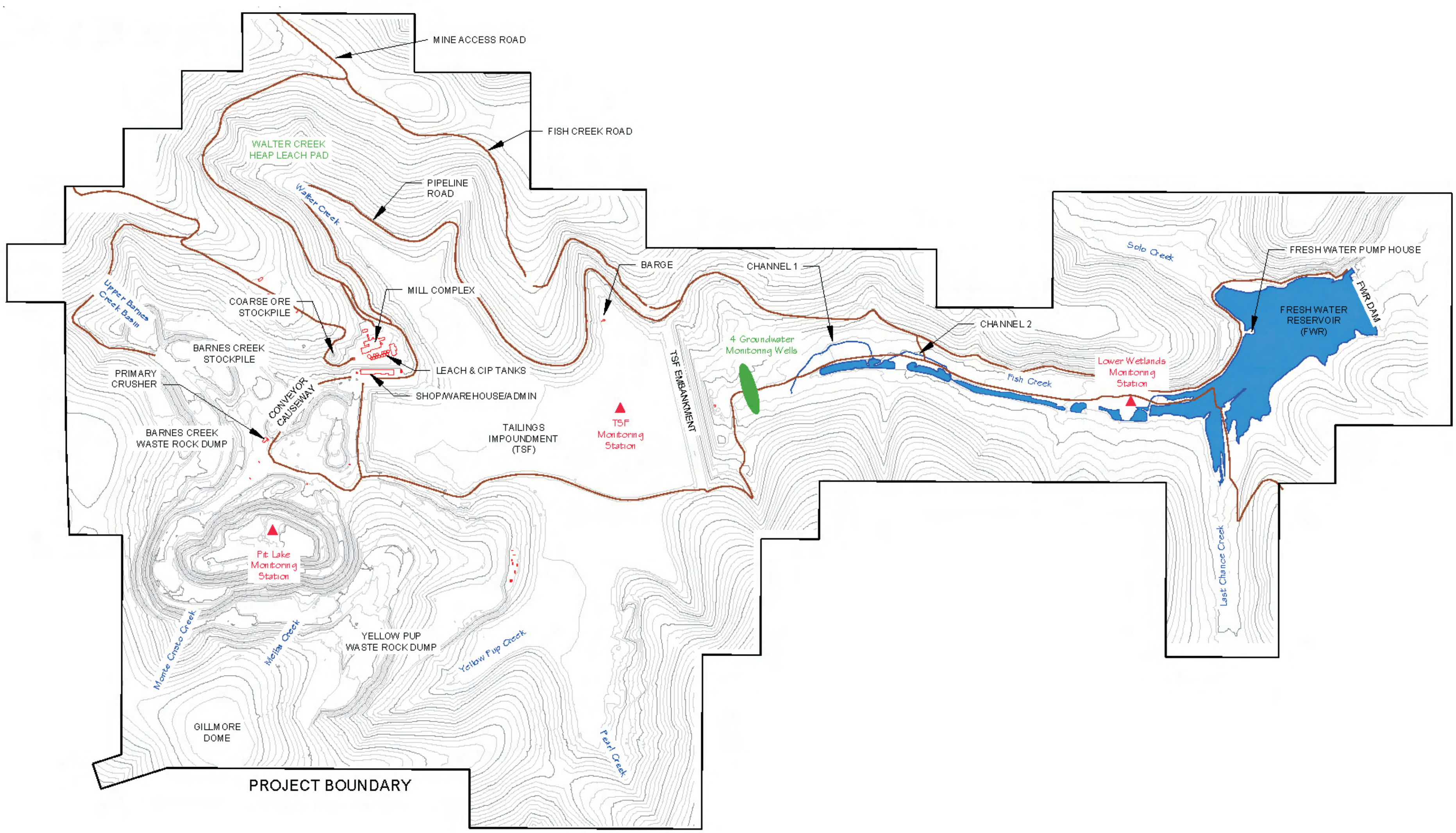

Figure 3.2: Long Term Monitoring Locations

4 INDICATOR PARAMETERS AND TOLERANCE LEVELS

The Fort Knox TSF functions as a zero discharge facility. All contact water is captured within the facility as a result of surface water controls and the groundwater interception system. The purpose of the indicator parameter monitoring and reporting is to confirm that the TSF continues to function as a zero discharge facility. The indicator parameters represent constituents present in the decant pond that are at concentrations significantly higher than the downgradient surface water and groundwater. The parameters are relatively conservative in the environment and provide unambiguous data regarding the performance of the controls responsible for maintaining zero discharge.

4.1 Decant water composition

Decant water is characterized by high pH, high total dissolved solids, and elevated concentrations of nitrogen and many trace metals. Decant water is predominantly alkaline, with a pH range from 7 to 10, and an average of 8.4. When plotted on a trilinear diagram, most decant water samples are of the calcium-sodium/sulfate type (Figure 4.1).

A number of parameters are found in high concentrations, which contributes to high total dissolved solids concentrations (average of 796 mg/L). The most common constituents are sulfate (average concentration 359.2 mg/L), calcium (average concentration 120.3 mg/L), and sodium (average concentration 85.86 mg/L). Trace constituents include relatively high levels of iron, cyanide, WAD cyanide, antimony, arsenic, manganese, and barium. Full descriptive statistics can be found in Table 4.1.

4.2 Indicator parameters

Indicator parameters were selected as those most likely to give an unambiguous chemical signature at monitoring locations in the event of a release from the tailing storage facility. Parameters were selected which showed a clear difference in concentration between decant waters and waters naturally found at monitoring locations. In selecting parameters, preference was also given to relatively conservative ions to reduce the possibility that these parameters would attenuate through chemical processes between the time of a possible release and when the constituents would arrive at the monitoring locations.

Based on these criteria, chloride, sulfate, nitrate, arsenic, copper, antimony, cyanide, nitrite, nitrogen as ammonia, and WAD cyanide were selected as indicator parameters. These parameters show significant differences in concentration between decant and ambient downgradient water (Table 4.2 for a summary). These parameters are all conservative, and the ones most likely to undergo chemical reaction (ammonia, nitrate, nitrite, cyanide and WAD cyanide),

Table 4.1 Summary statistics for tailings pond decant water

Variable	Number of:		Fraction	Statistics Calculated using Detected Observations Only (mg/L)				
	Detections	Non-Detects	Non-detects	Minimum	Maximum	Mean	Median	Standard Deviation
Lab pH	41	0	0.00%	7	10	8.376	8.2	0.601
TDS	41	0	0.00%	180	1170	795.6	803	194.9
TSS	32	9	21.95%	1.2	175	25.98	21.5	29.7
CA	59	0	0.00%	18	233	120.3	118	39.97
MG	59	0	0.00%	0.94	12.7	5.809	5.6	2.131
NA	59	0	0.00%	8.6	119	85.86	88.5	21.76
K	59	0	0.00%	3.8	34.6	15.41	15.1	4.823
SI	59	0	0.00%	4	36.2	6.613	5.7	4.17
CL	41	0	0.00%	0.83	92	34.31	29.8	19.23
SO_4	41	0	0.00%	5.33	637	359.2	353	133.8
NO_3	41	0	0.00%	0.5	20.6	9.013	7.9	4.994
F	35	6	14.63%	0.1	1	0.395	0.36	0.162
FE	46	13	22.03%	0.03	5.15	0.533	0.38	0.783
MN	58	1	1.69%	0.008	0.307	0.062	0.0435	0.0521
AS	58	1	1.69%	6.00E-03	1.09	0.326	4.00E-02	0.393
CD	8	51	86.44%	5.00E-04	0.009	0.0027	7.35E-04	0.00378
CN	38	3	7.32%	2.00E-02	3.8	0.828	2.50E-01	1.057
CR	3	56	94.92%	3.00E-04	0.05	0.0169	4.00E-04	0.0287
CU	59	0	0.00%	3.00E-02	3.04	0.88	0.447	0.933
PB	11	48	81.36%	1.00E-04	0.012	0.0035	0.003	0.0032
ZN	19	40	67.80%	0.002	0.04	0.0159	0.01	0.0107
NO_2	39	2	4.88%	1.00E-01	13.8	1.889	0.93	2.64
AG	2	57	96.61%	2.00E-04	0.01	0.0051	0.0051	0.00693
BA	59	0	0.00%	0.016	0.194	0.0357	0.032	0.0226
BI	0	59	100.00%	N/A	N/A	N/A	N/A	N/A
HG	0	59	100.00%	N/A	N/A	N/A	N/A	N/A
SB	47	12	20.34%	0.002	2.42	0.796	0.545	0.804
SE	33	26	44.07%	0.006	0.065	0.0261	0.023	0.0153
Ammonia (as Nitrogen)	39	2	4.88%	4.4	50.1	18.9	15.9	11.46
WAD Cyanide	38	3	7.32%	0.01	2.6	0.566	0.14	0.765
Total Alkalinity	41	0	0.00%	37	92	61.04	59	14.05
Bicarbonate Alkalinity	40	1	2.44%	5	86	51.37	53	20.43
PO_4	25	17	40.48%	0.01	0.44	0.162	0.12	0.136

N/A Indicates no sampled values above detection.
Period of Record 1996 to 2008.

Table 4.2 Summary statistics for indicator parameters in decant and monitoring location waters

	Variable	Number of Detection	Number of Non-Detects	Proportion Non-Detects	Minimum	Maximum	Mean	Median	SD
					Statistics Calculated Using Detected Observations Only				
Decant Water	Cl	41	0	0.00%	0.83	92	34.31	29.80	19.23
	SO_4	41	0	0.00%	5.33	637	359.2	353.0	133.8
	NO_3	41	0	0.00%	0.5	20.6	9.013	7.900	4.994
	As	58	1	1.69%	0.006	1.09	0.326	0.040	0.393
	Cu	59	0	0.00%	0.030	3.04	0.880	0.447	0.933
	Sb	47	12	20.34%	0.0020	2.420	0.796	0.5450	0.804
	CN	38	3	7.32%	0.02	3.8	0.828	0.250	1.057
	NO_2	39	2	4.88%	0.1	13.8	1.889	0.930	2.640
	NAmmonia	39	2	4.88%	4.4	50.1	18.900	15.900	11.460
	WAD Cyanide	38	3	7.32%	0.01	2.6	0.566	0.140	0.765
Seepage Water	Cl	43	3	6.52%	3	54	24.12	25.00	6.95
	SO_4	46	0	0.00%	11	475	302.0	311.0	102.1
	NO_3	46	0	0.00%	0.4	13.2	8.416	8.880	3.020
	As	3	43	93.48%	0.0005	0.009	0.003	0.001	0.005
	Cu	4	42	91.30%	0.002	0.08	0.046	0.050	0.041
	Sb	27	19	41.30%	0.0020	0.105	0.044	0.0426	0.022
	CN	34	12	26.09%	0.01	0.21	0.059	0.039	0.054
	NO_2	31	10	24.39%	0.02	9.96	0.889	0.160	2.300
	NAmmonia	45	1	2.17%	0.1	21.3	2.100	1.300	3.484
	WAD Cyanide	28	18	39.13%	0.007	0.13	0.026	0.020	0.024
Groundwater Sites	Cl	55	50	47.62%	0.7	26	2.94	2.00	4.96
	SO_4	74	31	29.52%	0.39	910	31.7	18.5	105.1
	NO_3	12	91	88.35%	0.01	13	2.280	0.090	4.243
	As	45	92	67.15%	0.0005	0.0031	0.001	0.001	0.001
	Cu	4	65	94.20%	0.004	0.01	0.007	0.007	0.003
	Sb	0	69	100.00%	N/A	N/A	N/A	N/A	N/A
	CN	4	102	96.23%	0.01	0.235	0.107	0.094	0.115
	NO_2	5	93	94.90%	0.01	0.12	0.046	0.020	0.046
	NAmmonia	41	65	61.32%	0.05	0.43	0.130	0.100	0.085
	WAD Cyanide	4	102	96.23%	0.011	0.091	0.039	0.028	0.037
Surface Water Sites	Cl	4	62	93.94%	0.7	1.7	0.98	0.75	0.49
	SO_4	69	0	0.00%	1	58	16.8	15.0	10.8
	NO_3	28	41	59.42%	0.02	1.6	0.331	0.205	0.402
	As	8	61	88.41%	0.003	0.0437	0.016	0.010	0.015
	Cu	6	132	95.65%	0.000	0.01	0.004	0.002	0.005
	Sb	3	135	97.83%	0.0003	0.016	0.005	0.0005	0.009
	CN	0	69	100.00%	N/A	N/A	N/A	N/A	N/A
	NO_2	3	66	95.65%	0.04	0.95	0.357	0.080	0.514
	NAmmonia	45	24	34.78%	0.05	1.7	0.279	0.170	0.326
	WAD Cyanide	0	69	100.00%	N/A	N/A	N/A	N/A	N/A

Note: Period of record for samples used extends from 1996 to 2008. MW-8 data range from 2007 to 2008 used in the groundwater analysis. All concentrations reported as mg/L.

reactions will most likely yield another of those parameters as a product, which will still indicate a potential discharge.

4.3 Tolerance limits

A number of methods are available to detect statistically significant deviations from baseline water quality. Among these methods, tolerance intervals have already been established as an acceptable method of detecting deviations from baseline conditions at the Fort Knox site in the Baseline Water Quality Analysis Memo (WMC, 2008). Appendix A contains explanations and references for tolerance interval techniques, along with citations for the ProUCL 4.0 software used to calculate tolerance limits and other statistics.

Before calculating tolerance limits, monitoring locations were divided into groups where necessary. This prevents inappropriately applying the same upper tolerance limits to monitoring locations with different water chemistries. Differences were identified using the Gehan test, a non-parametric method suitable for identifying differences between site chemistries. The Gehan test was selected over other methods because it is effective even when considering a high proportion of non-detected observations and multiple detection limits as are found in the monitoring location data for the indicator parameters (ProUCL Version 4.0 Technical Guide, 2007).

The results of the Gehan tests found that both surface water sites (the Upper Wetlands and Lower Wetlands monitoring locations) belonged to the same group. The groundwater monitoring locations were segregated into one group containing MW-5, MW-6, and MW-8, and one grouping encompassing MW-7. This result confirms results of other analyses such as water typing using trilinear diagrams, which also show that MW-7 has a distinct chemistry relative to the other monitoring wells (Figure 4.2).

Upper tolerance limits with 95 percent coverage and 95 percent confidence were calculated for each group of monitoring locations using non-parametric methods, which were selected because of the high percentage of non-detected data (for a fuller explanation of the tolerance interval approach, consult Appendix A). Tolerance limits were computed using dissolved concentrations for groundwater sites and total concentrations for surface water sites. For parameters with no observations above the detection, the detection limit was used to define the upper tolerance limit. Results are summarized in Table 4.3 and Table 4.4.

Table 4.3 Upper tolerance limits for groundwater monitoring locations

Parameter:	MW-5, MW-6, and MW-8 Upper Tolerance Limit (mg/L)	MW-7 Upper Tolerance Limit (mg/L)
As	0.005	0.002
Cu	0.02	0.02
Cl	17	26
CN WAD	ML	ML
NO_2	1	1
NO_3	3.87	13
NH_4	0.33	0.36
Sb	0.002	0.0155
SO_4	70	910

**Dissolved concentrations*

Note: If the minimum level (ML) for any indicator parameter is greater than the calculated tolerance limit, the ML will be adopted as the tolerance limit.

Table 4.4 Upper tolerance limits for surface water monitoring locations

Parameter:	Upper and Lower Wetlands Upper Tolerance Limit (mg/L)
As	0.0437
Cu	0.01
Cl	2.5
CN WAD	ML
NO_2	1
NO_3	1.4
NH_4	1.1
Sb	0.005
SO_4	53

** Total recoverable concentrations*
Note: If the minimum level (ML) for any indicator parameter is greater than the calculated tolerance limit, the ML will be adopted as the tolerance limit.

Other parameters will continue to be monitored as set forth in Sections 5 and 6. For wells and surface waters downgradient of the facility, monitoring of parameters other than indicator parameters is to provide continuing reference data for overall water quality within the system, rather than for compliance purposes.

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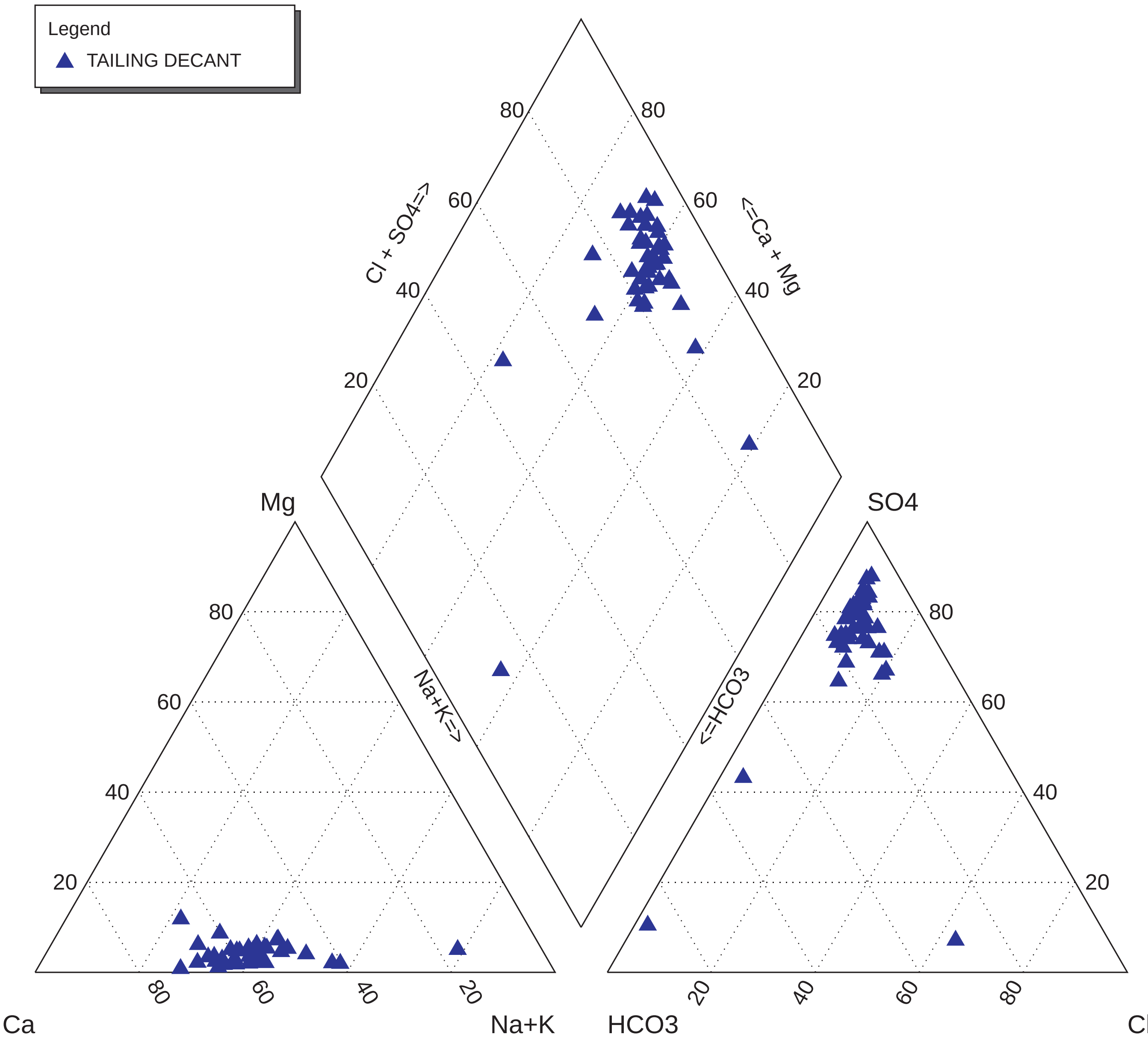
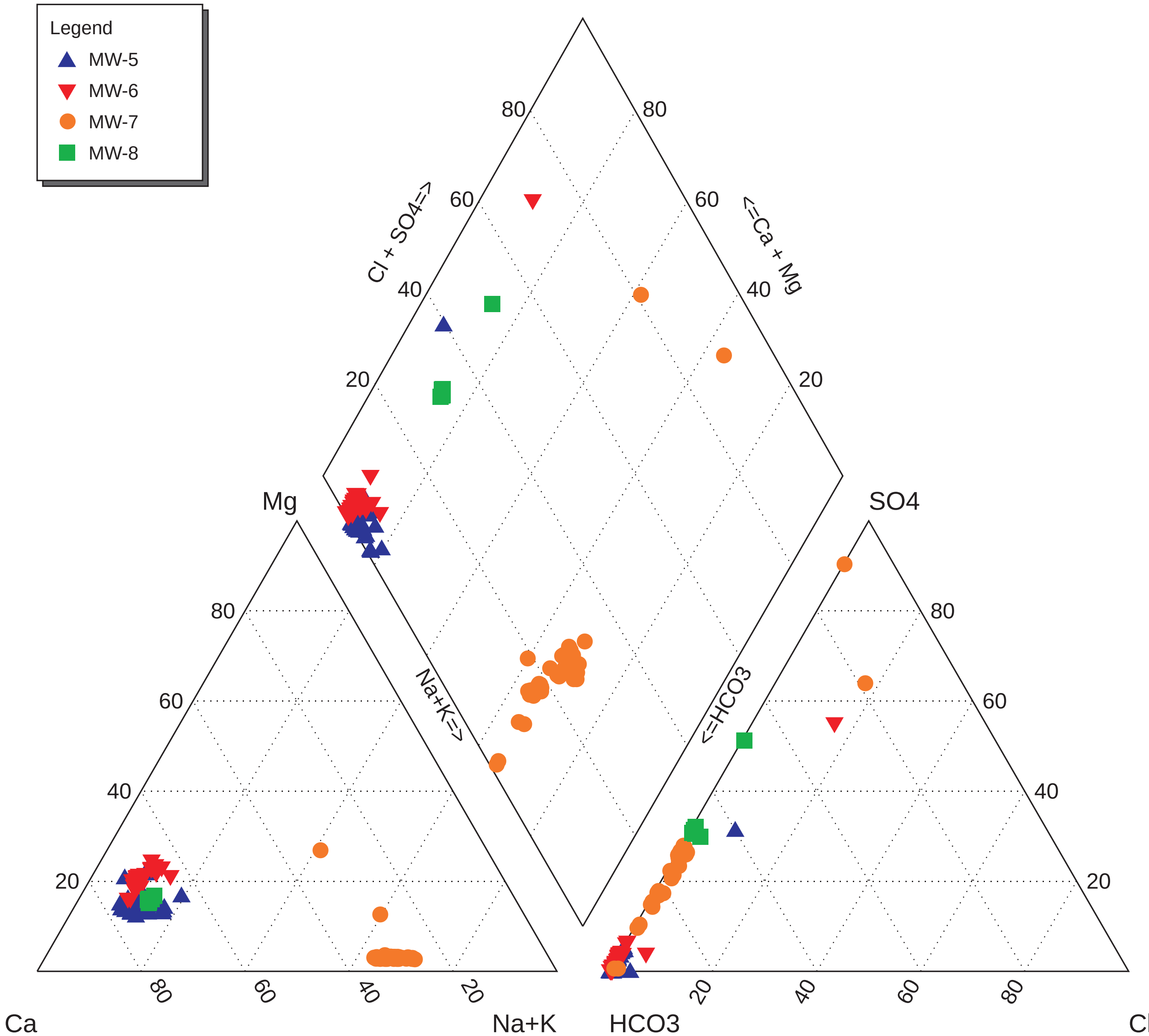


WATER MANAGEMENT CONSULTANTS A Schlumberger Company	TAILINGS POND DECANT COMPOSITION		
	CLIENT: FGMI	PROJECT: WATER QUALITY EVALUATION	
	JOB: 2766 FILE: DECANT.CDR	DRAWN: MG	CHECKED: JC
	DATE: JUNE 2008	FIGURE: 4.1	



WATER MANAGEMENT CONSULTANTS A Schlumberger Company	GROUNDWATER COMPOSITION FOR COMPLIANCE MONITORING WELLS			
	CLIENT: FGMI		PROJECT: WATER QUALITY EVALUATION	
	JOB: 2766	FILE: MWS.CDR	DRAWN: MG	CHECKED: JC
	DATE: JUNE 2008		FIGURE: 4.2	

5 ANALYTICAL PROFILES

The current analytical profiles used for surface water, groundwater, and organic parameters are summarized in Tables 5.1 through 5.3. Analytical methods are all USEPA and state approved. Baseline samples were analyzed for organic parameters only once. The results were below detection for all parameters and the analysis was not repeated.

