Mount Polley Mining Corporation

Annual Environmental & Reclamation Report 2008

For Submission to:

Ministry of Energy, Mines and Petroleum Resources
and
Ministry of Environment

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1.0 INTRODUCTION

Imperial Metals Corporation is the sole owner/operator of the Mount Polley Mine, an open pit copper-gold mine, located approximately 60 km northeast of Williams Lake, B.C. (Figure 1). Access to the mine site from 150 Mile House is north along secondary highway No. 115 for 60 km to Morehead Lake and then south at the Bootjack Lake turn-off for another 12 km on the site access road to the property. The mine is positioned on a ridge dividing the Polley Lake / Hazeltine Creek drainage from the Bootjack Lake / Morehead Creek drainage, both of which are situated within the Quesnel River Watershed.

Approval of the Mount Polley Mine Reclamation and Closure Plan by the Ministry of Energy, Mines and Petroleum Resources (previously the Ministry of Energy and Mines) resulted in the issuance of Permit M-200 in July of 1997. In 2008 the mine received amendments to the M-200 permit approving the following:

- The Tailings Storage Facility (TSF) Stage 6 construction; and
- Transfer of Road Use, Maintenance and Reclamation Obligations.

In May of 1997 the mine received a Ministry of Environment (previously the Ministry of Water, Land and Air Protection) Effluent Permit (PE 11678) issued under the provisions of the provincial *Waste Management Act*. The permit authorized the discharge of concentrator tailings, mill site runoff, mine rock runoff, contaminated soil, open pit water, and septic tank effluent to a tailings impoundment. The most recent amendment to this permit (May 2005) allows for the discharge of effluent from the Main Embankment Seepage Collection Pond. There have been no discharges from this location in 2006, 2007 or 2008. In 2007 and 2008, a number of studies were commissioned to obtain the information necessary to apply for an additional discharge permit into Hazeltine Creek. These studies are detailed in Section 2.7.2.

The Mount Polley open pit operation is on a phased development schedule, ultimately involving the creation of six and possibly seven pits. The current project infrastructure consists of the mill site, four open pits, three rock disposal sites and a *Tailings Storage Facility*, as well as the main access road, power line, tailings pipeline and sediment and seepage control ponds. Construction activities in 1995 consisted primarily of clearing the mill site. Construction of the entire facility began in 1996 with the mill being commissioned in June 1997. The first full year of mining and milling at Mount Polley took place in 1998. The mine suspended operations in October 2001. The mine re-opened in December 2004, with mill production commencing again in March of 2005.

Each year all data collected under the requirements of permit PE 11678 is submitted in an Annual Environmental Report by April 30th of the year following the reporting period. This includes a report on the construction and performance of the tailings impoundment and dam, reclamation activities, and an evaluation of the impacts of the operation on the receiving environment. For the M-200 permit, an Annual Reclamation Report outlining the results of all geological characterization, material characterization test work, and water quality monitoring is submitted by March 31st of each year. Also provided in this report are details of the reclamation plan and a summary of the disturbance and reclamation activities for the previous years and for five (5) subsequent years. Since the reporting year 2000, these two reports have been combined into one for submission to the Ministry of Energy, Mines and Petroleum Resources and to the Ministry of Environment in order to satisfy the requirements of the respective permits. This reporting format of a combined report for both Ministries has been continued for the 2008-reporting year.

1.1. RECLAMATION OBJECTIVES

In accordance with the BC Mines Act and the Health, Safety and Reclamation Code for Mines in British Columbia, the primary objective of the Reclamation Plan is to *"return all mine-disturbed areas to an equivalent level of capability to that which existed prior to mining on an average property basis, unless the owner, agent or manager can provide evidence which demonstrates to the satisfaction of the chief inspector the impracticality of doing so*".

In 1995 and 1996, a comprehensive environmental baseline-monitoring program, which expanded on previous studies (1989/1990), was designed and carried out in order to support mine planning, operations, and reclamation. The program included environmental baseline studies documenting the pre-development land use and conditions of the aquatic and terrestrial ecosystems. This provided the foundation upon which the operational and post–closure monitoring programs are based and reclamation activities are developed, such that the land may be returned to its original capability once mining has ceased. Environmental monitoring is ongoing, fulfilling both the requirements of the M–200 permit by the Ministry of Energy, Mines and Petroleum Resources (MEMPR) and the effluent permit PE 11678 by the Ministry of Environment.

As identified in the reclamation plan, the primary end land uses for the Mount Polley project area are wildlife habitat and commercial forestry. Reclaimed areas will also be capable of supporting secondary end land uses such as hunting, guide-outfitting, trapping and outdoor recreation. Perpetuating, and, if possible, enhancing biodiversity are important considerations when planning for wildlife habitat as an end land use objective. The following goals are implicit in achieving this primary objective:

- Long-term preservation of receiving water quality within and downstream of the receiving environment of the decommissioned operations;
- Long-term stability of engineered structures, including the rock disposal sites, Tailings Storage Facility and open pits, as well as all exposed erodible materials;
- Natural integration of disturbed lands into surrounding landscape and, to the greatest possible extent, restoration of the natural appearance of the area after mining ceases;
- Establishment of a self-sustaining vegetative cover, consistent with the end land uses of wildlife habitat, commercial forestry, and outdoor recreation; and
- Removal and proper decommissioning of all secondary access roads, structures and equipment not required after the mine closes.

To achieve these goals, reclamation planning must be flexible enough to allow for modifications to the mine plan, and to incorporate results from ongoing reclamation research programs into the plan.

1.2. ENVIRONMENTAL MONITORING

The main objective of the environmental monitoring program is to monitor and track changes to drainage chemistry from disturbed areas and waste material in surface water, seepage water and groundwater. Sampling procedures follow those that are described in the "British Columbia Field Sampling Manual for Continuous Monitoring plus the Collection of Air, Air Emission, Water, Wastewater, Soil, Sediment, and Biological Samples" 2003 edition and the Mount Polley "Quality Assurance/Quality Control Manual".