Table 5.1 Analytical profile I–surface water inorganic parameters

Major ion chemistry	Minor ion chemistry	Trace ion chemistry
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide, Total	* Barium
Temperature (field)	Cyanide, WAD	* Bismuth
Turbidity	Fluoride	* Cadmium
Settleable Solids	*Iron	* Chromium
Total Suspended Solids	* Manganese	* Copper
Total Dissolved Solids	Nitrogen, Ammonia	* Lead
* Calcium	Nitrate as Nitrogen	* Mercury
* Magnesium	Nitrite as Nitrogen	* Nickel
* Potassium	Total Phosphorus	* Selenium
* Silicon	TPH	* Silver
* Sodium		* Zinc
Chloride		
Sulfate		
Alkalinity (as $CaCO_3$)		
Bicarbonate		
Total Hardness		

** Total recoverable*

Table 5.2 Analytical profile II– groundwater inorganic parameters

Major ion chemistry	Minor ion chemistry	Trace ion chemistry
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide, Total	* Barium
Temperature (field)	Cyanide, WAD	* Bismuth
Turbidity	Fluoride	* Cadmium
Total Suspended Solids	*Iron	* Chromium
Total Dissolved Solids	* Manganese	* Copper
* Calcium	Nitrogen, Ammonia	* Lead
* Magnesium	Nitrate as Nitrogen	* Mercury
* Potassium	Nitrite as Nitrogen	* Nickel
* Silicon	Total Phosphorus	* Selenium
* Sodium	Sulfide	* Silver
Chloride		* Zinc
Sulfate		
Alkalinity (as $CaCO_3$)		
Bicarbonate		
Total Hardness		

** Dissolved*

Table 5.3 Analytical profile III–organic parameters

Benzene	Lindane
Carbon tetrachloride	Methoxychlor
Chlordane	Methyl ethyl ketone
Chlorobenzene	Nitrobenzene
Chloroform	Pentachlorophenol
o-Cresol	Pyridine
m-Cresol	Tetrachloroethylene
p-Cresol	Toluene
2,4-D	Toxaphene
1,4-Dichlorbenzene	Trichloroethylene
1,1-Dichloroethylene	2,4,5-Trichlorophenol
Endrin	2,4,6-Trichlorophenol
Ethyl benzene	2,4,5-TP (silvex)
Heptachlor	Vinyl chloride
Hexachlorobenzene (and its hydroxide)	PCB
Hexachlor-1,3-butadiene	Xylene (total)
Hexachloroethane	

Note: Organic analyses completed once as part of baseline characterization. Organic parameters are not part of the current monitoring program.

On August 15, 2003 FGMI received approval from ADEC to reduce the water quality analysis for both Profile I and Profile II for Fort Knox. Approval was given to conduct analyses for dissolved constituents in groundwater samples and to conduct total recoverable analyses in surface water samples. Previously, analyses were performed for both total recoverable and dissolved constituents for both profiles.

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6 COMPLIANCE MONITORING AND SAMPLING

6.1 Mill and tailing facilities process fluids

Monitoring requirements for the fluid management system associated with the Mill and Tailing Facilities are shown in Table 6.1. Analytical profiles are described in Section 5.0.

Table 6.1 Monitoring requirements for process fluid monitoring network

Identification	Parameter	Frequency
Tailing at Mill (post cyanide detox)	pH and WAD CN	2 per day
Tailing Liquor (filtrate)	Profile I	Quarterly
Tailing Solids at Mill (post cyanide detox)	Profile II	Quarterly
	Acid/Base Accounting	Quarterly
Tailing Decant Solution	Profile I	Quarterly
Tailing Seepage Reclaim	4 Metals[1]	Monthly
	Profile I	Quarterly
Interceptor Wells[2]	Profile II	Quarterly
	Static Water Depth	
Compliance Monitoring Wells[3]	Profile II	Quarterly
	Static Water Depth	Daily

1 Antimony, arsenic, selenium, and lead are tested on a monthly basis and the results sent to ADEC.
2 Includes IW-1, IW-2, IW-3, IW-4, IW-5, IW-6, IW-7, IW-8, IW-11, MW-1, MW-3, and 401
3 MW-5, MW-6, MW-7, and MW-8

Results of analysis for the two samples per day collected from the mill tailings at the post cyanide detox point are recorded on the mill operations log and available for review. Mill tailing samples are drawn at two hour intervals on each of the two 12 hour shifts. The sample analyzed and reported represents a composite of the six, two hour interval, post cyanide detox, samples collected during each shift. The information is summarized on the quarterly report indicating maximum, minimum and average pH/WAD cyanide readings for the quarter.

Individual parameters may be reduced after additional sampling. The criteria for reducing parameters will be based on consistent results of analysis below the detection limit and the potential for changes that could result in water quality concerns.

6.2 Heap leach process fluids

Table 6.2 summarizes the monitoring requirements for the Walter Creek Heap Leach Facility. Monitoring is required for the heap leach LCRS and PCMS and the underdrain system due to their potential to be affected by process fluids. During the first six months of heap operation the LCRS and the PCMS will be checked for flow weekly, and if fluid is present a sample will be analyzed for WAD CN and pH. If no flow is visible, monitoring frequency for the LCRS and the PCMS will be reduced to once a month. The underdrain system will be sampled monthly for the first year and then quarterly beginning the second year. Underdrain system samples will be analyzed using the Profile II list of analytes (Table 5.2). The pregnant solution will also be sampled quarterly and analyzed for WAD CN and pH. The elevation of the in-heap storage pond will be monitored and controlled automatically.

Table 6.2 Summary of heap leach monitoring requirements

Identification	Parameter	Frequency
LCRS–First six months	WAD CN/pH	Weekly[1]
LCRS–seventh month forward	WAD CN/pH	Monthly
PCMS–First six months	WAD CN/pH	Weekly[1]
PCMS–seventh month forward	WAD CN/pH	Monthly
Underdrain–3 wells first year	Profile II	Monthly[2]
Underdrain–beginning 13th month	Profile II	Quarterly
Preg Solution	WAD CN/pH	Quarterly
In-Heap Storage Pond	Elevation	Continuous Automatic Monitoring
Solution Recirculation/Rinsing	Profile II	Quarterly[3]

1 *During initial 6 months of operation, monitoring reduced if no flow.*
2 *During initial 12 months of operation, monthly sampling will occur; monitoring will then be reduced to quarterly.*
3 *Begins after economic leaching is completed-continuing for approximately one year.*

Required monitoring locations will include the Walter Creek Valley Heap Leach Facility discharges, which include: 1) heap water to the TSF, 2) leak detection monitoring in the LCRS and Process Component Monitoring System (PCMS) sumps, 3) the heap underdrain system consisting of three monitoring wells in the following locations: the base platform, the bench of the in-heap storage pond embankment, and the crest of the in-heap storage pond embankment, and groundwater monitoring wells including the old batch plant well.

If WAD cyanide concentration above 10 mg/L is detected in the heap's PCMS sumps, then all sump water must remain contained within heap leach system. ADEC must be notified within one working day of discovery.

If WAD cyanide concentration above 0.2 mg/L is detected in the underdrain system, the permittee must notify ADEC within one working day of discovery. Then, the permittee must demonstrate to the department's satisfaction that all water reports to the TSF.

The specific MDL and ML for WAD cyanide concentration values between the MDL and ML provide a margin of safety indicating increasing trends prior to any exceedances. Based on the rate and magnitude of a trend, ADEC may require corrective action. When a MDL is exceeded, the permittee shall verbally notify ADEC within 60 days of the end of the calendar quarter when it occurred and provide written notification within 7 days of verbal notice.

FGMI will conduct periodic audits for the purpose of reviewing performance under this permit and approvals, and the agencies' regulatory oversight of such performance, and to aid in updating the Reclamation and Closure Plan and associated closure and post closure monitoring cost estimate. The first audit shall occur in 2011 (coordinate with DNR) or prior to final closure if final closure occurs prior to 2011.

The Walter Creek Valley Heap Leach Facility must be closed before the TSF is closed. Until closure of the TSF, any surface, groundwater, heap process water, and any other water originating from Walter Creek Valley must meet the following requirements; the tailing waste slurry shall be neutralized to contain a monthly average of 10 mg/L or less of WAD cyanide. The maximum concentration of WAD cyanide in the slurry discharge shall be 25 mg/L.

6.3 Developed wetlands and water supply reservoir

The monitoring requirements for the developed wetlands and water supply reservoir are summarized in Table 6.3. Individual parameters may be reduced after additional sampling. The criteria for reducing parameters will be based on consistent result of analysis below the detection limit and the potential for changes that could result in water quality concerns.

Table 6.3 Quarterly monitoring requirements for the developed wetlands and the water supply reservoir

Identification	Parameter	Frequency
Lower developed wetlands	Profile I	Quarterly
Upper developed wetlands	Profile I	Quarterly
Water supply reservoir	Profile I	Quarterly
Surface water below the water supply reservoir (Freshwater Seepage)	Profile I	Quarterly

6.4 Characterization of acid generation potential

Annual characterization of overburden/topsoil, B-stockpile, waste rock, and ore will continue over the life of the mine. Collection of representative samples will be based on annual operational and geological records identifying materials mined. Meteoric Water Mobility Procedure (MWMP) and acid/base accounting (ABA) will be performed on the samples. If ABA results show less than a 3 to 1 ratio of net neutralization potential to net acid generation, kinetic testing (12-week humidity cell testing) will be completed.

Tailing solids are submitted quarterly for ABA analysis. If these test results indicate less than 3 to 1 net neutralization potential, a 12-week humidity cell test will be completed. MWMP testing will also be performed on the tailings solids, using Profile II analysis.

6.5 Solid waste landfill monitoring

Inert construction and demolition materials from the mine and mill operations will be disposed of in the solid waste land fill trenches in accordance with the Fort Knox Construction and Demolition Debris Landfill Permit #9931-BA001. For a more detailed discussion of permit requirements please refer to the *Fort Knox Mine Solid Waste Management Plan*. Since materials disposed of within the landfill trenches are inert, the potential for leachate is minimal. Furthermore landfill trenches will be located at least 100 feet from any surface water body, greater than 200 feet from any surface drinking water source, and all surface water runoff will be diverted away or around landfill trenches to minimize infiltration. Additionally, trench bottoms will be located more than 10 feet above existing or expected future groundwater table. Therefore, no special groundwater or surface water monitoring is planned.

Weekly visual inspections will be made to ensure that landfill trenches are being operated properly and in compliance with the Fort Knox Construction and Demolition Debris Landfill Permit #9931-BA001. A summary of monitoring requirements for an active landfill is shown in Table 6.5.

Table 6.4 Summary of monitoring requirements for an active landfill

Frequency	Action
Weekly	Landfill inspection
Monthly	Litter cleanup, site wide, during snow free months (begin within 2 weeks of snowmelt)
Spring	Cover waste with 6” compacted soil
Fall	Cover waste with 6” compacted soil
Annually	Report to ADEC by December 31 of each year
As Needed	Cover light debris (foam, packing material) within 24 hrs of placement to prevent windblown debris
As Needed	Vector control (flies/rodents) to prevent health hazards

6.6 Embankment monitoring

The TSF embankment and the Water Supply Reservoir embankment are routinely monitored. For a completed description of monitoring requirements please refer to the *Fort Knox Mine Tailing Storage Facility Operation and Maintenance Manual April, 2007* and the *Fort Knox Mine Water Dam Operation and Maintenance Manual April, 2007.* Table 6.6 shows the TSF inspection schedule and Table 6.7 shows the Water Supply Reservoir inspection schedule.

Table 6.5 Tailing storage facility inspection schedule

<u>DAILY</u>

1. Mill operator’s Daily Report: inspection of tailing barge/reclaim pumps, seepage pumps and ballast readings. Barge and seepage water samples.
2. Tailing Embankment Inspection: check condition of upstream slope, downstream slope, downstream toe, crest of dam.
3. Barge Inspection Form: record tailing discharge point, pool depth, instantaneous flow, totalizer flow, general housekeeping.
4. Inspection of tailing discharge lines, process water pipeline and discharge point.
5. Automatic collection of electronic depth-to-water data for Interceptor Wells (IW) 1–8 and 11, Monitor Wells (MW) 1 and 3, and seepage sump levels.

<u>WEEKLY</u>

1. Record Totalizer Flow for Interceptor Wells, MW-1 and MW-3.
2. Record Instantaneous Flow for Interceptor Wells, MW-1 and MW-3.
3. Static water levels for MW-2 and MW-4 through MW-8.
4. Inspection of automatically collected depth-to-water data in mill control Data Collection System.

Table 6.5 Tailing storage facility inspection schedule (continued)

5. Record Tailing Impoundment water elevation.
6. Check Freeboard.

MONTHLY

1. Record Impoundment elevation level, record data graphically.
2. Read piezometers, record data graphically.
3. Record total volume pumped and average flow rates to tails pond and mill.
4. Survey embankment settlement monuments (until July 1997).

SEMI-ANNUALLY

1. Survey embankment monuments (after July 1997).

ANNUALLY

1. Complete detailed facility inspection including all exposed earthwork, concrete, structural steelwork (bridge), pump house, sumps, valves, and exposed piping.
2. Review and update Water Dam Operation and Maintenance Manual, if necessary.
3. Review and update Emergency Action Plan, if necessary.

AS REQUIRED

1. Carry out checks and services, as specified by the manufacturer, on pumps, valves, and controls.

Table 6.6 Water supply reservoir inspection schedule

DAILY

1. Check pump station including trash screens, heater, piping and valves when operating
2. Record instantaneous flow rates to tails pond and mill (when operating).
3. Check spillway for blockage damage.
4. Check condition of: Upstream slope, Downstream slope, Downstream toe, Crest of Dam.
5. Visually check seepage flow rate and clarity.

WEEKLY

1. Check pump station condition.
2. Record pond elevation weekly.
3. Check spillway and outlet works for blockage/damage.
4. Check embankment condition.
5. Observe flow into seepage sump, rate and clarity.
6. Check sump overflow line.
7. Check Solo Creek causeway.
8. Check Solo Creek culvert and riprap.
9. Check security and safety devices.

Table 6.6 Water supply reservoir inspection schedule (continued)

MONTHLY
1. Note pond elevation fluctuation.
2. Record total volume pumped and average flow rates to tails pond and mill.
3. Survey embankment settlement monuments (until July 1997).
4. Summarize pertinent weekly and daily comments.

QUARTERLY
1. Read Piezometers, update graphs.

SEMI-ANNUALLY
1. Survey embankment monuments (after July 1997).

ANNUALLY
1. Complete detailed facility inspection including all exposed earthwork, concrete, structural steelwork (bridge), pump houses, sumps, valves, and exposed piping.
2. Review and update Water Dam Operation and Maintenance Manual, if necessary.
3. Review and update Water Dam Operation and Maintenance Manual, if necessary.
4. Review and update Emergency Action Plan, if necessary.

AS REQUIRED
1. Carry out checks and services, as specified by the manufacturer, on pumps, valves, and controls.

6.7 Potable water supply monitoring

Routine sampling and analysis of water from the potable water system at appropriate points and times are completed in accordance with 18 AAC 80.200. Reporting requirements conform to 18 AAC 80.260. Presently, Pioneer Water is trucking potable water to the Fort Knox Mine on a daily basis. A detailed monitoring plan for the potable water system is described in the *Fort Knox Mine Drinking Water Monitoring Plan PWSID#314093*, *June 2004.* Table 6.8 summarizes the monitoring requirements for the potable water system.

Table 6.7 Summary of potable water monitoring requirements

Analyte	Analytical Method	Frequency	Report
Free Chlorine	Pocket Colorimeter Analysis System	Monthly	Submit to ADEC
Bact-T	Sample to Lab	Monthly	Submit to ADEC
Vendor Bact-T	Copy from Vendor	Monthly	Environmental Department Filing System
TTHM	Sample to Lab	Every Third Year[1]	Submit to ADEC
HAA5	Sample to Lab	Every Third Year*	Submit to ADEC
Cross-Connection Report	Internal Inspection	Annually	Environmental Department Filing System
Sanitary Survey	ACED Certified Inspector	Every Five Years[2]	Submit to ADEC

1 If results of test are "no detect" then sampling is only required every third year. First sample in July 2004 was no detect.

2 Most recent Sanitary Survey conducted December 2005.

6.8 Avian and Terrestrial Wildlife Monitoring

Frequent visual inspection of the tailing impoundment surface focuses on the decant pool and unconsolidated tailing depositional areas. No open pools of process solution were included in the heap leach design; therefore inspections would focus on any unusual occurrences of surface ponding of solution. Although all employees are directed to report unusual circumstances involving wildlife to security; all environmental, mill and mine maintenance, and mill and mine operations personnel have specific responsibility to thoroughly inspect and report wildlife mortalities and terrestrial animals mired in unconsolidated tailing.

Operational standards require the tailing discharge from the mill and the resultant decant pool to be non-toxic to avian and terrestrial wildlife species. However, realizing that all wildlife species have a finite life span, some natural mortalities will occur within the boundaries of the mine site. Occurrences within specific process component areas, such as the tailing impoundment, will require special collection and sampling.

All wildlife mortalities will be immediately reported to the security officer on duty. The species and a decant water or heap leach solution sample, will be collected. The decant/solution water sample will be collected as close to the site of the carcass as standing solution is present. The solution sample will be preserved immediately with sodium hydroxide to attain a pH >10 and submitted to an outside laboratory for WAD cyanide analysis. The collected wildlife species will be immediately preserved by freezing (size dependant) and temporarily stored in a facility under the control of mine security.

U.S. Fish & Wildlife Service (USFWS), the Alaska Office of Habitat Management and Permitting (OHM&P), and ADEC will be contacted to report mortalities within 24-hours or during their next scheduled workday. A written follow-up report (Appendix B) will be submitted to USFWS and OHM&P with the date the mortality was discovered, identification of species, and WAD cyanide level of solution sample. The follow-up report will be submitted within seven (7) days of the initial verbal notification to allow verification of analytical results.
Contact:

U.S. Fish & Wildlife Service
Ecological Service
101- 12th Avenue
Fairbanks, Alaska 99701
Telephone (907) 456-0388

Alaska Office of Habitat Management and Permitting
1300 College Road
Fairbanks, Alaska 99701-1599
Telephone (907) 451-6292

Alaska Department of Environmental Conservation
Northern Regional Office
610 University Avenue
Fairbanks, Alaska 99709
Telephone (907) 451-2360

All carcasses will be available for final collection by USFWS or OHM&P, depending on species (i.e., migratory bird or game species). Laboratory results of analysis for WAD cyanide concentration from solution samples will determine final disposal procedure for all carcasses collected. WAD cyanide levels >25 mg/L will trigger a necropsy to determine cause of death. WAD cyanide levels <25 mg/L will not require further analytical analysis. Final deposition of all carcasses will be determined by the appropriate agency.

Terrestrial animals mired in unconsolidated tailing material will be extracted and moved or herded to a safe area. All attempts to extract mired animals will be based on evaluation as to the health and safety of employees and that of the animal.

6.9 Mine closure monitoring

For a complete description of monitoring after mine closure please refer to the *Fort Knox Reclamation and Closure Plan.* Table 6.9 is a summary of closure monitoring requirements for the pit lake, decant pond, seepage collection system, injection system, groundwater compliance wells, and surface water compliance point. Table 6.10 shows a summary of monthly and quarterly analytes.

Table 6.8 Summary of closure monitoring

Monitoring location	0 to 2 years		3 to 5 years		+ 6 years	
	Frequency	**Parameter list**	**Frequency**	**Parameter list**	**Frequency**	**Parameter list**
Decant pond	Quarterly	Complete	Quarterly	Complete	Quarterly	Complete
Pit lake	Annual	Complete	Annual	Complete	Annual	Complete
Seepage collection system	Monthly	Indicator	Quarterly[1]	Complete	NA	NA
Injection system	Monthly	Indicator	Quarterly[1]	Complete	NA	NA
compliance wells	Monthly	Indicator	Quarterly	Complete	Annual	Complete
Surface water compliance point	NA	NA	NA	NA	Monthly[2]	Indicator

1 Only if operational

2 Discharges predicted to begin after about 12 years

Table 6.9 Summary of monthly and quarterly analyte lists

Monthly samples	Quarterly samples
pH	pH
TDS	TDS
Sulfate	TSS[1]
Alkalinity	Calcium
Arsenic	Magnesium
Antimony	Sodium
Cadmium	Potassium
Copper	Chloride
Iron	Sulfate
Manganese	Alkalinity
Selenium	Arsenic
Cyanide	Antimony
WAD cyanide	Cadmium
	Copper
	Iron
	Manganese
	Selenium
	Zinc
	Nitrate
	Nitrite
	Ammonia
	Cyanide
	WAD cyanide

1 Surface water only

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7 MONITORING/SAMPLE RECORDS AND REPORTING

7.1 Documentation of measurements, sampling, and inspections

For each measurement or sample taken pursuant to this monitoring plan, the following information shall be recorded:

- The exact place, date, and time of inspection, observation, measurement, or sampling;
- The person(s) who inspected, observed, measured, or sampled;
- The dates the analyses were performed and by which analytical facility;
- The analytical techniques or methods used;
- The accuracy of the analytical method (detection limits); and
- The results of all required analysis.

7.2 Retention of records

During operation, closure and reclamation all records of monitoring activities and results, calibrations, and maintenance records will be retained for a period of three years.

7.3 Monitoring reports and submission schedules

Indicator parameters have been selected to represent constituents present in the decant pond that are at concentrations significantly higher than the downgradient surface water and groundwater. The indicator parameters have been selected because they are relatively conservative in the environment and provide the best indication of performance of controls responsible for maintaining zero discharge. Monitoring results for indicator parameters will be compared with the upper tolerance limits established in Section 4.3. If an indicator parameter exceeds its established tolerance limit, this exceedance will be reported to the state.

Other parameters will continue to be monitored as set forth in Sections 5 and 6. For wells and surface waters downgradient of the facility, monitoring of parameters other than indicator parameters is to provide continuing reference data for overall water quality within the system, rather than for compliance purposes.

This is consistent with operation of a zero-discharge facility where the primary purpose of monitoring is to confirm performance of discharge controls rather than measuring changes in downgradient water quality.

Monitoring results will be reported quarterly to ADEC. All quarterly reports will be submitted on or before the 15th day of the month following the quarter. An Annual Activity Report will be presented to the ADEC, ADNR, COE and U.S. Environmental Protection Agency (EPA) during the first quarter of the following year summarizing monitoring results. Along with previous requirements from the Fort Knox Monitoring Plan, the annual report prepared for the ADEC, ADNR, COE and EPA will address the following:

- The groundwater collection system is operating adequately to collect all groundwater from the tailing impoundment.
- The LCRS and PCMS and underdrain groundwater collection systems are operating adequately.
- An updated annual water accounting including the heap leach.
- Contaminant levels within the tailing impoundment and documentation of any increases that would indicate toxic concentrations to wildlife.
- Reports will be on forms or in a data base format, which is agreeable to ADEC, ADNR, COE and EPA.

In addition, a trend analysis will be completed on selected parameters as a confirmation that the TSF continues to function as zero-discharge.

8 REFERENCES

FGMI, (1994). *Fort Knox Project Water Resources Plan, March 1994.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2004a). *Fort Knox Mine Tailing Storage Facility Operation and Maintenance Manual June, 2007.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2004b). *Fort Knox Mine Water Dam Operation and Maintenance Manual July 2004.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2004c). *Fort Knox Mine Potable Water Monitoring Plan, June 2004. PWSID#314093.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2006a). *Fort Knox Mine Reclamation and Closure Plan, January 2006.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2006b). *Walter Creek Heap Leach Facility Project Description, January 2006.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2006c). *Fort Knox Mine Solid Waste Management Plan, January 2006.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

FGMI, (2006d). *Fort Knox Water Monitoring QA/QC and Field Procedures Manual, January 2006.* Fairbanks Gold Mining, Inc. Fairbanks, Alaska

Knight Piesold & Co., (2005). *FGMI Walter Creek Valley Fill Heap Leach Facility Design Report Issued For Agency Review*. Knight Piesold & Co. Denver, Colorado

WMC, (2005a). *Fort Knox Mine Tailing Facility Closure Management Plan*. Water Management Consultants , Inc. Denver, Colorado.

WMC (2005b). *Fort Knox Mine Closure Management Plan for the Proposed Heap Leach Facility*, Water Management Consultants, Inc. Denver, Colorado.

WMC, (2008). Baseline Water Quality Analysis Technical Memorandum to Delbert Parr, March 5, 2008.

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FAIRBANKS GOLD MINING, INC.

FORT KNOX MINE
COMPLIANCE MONITORING PLAN

Appendix A

Baseline Water
Quality Analysis

TECHNICAL MEMORANDUM

WATER MANAGEMENT CONSULTANTS
A Schlumberger Company

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To:	Delbert Parr (Delbert.Parr@Kinross.com)
Company:	FGMI
Project No.:	2766
From:	John Chahbandour (jchahbandour@watermc.com)
Date:	March 5, 2008
Subject:	Baseline Water Quality Analysis

1 INTRODUCTION AND METHODS

Water Management Consultants, Inc.–A Schlumberger Company (WMC) has completed a background water quality statistical analysis with the objective of establishing compliance levels for parameters with historically elevated concentrations in both groundwater and surface water in the Fish Creek drainage below the Ft. Knox tailing storage facility. The method utilized is based on guidelines set forth in the Alaska Administrative Code (AAC) Title 18 Chapter 60 Section 810-840. Under the Waste Management Permit # 2006-DB0043, the owner/operator must establish an appropriate method for evaluating statistically significant changes in water quality. The AAC identifies four different methods for evaluating water quality monitoring data: (1) parametric analysis of variance, (2) analysis of variance, (3) prediction or tolerance interval, or (4) control charts (18.AAC 60.830).

Analysis of the pre-mining baseline water quality data was completed using the tolerance interval approach to establish action limits for four parameters, antimony, arsenic, iron, and manganese. These constituents are known to occur at elevated levels in the Fish Creek drainage. The purpose of the tolerance interval approach is to define a concentration at which a there is 95 percent confidence that values reported below the action limits are consistent with background conditions. The analysis was completed using ProUCL 4.0, a statistical analysis program developed by the EPA (2007). The distributions of the data were analyzed for normality, transformed when possible and analyzed for upper tolerance limits (UTLs) using the appropriate parametric methodology outlined in the EPA guidance. In some cases (i.e., high percentage of non-detects), non-parametric techniques were used to establish the UTLs. Results from groundwater analysis are presented in Section 2, and results of the surface water analysis are presented in Section 3. Appendix A includes the water quality databases used in the statistical analysis. Appendix B presents the statistical analysis outputs.

2 GROUNDWATER

2.1 Background data: source and quality

Before Ft. Knox began mining operations, groundwater monitoring wells were installed in the Fish Creek drainage. A subset of these wells was selected to best represent the same groundwater system which provides water to the current compliance wells to characterize baseline water quality. Figure 2.1 illustrates the location of the baseline monitoring wells. Beginning in May 1992, water quality samples were collected from these wells on a quarterly basis until May of 1994. In September 1995, another set of samples was collected before operations began in 1996. A total of 199 groundwater samples were collected to establish baseline water quality conditions. The sampling frequency is summarized in Table 2.1.

These wells are all in the immediate vicinity of the existing compliance monitoring wells, and all lie in the same hydrogeologic system along the valley bottom. Groundwater compositions in the baseline wells are virtually identical to those in the compliance wells. As illustrated in Figures 2.2 through 2.4, the baseline samples plot within the same compositional field defined by the current compliance wells. The similarity between the two data sets indicates that the historical data are representative of current conditions and valid for establishing upper tolerance limits.

Figure 2.5 illustrates the frequency distributions for both total and dissolved concentrations of the four parameters analyzed. Figure 2.6 illustrates sample distribution by month and depth. The samples were collected from intervals between 20 and 142 feet. For comparison, the compliance monitoring wells have depths between 120 and 150 feet.

Table 2.1 Groundwater sample frequency

Site Name	1992	1993	1994	1995	Total
FA1	6	8	4		18
FA2	6	8	4		18
FA3	6	6	4		16
FA7	6	8	4		18
FA8	6	8	10	8	32
FB1S	6	8	4		18
FB4S	8	8	4		20
FB5S	6	3	6		15
FB7D	6	12	4		22
FB7S	8	8	4		20
FB8S	2				2
Total	66	77	48	8	199

2.2 Discussion

The results of the statistical analysis are presented in Table 2.2. Analysis of the data indicates that concentration distributions for groundwater are non-normal and non-transformable. The results of the normality testing are located in Appendix B.1. UTLs were therefore calculated using nonparametric techniques instead of being fit to a modeled distribution. Non parametric UTLs are established using the ordinal ranking of the observations and selecting a defined observation rank as the UTL. The selection was based on the observation resulting in 95 percent coverage of the average with a confidence of 95 percent.

Table 2.2 Groundwater summary statistics

Variable	# Detections	# Nondetects	% Nondetects	Minimum (mg/L)	Maximum (mg/L)	Mean (mg/L)	Median (mg/L)	SD	Skewness	CV	Distribution
Fe (d)	99	1	1.00	0.011	58.2	14.96	8.91	15.19	1.066	1.015	Non-normal
Fe (t)	98	1	1.01	0.011	110	20.2	10.7	19.84	1.401	0.982	Non-normal
Mn (d)	100	0	0.00	0.016	2.19	1.019	1.09	0.496	-0.0688	0.487	Non-normal
Mn (t)	99	0	0.00	0.194	2.4	1.062	1.12	0.517	0.0279	0.487	Non-normal
As (d)	80	20	20.00	0.001	0.044	0.012	0.007	0.0116	1.037	0.962	Non-normal
As (t)	83	16	16.16	0.001	0.256	0.0182	0.01	0.0282	6.337	1.553	Non-normal
Sb (d)	8	92	92.00	0.003	0.1	0.00753	0.003	0.0157	4.697	2.087	Non-normal
Sb (t)	2	97	97.98	0.003	0.1	0.00749	0.003	0.0159	4.606	2.124	Non-normal

For summary statistics, all nondetects set to detection limits

CV – Coefficient of variation
SD – Standard deviation
(d) – Dissolved concentration
(t) – Total concentration

Table 3.3 Upper tolerance limits for surface water

Parameter	Derived from Log-Normal Distribution (mg/L)	Derived from Non-Parametric Techniques (mg/L)	Applicable Drinking Water Standard MCL (mg/L)	Recommended Action Limit (mg/L)
Dissolved Fe	1.94		0.3	1.941
Total Fe		39.5	0.3	39.5
Dissolved Mn	0.36		0.2	0.363
Total Mn		0.79	0.2	0.79
Dissolved As		0.008	0.05	0.05
Total As		0.045	0.05	0.05
Dissolved Sb		0.05	0.006	0.05
Total Sb		0.05	0.006	0.05

REFERENCES

Alaska Administrative Code (AAC) Title 18 Chapter 60 Section 810-840.

Environmental Protection Agency (EPA). 2007. EPA ProUCL Version 4.0 Users Guide. EPA/600/R-07/038.

EPA. 2006. Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S.

Table 2.3 presents the UTLs calculated for dissolved and total concentrations for each parameter. This method establishes a 95 percent confidence level for concentrations falling below the UTL. This means that concentrations not exceeding this limit can be reasonably expected to represent background conditions. Any detection above these tolerance levels would indicate a possible change from background conditions.

Table 2.3 Upper tolerance limits for groundwater

Parameter	Upper Tolerance Limit (mg/L)	Applicable Drinking Water Standard MCL (mg/L)	Recommended Action Limit (mg/L)
Dissolved Fe	52.5	1	52.5
Total Fe	60.1	NA	60.1
Dissolved Mn	1.9	0.2	1.9
Total Mn	1.96	NA	1.96
Dissolved As	0.034	0.05	0.05
Total As	0.065	NA	0.065
Dissolved Sb	NA	0.006	0.006
Total Sb	NA	NA	0.006

Note: Action limits presented for total concentrations for comparison purposes only. Compliance will be based on dissolved concentrations.

The upper tolerance limit for dissolved iron is 52.5 milligrams per liter (mg/L) which is significantly higher than the maximum contaminant level (MCL) of 1.0 mg/L. This reflects the naturally elevated levels of dissolved iron found in the Fish Creek drainage. The UTL for dissolved manganese is 1.9 mg/L, in comparison to the MCL of 0.05 mg/L. The manganese data are characterized by a low standard deviation indicating consistently elevated concentrations. The UTL for dissolved arsenic was less than that of the MCL due to a high proportion of nondetects. Therefore the recommended action limit for dissolved arsenic is the MCL of 0.05 mg/L. Detections of dissolved and total antimony were infrequent and the high number of analyses below the detection limit prevented the calculation of meaningful tolerance levels.

3 SURFACE WATER

3.1 Background data: source and quality

Before Ft. Knox mining operations began in the Fish Creek drainage, surface water monitoring sites were established in four of the sub-basins contributing to Fish Creek to define baseline surface water quality. The locations of these basins and the surface water sampling sites are presented in Figure 3.1. Beginning in May 1992, baseline water quality samples were collected from these locations until the mine opened in 1996. A total of 252 samples were collected during this period. The sampling frequency is summarized in Table 3.1. Figure 3.2 illustrates the frequency distributions of both total and dissolved levels of the four parameters analyzed. Figure 3.3 illustrates the distributions by month. Samples were taken on a biweekly frequency throughout the year to capture seasonal variations.

Table 3.1 Surface water sampling

Site Name	1992	1993	1994	1995	Total
Last Chance Creek	18	18	17	8	61
Lower Fish Creek	21	17	16	34	88
Solo Creek	18	19	16	8	61
Upper Fish Creek	14	16	12	NA	42
Total	71	70	61	50	252

3.2 Discussion

The results of the statistical analysis are presented in Table 3.2. Surface water data for dissolved iron and dissolved manganese are log-normally distributed. High percentages of non-detects in arsenic and antimony prevented definition of a distribution. The results of the normality testing are included in Appendix B.2.

Table 3.3 presents the UTLs calculated from the pre-Ft. Knox mine data for each parameter. The UTL for dissolved iron is 1.94 mg/L. This reflects the naturally high levels of dissolved iron found in the Fish Creek drainage and is consistent with groundwater quality data. The UTL for total iron is 39.5 mg/L. The UTL for dissolved manganese is 0.36 mg/L compared to an MCL of 0.2 mg/L. Total manganese has a UTL of 0.5 mg/L. The data for total and dissolved arsenic results in action limits equal to the MCL of 0.05 mg/L. The UTL for antimony was calculated to be 0.05 mg/L for dissolved and 0.05 mg/L for total, both above the MCL of 0.006 mg/L.

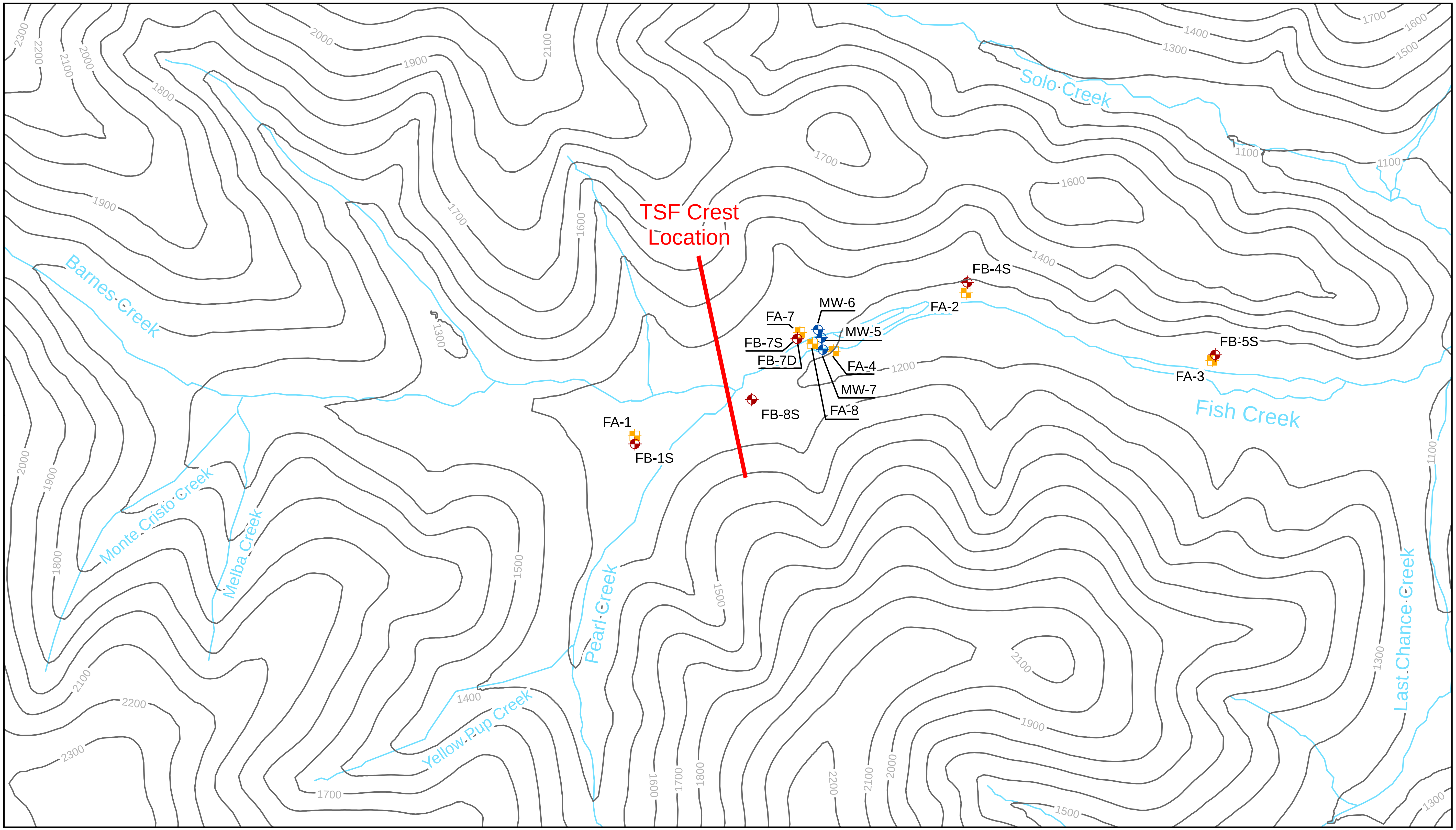
Table 3.2 Surface water summary statistics

Variable	# Detections	# Nondetects	% Nondetects	Minimum (mg/L)	Maximum (mg/L)	Mean (mg/L)	Median (mg/L)	SD	Skewness	CV	Distribution
Fe (d)	114	0	0.0	0.085	3.16	0.603	0.449	0.5	2.038	0.829	Log-normal
Fe (t)	115	0	0.0	0.3	117	6.638	2.16	13.78	5.235	2.076	Non-normal
Mn (d)	114	0	0.0	0.015	0.409	0.115	0.0895	0.0802	1.151	0.699	Log-normal
Mn (t)	115	0	0.0	0.02	1.88	0.203	0.132	0.261	4.508	1.285	Non-normal
As (d)	41	73	64.04	0.001	0.009	0.00308	0.003	0.00178	1.018	0.577	Non-normal
As (t)	57	58	50.43	0.001	0.056	0.00774	0.004	0.0113	2.855	1.454	Non-normal
Sb (d)	18	93	83.78	0.003	0.05	0.00528	0.003	0.00877	4.899	1.661	Non-normal
Sb (t)	4	108	96.43	0.003	0.05	0.00683	0.003	0.0113	3.108	1.653	Non-normal

For summary statistics, all nondetects set to detection limits

CV – Coefficient of variation
SD – Standard deviation
(d) – Dissolved concentration
(t) – Total concentration

FIGURES



Legend

- TSF Crest
- Historic Alluvial Wells
- Historic Bedrock Wells
- Current Monitoring Wells

All Contours Reflect Pre-mining Conditions

~WMC

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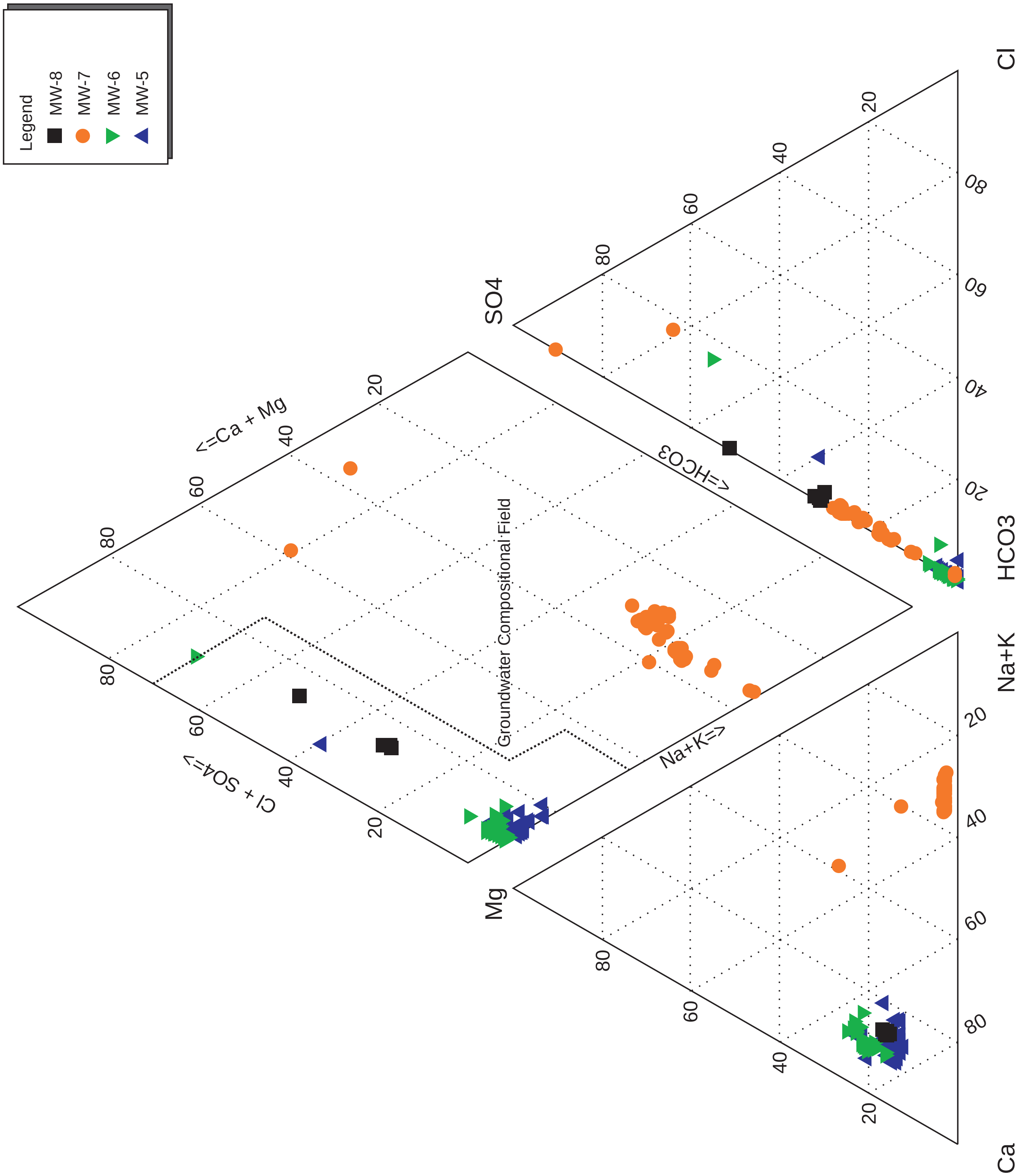
BASELINE WELL LOCATIONS			
CLIENT: FGMI		PROJECT: Ft. Knox WQ evaluation	
JOB: 2766	FILE: MW_COMPARISON.MXD	DRAWN: MG	CHECKED: JC
DATE: January 2008		FIGURE 2.1	



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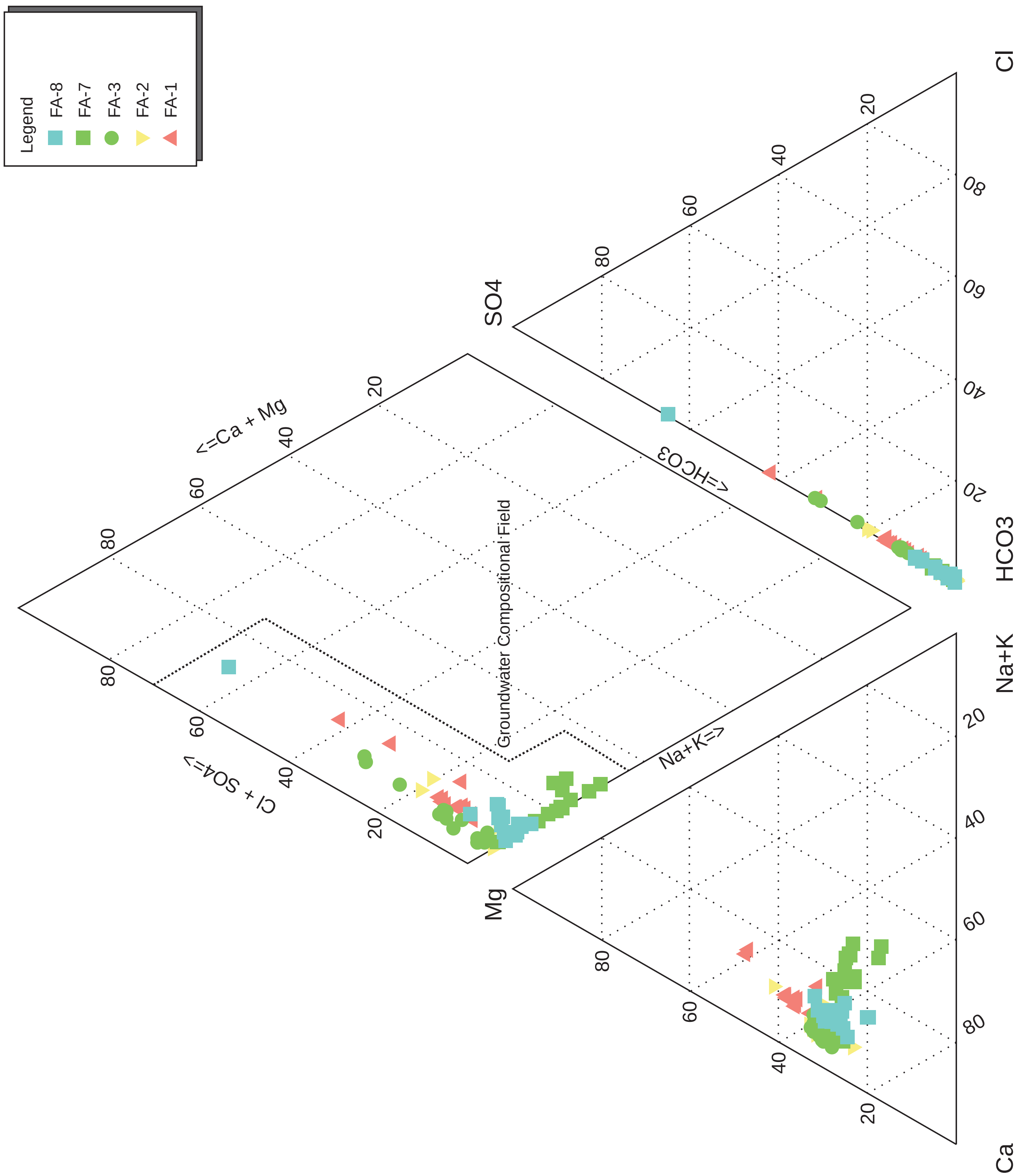
WATER COMPOSITION IN CURRENT MONITORING WELLS

CLIENT: FGMI		PROJECT: FT KNOX WQ EVALUATION	
JOB: 2766	FILE: CurrentMWsPiper.cdr	DRAWN: MG	CHECKED: JC
DATE: JANUARY 2008		FIGURE: 2.2	



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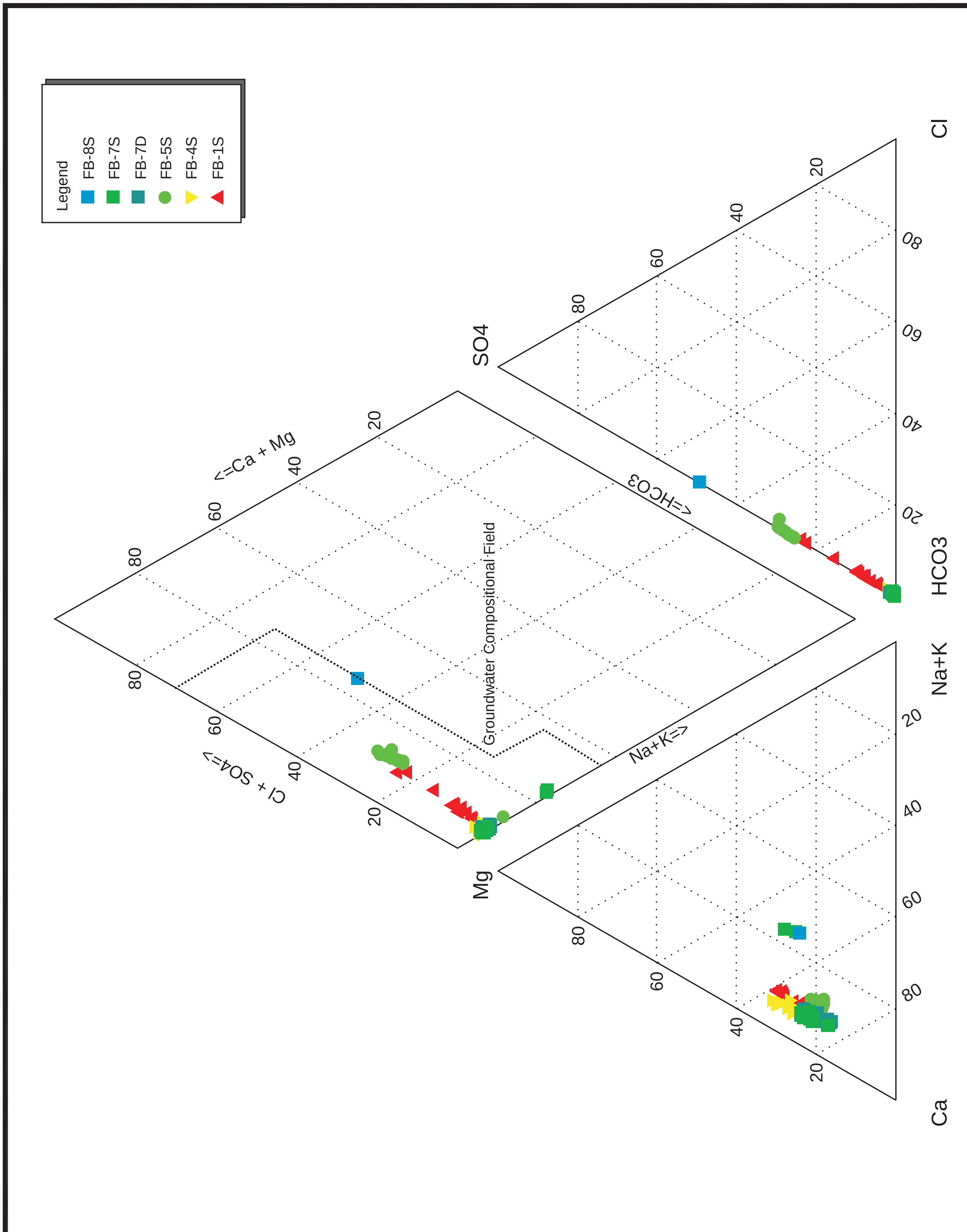
WATER COMPOSITION IN BASELINE ALLUVIAL WELLS