Throughout the year, on a regularly scheduled basis, surface water and ground water are sampled and analyzed at locations and time intervals consistent with specifications listed in Permit PE 11678. These surface and groundwater monitoring locations are shown in Figure 2. In addition, surface water flows and static ground water levels are also measured and recorded on a regular basis at locations specified in permit PE 11678. Static water levels are recorded in conjunction with water sampling of the groundwater monitoring wells.

The Mount Polley weather station continuously measures daily precipitation (rainfall during non freezing months only), and temperature. The weather data is downloaded on a monthly basis. In June of 2008 the weather station was recalibrated and received a hardware upgrade. Evaporation rates are measured on site with an evaporation pan (non-freezing months only) and are summarized at year-end along with the precipitation and temperature data. Winter, snow pack measurements are taken at the end of each month during the applicable months. This data is used to update the water balance on a monthly basis.

At such time that the mine discharges under the current permit, or under a new discharge permit, a biological monitoring program initiated in accordance with the Metal Mining Effluent Regulations will be developed.

Mount Polley continues to recycle used materials including waste oil, scrap steel, batteries, and beverage containers. In 2008 Mount Polley donated the funds generated by its beverage container recycling program to the Big Brothers and Big Sisters of Williams Lake. As part of promoting our habitat stewardship initiatives, the mine discourages bear interaction through a garbage management program. In 2008 there were no bear encounters or mortalities.

In 2008, Mount Polley received approximately 1,665 tonnes of sulphur product as part of a federal clean up initiative from the Greater Vancouver area. This project allows for environmental clean up activities to take place, it recycles Sulphur contaminated soil and it aids in the recovery of copper by adding it to the test oxide leach. In addition, Mount Polly accepted approximately 21,700 tonnes of mineral-enriched soil from the Pacific Environmental Centre (PEC). The material is similar to mine waste material found at Mount Polley.

2.0 ENVIRONMENTAL PROTECTION & RECLAMATION PROGRAM

2.1. RECLAMATION FACILITIES AND STAFF

During operations, the Mount Polley reclamation research program and annual reclamation initiatives are under the direction of the Environmental Superintendent, who reports to the General Manager. The environmental technologist, survey crew, and the engineering department also contribute to reclamation activities undertaken at Mount Polley. Some programs also draw on the advice of reclamation specialists, including government and industry staff, professional agrologists, registered professional foresters, professional geologists and professional biologists. Some of this work includes: soils inventory, soil classification and mapping, waste characterization, and fish and fish habitat assessments.

In-house reclamation activities conducted by Mount Polley include:

- Drafting and surveying;
- Site preparation, and land contouring;
- Installation of diversion ditches, drainage works, sediment control and settling ponds;
- Placement of stockpiled materials on reclamation sites;

- Seeding of domestic grass-legume cover crops; and
- Monitoring/Reporting.

Mount Polley has much of the heavy equipment necessary to carry out a majority of the reclamation activities, such as bulldozers, backhoes and haulage trucks. It will also rent additional equipment, such as hydro seeders, harrows, plows and diskers as they are needed.

Since operations restarted in December of 2004 minimal reclamation has taken place due to increasing and continuing development.

2.2. RECLAMATION ACTIVITIES – 2008

2.2.1. STABILITY OF WORKS

2.2.1.1. ROCK DISPOSAL SITES

Examinations of rock disposal sites are made in accordance with section 6.12.1 of the "Health, Safety and Reclamation Code for Mines in British Columbia". A variance was granted by MEM on February 9, 2001. Mount Polley operates in accordance with the terms and reference of this variance. Monitoring occurs at the East Rock Disposal Site, the North Rock Disposal Site, Northeast Zone Rock Disposal Site and the Cariboo Pit Rock Disposal Site.

2.2.1.2. TAILINGS STORAGE FACILITY AND ASSOCIATED WORKS

The last inspection of the Tailings Storage Facility and associated works took place in September of 2008 by Knight Piésold Consulting (KP). KP's findings are documented in a report found in Appendix 1 entitled, *Tailings Storage Facility Report on 2008 Annual Inspection (Ref. No VA101-1/24-1)*. This report was submitted to the Ministry of Energy, Mines and Petroleum Resources in March of 2009.

2.2.2. RE-VEGETATION TREATMENTS & FERTILIZER APPLICATIONS

The total area that has been seeded/planted throughout the mine site in 2008 was minimal, being limited to seeding bermed area's along the tailings haul road to the tailings pond and drainage ditches to reduce downstream siltation.

2.2.3. ROCK DISPOSAL SITE RECLAMATION

No reclamation was conducted on the East, North, Northeast Zone or Cariboo Pit rock disposal sites during 2008.

2.2.4. WATERCOURSE RECLAMATION

In 2008 a long ditch was created along the east edge of the mine site, just south of the Wight pit, upstream of Polley Lake and to the Perimeter Pond east of the Tailings Storage Facility. No other changes to the watercourses at the Mount Polley mine site were made in 2008. All diversion ditches and pipelines continue to operate as designed. The focus in 2008 was to mitigate potential sediment loading from the mine site and to predict long term water quality that would discharge from the site.

2.2.5. PIT RECLAMATION

In 2008, no reclamation was conducted on the Cariboo, Bell or Wight pits. The Cariboo pit has been used as a PAG dump and a catchment for Tailings Supernatant. Mining of the Bell pit was completed in 2008 and is being used as a rock dump. An amendment to Permit PE-11678 has been applied for, requesting the allowance for transfer of Tailings Supernatant to the Bell Pit. The Wight pit will be completed in early 2009. From a reclamation standpoint, the transfer of supernatant provides for rapid filling of pits and submergence of pit walls that may otherwise have contributed to metal leaching.

2.2.6. TAILINGS STORAGE FACILITY RECLAMATION

No reclamation was conducted at the *Tailings Storage Facility* in 2008; however, in planning for mine site closure, an experimental anaerobic bioreactor (discussed further in Section 2.7.4 and Appendix 4) was designed and constructed adjacent to the main embankment seepage collection pond as part of a research initiative investigating the ability of sulfate reducing bacteria to improve effluent water quality. This research program was initiated in 2008 in conjunction with Genome B.C. and the University of British Columbia for consideration as a long-term passive treatment technology option in reclamation.