CLIENT: FGMI		PROJECT: FT KNOX WQ EVALUATION	
JOB: 2766	FILE: AHistWellsPiper.cdr	DRAWN: MG	CHECKED: JC
DATE: JANUARY 2008		FIGURE: 2.3	



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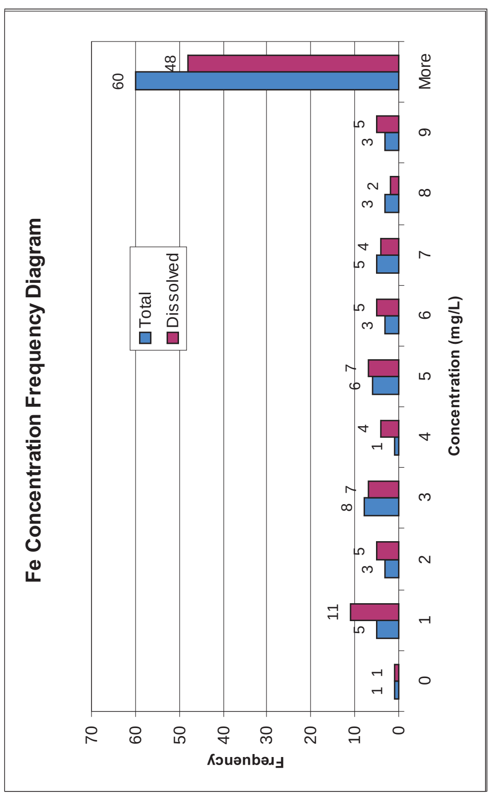
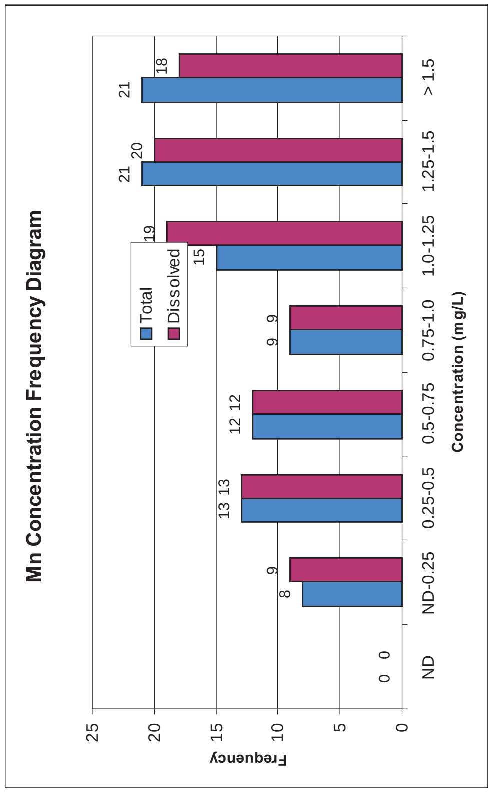
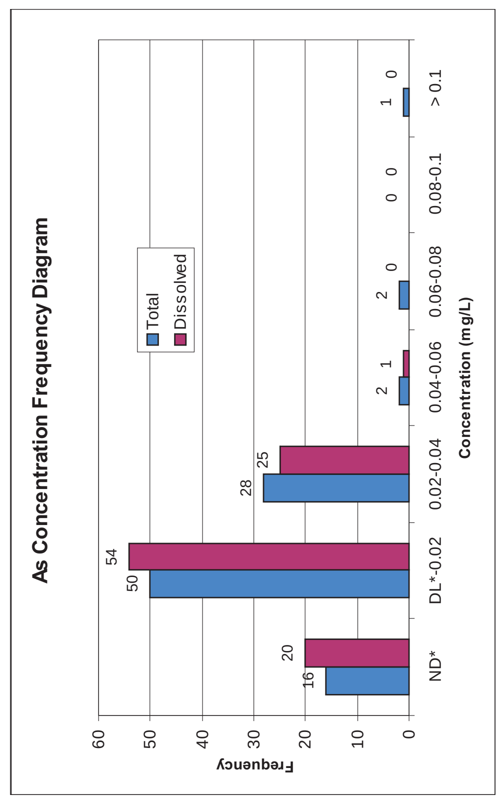
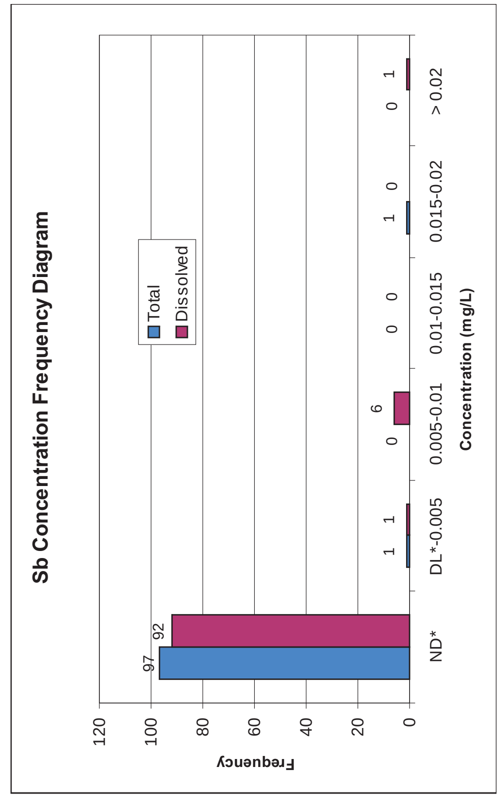
WATER COMPOSITION IN BASELINE BEDROCK WELLS

CLIENT: FGMI		PROJECT: FT KNOX WQ EVALUATION	
JOB: 2766	FILE: BHistWellsPiper.cdr	DRAWN: MG	CHECKED: JC
DATE: JANUARY 2008		FIGURE: 2.4	



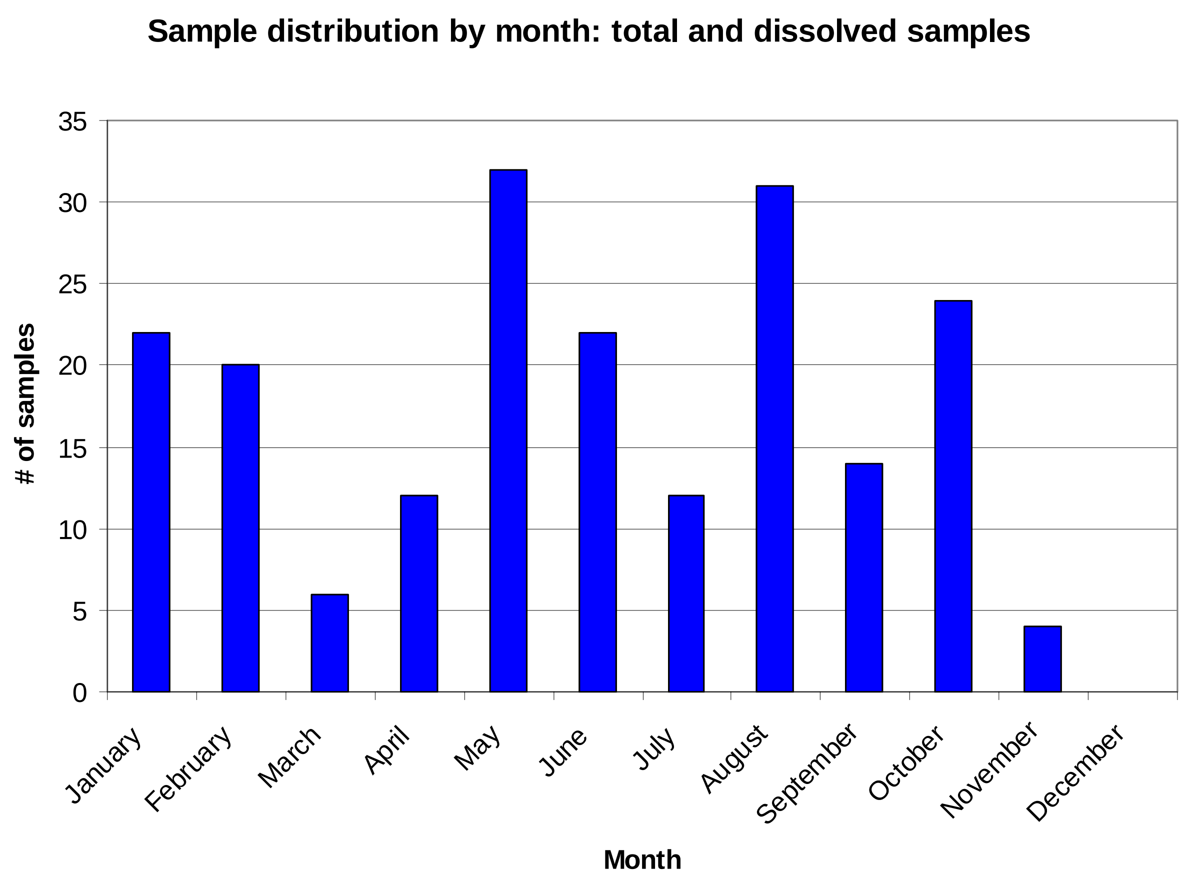


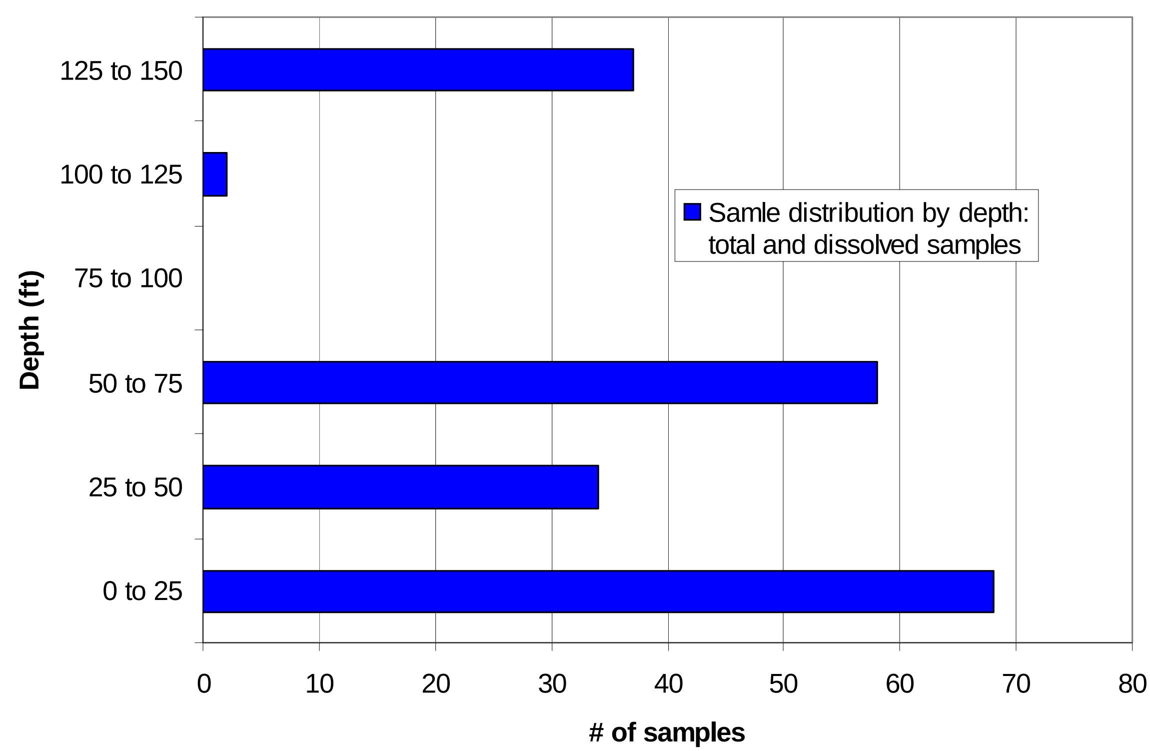




*Note: ND = Non-detect
DL = Detection limit

WATER MANAGEMENT CONSULTANTS A Schlumberger Company	GROUNDWATER CONCENTRATION FREQUENCY DIAGRAMS		
	CLIENT: FGMI		PROJECT: FT. KNOX WQ EVALUATION
	JOB: 2766	FILE: GW ProUCL Histo	DRAWN: LTSG CHECKED: JC
	DATE: JANUARY 2008		FIGURE: 2.5





WATER MANAGEMENT CONSULTANTS
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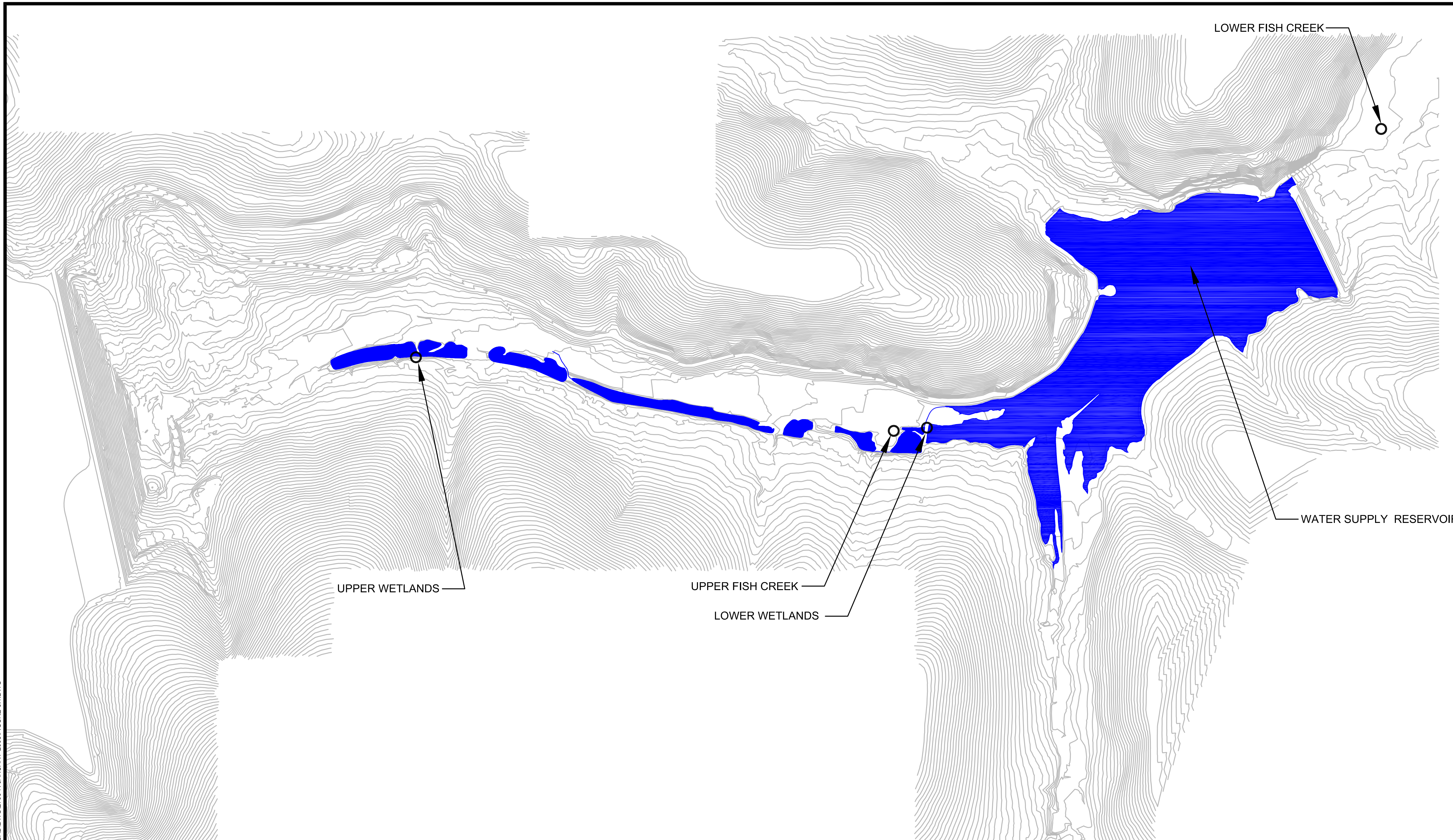
GROUNDWATER SAMPLE DISTRIBUTION BY MONTH AND DEPTH

CLIENT: FGMI		PROJECT: FGMI	
JOB: 2766	FILE: FIGURE-2.6.DWG	DRAWN: RN	CHECKED: MG
DATE: JANUARY 2008		FIGURE: 2.6	

P:\2766 - FT KNOX WQ EVALUATION\CAD\DWG\2766-R-JANUARY-2008\FIGURE-2.6.DWG



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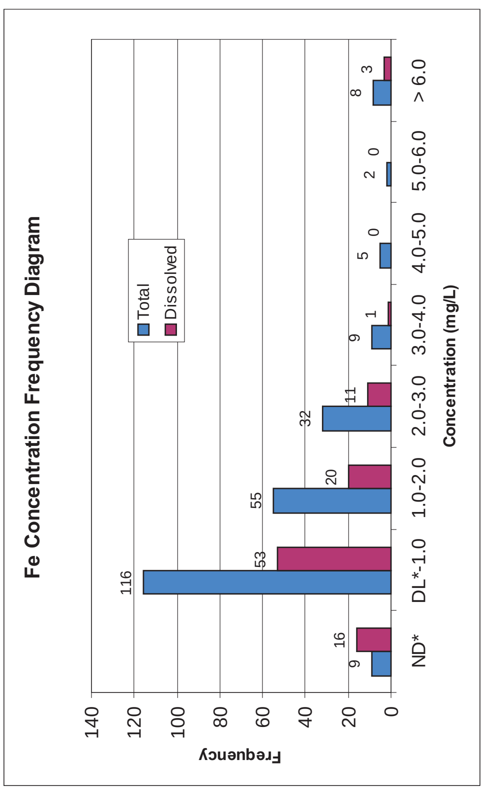
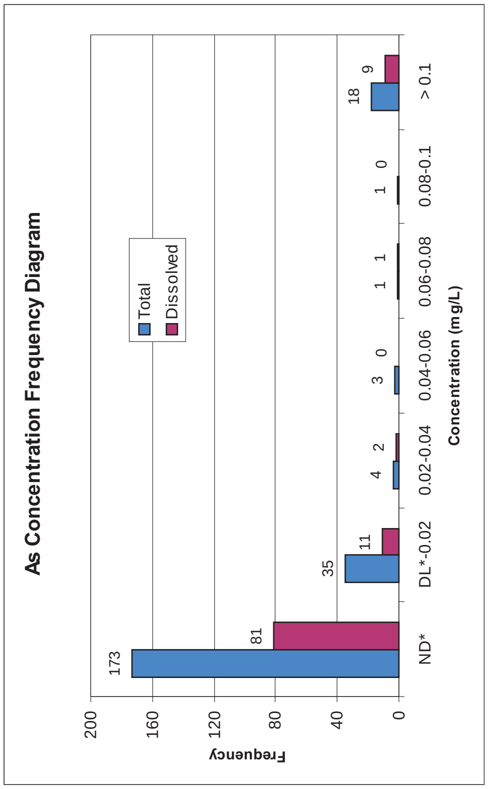
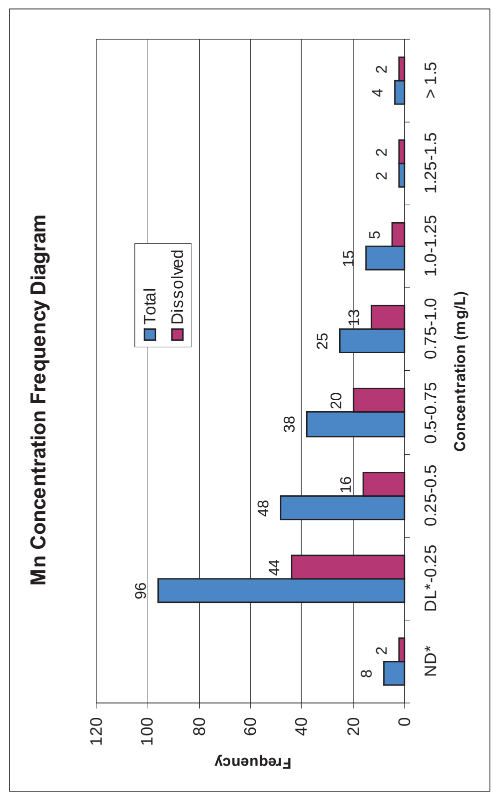
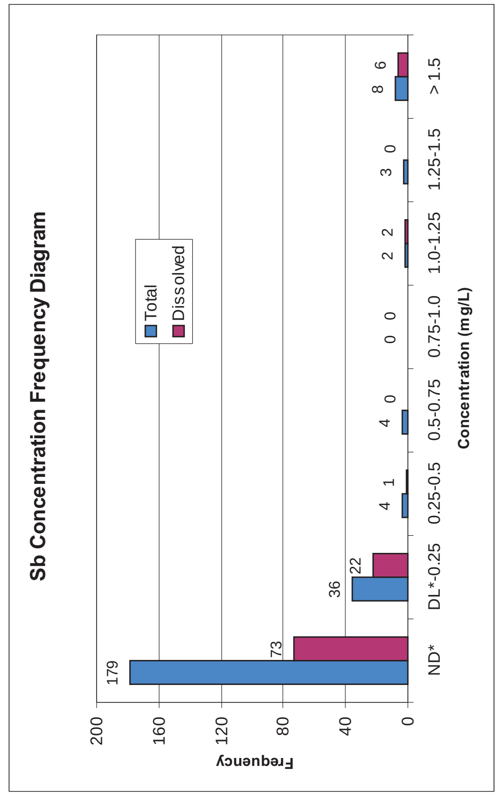
HISTORIC SURFACE WATER SAMPLING LOCATIONS			
CLIENT: FGMI		PROJECT: FT KNOX WQ EVALUATION	
JOB: 2766	FILE: FIGURE-3.1.DWG	DRAWN: RN	CHECKED: JC
DATE: JANUARY 2008		FIGURE: 3.1	

P:\2766 - FT KNOX WQ EVALUATION\CAD\DWG\2766-R-JANUARY-2008\FIGURE-3.1.DWG









*Note: ND = Non-detect
DL = Detection limit

WATER MANAGEMENT CONSULTANTS
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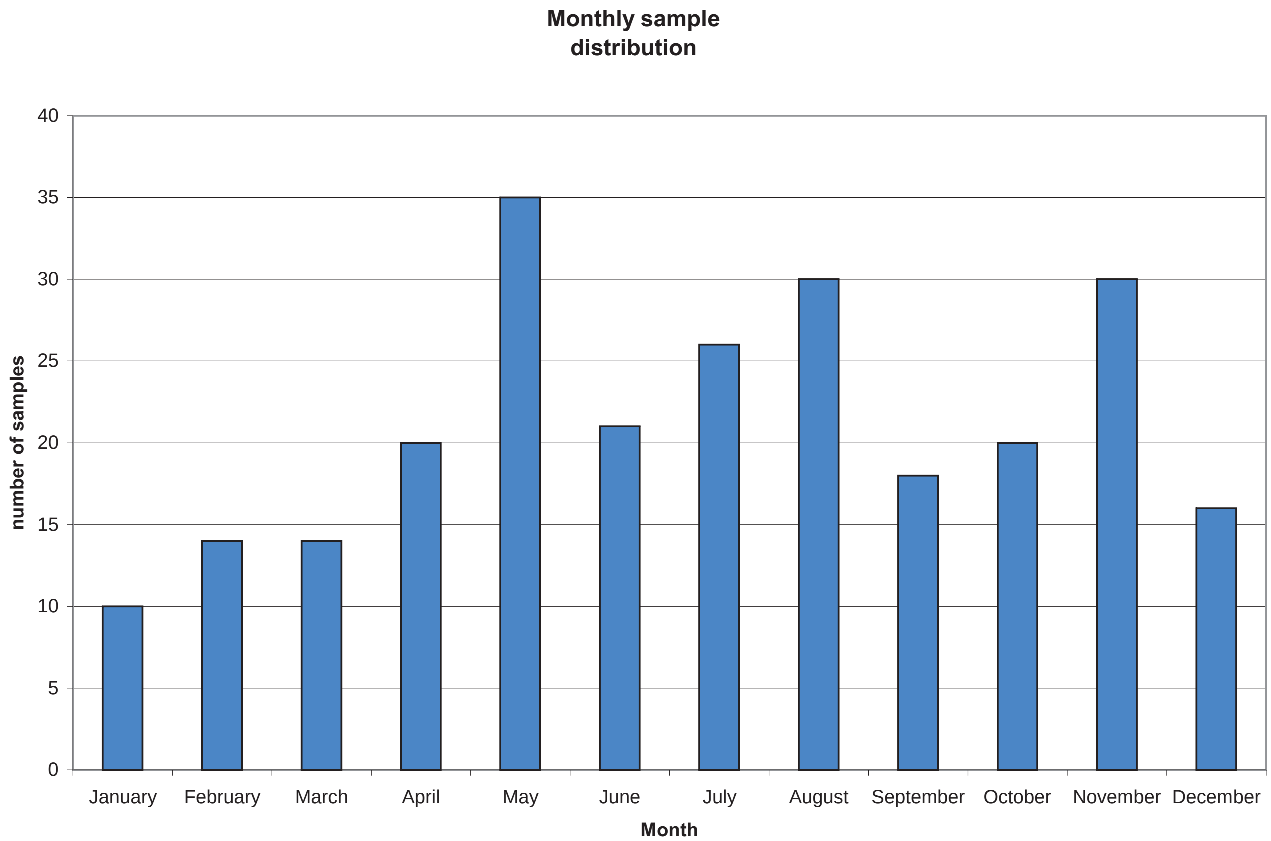
SURFACE WATER CONCENTRATION FREQUENCY DIAGRAMS