2.2.7. ROAD RECLAMATION

No road reclamation was conducted during 2008.

2.2.8. SECURING OF MINE OPENINGS

Mount Polley Mine consists exclusively of open pits. Therefore, there are no mine openings to secure. In 2008, permit M-200 was amended by bringing some existing logging roads in the area under permit. This amendment has helped to restrict access to the mine site and facilitate access planning.

2.2.9. CHEMICAL, REAGENT OR SPILL WASTE DISPOSAL

In the course of its ongoing operations, Mount Polley utilizes chemicals and reagents that are subject to a waste disposal management plan. Included in this plan are provisions for dealing with the waste products. In 2008 Sumas Environmental Services Ltd. was scheduled on a routine basis to remove and dispose of these waste products in an environmentally safe manner compliant with all relevant waste management legislation.

2.2.10. ACID ROCK DRAINAGE/ METAL LEACHING PROGRAM

The Acid Rock Drainage / Metal Leaching (ARD/ML) Monitoring Program for the Mount Polley Mine continued through 2008. The program characterizes all material types that will be handled during the mine life. Mount Polley's LECO analytical machine allows the mine to best manage mine waste by directing it to suitable storage sites, or to construction usage when required and if deemed suitable. The following sub-sections cover general discussions regarding the present program.

2.2.10.1. Waste Rock

Wight Pit, Bell Pit, Southeast Pit and Springer Pit:

On each bench, a sample of cuttings was collected from each blast hole and analyzed for total copper, non-sulphide copper, iron, and gold. Blast hole patterns were on average 7.4m burden by 8.5m spacing. Bench height is typically 12 metres. Areas of ore and waste were identified by indicator kriging and assigning assay values, mill head value, etc. using an inverse distance calculation. The Mine Geologist and Mine Planners then established ore/waste boundaries based on the calculated mill head values. For purposes of ARD-ML monitoring, only waste areas were sampled. Each month, approximately five composite blast hole samples were collected for PAG (potential acid generating), NAG (non-acid generating) or probable NAG material from every blast of more than 20 holes (shown in Table 2.25: *Summary of Blast Hole ABA Samples by Pit*).

A summary (by individual pit) of materials classified NAG and PAG, as well as the weight of overburden and waste rock are presented in the tables below and discussed in the following paragraphs. The discussion will refer to an approximate tonnage of material as average weights were taken between the Mine department's truck count tonnage and the Engineering department's surveyed tonnage.

2008 Truck Counts of Waste Material by Pit.

2008 Truck Counts	NAG	PAG	OB*	Waste
Wight Pit	4,237,055	0	18,812	4,255,867
Bell Pit	1,139,095	0	0	1,139,095
South East Pit	62,650	529,658	0	592,308
Springer Pit	17,455,930	0	58,842	17,514,772
PIT TOTAL	**22,894,730**	**529,658**	**77,654**	**23,502,042**

* Overburden

All waste material in the Wight Pit was designated NAG. Approximately

4,200,000 tonnes of NAG rock was used in road, *Tailings Storage Facility* (TSF) and North East dump construction. 8,500 tonnes of overburden was placed in the

Wight Pit till dump and 11,500 tonnes of overburden went to the Boundary Dump.

The Bell Pit was completed in 2008, including approximately 1,164,500 tonnes of NAG waste removal, which was used in road, TSF and dump construction.

Although the Southeast Pit rock is not strictly by definition, PAG rock, it lacks the components required to qualify as NAG and therefore, in most cases has been designated PAG. Approximately 544,000 tonnes of designated PAG and approximately 60,000 tonnes of NAG were deposited into the Bell Pit Dump from the Southeast Pit.

A total of approximately 16,700,000 tonnes of NAG rock generated from the Springer Pit was placed in the Bell Pit Dump, the Cariboo Pit Dump and used in the construction of the Wight Pit Rock Dump, the TSF and roads. A further 37,000 tonnes of overburden was placed in the Wight Pit Till Dump. Approximately 2,000 tonnes of overburden went to the Wight Pit Rock Dump and about 18,000 tonnes of overburden was used in the Bell Pit to cap the Southeast Pit PAG.

2008 Waste Material Survey Data by Pit.

		2008 Survey Data			
	Bench	**NAG**	**PAG**	**OB***	**Waste**
Wight Pit	1020	23,082	0	7,611	23,082
	1008	243,110	0	3,879	243,110
	996	281,699	0	0	281,699
	924 - 996	0	0	1,550	1,550
	912	72,951	0	0	72,951
	900	239,826	0	8,083	247,909
	888	458,483	0	0	458,483
	876	756,274	0	0	756,274
	864	924,554	0	0	924,554
	852	667,193	0	0	667,193
	840	397,031	0	0	397,031
	828	99,533	0	0	99,533
WP Total		**4,163,736**	**0**	**21,123**	**4,184,859**
Bell Pit	1084	26,956	0	0	26,956
	1072	392,173	0	0	392,173
	1060	440,166	0	0	440,166
	1048	258,993	0	0	258,993
	1036	71,353	0	0	71,353
	1024	316	0	0	316
BP Total		**1,189,957**	**0**	**0**	**1,189,957**
South East Pit	1080	0	39,260	0	39,260
	1070	1,594	384,443	5,635	391,672
	1060	7,824	135,076	0	142,900
SE Total		**9,418**	**558,779**	**5,635**	**573,832**
Springer Pit	1204	1,544	**0**	2,341	5883
	1192	82,861	**0**	4,462	88,323
	1180	630,553	0	5,429	635,982
	1168	2,187,766	0	2,109	21,89,875
	1156	3,446,445	0	10,952	3,457,397
	1144	4,156,300	0	13,224	4,171,539
	1132	3,896,987	0	4,786	3,901,773
	1120	1,407,128	0	9,355	1,417,483
	1108	94,136	0	2,169	96,305
SP Total		**15,903,720**	**0**	**54,827**	**15,962,562**
PIT TOTAL		**21,266,831**	**558,779**	**85,600**	**21,911,210**

There were 111-pit blast hole samples analyzed for ABA (Table 2.25). Where the NPR value was equal to or less than 2 the corresponding material from that specific blast would be designated PAG and sent to the Bell Pit PAG dump.

Any waste rock with ABA results of less than 2 from the Springer Pit, Bell Pit and Wight Pit was designated as NAG and delivered to the nearest NAG dumps. This is because the amount of material was not considered significant compared to the amount of NAG material sent to the respective dumps throughout the year.

ABA sampling determined that approximately 559,000 tonnes of rock from the South East Pit was PAG. This material was submerged in the bottom of the Bell Pit Dump below elevation 1075 m , capped with till material and organic debris from the Springer Pit and covered with NAG material from various sources.

The following table shows that the mean NPR value of the 111 ABA samples was 4.23 and the range was 0.20 to 108.24.

NPR Results by Pit.

Pit	# of samples	Mean NPR	Min NPR	Max NPR
Bell Pit	11	12.80	1.59	108.24
Southeast Pit	10	1.07	0.20	13.09
Springer Pit	68	6.25	0.30	91.20
Wight Pit	22	3.59	1.58	30.79
Summary	111	4.23	0.20	108.24

ABA samples designated as PAG are shown in the following table. Two (2) samples collected from the Wight Pit, four (4) samples from the Springer Pit, one (1) sample from the Bell Pit and seven (7) samples from the Southeast Pit had NPR values of less than 2.00. The overall mean NPR value was 1.18, the Min and Max range of NPR values was from 0.20 to 1.79.

PAG samples by Pit.

Blast	Total Sulphur	AP	Total Carbon	NP	NPR
W852-08	2.66	83.13	1.65	137.50	1.65
W852-10	1.65	51.56	0.98	81.67	1.58
S1156-07	0.18	5.69	0.10	7.92	1.39
S1156-15	0.84	26.25	0.20	16.75	0.64
S1168-23	0.11	3.44	0.07	6.17	1.79
S1180-18	0.77	24.06	0.09	7.33	0.30
B1036-07	0.13	4.19	0.08	6.67	1.59
Z1060-02	0.43	13.38	0.03	2.67	0.20
Z1060-02	0.30	9.25	0.05	3.75	0.41
Z1060-02	0.16	5.03	0.05	3.75	0.75
Z1060-02	0.11	3.34	0.05	4.25	1.27
Z1060-02	0.22	6.81	0.05	4.42	0.65
Z1060-01	0.53	16.66	0.19	15.67	0.94
Z1060-02	0.07	2.19	0.03	2.08	0.95
Mean Values	**0.58**	**18.21**	**0.26**	**21.47**	**1.18**

2.2.10.2. Low Grade Stockpile

At 2008 year end, the low-grade leach ore stockpile was estimated to contain 2,159,118 tonnes of ore grading 0.35% Cu and 0.33% Au. The mean NPR was measured at 9.84.

2.2.10.3. Rock Borrow Pit

No rock was extracted from the rock borrow in 2008.

2.2.10.4. Tailings

Representative composite tailings samples were collected to represent the tonnage of tailings deposited to the *Tailings Storage Facility*. Samples were collected and analyzed for 11 of the 12 months. Table 2.26 shows a summary of the ABA data for each of these samples. From January to December 2008, approximately 7,100,000 tonnes of tailings were deposited into the TSF. The composite tailings sample had an average NPR value of 5.33 and a range of NPR values from 3.54 to 7.07.

2.2.10.5. Soils and Till

In 2008, a total of 45,739 tonnes of soil / till were stockpiled generally from the Wight pit and Springer pit area. No ABA samples were taken for analysis.

2.2.10.6. Field Grab Samples

Four (4) samples were collected from the Springer Oxide Stockpile; samples had a mean NPR value of 3.91 and a range of NPR values from 2.37 to 9.96.

Four (4) samples were collected from the Springer Waste Dump; samples had a mean NPR value of 14.04 and a range of NPR values from 7.73 to 29.90.

Three (3) samples were collected from the Boundary Waste Dump; samples had a mean NPR value of 2.76 and a range of NPR values from 1.58 to 3.60.

Two (2) samples were collected from the Bell PAG Dump; samples had a mean NPR value of 4.26 and a range of NPR values from 3.23 to 5.52.

Two (2) samples were collected from the North Bell Dump; samples had a mean NPR value of 4.55 and a range of NPR values from 4.44 to 4.70.

Two (2) samples were collected from the C zone shell the Tailings Storage Facility; samples had a mean NPR value of 9.27 and a range of NPR values from 4.17 to 15.33. One (1) filter zone sample was taken, its NPR was 6.00.

Two (2) samples were collected from the Low grade stockpile the mean NPR was 1.61.

2.2.10.7. Quality Control and Assurance

Twenty-two (22) drill hole rejects were submitted to Acme and ALS for independent ABA analysis as part of Mount Polley's Quality Control and Assurance program. From the analysis Mount Polley's lab consistently reported a higher AP than the external lab, the average was 7.23%.

2.2.10.8. Geological Characterization

Mount Polley ore bodies are alkalic porphyry copper-gold deposits hosted within Jurassic - Triassic Polley Stock that intrudes the Nicola Group volcanic rocks. The Polley Stock is a northwesterly, elongated body approximately five kilometers long and extends from Bootjack to Polley Lakes in the east west direction. The stock is a multi-phase pluton with composition ranging from diorite -to- monzodiorite -to- monzonite. It is variable altered and brecciated. Felsic (plagioclase phyric) and mafic (augite phyric) dykes occur as late stage intrusive phases. Late brittle faults offset lithologies, alteration, and mineralization.

<u>Lithologies</u>

<u>Volcanics:</u> These volcanic and volcaniclastic rocks are the oldest on the property, form part of the Nicola Group, and are Upper Triassic in age. They consist mainly of andesitic basalt or augite phyric alkali basalt, and volcanic breccias. Volcanic rocks do not make up a significant component of material from the pits.