CLIENT: FGMI	PROJECT: FT. KNOX WQ EVALUATION
JOB: 2766 FILE: SW ProUCL Histo	DRAWN: LTSG CHECKED: JC
DATE: JANUARY 2008	FIGURE: 3.2



WATER MANAGEMENT CONSULTANTS A Schlumberger Company	SURFACE WATER SAMPLE FREQUENCY BY MONTH		
	CLIENT: FGMI	PROJECT: FT. KNOX WQ EVALUATION	
	JOB: 2766 FILE: month_dis.xls	DRAWN:	CHECKED: JC
	DATE: JANUARY 2008	FIGURE: 3.3	

APPENDIX A.1

Baseline groundwater database

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
124		6/1/1992	1	FA-1	20	D		3.92	0.85	0.003	0.005
125		6/1/1992	1	FA-1	20	T	183	38.7	1.11	0.037	<0.003
126		7/1/1992	1	FA-1	20	D		3.6	0.848	0.001	<0.003
127		7/1/1992	1	FA-1	20	T	140	60.1	1.22	0.065	<0.003
128		9/23/1992	4	FA-1	20	D		8	1.36	0.005	<0.003
129		9/23/1992	4	FA-1	20	T	200	12.2	1.33	0.005	<0.003
130		2/10/1993	3	FA-1	20	D		5.8	1.85	0.004	<0.003
131		2/10/1993	3	FA-1	20	T	227	6.89	1.79	0.003	<0.003
132		5/28/1993	1	FA-1	20	D		4.07	1.73	<0.006	<0.003
133		5/28/1993	1	FA-1	20	T	264	4.33	1.87	<0.006	<0.003
134		8/4/1993	4	FA-1	20	T	214	11.6	1.59	0.009	<0.003
135		8/4/1993	4	FA-1	20	D		4.06	155	0.003	<0.003
136		10/19/1993	102	FA-1	20	D		3.32	1.56	0.006	0.008
137		10/19/1993	102	FA-1	20	T	199	5.01	1.6	<0.003	<0.003
138		5/19/1992	1	FA-2	21	T	279	55.7	1.65	0.03	<0.003
139		5/19/1992	1	FA-2	21	D		58.2	1.67	0.022	<0.003
140		6/27/1992	3	FA-2	21	D		46.4	1.43	0.021	<0.03
141		6/27/1992	3	FA-2	21	T	211	110	1.91	0.073	<0.033
142		10/1/1992	4	FA-2	21	T	227	44.4	1.12	0.031	<0.003
143		10/1/1992	4	FA-2	21	D		36.3	1.06	0.028	<0.003
144		2/10/1993	1	FA-2	21	D		57.5	1.41	0.031	<0.003
145		2/10/1993	1	FA-2	21	T	289	56.5	1.38	0.046	<0.003
146		6/1/1993	1	FA-2	21	T	254	53.4	1.41	0.036	<0.003
147		6/1/1993	1	FA-2	21	D		52.5	1.43	0.034	<0.003
148		8/5/1993	2	FA-2	21	T	264	46.7	1.29	0.037	<0.003
149		8/5/1993	2	FA-2	21	D		45.4	1.29	0.034	<0.003
150		10/28/1993	101	FA-2	21	D		12	0.384	0.015	<0.003
151		10/28/1993	101	FA-2	21	T	114	14.1	0.418	0.016	<0.003
152		5/21/1992	1	FA-3	26	T	279	3.77	1.36	0.004	<0.003
153		5/21/1992	1	FA-3	26	D		0.164	1.22	0.003	0.005
154		6/29/1992	1	FA-3	26	D		0.789	1.26	<0.001	<0.03
155		6/29/1992	1	FA-3	26	T	182	19	1.38	0.256	<0.033
156		10/15/1992	1	FA-3	26	D		4.01	1.63	0.003	<0.003
157		10/15/1992	1	FA-3	26	T	230	4.5	1.53	0.005	<0.003
158		2/16/1993	3	FA-3	26	D		17.1	1.91	0.002	<0.003
159		2/16/1993	3	FA-3	26	T	271	16.4	1.98	0.002	<0.003

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
160		6/4/1993	2	FA-3	26	D		0.564	1.42	0.004	<0.003
161		6/4/1993	2	FA-3	26	T	246	9.03	1.79	0.004	<0.003
162		9/23/1993	101	FA-3	26	T	321	49.5	2.4	0.023	<0.003
163		9/23/1993	101	FA-3	26	D		16.7	2.19	0.009	<0.003
184		5/20/1992	1	FA-7	30.5	D		13.8	1.3	0.003	<0.003
185		5/20/1992	1	FA-7	30.5	T	261	34.2	1.6	0.015	<0.003
186		7/1/1992	4	FA-7	30.5	D		19	1.69	0.002	<0.003
187		7/1/1992	4	FA-7	30.5	T	310	45.5	1.86	0.02	<0.003
188		9/24/1992	4	FA-7	30.5	D		23	1.85	<0.001	<0.003
189		9/24/1992	4	FA-7	30.5	T	260	55.9	1.96	0.039	<0.003
190		1/20/1993	2	FA-7	30.5	D		5.33	0.747	0.013	<0.017
191		1/20/1993	2	FA-7	30.5	T	239	5.32	0.767	0.013	<0.017
192		6/3/1993	1	FA-7	30.5	D		1.84	1.21	<0.006	<0.003
193		6/3/1993	1	FA-7	30.5	T	253	36.3	1.45	0.011	<0.003
194		8/5/1993	3	FA-7	30.5	T	267	27.4	1.43	0.009	<0.003
195		8/5/1993	3	FA-7	30.5	D		20.8	1.46	<0.003	<0.003
196		10/14/1993	102	FA-7	30.5	T	256	31.8	1.57	0.005	<0.003
197		10/14/1993	102	FA-7	30.5	D		22.4	1.56	0.005	<0.003
198		8/27/1992	1	FA-8	20	D		35.9	1.14	0.03	<0.003
199		8/27/1992	2	FA-8	20	T	183	40.2	1.28	0.032	<0.003
200		8/27/1992	2	FA-8	20	D		36.3	1.14	0.032	<0.003
201		8/27/1992	1	FA-8	20	T	184	39.6	1.23	0.027	<0.033
202		9/24/1992	3	FA-8	20	D		39.4	1.33	0.031	<0.003
203		9/24/1992	3	FA-8	20	T	174	37.8	1.3	0.036	<0.003
204		2/9/1993	2	FA-8	20	T	162	38	1.3	0.038	<0.003
205		2/9/1993	2	FA-8	20	D		38.1	1.3	0.033	<0.003
206		6/3/1993	3	FA-8	20	T	162	46.1	1.21	0.019	<0.003
207		6/3/1993	3	FA-8	20	D		30.3	1.09	0.023	<0.003
208		8/10/1993	1	FA-8	20	T	197	36.1	1.23	0.036	<0.003
209		8/10/1993	1	FA-8	20	D		34	1.22	0.034	<0.003
210		10/19/1993	101	FA-8	20	T	147	30.2	1.1	0.026	<0.003
211		10/19/1993	101	FA-8	20	D		29.5	1.09	0.03	0.005
222		5/14/1992	3	FB-1S	50	D		5.97	0.369	0.007	<0.003
223		5/14/1992	3	FB-1S	50	T	197	6.75	0.392	0.029	<0.003
224		7/1/1992	2	FB-1S	50	D		7.63	0.31	0.002	<0.003
225		7/1/1992	2	FB-1S	50	T	225	66.5	0.305	0.006	<0.003

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
226		9/23/1992	3	FB-1S	50	D		10.4	0.566	0.002	<0.003
227		9/23/1992	3	FB-1S	50	T	273	10.3	0.542	0.007	<0.003
228		2/10/1993	2	FB-1S	50	D		9.59	0.551	0.003	<0.003
229		2/10/1993	2	FB-1S	50	T	250	9.52	0.558	0.004	<0.003
230		5/28/1993	2	FB-1S	50	D		8.76	0.685	<0.006	<0.003
231		5/28/1993	2	FB-1S	50	T	268	8.99	0.699	<0.006	<0.003
232		8/5/1993	1	FB-1S	50	T	273	9.13	0.713	<0.003	<0.003
233		8/5/1993	1	FB-1S	50	D		9.12	0.716	<0.003	<0.003
234		10/19/1993	103	FB-1S	50	T	246	9.63	0.747	0.004	<0.003
235		10/19/1993	103	FB-1S	50	D		8.83	0.704	0.004	<0.003
255		5/13/1992	3	FB-4S	72	D		7.55	1.56	0.007	<0.003
256		5/13/1992	3	FB-4S	72	T	334	8.1	1.47	0.006	<0.003
257		6/28/1992	1	FB-4S	72	D		9.28	1.59	0.007	<0.03
258		6/28/1992	1	FB-4S	72	T	350	9.58	1.55	0.006	<0.017
259		10/1/1992	2	FB-4S	72	D		10.4	1.58	0.01	<0.003
260		10/1/1992	3	FB-4S	72	T	318	11.2	1.6	0.009	<0.003
261		10/1/1992	3	FB-4S	72	D		10.4	1.58	0.009	<0.003
262		10/1/1992	2	FB-4S	72	T	352	10.9	1.61	0.007	<0.003
263		1/12/1993	1	FB-4S	72	D		8.99	1.29	0.015	<0.017
264		1/12/1993	1	FB-4S	72	T	340	9.22	1.29	0.013	<0.003
265		6/1/1993	2	FB-4S	72	T	352	10.7	1.49	0.011	<0.003
266		6/1/1993	2	FB-4S	72	D		10.7	1.46	0.011	<0.003
267		8/30/1993	104	FB-4S	72	T	357	12.2	1.6	0.009	<0.003
268		8/30/1993	104	FB-4S	72	D		11.8	1.61	0.006	<0.003
269		10/28/1993	102	FB-4S	72	T	315	10.8	1.49	0.014	<0.003
270		10/28/1993	102	FB-4S	72	D		10.7	1.48	0.01	<0.003
271		5/14/1992	2	FB-5S	141	T	140	0.449	0.211	<0.001	<0.003
272		5/14/1992	2	FB-5S	141	D		0.034	0.206	<0.001	<0.003
273		5/14/1992	1	FB-5S	141	D		0.045	0.202	0.007	<0.003
274		5/14/1992	1	FB-5S	141	T	136	0.568	0.216	<0.001	<0.003
275		10/15/1992	2	FB-5S	141	D		0.033	0.211	<0.001	<0.003
276		10/15/1992	2	FB-5S	141	T	149	0.05	0.194	<0.001	<0.003
277		8/11/1993	301	FB-5S	141	T	156	0.125	0.224	0.004	0.005
278		8/11/1993	301	FB-5S	141	D		0.04	0.219	<0.003	<0.003
280		8/11/1993	101	FB-5S	141	D		0.019	0.219	0.006	0.005
303		5/12/1992	1	FB-7D	142	D		1.01	0.404	0.004	<0.003

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
304		5/12/1992	1	FB-7D	142	T	248	1.28	0.426	0.005	<0.003
305		7/6/1992	1	FB-7D	142	D		1.63	0.44	0.002	<0.003
306		7/6/1992	1	FB-7D	142	T	225	1.62	0.425	0.003	<0.003
307		9/24/1992	1	FB-7D	142	D		1.83	0.456	0.002	<0.003
308		9/24/1992	1	FB-7D	142	T	230	1.95	0.452	0.003	<0.003
309		2/9/1993	1	FB-7D	142	T	235	2.14	0.478	0.003	<0.003
310		2/9/1993	1	FB-7D	142	D		2.11	0.454	0.002	<0.003
311		6/4/1993	1	FB-7D	142	D		2.58	0.469	0.004	<0.003
312		6/4/1993	1	FB-7D	142	T	234	2.62	0.471	<0.003	<0.003
313		8/26/1993	101	FB-7D	142	T	243	2.51	0.466	<0.003	<0.003
314		8/26/1993	101	FB-7D	142	D		2.53	0.472	0.007	0.005
315		8/26/1993	301	FB-7D	142	T	236	2.55	0.47	0.006	<0.003
316		8/26/1993	301	FB-7D	142	D		2.58	0.47	0.009	<0.003
317		8/26/1993	302	FB-7D	142	T	242	2.11	0.38	<0.005	<0.1
318		8/26/1993	302	FB-7D	142	D		1.87	0.35	0.026	<0.1
319		11/24/1993	101	FB-7D	142	D		2.87	0.502	<0.003	<0.003
320		11/24/1993	101	FB-7D	142	T	190	2.92	0.5	0.003	<0.003
321		5/13/1992	1	FB-7S	53	D		4.04	0.696	0.006	<0.003
322		5/13/1992	1	FB-7S	53	T	238	4.06	0.676	0.006	<0.003
323		7/6/1992	3	FB-7S	53	D		4.45	0.838	0.012	<0.003
324		7/6/1992	2	FB-7S	53	D		4.56	0.871	0.011	<0.003
325		7/6/1992	2	FB-7S	53	T	268	4.21	0.803	0.01	<0.003
326		7/6/1992	3	FB-7S	53	T	259	4.22	0.803	0.01	<0.003
327		9/24/1992	2	FB-7S	53	D		5.61	0.848	0.002	<0.003
328		9/24/1992	2	FB-7S	53	T	264	5.34	0.845	0.012	<0.003
329		1/20/1993	1	FB-7S	53	T	253	31.1	1.57	0.016	<0.017
330		1/20/1993	1	FB-7S	53	D		23.9	1.54	0.008	<0.015
331		6/3/1993	2	FB-7S	53	D		5.99	0.734	<0.006	<0.003
332		6/3/1993	2	FB-7S	53	T	298	6	0.734	0.01	<0.003
333		8/4/1993	3	FB-7S	53	T	251	7.17	0.795	0.01	<0.003
334		8/4/1993	3	FB-7S	53	D		6.53	0.772	0.007	<0.003
335		10/14/1993	101	FB-7S	53	T	264	6.56	0.719	0.011	<0.003
336		10/14/1993	101	FB-7S	53	D		6.76	0.763	0.006	<0.003
337		5/11/1992	1	FB-8S	103	D		0.025	0.016	0.007	0.025
338		5/11/1992	1	FB-8S	103	T	84	15	0.237	0.024	0.02
501		4/19/1994	1	FB-7D	142	T	238	2.42	0.466	0.005	<0.003

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
502		4/19/1994	1	FB-7D	142	D		2.37	0.459	<0.003	<0.003
503		4/19/1994	2	FB-7S	53	T	262	7.15	0.732	0.007	<0.003
504		4/19/1994	2	FB-7S	53	D		6.96	0.706	0.009	<0.003
505		4/20/1994	1	FB-4S	72	T	320	9.21	1.26	0.012	<0.003
506		4/20/1994	1	FB-4S	72	D		9.3	1.26	0.014	<0.003
507		4/20/1994	2	FA-2	21	T	304	40	1.17	0.03	<0.003
508		4/20/1994	2	FA-2	21	D		39.8	1.15	0.033	<0.003
509		4/20/1994	3	FA-7	30.5	T	336	30.5	1.29	0.009	<0.003
510		4/20/1994	3	FA-7	30.5	D		27.7	1.22	0.008	<0.003
517		4/28/1994	1	FA-3	26	T	366	36.5	1.47	0.026	<0.003
518		4/28/1994	1	FA-3	26	D		29.3	1.45	0.021	<0.003
519		5/5/1994	1	FA-8	20	T	154	29.8	1.02	0.028	<0.003
520		5/5/1994	1	FA-8	20	D		29.6	1.01	0.028	<0.003
523		5/5/1994	3	FB-5S	141	T	156	0.033	0.202	<0.003	<0.003
524		5/5/1994	3	FB-5S	141	D		0.017	0.212	<0.003	<0.003
541		5/17/1994	1	FB-1S	50	T	268	9.35	0.801	<0.003	<0.003
542		5/17/1994	1	FB-1S	50	D		9.34	0.792	<0.003	<0.003
543		5/17/1994	2	FA-1	20	T	280	7.28	1.95	0.005	<0.003
544		5/17/1994	2	FA-1	20	D		4.75	1.9	0.006	<0.003
571		1/26/1994	103	FA-8	20	T	160	24.9	0.839	0.029	<0.003
572		1/26/1994	103	FA-8	20	D		24.5	0.839	0.03	<0.003
581		8/30/1994	101	FA-8	20	T	157	27	1.05	0.031	<0.05
582		8/30/1994	101	FA-8	20	D		28.3	1	0.03	<0.05
605		1/26/1994	101	FA-2	21	T	119	40.4	1.12	0.034	<0.003
606		1/26/1994	101	FA-2	21	D		39.2	1.1	0.033	<0.003
607		1/26/1994	102	FB-4S	72	T	159	9.83	1.29	0.01	<0.003
608		1/26/1994	102	FB-4S	73	D		9.63	1.26	0.009	<0.003
609		1/27/1994	101	FB-7D	142	T	228	2.41	0.42	<0.003	<0.003
610		1/27/1994	101	FB-7D	142	D		2.4	0.422	<0.003	0.004
611		1/27/1994	102	FB-7S	53	T	262	6.41	0.66	0.006	<0.003
612		1/27/1994	102	FB-7S	53	D		6.67	0.707	0.004	<0.003
613		1/27/1994	103	FA-7	30.5	T	256	30.9	1.05	0.014	<0.003
614		1/27/1994	103	FA-7	30.5	D		21.8	1.08	0.011	<0.003
615		1/31/1994	101	FB-1S	50	T	238	8.48	0.69	<0.003	<0.003
616		1/31/1994	101	FB-1S	50	D		8.42	0.685	<0.003	<0.003
617		1/31/1994	102	FA-1	20	T	182	4.05	1.46	0.004	<0.003

ID	Lab ID	Date	Sample .	Site Name	Depth	TorD	TDS	FE	MN	AS	SB
618		1/31/1994	102	FA-1	20	D		3.73	1.44	<0.003	<0.003
649		3/29/1994	101	FB-5S	141	T	154	<0.011	0.226	<0.003	<0.003
650		3/29/1994	101	FB-5S	141	D		<0.011	0.231	<0.003	<0.003
651		3/29/1994	301	FB-5S	141	T	150	0.028	0.243	<0.003	<0.003
652		3/29/1994	301	FB-5S	141	D		0.012	0.242	<0.003	<0.003
653		3/29/1994	102	FA-3	26	T	444	39.8	1.54	0.023	<0.003
654		3/29/1994	102	FA-3	26	D		24.1	1.39	0.016	<0.003
657		8/30/1994	301	FA-8	20	T	160	27.8	0.98	0.032	<0.05
658		8/30/1994	301	FA-8	20	D		29	1.03	0.03	<0.05
668		11/14/1994	101	FA-8	20	T	184	23.4	1.04	0.031	<0.005
669		11/14/1994	101	FA-8	20	D		30.7	1.04	0.029	<0.005
685		2/7/1995	101	FA-8	20	T	131	36.8	1.21	0.029	<0.005
686		2/7/1995	101	FA-8	20	D		38	1.2	0.029	<0.005
687		2/7/1995	301	FA-8	20	T	188	37.2	0.9	0.046	<0.1
688		2/7/1995	302	FA-8	20	T	151	35.9	1.21	0.037	<0.003
689		2/7/1995	301	FA-8	20	D		44.7	1.2	0.044	<0.1
690		2/7/1995	302	FA-8	20	D		35.8	1.21	0.036	<0.003
695		2/9/1995	101	FA-8	20	T	186	38.4	1.25	0.033	<0.005
696		2/9/1995	101	FA-8	20	D		38.8	1.26	0.033	<0.005

APPENDIX A.2

Baseline surface water database

ID	Lab ID	Date	Sample #	Site Name	TorD	FE	MN	AS	SB
127		12-May-93	1	LAST CHANCE CREEK	D	0.392	0.09	0.006	0.003
118		11-Nov-92	2	LAST CHANCE CREEK	T	0.445	0.046	<0.001	<0.003
119		11-Nov-92	2	LAST CHANCE CREEK	D	0.105	0.045	<0.001	<0.003
120		10-Dec-92	1	LAST CHANCE CREEK	T	0.549	0.061	0.004	<0.003
121		10-Dec-92	1	LAST CHANCE CREEK	D	0.217	0.063	0.002	0.007
122		10-Mar-93	1	LAST CHANCE CREEK	D	0.352	0.126	0.002	<0.003
123		10-Mar-93	1	LAST CHANCE CREEK	T	0.896	0.132	0.004	<0.003
124		29-Apr-93	1	LAST CHANCE CREEK	D	0.774	0.099	0.002	<0.003
126		12-May-93	1	LAST CHANCE CREEK	T	1.2	0.075	0.004	<0.003
114		01-Sep-92	203	LAST CHANCE CREEK	D	0.085	0.03	<0.001	<0.003
134		08-Jul-93	4	LAST CHANCE CREEK	D	0.144	0.02	<0.003	0.004
135		02-Aug-93	4	LAST CHANCE CREEK	T	0.918	0.028	<0.003	<0.003
125		29-Apr-93	1	LAST CHANCE CREEK	T	0.626	0.094	0.003	<0.003
93			101	LAST CHANCE CREEK	T	0.3	0.162	0.002	
94		22-Apr-92	101	LAST CHANCE CREEK	D	0.195	0.135	<0.001	<0.003
95		22-Apr-92	101	LAST CHANCE CREEK	T	0.315	0.147	<0.001	<0.003
96		14-May-92	103	LAST CHANCE CREEK	D	0.239	0.031	0.001	<0.003
97		14-May-92	103	LAST CHANCE CREEK	T	0.327	0.04	<0.001	<0.003
101		09-Jun-92	102	LAST CHANCE CREEK	D	0.662	0.071	0.001	0.009
117		08-Oct-92	104	LAST CHANCE CREEK	T	0.345	0.037	<0.001	<0.003
116		08-Oct-92	104	LAST CHANCE CREEK	D	0.101	0.04	<0.001	0.004
106		06-Jul-92	205	LAST CHANCE CREEK	D	0.2	0.075	<0.001	<0.003
109		06-Jul-92	205	LAST CHANCE CREEK	T	0.968	0.071	<0.001	<0.003
112		04-Aug-92	102	LAST CHANCE CREEK	D	0.256	0.042	0.001	<0.003
139		07-Sep-93	103	LAST CHANCE CREEK	D	0.249	0.023	<0.003	<0.003
102		09-Jun-92	102	LAST CHANCE CREEK	T	2.17	0.077	0.002	<0.033
403		02-Feb-95	102	LAST CHANCE CREEK	D	0.66	0.074	<0.005	<0.005
137		02-Aug-93	4	LAST CHANCE CREEK	D	0.186	0.018	<0.003	<0.003
164		25-Aug-94	102	LAST CHANCE CREEK	D	0.412	0.022	<0.005	<0.05
165		08-Nov-94	101	LAST CHANCE CREEK	T	2.11	0.104	<0.005	<0.005
166		08-Nov-94	101	LAST CHANCE CREEK	D	0.757	0.094	<0.005	<0.005
206		07-Dec-93	101	LAST CHANCE CREEK	T	0.677	0.066	<0.003	<0.003
273		08-Jul-93	4	LAST CHANCE CREEK	T	0.668	0.029	<0.003	<0.003
162		06-Jun-94	103	LAST CHANCE CREEK	D	0.385	0.028	<0.003	<0.003

402		02-Feb-95	102	LAST CHANCE CREEK	T	1.14	0.078	<0.005	<0.005
161		06-Jun-94	103	LAST CHANCE CREEK	T	0.834	0.056	<0.003	<0.003
416		10-May-95	101	LAST CHANCE CREEK	T	2.18	0.115	<0.005	<0.005
417		10-May-95	101	LAST CHANCE CREEK	D	1.07	0.089	<0.005	<0.005
422		25-Jul-95	102	LAST CHANCE CREEK	T	0.82	0.054	<0.005	<0.005
423		25-Jul-95	102	LAST CHANCE CREEK	D	0.64	0.05	<0.005	<0.005
464		06-Nov-95	101	LAST CHANCE CREEK	T	0.953	0.074	<0.003	0.004
465		06-Nov-95	101	LAST CHANCE CREEK	D	0.81	0.07	<0.003	<0.003
277		04-Nov-93	103	LAST CHANCE CREEK	T	0.492	0.053	<0.003	<0.003
152		09-Feb-94	102	LAST CHANCE CREEK	D	0.141	0.047	<0.003	<0.003
113		04-Aug-92	102	LAST CHANCE CREEK	T	0.858	0.044	0.002	<0.003
140		05-Oct-93	1	LAST CHANCE CREEK	T	0.496	0.038	0.005	<0.003
141		05-Oct-93	1	LAST CHANCE CREEK	D	0.154	0.035	<0.003	0.005
144		04-Nov-93	103	LAST CHANCE CREEK	D	0.446	0.054	<0.003	<0.003
147		07-Dec-93	101	LAST CHANCE CREEK	D	0.217	0.063	<0.003	<0.003
149		04-Jan-94	104	LAST CHANCE CREEK	T	0.714	0.082	0.006	<0.003
163		25-Aug-94	102	LAST CHANCE CREEK	T	1.1	0.066	<0.005	<0.05
151		09-Feb-94	102	LAST CHANCE CREEK	T	0.416	0.048	<0.003	<0.003
138		07-Sep-93	103	LAST CHANCE CREEK	T	0.648	0.026	<0.003	<0.003
153		14-Mar-94	101	LAST CHANCE CREEK	T	0.768	0.102	<0.003	<0.003
154		14-Mar-94	101	LAST CHANCE CREEK	D	0.346	0.098	<0.003	<0.003
157		21-Apr-94	102	LAST CHANCE CREEK	T	0.441	0.087	<0.003	<0.003
158		21-Apr-94	102	LAST CHANCE CREEK	D	0.202	0.082	<0.003	<0.003
159		04-May-94	102	LAST CHANCE CREEK	T	1.25	0.179	<0.003	<0.003
160		04-May-94	102	LAST CHANCE CREEK	D	0.72	0.164	<0.003	<0.003
150		04-Jan-94	104	LAST CHANCE CREEK	D	0.238	0.078	<0.003	<0.003
3		25-Aug-94	102	LAST CHANCE CREEK	T	1.1	0.066	<0.005	<0.05
115		01-Sep-92	203	LAST CHANCE CREEK	T	0.514	0.029	0.001	<0.003
418		26-Jul-95	101	LOWER FISH CREEK	T	14.9	0.331	<0.005	<0.005
414		08-May-95	102	LOWER FISH CREEK	T	9	0.274	<0.005	<0.005
415		08-May-95	102	LOWER FISH CREEK	D	1.44	0.141	<0.005	<0.005
9		14-May-92	101	LOWER FISH CREEK	D	0.79	0.186	<0.001	<0.003
419		26-Jul-95	101	LOWER FISH CREEK	D	3.16	0.187	<0.005	<0.005
7		22-Apr-92	103	LOWER FISH CREEK	T	15.6	0.528	0.018	<0.003
6		22-Apr-92	103	LOWER FISH CREEK	D	0.159	0.409	0.001	<0.003

5		19-Mar-92	101	LOWER FISH CREEK	T	2.01	0.32	0.004	
10		14-May-92	101	LOWER FISH CREEK	T	2.34	0.213	0.002	<0.003
18		05-Jun-92	201	LOWER FISH CREEK	T	41	0.788	0.054	<0.033
17		05-Jun-92	201	LOWER FISH CREEK	D	0.34	0.09	0.003	<0.003
170		07-Jul-93	1	LOWER FISH CREEK	T	8.35	0.194	0.014	<0.003
394		02-Feb-95	101	LOWER FISH CREEK	T	3.41	0.237	<0.005	<0.005
395		02-Feb-95	101	LOWER FISH CREEK	D	1.85	0.226	<0.005	<0.005
430		15-May-95	101	LOWER FISH CREEK	T				
454		21-Nov-95	101	LOWER FISH CREEK	T				
447		28-Sep-95	105	LOWER FISH CREEK	T				
448		05-Oct-95	101	LOWER FISH CREEK	T				
449		18-Oct-95	101	LOWER FISH CREEK	T				
450		24-Oct-95	101	LOWER FISH CREEK	T				
451		30-Oct-95	101	LOWER FISH CREEK	T				
428		04-May-95	101	LOWER FISH CREEK	T				
453		16-Nov-95	101	LOWER FISH CREEK	T				
444		22-Aug-95	101	LOWER FISH CREEK	T				
461		07-Nov-95	101	LOWER FISH CREEK	T	2.27	0.256	<0.003	<0.003
4		19-Mar-92	101	LOWER FISH CREEK	D	0.604	0.356	0.002	
438		11-Jul-95	101	LOWER FISH CREEK	T				
431		24-May-95	101	LOWER FISH CREEK	T				
432		01-Jun-95	101	LOWER FISH CREEK	T				
433		07-Jun-95	101	LOWER FISH CREEK	T				
434		13-Jun-95	101	LOWER FISH CREEK	T				
435		22-Jun-95	101	LOWER FISH CREEK	T				
446		06-Sep-95	101	LOWER FISH CREEK	T				
437		05-Jul-95	101	LOWER FISH CREEK	T				
445		31-Aug-95	101	LOWER FISH CREEK	T				
439		20-Jul-95	101	LOWER FISH CREEK	T				
440		26-Jul-95	102	LOWER FISH CREEK	T				
441		03-Aug-95	101	LOWER FISH CREEK	T				
442		09-Aug-95	103	LOWER FISH CREEK	T				
443		17-Aug-95	101	LOWER FISH CREEK	T				
429		10-May-95	101	LOWER FISH CREEK	T				
436		27-Jun-95	101	LOWER FISH CREEK	T				

466		07-Nov-95	101	LOWER FISH CREEK	D	1.6	0.239	<0.003	0.004
57		02-Aug-93	1	LOWER FISH CREEK	T	13.9	0.3	0.015	<0.003
72		04-Jan-94	103	LOWER FISH CREEK	T	2.56	0.221	<0.003	<0.003
70		02-Dec-93	103	LOWER FISH CREEK	D	0.452	0.191	<0.003	<0.003
67		07-Oct-93	101	LOWER FISH CREEK	D	0.482	0.183	<0.003	<0.003
66		08-Nov-93	101	LOWER FISH CREEK	D	1.71	0.208	<0.003	<0.003
74		08-Feb-94	101	LOWER FISH CREEK	T	2.58	0.251	0.004	0.004
65		08-Nov-93	101	LOWER FISH CREEK	T	3.06	0.214	0.004	<0.003
75		08-Feb-94	101	LOWER FISH CREEK	D	0.579	0.236	0.004	<0.003
63		08-Sep-93	103	LOWER FISH CREEK	D	0.423	0.168	0.009	<0.003
62		07-Oct-93	101	LOWER FISH CREEK	T	16.4	0.288	0.009	<0.003
61		08-Sep-93	103	LOWER FISH CREEK	T	31.1	0.393	0.041	<0.003
60		02-Aug-93	1	LOWER FISH CREEK	D	0.545	0.121	0.004	<0.003
23		06-Jul-92	203	LOWER FISH CREEK	D	0.683	0.129	0.002	<0.003
82		04-May-94	101	LOWER FISH CREEK	T	9.58	0.281	0.006	<0.003
90		09-Nov-94	101	LOWER FISH CREEK	T	6.57	0.263	<0.005	<0.005
91		09-Nov-94	101	LOWER FISH CREEK	D	1.82	0.199	<0.005	<0.005
86		25-Aug-94	101	LOWER FISH CREEK	T	3.87	0.166	<0.005	<0.05
85		06-Jun-94	102	LOWER FISH CREEK	D	1.29	0.135	<0.003	<0.003
73		04-Jan-94	103	LOWER FISH CREEK	D	0.41	0.214	0.006	<0.003
83		04-May-94	101	LOWER FISH CREEK	D	1.05	0.166	<0.003	<0.003
81		21-Apr-94	101	LOWER FISH CREEK	D	0.363	0.204	<0.003	<0.003
80		21-Apr-94	101	LOWER FISH CREEK	T	3.26	0.236	<0.003	<0.003
79		09-Mar-94	101	LOWER FISH CREEK	D	0.821	0.326	<0.003	<0.003
78		09-Mar-94	101	LOWER FISH CREEK	T	2.52	0.331	<0.003	<0.003
84		06-Jun-94	102	LOWER FISH CREEK	T	2.16	0.148	<0.003	<0.003
31		09-Oct-92	101	LOWER FISH CREEK	D	0.243	0.266	0.003	<0.003
58		07-Jul-93	1	LOWER FISH CREEK	D	0.41	0.102	<0.003	<0.003
36		09-Dec-92	1	LOWER FISH CREEK	D	0.225	0.28	0.001	<0.003
148		02-Dec-93	103	LOWER FISH CREEK	T	2.52	0.198	<0.003	<0.003
35		09-Dec-92	1	LOWER FISH CREEK	T	2.32	0.28	0.001	<0.003
34		13-Nov-92	1	LOWER FISH CREEK	T	4.21	0.285	0.004	<0.003
32		09-Oct-92	101	LOWER FISH CREEK	T	5.73	0.286	0.002	<0.003
30		01-Sep-92	201	LOWER FISH CREEK	T	5.93	0.225	0.005	<0.003
29		01-Sep-92	201	LOWER FISH CREEK	D	0.829	0.169	<0.001	0.008

28		04-Aug-92	101	LOWER FISH CREEK	T	31.8	0.373	0.045	<0.003
27		04-Aug-92	101	LOWER FISH CREEK	D	0.249	0.155	0.001	0.004
87		25-Aug-94	101	LOWER FISH CREEK	D	0.98	0.089	<0.005	<0.05
33		13-Nov-92	1	LOWER FISH CREEK	D	0.196	0.275	0.002	<0.003
47		13-May-93	1	LOWER FISH CREEK	T	9.21	0.221	0.011	<0.003
48		13-May-93	1	LOWER FISH CREEK	D	0.854	0.104	<0.001	0.005
24		06-Jul-92	203	LOWER FISH CREEK	T	26.6	0.376	0.036	<0.003
46		04-May-93	1	LOWER FISH CREEK	D	1.14	0.178	<0.001	<0.003
45		04-May-93	1	LOWER FISH CREEK	T	1.03	0.184	<0.001	0.006
44		09-Mar-92	1	LOWER FISH CREEK	D	0.489	0.249	0.003	0.004
43		08-Mar-93	1	LOWER FISH CREEK	T	1.93	0.268	0.004	<0.003
252		15-Dec-92	1	SOLO CREEK	T	1.1	0.061	<0.001	<0.003
409		08-May-95	101	SOLO CREEK	D	0.92	0.046	<0.005	<0.005
246		02-Sep-92	203	SOLO CREEK	D	0.387	0.05	<0.001	<0.003
247		02-Sep-92	203	SOLO CREEK	T	1.06	0.056	0.004	<0.003
248		13-Oct-92	101	SOLO CREEK	D	0.169	0.041	<0.001	<0.003
249		13-Oct-92	101	SOLO CREEK	T	0.981	0.047	<0.001	<0.003
420		25-Jul-95	101	SOLO CREEK	T	32.1	0.568	0.017	<0.005
421		25-Jul-95	101	SOLO CREEK	D	1.57	0.146	0.006	<0.005
265		04-Aug-93	1	SOLO CREEK	T	1.25	0.051	<0.003	<0.003
251		10-Nov-92	1	SOLO CREEK	D	0.184	0.042	0.002	0.004
405		02-Feb-95	103	SOLO CREEK	D	0.66	0.081	<0.005	<0.005
253		15-Dec-92	1	SOLO CREEK	D	0.163	0.05	<0.001	<0.003
254		09-Mar-93	1	SOLO CREEK	D	0.188	0.07	0.008	0.007
255		09-Mar-93	1	SOLO CREEK	T	1.2	0.075	0.004	<0.003
256		30-Apr-93	1	SOLO CREEK	D	0.489	0.058	<0.001	<0.003
258		19-May-93	1	SOLO CREEK	T	0.839	0.02	<0.006	<0.003
263		08-Jul-93	1	SOLO CREEK	D	0.459	0.028	<0.003	<0.003
250		10-Nov-92	1	SOLO CREEK	T	0.947	0.048	0.001	<0.003
234		09-Jun-92	103	SOLO CREEK	T	0.995	0.028	0.001	<0.033
224			101	SOLO CREEK	T	1.19	0.067	0.003	
226		20-Apr-92	101	SOLO CREEK	D	0.164	0.062	0.001	<0.003
369		08-Sep-93	101	SOLO CREEK	D	0.636	0.055	<0.003	<0.003
227		20-Apr-92	101	SOLO CREEK	T	1.44	0.077	<0.001	<0.003
376		04-Nov-93	102	SOLO CREEK	T	1.45	0.068	0.005	<0.003

229		21-May-92	103	SOLO CREEK	D	0.512	0.052	<0.001	<0.003
230		21-May-92	103	SOLO CREEK	T	1.27	0.069	0.001	<0.003
408		08-May-95	101	SOLO CREEK	T	2.69	0.102	<0.005	<0.005
69		08-Jul-93	1	SOLO CREEK	T	0.898	0.033	0.006	<0.003
238		06-Jul-92	202	SOLO CREEK	D	0.26	0.032	<0.001	<0.003
239		06-Jul-92	202	SOLO CREEK	T	6.25	0.103	0.006	<0.003
242		05-Aug-92	103	SOLO CREEK	T	3.16	0.067	0.002	<0.003
243		05-Aug-92	103	SOLO CREEK	D	0.413	0.038	0.001	<0.003
404		02-Feb-95	103	SOLO CREEK	T	1.01	0.083	<0.005	<0.005
259		19-May-93	1	SOLO CREEK	D	0.444	0.015	<0.006	<0.003
233		09-Jun-92	103	SOLO CREEK	D	0.509	0.023	<0.001	0.004
289		04-May-94	103	SOLO CREEK	D	0.782	0.138	<0.003	<0.003
295		25-Aug-94	103	SOLO CREEK	D	0.575	0.027	<0.005	<0.05
286		21-Apr-94	103	SOLO CREEK	T	4.84	0.19	0.006	<0.003
282		08-Feb-94	102	SOLO CREEK	T	2.13	0.118	<0.003	<0.003
279		04-Jan-94	101	SOLO CREEK	D	0.229	0.064	<0.003	<0.003
293		06-Jun-94	104	SOLO CREEK	D	0.635	0.05	<0.003	<0.003
292		06-Jun-94	104	SOLO CREEK	T	2.16	0.079	<0.003	<0.003
276		02-Dec-93	102	SOLO CREEK	D	0.267	0.046	<0.003	<0.003
294		25-Aug-94	103	SOLO CREEK	T	4.72	0.104	<0.005	<0.05
288		04-May-94	103	SOLO CREEK	T	7.75	0.322	0.004	<0.003
270		05-Oct-93	2	SOLO CREEK	T	1.1	0.059	<0.003	<0.003
287		21-Apr-94	103	SOLO CREEK	D	0.286	0.089	<0.003	<0.003
257		30-Apr-93	1	SOLO CREEK	T	0.403	0.056	<0.001	<0.003
285		14-Mar-94	102	SOLO CREEK	D	0.257	0.074	<0.003	<0.003
284		14-Mar-94	102	SOLO CREEK	T	0.973	0.083	<0.003	<0.003
283		08-Feb-94	102	SOLO CREEK	D	0.318	0.084	<0.003	<0.003
272		05-Oct-93	2	SOLO CREEK	D	0.188	0.05	<0.003	0.007
463		06-Nov-95	102	SOLO CREEK	D	1.87	0.09	<0.003	<0.003
462		06-Nov-95	102	SOLO CREEK	T	2.52	0.101	<0.003	<0.003
278		04-Jan-94	101	SOLO CREEK	T	2.21	0.101	<0.003	<0.003
275		02-Dec-93	102	SOLO CREEK	T	1.43	0.067	<0.003	<0.003
274		04-Nov-93	102	SOLO CREEK	D	1.27	0.062	0.004	<0.003
268		04-Aug-93	1	SOLO CREEK	D	0.445	0.044	<0.003	0.005
269		08-Sep-93	101	SOLO CREEK	T	1.27	0.063	<0.003	<0.003

297		07-Nov-94	101	SOLO CREEK	D	0.192	0.058	<0.005	<0.005
296		07-Nov-94	101	SOLO CREEK	T	1.42	0.069	<0.005	<0.005
314		19-May-93	1	SOLO CREEK	T				
346		28-Apr-93	1	UPPER FISH CREEK	D	0.581	0.207	0.003	<0.003
142		28-Apr-93	1	UPPER FISH CREEK	T	43	0.837	0.043	<0.017
202		04-Nov-93	101	UPPER FISH CREEK	T	2.23	0.206	<0.003	<0.003
195		02-Aug-93	1	UPPER FISH CREEK	T	29.3	0.469	0.049	<0.003
200		07-Sep-93	101	UPPER FISH CREEK	T	10.8	0.268	0.019	<0.003
360		06-Jul-93	1	UPPER FISH CREEK	T	12.6	0.24	0.024	<0.003
373		02-Dec-93	101	UPPER FISH CREEK	T	2.21	0.159	<0.003	<0.003
372		04-Nov-93	101	UPPER FISH CREEK	D	1.23	0.211	0.004	<0.003
368		07-Sep-93	101	UPPER FISH CREEK	D	1.01	0.133	0.004	<0.003
377		02-Dec-93	101	UPPER FISH CREEK	D	0.358	0.141	<0.003	<0.003
362		02-Aug-93	1	UPPER FISH CREEK	D	0.817	0.062	0.003	<0.003
378		04-Jan-94	102	UPPER FISH CREEK	T	1.85	0.157	0.007	<0.003
359		06-Jul-93	1	UPPER FISH CREEK	D	1.09	0.069	<0.003	<0.003
386		04-May-94	104	UPPER FISH CREEK	T	117	1.88	0.056	<0.003
271		05-Oct-93	3	UPPER FISH CREEK	T	3.72	0.206	<0.013	<0.003
344		14-Dec-92	1	UPPER FISH CREEK	D	0.122	0.197	0.001	<0.003
393		25-Aug-94	104	UPPER FISH CREEK	D	0.72	0.038	<0.005	<0.05
392		25-Aug-94	104	UPPER FISH CREEK	T	7.75	0.198	<0.005	<0.05
389		06-Jun-94	101	UPPER FISH CREEK	D	0.867	0.08	<0.003	<0.003
387		04-May-94	104	UPPER FISH CREEK	D	1.37	0.098	0.006	<0.003
383		25-Apr-94	101	UPPER FISH CREEK	D	0.49	0.098	<0.003	<0.003
382		25-Apr-94	101	UPPER FISH CREEK	T	12.4	0.267	0.006	<0.003
381		09-Feb-94	101	UPPER FISH CREEK	D	0.335	0.15	<0.003	<0.003
380		09-Feb-94	101	UPPER FISH CREEK	T	1.88	0.163	0.004	<0.003
379		04-Jan-94	102	UPPER FISH CREEK	D	0.308	0.141	<0.003	<0.003
388		06-Jun-94	101	UPPER FISH CREEK	T	2.09	0.103	<0.003	<0.003
329		06-Jul-92	201	UPPER FISH CREEK	T	26.7	0.488	0.033	<0.003
328		06-Jul-92	201	UPPER FISH CREEK	D	0.72	0.106	0.003	<0.003
332		10-Aug-92	101	UPPER FISH CREEK	T	7.3	0.294	0.01	<0.003
322		05-Jun-92	202	UPPER FISH CREEK	D	0.608	0.079	0.008	0.008
321		05-Jun-92	202	UPPER FISH CREEK	T	39.5	1.76	0.021	<0.033
351		11-May-93	2	UPPER FISH CREEK	D	0.94	0.111	0.009	<0.003

370		05-Oct-93	3	UPPER FISH CREEK	D	0.571	0.167	0.005	<0.003
333		10-Aug-92	101	UPPER FISH CREEK	D	0.694	0.223	0.003	<0.003
350		11-May-93	2	UPPER FISH CREEK	T	13.8	0.309	0.019	<0.003
345		14-Dec-92	1	UPPER FISH CREEK	T	2.39	0.207	<0.001	<0.003
343		09-Nov-92	1	UPPER FISH CREEK	T	3.91	0.23	0.006	<0.003
342		09-Nov-92	1	UPPER FISH CREEK	D	0.111	0.187	0.002	<0.003
338		08-Oct-92	101	UPPER FISH CREEK	D	1.99	0.287	0.001	0.003
336		02-Sep-92	201	UPPER FISH CREEK	T	10.8	0.247	0.018	<0.033
339		08-Oct-92	101	UPPER FISH CREEK	T	4.42	0.31	0.006	0.004
335		02-Sep-92	201	UPPER FISH CREEK	D	0.36	0.154	<0.001	<0.003

APPENDIX B.1

Groundwater statistics
PROUCL 4.0

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options

	C:\Documents and Settings\mgrant\Desktop\Ft Know WQ\Stats\Dev
From File	Tolerance Limits.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

FE (d)

Total Number of Data	100
Number of Non-Detect Data	1
Number of Detected Data	99
Minimum Detected	0.012
Maximum Detected	58.2
Percent Non-Detects	1.00%
Minimum Non-detect	0.011
Maximum Non-detect	0.011
Mean of Detected Data	15.11
SD of Detected Data	15.19
Mean of Log-Transformed Detected Data	1.788
SD of Log-Transformed Detected Data	1.979

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	98
Achieved CC	0.963
UTL	52.5
Largest Non-detect at Order	1
95% UPL	
95% UPL	45.37
Kaplan-Meier (KM) Method	
Mean	14.96
SD	15.11
Standard Error of Mean	1.519
95% UTL 95% Coverage	44.03
95% KM Chebyshev UPL	81.16
95% KM UPL (t)	40.18
90% KM Percentile (z)	34.33
95% KM Percentile (z)	39.82
99% KM Percentile (z)	50.12

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:

KM-UPL may be used when multiple detection limits are present

FE (t)

Total Number of Data	99
Number of Non-Detect Data	1
Number of Detected Data	98
Minimum Detected	0.028
Maximum Detected	110
Percent Non-Detects	1.01%
Minimum Non-detect	0.011
Maximum Non-detect	0.011
Mean of Detected Data	20.41
SD of Detected Data	19.84
Mean of Log-Transformed Detected Data	2.302
SD of Log-Transformed Detected Data	1.587

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	97
Achieved CC	0.961
UTL	60.1
Largest Non-detect at Order	1
95% UPL	
95% UPL	55.9

Kaplan-Meier (KM) Method	
Mean	20.21
SD	19.74
Standard Error of Mean	1.994
95% UTL 95% Coverage	58.2
95% KM Chebyshev UPL	106.7
95% KM UPL (t)	53.15
90% KM Percentile (z)	45.5
95% KM Percentile (z)	52.67
99% KM Percentile (z)	66.13

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

MN (d)

Some Non-Parametric Statistics	
Number of Valid Samples	100
Number of Unique Samples	80
Minimum	0.016
Maximum	2.19
Second Largest	1.91
Mean	1.019
First Quartile	0.596
Median	1.09
Third Quartile	1.428
SD	0.496
Variance	0.246
Coefficient of Variation	0.487
Skewness	-0.0688
Mean of Log-Transformed data	-0.166
SD of Log-Transformed data	0.733

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics	
90% Percentile	1.608
95% Percentile	1.844
99% Percentile	2.187
95% UTL with 95% Coverage	
Order Statistic	98
Achieved CC	0.963
UTL	1.9
95% BCA Bootstrap UTL with 95% Coverage	1.85
95% Percentile Bootstrap UTL with 95% Coverage	1.9
95% UPL	1.844
95% Chebyshev UPL	3.194
Upper Limit Based upon IQR	2.675

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

MN (t)

Some Non-Parametric Statistics	
Number of Valid Samples	99
Number of Unique Samples	80
Minimum	0.194
Maximum	2.4
Second Largest	1.98
Mean	1.062
First Quartile	0.66
Median	1.12
Third Quartile	1.47
SD	0.517
Variance	0.268
Coefficient of Variation	0.487
Skewness	0.0279
Mean of Log-Transformed data	-0.101
SD of Log-Transformed data	0.629

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics	
90% Percentile	1.65
95% Percentile	1.91
99% Percentile	2.4
95% UTL with 95% Coverage	
Order Statistic	97
Achieved CC	0.961
UTL	1.96
95% BCA Bootstrap UTL with 95% Coverage	1.96
95% Percentile Bootstrap UTL with 95% Coverage	1.96
95% UPL	1.91
95% Chebyshev UPL	3.328
Upper Limit Based upon IQR	2.685

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

AS (d)