<u>Diorite:</u> The diorite occurs mainly in the western section of the Bell Pit and is bluish-grey, fine to medium grained and equigranular to weakly porphyritic. Phenocrysts are plagioclase, minor augite, and occasional magnetite, biotite, calcite, and apatite.

<u>Monzonite</u>: The monzonite unit is greyish white to pinkish grey or greenish grey, medium to coarse-grained, and equigranular to weakly feldspar phyric. Predominate feldspars are orthoclase and albite. Accessory minerals include magnetite, augite, biotite, calcite, apatite, and epidote. This unit is variably flooded with potassic alteration and epidote. This unit is variable brecciated and hosts copper / gold mineralization.

Potassium feldspar phyric dykes: These dykes are pinkish orange to orangish grey. The matrix is fine to medium grained, orangish grey and composed largely of potassium feldspar. The phenocrysts are elongated subhedral to euhedral plagioclase laths up to 10mm long. These dykes are often planar occurring in various orientations and filling fractures of the brecciated monzonite. They vary in width from fractions of a metre to 5 meters wide.

Augite Phyric Dykes: These dykes are distinctive dark green with a fine to medium grained mafic matrix and scattered up to 3mm augite phenocrysts (up to 8% of rock) and occasionally up to 2% euhedral magnetite phenocrysts. Dykes are generally planar in form and tend to fill fractures and faults. They occasionally exhibit orange potassic alteration.

Alteration and Mineralization:

Brecciation and hyrothermal alteration variably affected the Polley Stock and the surrounding Nicola Group volcanics. Alteration can be described in terms of a potassic core enveloped by a propylitic zone. In core of the system, intense potassic alteration is accompanied by variable strong albite, magnetite, and actinolite alteration. Propylitic alteration (calcite – chlorite – minor pyrite) occurs near the perimeter of the system.

Mineralization is variable. In the Bell Pit, chalcopyrite is the dominant sulphide. In the northeast corner of this pit, there is a pyrite zone, where up to 5 % pyrite occurs. From an ABA point of view, this material is generally potentially acid generating. Ore waste contacts in the Bell Pit are generally gradational. The west contact is lithologically controlled by a diorite contact. In the Wight Pit, chalcopyrite and bornite are the main sulphides accompanied by locally minor pyrite. The mineralizing solutions were deficient of sulphur. Wight Pit ore is particularly high in silver (compared to Bell Pit ore).

Structures

Faults recognized to date are late and brittle. Two dominate fault sets have been recognized. One is a north-north-east trending, steeply dipping set. The other is a west northwest trending, also steeply dipping. Both fault sets offset and terminate the ore.

2.2.10.9. Drainage Monitoring Program

Mount Polley's Effluent Permit PE 11678 with the Ministry of Environment requires that water samples be collected from the Tailings Supernatant Pond (Sample Site E1) and the Main Embankment Seepage collection Pond (Sample Site E4). Composite samples of the foundation drains (Sample Site E5) of the *Tailings Storage Facility* are also collected. Sampling occurs twelve (12) times per year. These samples are analyzed for total metals using ICP scan and for conventional parameters such as nutrients, pH, alkalinity and sulphate. Discussion of sampling results for these and other sample sites are found in Section 2.3.

2.2.10.10. ARD/ML Research - Kinetic Testing

Kinetic Rate information is a critical part of drainage chemistry prediction that provides a measure of the dynamic performance or "reactivity" of the material being tested. Steve Day of SRK has been retained by Mount Polley Mining Corporation to interpret results of the kinetic-testing program and suggest other recommended testing, if required.

Four (4) tests were started on July 19th, 2004 on the Northeast Zone samples. These tests contain the following drill core samples of waste rock:

HC2 – Contains sample 31576
HC3 – Contains sample 32491
HC4 – Contains sample 31943
HC5 – Contains sample 32519

In response to recommendations made in the 2007 Annual Report, humidity cells HC3, HC4 and HC5 were terminated on August 11th, 2008. At the time of this report, 236 weeks of data were available for HC2.

Two tests were started on September 26, 2005 for the Southeast Zone, providing 174 weeks of data at the time of this report. These tests contain drill core chips from the following samples:

HC6 – Contains sample SE-05-17 Comp #1
HC7 – Contains sample SE-05-30 Comp #1

Four tests were started on August 11, 2008 providing 25 weeks of data at the time of this report. HC8 contained a sample from the Southeast Zone and HC9, HC10 and HC11 contained samples from the Springer Zone. These tests contained drill core chips from the following samples:

HC8 – Contains sample SE-07-66-72.5-75.13

HC9 – Contains sample 476111

HC10 – Contains sample 146677

HC11 – Contains sample 146794

Seven humidity cell tests are currently operating at CANTEST Ltd. (formerly Vizon Scitech Inc.).

The following is a summary of the analysis report prepared by SRK Consulting. The full report is provided in Appendix 3: SRK Kinetic Testing Results. Consistent with previous reports by SRK, results obtained from humidity cell test work to date indicate:

- Neutral pH weathering conditions consistent with the carbonate content of the rock;
- A site specific criterion for PAG rock of about 2.5. The criterion could be better defined if samples containing higher sulphur concentrations were tested;
- Time frames to generate ARD is in the order of decades but certainly shorter in the Southeast Zone where AP is higher than in the Northeast Zone. HC8 showed a particularly low time to ARD onset, however results from HC8 may be influenced by an initial flushing period; and
- Relatively low contaminant-leaching rates, with only molybdenum showing release rates that correlate with bulk characteristics. No parameters showed correlations with sulphur content.

2.2.10.11. Metal Mobility

Two (2) South East Zone waste samples and 3 Springer waste samples were subjected to sequential and modified shake flask test. Results show that Selenium and Copper behave differently (see table below). Selenium is more mobile at low water additions for both Springer and SEZ waste. Copper is more mobile at low water addition for the Springer while SEZ waste releases copper with increasing water addition.

Parameter	Units	SEQUENTIAL RINSE			(3:1) MODIFIED RINSE		
		Day 1	Day 2	Day 3	(1:1)	(3:1)	(10:1)
Dissolved Copper Cu							
SE-07-63	**mg/l**	0.044	0.040	0.116	0.053	0.044	0.170
SE-07-67	**mg/l**	0.023	0.048	0.137	0.072	0.023	0.100
Average		***0.033***	***0.044***	***0.126***	***0.063***	***0.033***	***0.135***
146674	**mg/l**	0.020	0.011	0.014	0.091	0.020	0.039
146799	**mg/l**	0.007	0.006	0.011	0.027	0.007	0.032
146795	**mg/l**	0.080	0.066	0.093	0.293	0.080	0.055
Average		***0.036***	***0.028***	***0.040***	***0.137***	***0.036***	***0.042***
Dissolved Selenium Se							
SE-07-63	**mg/l**	0.007	0.004	0.004	0.082	0.007	0.007
SE-07-67	**mg/l**	0.108	0.023	0.030	0.910	0.108	0.080
Average		***0.058***	***0.013***	***0.017***	***0.496***	***0.058***	***0.044***
146674	**mg/l**	0.084	0.040	0.034	0.570	0.084	0.097
146799	**mg/l**	0.024	0.018	0.016	0.200	0.024	0.030
146795	**mg/l**	0.206	0.180	0.167	1.226	0.206	0.200
Average		***0.105***	***0.079***	***0.072***	***0.665***	***0.105***	***0.109***

2.3. SURFACE WATER MONITORING

Surface water sampling and analysis was conducted in accordance with sub-section 3.1 of the Mount Polley Effluent Permit PE 11678. The calibration, sampling, filtering, preservation and shipping procedures used for the monitoring program are outlined in the "Quality Assurance/ Quality Control Manual 2003". Field pH, temperature and conductivity were measured at the time of sampling using a WTW Multimeter and recorded in a field book. The sampling program included monthly sampling at six sites (E1, E4, E5, W4, W8 and W8z), quarterly sampling at six sites (W1, W3a, W5, W7, W12 and W13), bi-annual sampling at one site (W11) and intensive (once a week for 5 weeks) sampling at three sites (W4, W8 and W8z) during spring freshet and autumn low flows. Samples were submitted to ALS Laboratory Group for analysis of: physical parameters (turbidity, total suspended solids, total dissolved solids, and hardness); anions and nutrients (alkalinity, sulfate, total nitrogen, nitrate plus nitrite, ammonia and ortho-phosphorus); total metals; and dissolved metals.

2.3.1. SITE E1 – TAILINGS SUPERNATANT

Tables 1.1-1 and 1.1-2 summarize the 2008 water quality-sampling results at the Tailings Storage Facility - site E1 (Tailings Supernatant). Some parameters have been graphically represented using data collected between 1997 and 2008. This data is presented as figures 1.1-1 and 1.1-2. A few key parameters are discussed in the following paragraph.

In late April and into May sulphate levels briefly dropped and then rose, until December when they peaked at 354 mg/l, slightly higher than last year's high of 346 mg/l. Increased sulphate levels are likely a result of mining the Wight Pit, transfer of water from the Cariboo Pit to the Tailings Storage Facility (approx. 1,000,000 m^3), and diversion of seepage and run-off water through a newly constructed ditch along the east edge of the mine site. Over the year, the nitrogen levels (as nitrate plus nitrite) rose from 2.26 mg/l in January to 3.03 mg/l at the end of the year.

Due to the continuous deposition of tailings into the pond, total suspended solids (TSS) are slightly elevated at this site. In 2008 TSS averaged 8.93 mg/l and ranged between 1.5 and 46.9 mg/l, peaking briefly in October.

Prior to 2001, total copper levels fluctuated drastically, reaching a peak of 2.5 mg/l in 1999. Since 2001, levels have been much more stable, typically fluctuating below 0.02 mg/l. In 2008, the maximum total and dissolved copper levels were 0.129 mg/l and 0.019 mg/l respectively. Mean values were 0.021 mg/l and 0.0035 mg/l respectively.

2.3.2. SITE E4 – MAIN EMBANKMENT SEEPAGE POND

Tables 1.2-1 and 1.2-2 summarize the 2008 water quality-sampling results at site E4. Figures 1.2-1 and 1.2-2 present graphs of selected parameter levels between 2001 and 2008. Analytical reports for the 96-hour LC50 toxicity (rainbow trout) tests can be found in Appendix 8 of this report; all toxicity results were non-lethal (i.e. no mortality observed in any test results).

This is the only site from which the mine is permitted a discharge; however, since the mine recommenced operation in 2005, there has been no discharge from this site. Although there have been no discharges the following discussion provides a comparison of the permitted discharge levels of certain parameters and the values obtained in samples taken in 2008.

The discharge limit for total suspended solids (TSS) is 25 mg/l. All samples taken in 2008 were below this discharge limit, reaching a maximum value of 13.4 mg/l in August.

The discharge limit for nitrogen (as nitrate plus nitrite) is 10 mg/l for this site. All samples taken in 2008 were below this discharge limit. The maximum level reported was 3.5 mg/l in May.

The discharge limit for ortho-phosphorus (as phosphorus) is 0.05 mg/l for this site. Ortho-phosphorus levels in all 2008 samples were below this discharge limit. The maximum concentration was 0.030 mg/l.

The discharge limit for dissolved sulphate is 200 mg/l for this site. All but one sample taken in 2008 exceeded this limit reaching a maximum of 308 mg/l. in December. Over the past four years, sulphate has shown a general increasing trend at this site from a low of 27.8 mg/l in 2004 to a high of 308 mg/l this year.

The total copper (T-Cu) discharge limit for this site is 0.020 mg/l. All samples taken in 2008 were below this discharge limit. The maximum concentration was 0.0068 mg/l, in April, a drop from last year's maximum of 0.011 mg/l.

The total iron (T-Fe) discharge limit for this site is 1.0 mg/l. All 2008 samples were below this discharge limit, with the highest level (0.558 mg/l) recorded in August, more than three times higher than the average of 0.173 mg/l.

The discharge limit for total selenium (T-Se) at this site is 0.01 mg/l. Two samples taken in 2008 exceeded this discharge limit but only slightly. The maximum level noted was 0.011 mg/l.