Total Number of Data	100
Number of Non-Detect Data	20
Number of Detected Data	80
Minimum Detected	0.001
Maximum Detected	0.044
Percent Non-Detects	20.00%
Minimum Non-detect	0.001
Maximum Non-detect	0.006
Mean of Detected Data	0.0142
SD of Detected Data	0.0119
Mean of Log-Transformed Detected Data	-4.669
SD of Log-Transformed Detected Data	0.978

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	98
Achieved CC	0.963
UTL	0.034
Largest Non-detect at Order	43
95% UPL	
95% UPL	0.034

Kaplan-Meier (KM) Method

Mean	0.0117
SD	0.0117
Standard Error of Mean	0.00118
95% UTL 95% Coverage	0.0343
95% KM Chebyshev UPL	0.0631
95% KM UPL (t)	0.0313
90% KM Percentile (z)	0.0268
95% KM Percentile (z)	0.031
99% KM Percentile (z)	0.039

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

AS (t)

Total Number of Data	99
Number of Non-Detect Data	16
Number of Detected Data	83
Minimum Detected	0.002
Maximum Detected	0.256
Percent Non-Detects	16.16%
Minimum Non-detect	0.001
Maximum Non-detect	0.006
Mean of Detected Data	0.0211
SD of Detected Data	0.03
Mean of Log-Transformed Detected Data	-4.326
SD of Log-Transformed Detected Data	0.943

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	97
Achieved CC	0.961
UTL	0.065
Largest Non-detect at Order	34

95% UPL	
95% UPL	0.046

Kaplan-Meier (KM) Method	
Mean	0.018
SD	0.0282
Standard Error of Mean	0.00285
95% UTL 95% Coverage	0.0723
95% KM Chebyshev UPL	0.141
95% KM UPL (t)	0.0651
90% KM Percentile (z)	0.0541
95% KM Percentile (z)	0.0644
99% KM Percentile (z)	0.0836

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV. For an Example: KM-UPL may be used when multiple detection limits are present

SB (d)

Total Number of Data	100
Number of Non-Detect Data	92
Number of Detected Data	8
Minimum Detected	0.004
Maximum Detected	0.025
Percent Non-Detects	92.00%
Minimum Non-detect	0.003
Maximum Non-detect	0.1
Mean of Detected Data	0.00775
SD of Detected Data	0.00707
Mean of Log-Transformed Detected Data	-5.066
SD of Log-Transformed Detected Data	0.589

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	98
Achieved CC	0.963
UTL	0.05
Warning: Largest Non-detect at Order	100

95% UPL	
95% UPL	0.03

Kaplan-Meier (KM) Method	
Mean	0.00433
SD	0.00221
Standard Error of Mean	2.45E-04
95% UTL 95% Coverage	0.00857
95% KM Chebyshev UPL	0.014
95% KM UPL (t)	0.00801
90% KM Percentile (z)	0.00715
95% KM Percentile (z)	0.00796
99% KM Percentile (z)	0.00946

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

SB (t)

Total Number of Data	99
Number of Non-Detect Data	97
Number of Detected Data	2
Minimum Detected	0.005
Maximum Detected	0.02
Percent Non-Detects	97.98%
Minimum Non-detect	0.003
Maximum Non-detect	0.1
Mean of Detected Data	0.0125
SD of Detected Data	0.0106
Mean of Log-Transformed Detected Data	-4.605
SD of Log-Transformed Detected Data	0.98

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	97
Achieved CC	0.961
UTL	0.05
Warning: Largest Non-detect at Order	99
95% UPL	
95% UPL	0.033

Kaplan-Meier (KM) Method	
Mean	0.00516
SD	0.00156
Standard Error of Mean	2.29E-04
95% UTL 95% Coverage	0.00816
95% KM Chebyshev UPL	0.012
95% KM UPL (t)	0.00776
90% KM Percentile (z)	0.00716
95% KM Percentile (z)	0.00772
99% KM Percentile (z)	0.00878

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

APPENDIX B.2

Surface water statistics
PROUCL 4.0

Lognormal Background Statistics for Data Sets with Non-Detects

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

FE (d)

Log-Transformed Statistics	
Number of Valid Samples	114
Number of Unique Samples	106
Minimum	-2.465
Maximum	1.151
Second Largest	0.688
Mean	-0.794
First Quartile	-1.432
Median	-0.801
Third Quartile	-0.243
SD	0.766
Lognormal Distribution Test	
Lilliefors Test Statistic	0.0718
5% Lilliefors Critical Value	0.083
Data appear Lognormal at 5% Significance Level	
Background Statistics Assuming Lognormal Distribution	
90% Percentile (z)	1.205
95% Percentile (z)	1.592
99% Percentile (z)	2.682
95% UPL	1.617
95% UTL with 95% Coverage	1.941
Some Nonparametric Background Statistics	
95% Chebyshev UPL	2.79
95% Bootstrap BCA UTL with 95% Coverage	1.856
95% Percentile Bootstrap UTL with 95% Coverage	1.856

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

FE (t)

Log-Transformed Statistics	
Total Number of Data	115
Number of Non-Detect Data	0
Number of Detected Data	115
Minimum Detected	-1.204

Maximum Detected	4.762
Percent Non-Detects	0.00%
Minimum Non-detect	N/A
Maximum Non-detect	N/A
Mean of Detected data	0.914
SD of Detected data	1.291

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.124
5% Lilliefors Critical Value	0.0826

Data not Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	0.914
SD (Log Scale)	1.291
95% UTL 95% Coverage	29.08
95% UPL	21.41
90% Percentile (z)	13.05
95% Percentile (z)	20.85
99% Percentile (z)	50.24

Note: DL/2 is not a recommended method.

Log ROS Method

Mean in Log Scale	0.603
SD in Log Scale	1.169
Mean in Orignal Scale	4.977
SD in Original Scale	13.03
95% UTL 95% Coverage	16.89
95% BCA UTL with 95% Coverage	39.88
95% Bootstrap (%) UTL with 95% Coverage	39.88
95% UPL (t)	12.8
90% Percentile (z)	8.173
95% Percentile (z)	12.5
99% Percentile (z)	27.71

Kaplan Meier (KM) Method

Mean	6.638
SD	13.72
SE of Mean	1.285
95% UTL 95% Coverage	32.74
95% KM Chebyshev UPL	66.71
95% KM UPL (t)	29.49
95% KM Percentile (z)	29.21

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

MN (d)

Log-Transformed Statistics	
Number of Valid Samples	114
Number of Unique Samples	88
Minimum	-4.2
Maximum	-0.894
Second Largest	-1.033
Mean	-2.415
First Quartile	-2.996
Median	-2.414
Third Quartile	-1.788
SD	0.737
Lognormal Distribution Test	
Lilliefors Test Statistic	0.0738
5% Lilliefors Critical Value	0.083
Data appear Lognormal at 5% Significance Level	
Background Statistics Assuming Lognormal Distribution	
90% Percentile (z)	0.23
95% Percentile (z)	0.3
99% Percentile (z)	0.496
95% UPL	0.305
95% UTL with 95% Coverage	0.363
Some Nonparametric Background Statistics	
95% Chebyshev UPL	0.466
95% Bootstrap BCA UTL with 95% Coverage	0.299
95% Percentile Bootstrap UTL with 95% Coverage	0.299

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

MN (t)

Log-Transformed Statistics	
Total Number of Data	115
Number of Non-Detect Data	0
Number of Detected Data	115
Minimum Detected	-3.912
Maximum Detected	0.631
Percent Non-Detects	0.00%
Minimum Non-detect	N/A
Maximum Non-detect	N/A
Mean of Detected data	-2.025
SD of Detected data	0.893
Lognormal Distribution Test with Detected Values Only	
Lilliefors Test Statistic	0.0897

5% Lilliefors Critical Value	0.0826
Data not Lognormal at 5% Significance Level	
Background Statistics Assuming Lognormal Distribution	
DL/2 Substitution Method	
Mean (Log Scale)	-2.025
SD (Log Scale)	0.893
95% UTL 95% Coverage	0.722
95% UPL	0.584
90% Percentile (z)	0.414
95% Percentile (z)	0.573
99% Percentile (z)	1.053
Note: DL/2 is not a recommended method.	
Log ROS Method	
Mean in Log Scale	-2.263
SD in Log Scale	0.833
Mean in Orignal Scale	0.164
SD in Original Scale	0.258
95% UTL 95% Coverage	0.508
95% BCA UTL with 95% Coverage	0.8
95% Bootstrap (%) UTL with 95% Coverage	0.8
95% UPL (t)	0.417
90% Percentile (z)	0.303
95% Percentile (z)	0.409
99% Percentile (z)	0.722
Kaplan Meier (KM) Method	
Mean	0.203
SD	0.26
SE of Mean	0.0243
95% UTL 95% Coverage	0.697
95% KM Chebyshev UPL	1.339
95% KM UPL (t)	0.635
95% KM Percentile (z)	0.63

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

Nonparametric Background Statistics for Data Sets with Non-Detects

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

FE (d)

Some Non-Parametric Statistics	
Number of Valid Samples	114
Number of Unique Samples	106
Minimum	0.085
Maximum	3.16
Second Largest	1.99
Mean	0.603
First Quartile	0.239
Median	0.449
Third Quartile	0.784
SD	0.5
Variance	0.25
Coefficient of Variation	0.829
Skewness	2.038
Mean of Log-Transformed data	-0.794
SD of Log-Transformed data	0.766

Data Follow Appr. Gamma Distribution at 5% Significance Level)

Non-Parametric Background Statistics	
90% Percentile	1.28
95% Percentile	1.738
99% Percentile	2.984
95% UTL with 95% Coverage	
Order Statistic	111
Achieved CC	0.928
UTL	1.85
95% BCA Bootstrap UTL with 95% Coverage	1.85
95% Percentile Bootstrap UTL with 95% Coverage	1.856
95% UPL	1.738
95% Chebyshev UPL	2.79
Upper Limit Based upon IQR	1.602

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

FE (t)

Total Number of Data	115
Number of Non-Detect Data	0
Number of Detected Data	115
Minimum Detected	0.3
Maximum Detected	117
Percent Non-Detects	0.00%
Minimum Non-detect	N/A
Maximum Non-detect	N/A
Mean of Detected Data	6.638
SD of Detected Data	13.78
Mean of Log-Transformed Detected Data	0.914
SD of Log-Transformed Detected Data	1.291

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	112
Achieved CC	0.931
UTL	39.5
Largest Non-detect at Order	0

95% UPL	
95% UPL	31.86

Kaplan-Meier (KM) Method	
Mean	6.638
SD	13.72
Standard Error of Mean	1.285
95% UTL 95% Coverage	32.74
95% KM Chebyshev UPL	66.71
95% KM UPL (t)	29.49
90% KM Percentile (z)	24.22
95% KM Percentile (z)	29.21
99% KM Percentile (z)	38.56

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

MN (d)

Some Non-Parametric Statistics	
Number of Valid Samples	114
Number of Unique Samples	88
Minimum	0.015

Maximum	0.409
Second Largest	0.356
Mean	0.115
First Quartile	0.05
Median	0.0895
Third Quartile	0.167
SD	0.0802
Variance	0.00643
Coefficient of Variation	0.699
Skewness	1.151
Mean of Log-Transformed data	-2.415
SD of Log-Transformed data	0.737

Data appear Gamma Distributed at 5% Significance Level

Non-Parametric Background Statistics	
90% Percentile	0.225
95% Percentile	0.276
99% Percentile	0.401
95% UTL with 95% Coverage	
Order Statistic	111
Achieved CC	0.928
UTL	0.287
95% BCA Bootstrap UTL with 95% Coverage	0.299
95% Percentile Bootstrap UTL with 95% Coverage	0.299
95% UPL	0.276
95% Chebyshev UPL	0.466
Upper Limit Based upon IQR	0.343

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

MN (t)

Total Number of Data	115
Number of Non-Detect Data	0
Number of Detected Data	115
Minimum Detected	0.02
Maximum Detected	1.88
Percent Non-Detects	0.00%
Minimum Non-detect	N/A
Maximum Non-detect	N/A
Mean of Detected Data	0.203
SD of Detected Data	0.261
Mean of Log-Transformed Detected Data	-2.025
SD of Log-Transformed Detected Data	0.893

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	112
Achieved CC	0.931
UTL	0.788
Largest Non-detect at Order	0
95% UPL	
95% UPL	0.536
Kaplan-Meier (KM) Method	
Mean	0.203
SD	0.26
Standard Error of Mean	0.0243
95% UTL 95% Coverage	0.697
95% KM Chebyshev UPL	1.339
95% KM UPL (t)	0.635
90% KM Percentile (z)	0.535
95% KM Percentile (z)	0.63
99% KM Percentile (z)	0.807

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

AS (d)

Total Number of Data	114
Number of Non-Detect Data	73
Number of Detected Data	41
Minimum Detected	0.001
Maximum Detected	0.009
Percent Non-Detects	64.04%
Minimum Non-detect	0.001
Maximum Non-detect	0.006
Mean of Detected Data	0.00324
SD of Detected Data	0.00233
Mean of Log-Transformed Detected Data	-5.976
SD of Log-Transformed Detected Data	0.717

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	111

Achieved CC	0.928
UTL	0.008
Largest Non-detect at Order	106

95% UPL	
95% UPL	0.006

Kaplan-Meier (KM) Method	
Mean	0.00197
SD	0.00174
Standard Error of Mean	1.73E-04
95% UTL 95% Coverage	0.00527
95% KM Chebyshev UPL	0.00957
95% KM UPL (t)	0.00486
90% KM Percentile (z)	0.00419
95% KM Percentile (z)	0.00482
99% KM Percentile (z)	0.00601

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

AS (t)

Total Number of Data	115
Number of Non-Detect Data	58
Number of Detected Data	57
Minimum Detected	0.001
Maximum Detected	0.056
Percent Non-Detects	50.43%
Minimum Non-detect	0.001
Maximum Non-detect	0.013
Mean of Detected Data	0.0122
SD of Detected Data	0.0146
Mean of Log-Transformed Detected Data	-5.025
SD of Log-Transformed Detected Data	1.117

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	112
Achieved CC	0.931
UTL	0.045
Largest Non-detect at Order	98

95% UPL	
95% UPL	0.0414

Kaplan-Meier (KM) Method	
Mean	0.00674
SD	0.0116
Standard Error of Mean	0.00109
95% UTL 95% Coverage	0.0287
95% KM Chebyshev UPL	0.0574
95% KM UPL (t)	0.026
90% KM Percentile (z)	0.0216
95% KM Percentile (z)	0.0258
99% KM Percentile (z)	0.0336

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

SB (d)

Total Number of Data	111
Number of Non-Detect Data	93
Number of Detected Data	18
Minimum Detected	0.003
Maximum Detected	0.009
Percent Non-Detects	83.78%
Minimum Non-detect	0.003
Maximum Non-detect	0.05
Mean of Detected Data	0.00528
SD of Detected Data	0.00187
Mean of Log-Transformed Detected Data	-5.301
SD of Log-Transformed Detected Data	0.343

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	109
Achieved CC	0.977
UTL	0.05
Warning: Largest Non-detect at Order	111
95% UPL	
95% UPL	0.0084

Kaplan-Meier (KM) Method	
Mean	0.00339
SD	0.00113
Standard Error of Mean	1.13E-04
95% UTL 95% Coverage	0.00556
95% KM Chebyshev UPL	0.00836
95% KM UPL (t)	0.00528

90% KM Percentile (z)	0.00485
95% KM Percentile (z)	0.00526
99% KM Percentile (z)	0.00603

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

SB (t)

Total Number of Data	112
Number of Non-Detect Data	108
Number of Detected Data	4
Minimum Detected	0.004
Maximum Detected	0.006
Percent Non-Detects	96.43%
Minimum Non-detect	0.003
Maximum Non-detect	0.05
Mean of Detected Data	0.0045
SD of Detected Data	0.001
Mean of Log-Transformed Detected Data	-5.42
SD of Log-Transformed Detected Data	0.203

Data do not follow a Discernable Distribution (0.05)

Nonparametric Background Statistics

95% UTL with 95% Coverage	
Order Statistic	109
Achieved CC	0.923
UTL	0.05
Warning: Largest Non-detect at Order	112

95% UPL	
95% UPL	0.0389

Kaplan-Meier (KM) Method	
Mean	0.00402
SD	1.98E-04
Standard Error of Mean	2.28E-05
95% UTL 95% Coverage	0.0044
95% KM Chebyshev UPL	0.00489
95% KM UPL (t)	0.00435
90% KM Percentile (z)	0.00427
95% KM Percentile (z)	0.00435
99% KM Percentile (z)	0.00448

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

FAIRBANKS GOLD MINING, INC.

FORT KNOX MINE
COMPLIANCE MONITORING PLAN

Appendix B

Quality Assurance /
Quality Control
and
Field Procedures Manual

QUALITY ASSURANCE / QUALITY CONTROL AND FIELD PROCEDURES MANUAL

prepared by

Fairbanks Gold Mining, Inc.
(a subsidiary of Kinross Gold Corporation)
PO Box 73726
Fairbanks, Alaska 99707-3726
(907) 488-4653

April 2008

QUALITY ASSURANCE/QUALITY CONTROL
AND
FIELD PROCEDURES MANUAL

Name of Facility: Fairbanks Gold Mining, Inc.

Corporate Information:

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Approval of QA/QC:

Delbert E Parr

Date: April 11, 2008

Delbert Parr, Environmental Manager
Fairbanks Gold Mining Inc.

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Project Organization

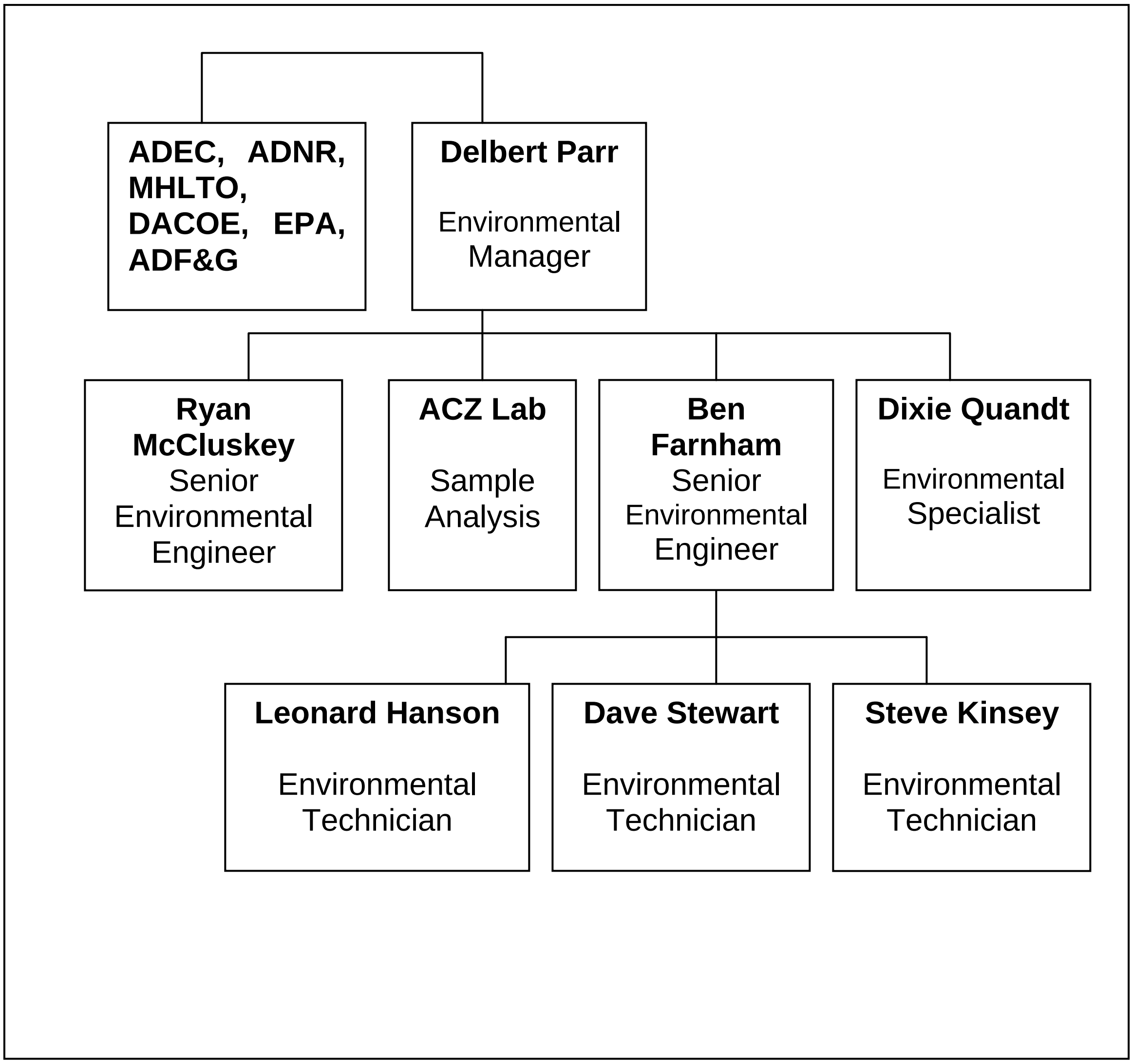
Description of Duties

Environmental Manager: Delbert Parr
Maintains communication with outside agencies. Addresses data discrepancies and takes corrective measures.

Senior Environmental Engineer: Ben Farnham
Project manager, overseeing quarterly monitoring results as well as the production of the quarterly reports and distribution of reports. Acting as quality assurance officers, overseer data gathering protocols and verifying proper sample containers & preservatives. Responsible for maintaining close communication with analytical laboratories and tracking sample progress as well as verifying all data is within established parameters.

Environmental Technicians: Dave Stewart, Leonard Hanson and Steve Kinsey
Collecting samples according to approved methods also supervising collection of blank and duplicate samples. Labeling and packaging samples according to protocols to prevent leakage or cross-contamination. Properly completing chain of custody forms, and maintaining adequate documentation. Shipping samples at properly maintained temperatures and within holding times. Also responsible for field instrument calibration, decontamination, documentation, and operation and maintenance procedures.

Compliance Sampling Communication Flow



1.0 INTRODUCTION

1.1 Objectives

This Water Monitoring QA/QC and Field Procedures Manual is for the use of Fairbanks Gold Mining, Inc. (FGMI) operating personnel. This manual will be used to maintain the quality of field activities, sample collection, sample handling, laboratory and data analyses, and to document the quality of data at each processing level. The QA/QC program identifies major aspects of the project requiring specific quality control and demonstrates that quality control is a major focus for this project. Additionally, this manual will be used for training employees in approved field monitoring procedures (i.e. instrument calibrations, measurements, and maintenance).

This document will be periodically reviewed and updated by site personnel to reflect actual site conditions and permit monitoring requirements as they change.

1.2 Quality Assurance/Quality Control Program

The QA/QC program consists of three components:

- **Field QA/QC** identifies the procedures to be used in the field to verify that water samples and field monitoring data are collected according to the requirements of the project. The objective of field QA/QC is to assure that both field measurements and samples collected for laboratory analyses can be demonstrated to be representative of the environment sampled and are of known and acceptable quality.

- **Laboratory QA/QC** identifies the protocols to be used by the laboratories to demonstrate that project data are analyzed according to U.S. Environmental Protection Agency (EPA)-acceptable methodologies, and that reported values are accurate. The objective of the laboratory QA/QC program is to produce data that will meet state and federal analytical requirements.

- **Data QA/QC** identifies the protocols to be used to verify that laboratory and field data have been reported accurately. The objective of the data QA/QC program is to demonstrate that the data reported meets the specified requirements, including comparability with data from previous years.

1.3 Data Uses and Data Quality Objectives

Quality assurance requirements are established in this QA/QC program to achieve the project objectives for the data uses. Applicable quality control procedures, quantitative target limits, and level of effort for assessing the data quality are dictated by the intended use of the data and the nature of the required field and analytical methods. The project objectives are to collect data of known and sufficient quality for FGMI to comply with the analytical permit requirements during operation and ultimately closure. The analyses to be conducted on the various sample types have been presented in the project specific monitoring plans. Protocols and appropriate detection limits are included in the laboratory's QA/QC plan available to all FGMI environmental personnel.

Federal and state levels of concern (i.e. ambient water quality criteria or maximum contaminant levels) exist for many of the parameters being analyzed in the water-monitoring program. EPA-approved analytical methods will always be used and will have detection limits low enough to determine if Alaska Water Quality Standards are being met.

1.4 Data Quality Parameters

The quality of laboratory data is measured by the precision, accuracy, representativeness, comparability, and completeness of the data. These parameters and the applicable quality control procedures and levels of effort are described below.

Precision

Precision is a qualitative measure of the reproducibility of a measurement under a given set of conditions. For duplicate measurements, analytical precision can be expressed as the relative percent difference. A quantitative definition of the relative percent difference is included in the current contract analytical laboratory's QA/QC Manual. ACZ Laboratory uses a relative percent difference of 10% (+ or -) to determine their ability to accurately reproduce results. FMGI finds this level of relative percent difference acceptable, as it is the industry standard. The level of effort for precision measurement will be at a minimum frequency of one in 20 (5 percent) or one per batch, whichever is more frequent.