Although there is no discharge limit for total molybdenum (T-Mo) at this site over the past four years this site has experienced a general increasing trend in T-Mo levels. In 2004, it started as low as 0.01 mg/l and reaching a peak in May of this year (0.169 mg/l) before dropping back down to below 0.14 mg/l.

2.3.3. SITE E5 – MAIN EMBANKMENT DRAIN COMPOSITE

Tables 1.3-1 and 1.3-2 summarize the 2008 water quality-sampling results at site E5. Figures 1.3-1 and 1.3-2 present graphs of selected parameter levels from the year 2000 to 2008.

Observed dissolved sulphate levels were generally stable between 250 and 300 mg/l. A brief peak to 417 mg/l was noted in April.

Nitrogen levels (as nitrate plus nitrite) ranged between 0.643 mg/l in March and 6.44 mg/l in April. Total and dissolved copper levels reached maximums of 0.049 mg/l and 0.004102 mg/l respectively. Molybdenum steadily increased from 2001 (0.002 mg/l) to 2005 (0.159 mg/l). Since 2005 levels have remained between 0.1 mg/l and 0.16 mg/l. The average total molybdenum level for 2008 was 0.135 mg/l.

Levels of total suspended solids at this site were high during two sampling events in 2008. A peak of 46.5 mg/l was observed in July and a slightly lower level of 28.4 mg/l was observed in August. Subsequently, the levels fluctuated from below the minimum detection limit (MDL) of 3 mg/l and 5.9 mg/l. In recent years, most samples exhibited levels below the MDL.

2.3.4. SITE W1 – MOREHEAD CREEK

Tables 1.4-1 and 1.4-2 summarize the 2008 water quality-sampling results at site W1. Figures 1.4-1 and 1.4-2 present graphs of selected parameter levels from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Dissolved sulphate levels ranged between 2.62 and 5.89 mg/l.

Levels of nitrogen (as nitrate plus nitrite) ranged between 0.003 and 0.049 mg/l. Both analytes fluctuated within the range of historical variability for this site.

Total copper values ranged between 0.00286 and 0.00985 mg/l. In August, total selenium levels peaked briefly at 0.0015 mg/l before returning to levels typical for this site - below the MDL of 0.001 mg/l.

2.3.5. SITE W3A – MINE DRAINAGE CREEK AT MOUTH

When the baseline-monitoring program began in 1995, sample site W3 was established to monitor surface drainage directly downstream of the mine site. The creek was given the name 'Mine Drainage Creek'. The site was monitored during the baseline periods of 1995 and 1996, and from 1997 through to April 2000 as part of the operational monitoring program. When the mine began operations in 1997, the water from the mine site that normally fed into this creek was intercepted and collected, in order to minimize the water from the operations entering the Bootjack Lake system. As a result, the original sample site (W3) became unsuitable due to a significant decrease in flow volumes over most of the year. Samples could only be collected during spring runoff and occasionally during fall turnover. Commencing in May 2000, the sampling location was moved further downstream on this same creek to its mouth at Bootjack Lake. This site is named 'Mine Drainage Creek at Mouth' and has the codeW3_a. Flow volumes at W3_a were sufficient for year round monitoring. Since May 2000 this has been the new sampling location.

Tables 1.5-1 and 1.5-2 summarize the 2008 water quality-sampling results at site W3a. Figures 1.5-1 and 1.5-2 present graphs of selected parameter levels from 1997 to April 2000 for site W3 and from May 2000 to 2008 for site W3a. A few key parameters are discussed below.

In 2008 sulphate values ranged between 6.2 mg/l to 16.3 mg/l. Nitrogen levels (as nitrate plus nitrite) ranged from a high of 0.187 mg/l to a low of 0.0261 mg/l.

Total copper increased from 0.011 mg/l to 0.038 mg/l before dropping down again in the fourth quarter. This pattern was similarly noted in 2007. The mean baseline value at the original site further upstream was 0.0348 mg/l. Mean total copper level of 0.0251 mg/l was comparable to the baseline mean of 0.0348 mg/l.

2.3.6. SITE W4 – NORTH DUMP CREEK

Tables 1.6-1 and 1.6-2 summarize the 2008 water quality-sampling results for site W4. Figures 1.6-1 and 1.6-2 present graphs of selected parameter levels from 1997 to 2008. A few key parameters are discussed in the following paragraphs.

Dissolved sulphate values for 2008 ranged between 89.3 mg/l in May to 444 mg/l in September. Levels above the AWQC maximum of 100 mg/l occurred in 18 of the 19 samples taken during the year. It should be noted that runoff from the North rock disposal site drains into this creek system. Site W4 is presently sampled monthly, as well as for five consecutive weeks during spring runoff and during autumn low flows - a suitably intense sampling schedule for this location.

With the exception of two notable spikes, one in 2002 and one in 2003, nitrogen (as nitrate plus nitrite) levels remained mostly low and flat throughout the monitoring period through 2005. Beginning in 2006 however, a general increasing trend has been seen (See Figure 1.6-1). In November 2006 the level spiked to 1.98 mg/l. Since March of 2007, nitrogen levels have fluctuated markedly peaking twice, with the highest levels recorded in July of 2008 at 11.9 mg/l.

Since 1997 when this monitoring site was established as part of the operational program, total copper levels have remained below the mean baseline of 0.035 mg/l. The maximum value in 2008 was 0.0349 mg/l, more than three times the mean value for the year of 0.01 mg/l.

In 2008, total iron fluctuated markedly from a low of 0.015 mg/l in January to a high of 0.513 mg/l in July.

2.3.7. SITE W5 – BOOTJACK CREEK ABOVE HAZELTINE CREEK)

Tables 1.7-1 and 1.7-2 summarize the 2008 water quality-sampling results for site W5. Figures 1.7-1 and 1.7-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed below.

Dissolved sulphate values for 2008 ranged between 3.6 mg/l and 25.5 mg/l.

Nitrogen (as nitrate plus nitrite) levels ranged from a high of 0.511 mg/l to a low of 0.151 mg/l.