See Appendix II for quantitative definitions of data quality parameters

Accuracy

For samples processed by the analytical laboratory, accuracy will be evaluated through the use of matrix spikes and standard reference materials (SRMs) to establish the average recovery. A quantitative definition of average recovery is included in the current contract analytical laboratory's QA/QC Manual. The laboratory will perform matrix spike and matrix spike duplicate measurements at a minimum frequency of one in 20 samples for organic parameters, and matrix spikes of one in 20 for inorganic or miscellaneous samples, or one per batch, whichever is more frequent.

Representativeness, Precision and Accuracy

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the soil and water sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, and transportation) have been developed and are discussed in other sections of this document. Proposed documentation will establish that protocols have been followed and sample identification and integrity assured. Field blanks (Profile III only) and field duplicates obtained at a minimum frequency of 5 percent or one per Sample event will be used to assess field and transport contamination and method variation. Laboratory sample retrieval, storage, and handling procedures have also been developed and are discussed in other sections of this document. Laboratory method blanks will be run at the minimum frequency of 5 percent or one per set to assess laboratory contamination.

Comparability

Comparability is the level of confidence with which one data set can be compared with another. Comparability of the data will be maintained by using EPA-defined procedures. If unavailable or inappropriate, FGMI and Alaska Department Environmental Conservation, will discuss using other than approved EPA methods before use. A 30% relative percent difference will be considered acceptable for comparing duplicate samples between different laboratories. Comparability will also be maintained by the use of consistent units.

Completeness

Completeness is a measure of the amount of valid data obtained from the measurement system. The target completeness objectives are approximately 90 percent for each analytical parameter; the actual completeness can vary with the intrinsic nature of the samples. The completeness of the data will be assessed during the data review.

2.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

2.1 Purpose

Producing data of known quality that are considered representative of the sampling environment at an appropriate level of detail is achieved by establishing a QA/QC program with specified data gathering protocols overseen by an Senior Environmental Engineer. The main components of the proposed QA/QC program include the following:

- Verification of use of proper sample containers and preservatives
- Collection and analysis of blank and duplicate samples
- Specific procedures for handling, labeling, and shipping samples
- Field equipment calibration
- Equipment decontamination
- Field documentation
- Field corrective action

Each Environmental Technician is responsible for implementing these components in the field. However, the Senior Environmental Engineer will oversee each aspect of field operations to verify that these components are accomplished within the strict requirements of the project.

2.2 Quality Control Samples

To aid in evaluating the accuracy of the analytical data, a rinse blank and duplicate sample are collected and subjected to the same analyses as identified in task samples. One rinse blank is collected for every 20 unknown samples, or one per sampling event (quarterly), whichever is less. In addition, a minimum of one duplicate sample is collected for every 20-task samples, or one per sampling event (quarterly) whichever is less.

Equipment blanks for surface water sampling are taken by pouring distilled water into a decontaminated sample collection bucket, then sample bottles are filled from the sample collection bucket with a decontaminated one-liter plastic pitcher. Blanks will be analyzed along with the unknown samples.

2.3 Sample Collection, Labeling, and Handling Procedures

Sample collection, labeling, and handling procedures are periodically checked by the Senior Environmental Engineer to verify that the following conditions are being met:

- Collection -- Samples are collected according to approved sampling methods.

- Labeling -- Samples are uniquely labeled using a code that prohibits unauthorized personnel from knowing the sampling locations.

- Packaging -- Samples are correctly packaged to prevent leakage or cross-contamination; Sample containers with proper preservatives are used; Amber sample bottles for UV protection are used when necessary.

- Chain-of-custody forms -- Chain-of-custody forms are properly completed to assure sample custody can be adequately documented.

- Shipping -- Samples are hand delivered to the laboratory or proper shipping procedures are used, including maintenance of proper temperatures and specified holding times.

Each Environmental Technician is responsible for implementing the proper sample collection, labeling, and handling procedures. The Senior Environmental Engineer will oversee these activities.

Acids are used in some sample bottles as preservative and it is important to use correct procedures to handle any corrosive substances safely. Some of the commonly used acids are:

- Sulfuric Acid
- Nitric Acid
- Sodium Hydroxide (base)
- Hydrochloric Acid

Personal protective gear, safety glasses and latex gloves, will be worn when opening sample bottles. In some cases an apron may be necessary, or rain gear and a face shield, when handling large quantities of acid or preservatives.

Adequate amounts of clean water will be kept on hand in the field, available for flushing eyes or skin that may come in contact with acids.

It is important to remember, if acid needs to be diluted, never pour water into acid. It is standard procedure to dilute acid by slowly pouring the acid into water.

Surface Water Grab Sampling

Surface water samples are collected in the following order:

1. Settable solids
2. Total suspended solids
3. Ammonia nitrogen
4. Miscellaneous parameters (i.e. fluoride, phosphorous, etc.)
5. TPH
6. Total and dissolved metals

Below, the surface water grab sampling procedure is listed.

1. Decontaminate compositing container (plastic bucket) and one-liter pitcher. Decontamination procedures are described later in this section.

2. Locate sampling site at a point in the stream exhibiting greatest flow and/or highest velocity, if possible.

3. Surface water sample sites may require filling the plastic-bucket by direct submergence.

    a. When submersion is required; submerge plastic-bucket at sampling point such that mouth of container is under water surface at least 2 to 3 inches, if possible. Allow container to fill partially, rinse container by shaking, and then discharge this water. Repeat this procedure three times. Collect sample, and then transfer water from plastic-bucket into the sample bottles with one-liter pitcher.

4. Fill out appropriate field data form(s) see documenting sample location, time, and other pertinent information before leaving sample site.

Surface Water Grab Sampling Through Ice

During winter months when ice cover is present, sample water is accessed with use of a manual handheld ice auger.

Clear snow off ice, an area large enough area for sampling equipment.

Drill sample hole in ice with auger periodically cleaning hole of ice chips.

After breaking through ice, cut a square area with an ax around the ice hole large enough (3-4” deep) to dip sample collection container in.

Purge three hole volumes from the ice hole prior to sampling, trying to remove all ice chips within the hole. This volume can be approximated from the hole-dimensions in the ice.

Follow surface water grab sample procedure steps 3 – 4 Surface Water
Grab Sample Procedure.

Groundwater Sampling

Groundwater sampling procedures are listed below.

The monitoring wells are sampled with a portable submersible Grundfos electric pump. A description of the sampling procedure is given below.

1. Adjust the reel support pins (on bar below roller) so that the roller is centered over the well opening. Lift and hang the REEL E-Z on the well casing by resting the support pins against the inside of the well casing.

2. Unlock the reel by pulling the pin lock mechanism outward and turning.

3. Using the operating handle gently reel down the pump to the necessary level and lock the reel in place. The cable is marked every five feet.

4. **DO NOT power the converter until the extension cord is connected.** Connect the extension cord to the electrical box. Connect the other end of the extension cable to the Grundfos MPI converter.

5. Connect the discharge hose to the discharge port.

6. Power up the MPI converter (220/240 V - 5KW generator), turn the frequency control knob to approximately mid-range (12 o'clock position) and start the pump by moving the start/stop switch to the "start" position. Adjust the speed dial to the desired frequency or flow rate.

7. Purge at least three well casing volumes prior to sampling, taking field parameters (pH, conductivity, and temperature) at each casing volume. After finishing purging and if field parameters were stable, fill sample bottles directly from sample discharge hose. A filter will be used for filling the dissolved metals sample bottle. See Appendix I (Section 5.0) for complete groundwater filtering procedure. If field parameters were unstable during well purging, continue purging well until stable field parameters are achieved. Fill out appropriate field data form(s) documenting sample location, time, and other pertinent information before leaving sample site.

8. When finished pumping, move the start/stop switch to the "stop" position. Turn off the generator. Disconnect the extension cord.

9. Disconnect the discharge hose, unlock the reel, and rewind the hose and pump back onto the reel.

Solids Sampling Procedure

As part of the mining operations, blast hole drills bore 6 3/4-inch diameter holes to a depth of 23 feet into schist bedrock within the open pit prior to blasting and loading operations. The holes are drilled on 16 X 16-foot centers using air rotary drilling methods. Generally 50-200 drill holes are drilled. The holes are loaded with explosives and detonated in one shot or blast pattern.

During drilling operations a device located near the drill steel, holds a sample container and collects approximately 7-15 kilograms of cuttings from the borehole. Each sample represents a block of approximately 440 tons of mine material. The sample is collected in a cloth sack, labeled with a bar code to identify the drill hole where sample was collected. These samples are currently taken to the FGMI assay lab (at Fort Knox) to determine the gold content by classical fire assay techniques. Based on analytical results, the block is zoned, by grade. If the grade of the material is less than 0.0018 oz Au per ton of ore, it is classified as development material and is placed in the appropriate development rock dump.

Tailing Solids

Following the determination of ore/waste for the material, assay laboratory personnel will store an assay pulp sample of development material from each blast pattern for each quarter throughout the calendar year. The Environmental Technician will then form a composite sample using approximately 7 grams from each sample. This composite sample will be forwarded to the contract laboratory for analysis. The remaining samples will be held until the results from the lab are received. Following receipt of the results of analysis the remaining samples will be discarded. If the analytical results vary significantly from previous sampling events, another composite sample will be formed, or samples from individual blast holes will be collected and shipped to the laboratory for analysis.

Annual Waste Rock Composite Sample

The ore control engineer and mine geologist will provide information on a quarterly basis relating to tonnage of development rock mined and placed in dumps over the previous three-month period. The following factors will be considered in collecting a representative sample for the annual composite sample:

- Lithological variation.
- Mineralogical variation.
- Extent of “sulfide” mineralization.
- Color variation.
- Degree of fracturing.

- Degree of oxidation.
- Extent of secondary mineralization.

Collect a representative sample of the material. The minimum sample size for this procedure is 12 pounds (5 kilograms). The maximum particle size for sample material is equal to or less than two inches (5 centimeters). All quarterly samples collected are to be saved and representatively composited during the year for evaluation. A composite sample of the quarterly samples will be composited and submitted to the contract laboratory to evaluate the potential to release pollutants by the Meteoric Water Mobility Procedure and for Acid/base Accounting.

Annual B-Stockpile & Overburden/Topsoil Samples

The same procedure described for the annual waste rock composite sample above, will be followed for sampling of the B-stockpile (low-grade stockpile) and active overburden/topsoil stockpiles. These samples will also be submitted to the contract laboratory to evaluate the potential to release pollutants by the Meteoric Water Mobility Procedure and for Acid/Base Accounting.

Sample Labeling

Labeling. Each sample container will have a waterproof label large enough to contain the information needed to easily identify each sample. The information to be included on each label includes the project name, date, time, preservative (if added), and sampling code. The sample code will be formatted to indicate sample number and date. In the field record book, the sampler identifies each sampling location. Each sample will be identified with a multi-digit number, which includes the date, and identification number of the sample. An example of sample identification is as follows:

0512017777101

Where:

051201 = Date (Dec 1, 2005)
7777 = Employee's identification number
101 = Sequential sample number recorded in logbook for that date

All blanks and duplicates will be noted on field data sheets. The following designation will be noted where natural samples are identified as 100 series, blanks as 200 series, and duplicates as 300 series.

Packaging

Each analytical sample bottle will be packed to prevent breakage and placed in an iced cooler to keep the samples cooled to 6°C. For hand delivered and shipped samples one copy of the chain-of-custody form will be placed in a sealed plastic bag. Additionally, for shipped samples, the cooler lid will be sealed with fiber tape and at least one chain-of-custody seal will be attached to the outside of the cooler so that this seal(s) must be broken if the cooler is opened. Before sealing coolers, the Senior Environmental Engineer will inspect sample packaging.

Chain-of-Custody

Chain-of-custody forms will be used for all samples. Once collected, the samples will remain within the custody of the sampler or will be locked up until the samples are prepared for shipment. Each time the sample bottle or sample changes hands, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have changed hands. The pink carbon copy of the chain-of-custody form is retained by FGMI and the original (white) and yellow carbon copy is sent to the laboratory. The laboratory will forward the original to FGMI.

The following information is to be included on the chain-of-custody form:

- Sample identification code
- Signature of sampler
- Date and time of collection
- Project name
- Type of sample
- Number and type of containers
- Sample analysis requested (Profile I, II, III, Acid/Base Accounting, etc.)
- Inclusive dates of possession
- Signature of receiver

Other chain-of-custody components will include sample labels, sample seals, field data sheets, sample shipment receipts, and the laboratory logbook noting the Analytical profiles I, II, and/or III.

Shipping

FGMI personnel or courier will deliver samples to the designated laboratory as soon as feasible after collection.

Field Documentation

Field observations, field equipment calibration information, field measurements, and sample documentation, including sample identification, sample duplicates, and date and time the sample was collected, will be the responsibility of the entire sampling team. Field logbooks will consist of waterproof paper.

Proper documentation for sample custody includes keeping records of all materials and procedures involved in sampling. Project notebook and field data sheets will be used to record field data. The Environmental Technician will record all information on the sampling station and respective samples and replicates collected at each site, including the positions of each station. The Environmental Technician will review all data before leaving the sampling station. Completed field logs will be kept on file for any QA/QC checks. Additionally, the Senior Environmental Engineer will inspect field documentation field data sheets regularly.

Corrections to Documentation

Unless weather conditions prevent it, all original data will be recorded using waterproof ink. No accountable documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on an accountable document assigned to one person, that person must make corrections by drawing a line through the error, initialing and dating the lined-out item, and entering the correct information. The erroneous information is not to be obliterated but is to remain legible. The person who made the entry will correct any subsequent error discovered on an accountable document. All such subsequent corrections will be initialed and dated.

Field Equipment Calibration

Field equipment used for collection, measurement, and testing is subject to a strict program of control, calibration, adjustment, and maintenance (See Appendix I). Portable water quality instruments will be used for the in situ measurement of pH, temperature, and conductivity. Recorded measurements will not be taken until an agreement of replicate measurements is obtained. Calibrations will be performed daily prior to beginning any sample tasks. The standards of calibration are in accordance with applicable criteria such as the NIST (National Institute of Standards Technology), ASTM standards, or other accepted procedures outlined in the manufacturer's handbook of specifications. All calibration activities will be documented on Field Data Sheets.

The Environmental Technician will review data measured in the field, and final validation will be by the Senior Environmental Engineer. Data validation will be completed by checking procedures used in the field and comparing the data with previous results. Data that cannot be validated will be so documented; corrective action may be required, as discussed later.

Decontamination Procedures

All sample processing equipment, such as buckets and hoses, which come into contact with a sample will be decontaminated by means of the following procedure:

1. Rinse in water
2. Wash with Alconox, or equivalent, in tap water
3. Double rinse in de-ionized water, and, if not to be used right away,
4. Air-dry
5. Place in plastic bag immediately after air-drying

The purpose of the water and Alconox, or equivalent, washes is to remove all visible particulate matter. This is followed by a de-ionized water rinse to remove the detergent. It is not anticipated that high concentrations of TPH will be sampled. If visible contamination is found, a solvent rinse will be added, followed by a de-ionized water rinse.

Field Corrective Action

Field sampling corrective actions includes procedures to follow when field data results are not within the acceptable error tolerance range. These procedures include the following:

- Comparing data readings being measured with readings previously recorded
- Recalibration of equipment (i.e., pH meters)
- Replacing or repairing faulty equipment
- Resampling when feasible

The Environmental Technician is responsible for ordering appropriate field corrective actions when deemed necessary. The Senior Environmental Engineer will be responsible for overseeing these corrections. All field corrective actions will be recorded in the field book.

3.0 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The laboratory QA/QC program is available to all FGMI personnel and a copy is also located in the FGMI library.

Data Quality Assurance/Quality Control Program

The data QA/QC program serves four major functions:

- Maintenance of a duplicate record of all field data
- Sample tracking through laboratory analysis
- Data validation
- Oversight of data management

During field operations, the Senior Environmental Engineer will receive copies of all field data sheets, which will then be filed in the Environmental Department Filing System. These duplicates will serve as a backup file and will be checked against the field data entered into the database management system.

The second major component of the data QA/QC program is sample tracking throughout the laboratory analytical process. The Senior Environmental Engineer will maintain close communication with all analytical laboratories to verify sample receipt, proper sample management, and strict adherence to sample holding times. The laboratories will immediately inform the Senior Environmental Engineer of sample breakages, inadequate sample media to meet QA objectives, and other sample problems. The Senior Environmental Engineer will then notify the Environmental Technician and the Environmental Manager so that corrective action can be implemented as deemed necessary.

Following the receipt of the analytical data package, the Senior Environmental Engineer will verify that all sample parameter data have been received and will compare detection limits and preliminary results with previous results. Should major discrepancies be found, the Senior Environmental Engineer will communicate these to either or both the Environmental Engineer and Environmental Manager. Possible corrective measures will then be evaluated as deemed necessary.

A data review or validation process will also be performed on 20 percent of all analytical data received from the laboratories. Chemical data will be reviewed with regard to the following:

- Analytical methodology
- Detection limits
- Cross-contamination as indicated by blank data
- Accuracy and precision
- Adherence to holding times

Where data do not meet the requirements specified in this QA/QC program, the data will be flagged with qualifiers. These reviews of data will be summarized and included in the report of sampling data.

4.1 Data Reporting

On a quarterly basis, all water quality data will be compiled, reviewed and validated, and a report of results sent to Alaska Department of Environmental Conservation. FGMI QA/QC documents and records are kept onsite and available for inspection upon request by ADEC. ACZ Laboratory has on file QC reports for all samples analyzed and these are available for inspection, upon request, by ADEC.

APPENDIX I

Instrument Calibration, Operation, and Maintenance Procedures

TABLE OF CONTENTS

Instrument Calibration, Operation, and Maintenance Procedures

The following sections discuss field sampling procedures and instrument calibration, maintenance, and measurements.

1.0 Electrical Conductance

Instrument Calibration

At the beginning of each day of sampling, check instrument linearity.

1. Rinse probe with deionized water.

2. Measure conductivity of two potassium chloride (KCl) solution standards, which bracket expected sample values.

3. Measure temperature of both KCl solution standards.

Calculate cell constant for each standard to determine if instrument linearity is reasonable. The cell constant is the ratio of the computed conductivity to the measured conductivity of the standard KCl solution.

Maintenance

1. Store meter in its case during transport.

2. Check batteries before taking meter into the field. Carry spare batteries in the field (9 volt).

3. Inspect conductivity probe for cracks or other damage.

Field Measurement Procedures

1. Turn instrument on.

2. Rinse plastic beaker with approximately 50 milliliters of sample water three times.

3. Place water sample in plastic beaker (fill to at least 50 millimeters).

4. Rinse probe with deionized or sample water and place in sample water.

5. Immerse conductivity probe in sample so that vent hole is submerged. Move probe around in sample to displace any air bubbles. Turn instrument on to appropriate scale to measure conductivity. Record conductivity reading after a stable reading is obtained.

6. Remove probe from sample and turn off instrument.

2.0 Field pH

Instrument Calibration

1. Calibrate pH meter at the beginning of each day of fieldwork when pH will be measured, and whenever the standard check is out of acceptable bounds.

2. Rinse pH electrode probe with deionized water.

3. Immerse electrode and temperature probe in beaker of fresh commercial calibration solution of pH 4.0. Calibrate meter to solution.

4. Remove electrode and temperature probe from solution, and then rinse with deionized water.

5. Immerse electrode and temperature probe in fresh pH 10.0 solution. Calibrate meter to solution.

6. Remove electrode and temperature probe from solution, and rinse with deionized water.

7. Measure pH of a third fresh calibration solution at pH 7.0. If measured value differs from expected value by more than 0.1 units, obtain fresh calibration solutions and recalibrate. If discrepancy persists, begin trouble-shooting procedures following meter-operating instructions: check batteries, connections, probe, etc.

Maintenance

1. Store meter in its case with electrode immersed in a pH 7 buffer solution.

2. Inspect electrode prior to use.

3. Check glass electrode for cracks or scratches.

4. Check batteries each time meter is used. Carry a spare battery pack into the field in the pH meter case.

Field Measurement Procedures

1. Rinse decontaminated glass beaker or sample bottle with approximately 50 milliliters of sample water three times.

2. Rinse pH electrode with deionized water.

3. If measurement is read ex situ, fill beaker with sample water.

4. Immerse electrode and temperature probe in sample while swirling the sample to provide thorough mixing. Turn on meter. Read pH to nearest 0.1 until the reading has stabilized (when beaker icon stops flashing).

5. Record sample pH. Note any problems such as erratic readings.

6. Rinse probe with deionized water and store according to manufacturer's directions.

3.0 Water Temperature

Linearity and Field Measurement Procedures

1. Use either a National Institute of Standards and Technology (NIST)-calibrated thermometer or a digital temperature probe calibrated against a NIST-calibrated thermometer to measure temperature.

2. Check thermometers for cracks or gaps in the mercury. Do not use thermometers if either cracks or gaps are visible.

3. When possible, measure temperature of surface water at midstream by submersing the thermometer or electronic temperature probe for approximately 1 minute or until temperature stabilizes.

4. When in situ temperature measurements are not possible, draw sample of at least 200 ml into a decontaminated beaker or sample bottle as soon after sampling as possible.

5. Place thermometer or electronic temperature probe in sample and allow temperature to stabilize.

6. Record temperature to nearest 0.5°C in field logbook or on field data sheet.

7. Rinse thermometer or electronic temperature probe with deionized water.

8. Check field thermometers or digital temperature probes against a NIST-certified laboratory thermometer, on a quarterly basis. Agreement should be within 0.5°C.

4.0 Dissolved Metal Filtration Method for Groundwater

1. Place disposable, high capacity, pre-cleaned, vacuum-type, .45-micron filter in two-way hose fitting/reducer fitting after restricting flow to one outlet.

2. After inserting filter firmly into the two-way hose fitting adjust valves so as to divert flow through the filter.

3. Let at least three filter volumes run through the filter before filling sample bottles.

APPENDIX II

QUANTITATIVE DEFINITIONS OF DATA QUALITY PARAMETERS

Quantitative Definitions of Data Quality Parameters

Precision

If calculated from duplicate measurements:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) / 2}$$

RPD = relative percent difference

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

If calculated from three or more replicates, use relative standard (RSD) rather than RPD:

RSD = (s/y) x 100%

RSD = relative standard deviation

s = standard deviation

y = mean of replicate analyses

Standard deviation, s, is defined as follows:

$$S = \sqrt{\frac{\sum (y_I - y)^2}{n - 1}}$$

s = standard deviation

y_i = measured value of th

y = mean replicate measurements

n = number of replicates

Accuracy

For measurements where matrix spikes are used:

$$\%R = 100\% \times \left[\left(S - U \right) / C_{sa} \right]$$

$\%R$ = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
C_{sa} = actual concentration of spike added

For situations where standard reference material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \times \left(C_m / C_{srm} \right)$$

$\%R$ = percent recovery
C_m = measured concentration of SRM
C_{srm} = actual concentration of SRM Accuracy

Completeness (Statistical)

Defined as follows for all measurements:

$$\%C = 100\% \times \left(V/n \right)$$

$\%C$ = percent completeness
V = number of measurements judged valid
n = total number of measurements to achieve a specified statistical level of confidence in decision making

APPENDIX III

CASING VOLUMES TABLE

Capacity of casing

DIAMETER OF CASING (inches)	GALLONS PER LINEAR FOOT	LINEAR FEET PER GALLON
2.00	0.1632	6.1275
2.50	0.2550	3.9216
3.00	0.3672	2.7233
3.50	0.4998	2.0008
4.00	0.6528	1.5319
4.25	0.7369	1.3570
4.50	0.8362	1.2104
4.75	0.9206	1.0862
5.00	1.0200	0.9804
5.25	1.1246	0.8892
5.50	1.2342	0.8102
5.75	1.3489	0.7413
6.00	1.4688	0.6808
6.25	1.5938	0.6276
6.50	1.7238	0.5801
6.75	1.8590	0.5379
7.00	1.9992	0.5002
7.25	2.1445	0.4663
7.50	2.2950	0.4357
7.75	2.4505	0.4081
8.00	2.6112	0.3830

One Casing Volume = (Well Depth – Depth To Water) x Gallons per Linear Foot
One Purge Volume = One Casing Volume x 3.0

Note: Well Depth and Depth to Water are measured in feet!

Reference: Anderson, Keith E., 1989, “Water Well Handbook”, Missouri Water Well & Pump Contractors Assn., Inc.

KINROSS

FAIRBANKS GOLD MINING, INC.

FORT KNOX MINE
COMPLIANCE MONITORING PLAN

<u>Appendix C</u>

Wildlife Mortality
Reporting Form

WILDLIFE MORTALITY REPORT FORM

Fairbanks Gold Mining Inc.
Fort Knox Mine
P.O. Box 73726
Fairbanks, Alaska 99707-3726

Date:____________________

WAD Cyanide:_____________

Identification	Number	Species Identification
Raptors		
Songbird		
Upland Game		
Waterfowl		
Shorebird		
Mammal		
Other		

Reporter:______________________________

Title:_________________________________

Phone:________________________________

Mail To:

U.S. Fish & Wildlife Service
Ecological Service
101-12th Avenue
Fairbanks, Alaska 99701

Alaska Office of Habitat Management & Permitting
1300 College Road
Fairbanks, Alaska 99701-1599

Alaska Department of Environmental Conservation
Northern Regional Office
610 University Avenue
Fairbanks, Alaska 99709