Total copper values have had extremely low variation throughout the monitoring period of 1997 to 2008, with all but three samples falling between the range of 0.001 mg/l and 0.014 mg/l. The values outside this range were seen in 1999, 2001 and 2008. In 2008, total copper spiked briefly to a high of 0.0429 mg/l in July and then returned to typical levels below 0.016 mg/l.

2.3.8. SITE W7 – UPPER HAZELTINE CREEK

Tables 1.8-1 and 1.8-2 summarize the 2008 water quality-sampling results for site W7. Figures 1.8-1 and 1.8-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed below.

Dissolved sulphate typically ranged between 2mg/l and 17.5 mg/l throughout the monitoring period of 1997 to 2007. Values in 2008 ranged from 7.13 to 18.8 mg/l.

Nitrogen (as nitrate plus nitrite) has historically fluctuated significantly from below the MDL of 0.005 mg/l to 0.25 mg/l. Highs of 0.414 mg/l and 0.441 mg/l were noted in December 1998 and November 2008 respectively. In 2008, the values ranged between 0.017 mg/l and 0.441 mg/l.

Total suspended solids (TSS) have historically been less than, or fluctuated around the MDL of 3 mg/l, with peaks of approximately 19 mg/l in 1998 and March 2002. In 2008, TSS levels remained below the MDL.

Total copper values ranged between 0.001 mg/l and 0.0059 mg/l, with a mean value of 0.0029 mg/l

Total iron has risen to as high as 1 mg/l (2000), but typically fluctuates between 0.1 mg/l and 0.5 mg/l. Total iron in samples collected in 2008 ranged from 0.015 mg/l to 0.348 mg/l. The mean baseline level is 0.12 mg/l.

2.3.9. SITE W8 – NORTHEAST EDNEY CREEK TRIBUTARY

Tables 1.9-1 and 1.9-2 summarize the 2008 water quality-sampling results for site W8. Figures 1.9-1 and 1.9-2 present graphs of selected parameters from 1997 to 2008. This site is downstream of the main embankment seepage pond (E4) - the permitted discharge point; however there was no discharge from E4 in 2008. A few key parameters are discussed below.

In 2008, the maximum sulphate level was seen in October (23.6 mg/l). The average sulphate value for this site in 2008 was 7.98 mg/l.

Nitrogen (as nitrate plus nitrite) levels ranged from below the minimum detection limits (MDL) (0.005mg/l) to 0.237 mg/l.

In 2008, the mean total copper value was 0.00277 mg/l. Total iron levels ranged within typical historical norms from a high of 0.586 mg/l to a low of 0.058 mg/l.

2.3.10. SITE W8Z – SOUTHWEST EDNEY CREEK TRIBUTARY

Tables 1.10-1 and 1.10-2 summarize the 2008 water quality-sampling results for site W8z. Figures 10.1-1 and 10.1-2 present graphs of selected parameters from 1997 to 2008. *It should be noted that this is a control site, as it is not downstream* *of any Mount Polley mine component.* A few key parameters are discussed in the following paragraph.

In 2008, dissolved sulphate values decreased from the previous year's high of 17.9 mg/l reached in February. The maximum level obtained in 2008 was 2.5 mg/l with an average of 1.29 mg/l.

Nitrogen levels (as nitrate plus nitrite) ranged from less than the MDL (0.005 mg/l) to 0.305 mg/l.

Mean total copper (0.005 mg/l) and mean total iron (0.281 mg/l) values hovered within ranges that approximated historic norms for the site and showed relatively low variation.

2.3.11. SITE W11 – LOWER EDNEY CREEK U/S OF QUESNEL LAKE

Tables 1.11-1 and 1.11-2 summarize the 2008 water quality-sampling results for site W11. Figures 1.11-1 and 1.11-2 present graphs of selected parameters from 1997 to 2008. *It should be noted that this site is a far-field site, selected for comparisons to the sites downstream from the mine disturbance.*

Since the summer of 2000 dissolved sulphate levels have shown a fluctuating trend upwards approximately rising by a factor of 10 from 1 mg/l to 10 mg/l. In 2008, observed levels peaked in June (10.5 mg/l).

Historically, nitrogen (as Nitrate plus nitrite) values have typically remained around the mean baseline of 0.039 mg/l, with a peak of 0.144 mg/l in 1999. In 2008, a significant increase to 0.366 mg/l was noted towards the end of the year (November).

Between 1997 and 2001 total copper values fluctuated considerably, reaching highs of 0.00612 mg/l in 1997 and 0.0058 mg/l in 2001. Since then, levels have continued to fluctuate but at lower levels and with less amplitude. In 2008, total copper levels were relatively stable, fluctuating only slightly around 0.0025 mg/l. In comparison, the mean baseline level is 0.0022 mg/l

2.3.12. SITE W12 – 6K CREEK AT ROAD

Tables 1.12-1 and 1.12-2 summarize the 2008 water quality-sampling results for site W12. Figures 1.12-1 and 1.12-2 present graphs of selected parameters from 1997 and 1999 to 2008. A few key parameters are discussed in the following paragraph.

Over the years, dissolved sulphate values have nearly all been below 8 mg/l, with most samples keeping close to the mean baseline of 3.6 mg/l. Samples from 2008 averaged 5.62 mg/l rising to10.3 mg/l in November.

In 1999 nitrogen (as nitrate plus nitrite) peaked at 0.221 mg/l. Since then, values have remained low.

Total copper values at this site have typically been at or below the mean baseline of 0.011 mg/l. 2008 was no exception, with a detected high of 0.009 mg/l.

2.3.13. SITE W13 – 9.5K CREEK ON BOOTJACK FOREST SERVICE ROAD

Tables 1.13-1 and 1.13-2 summarize the 2008 water quality-sampling results for site W13. Figures 1.13-1 and 1.13-2 present graphs of selected parameters from 2000 to 2008. *It should be noted that this site was added to the monitoring program to find any effects that may come from the mining of the Springer Pit. This pit is in the early stages of development and has not yet impacted the water quality at W13.* Although this site is required to be sampled quarterly, no sample was taken in the third quarter because there was no flow. A few key parameters are discussed in the following paragraph.

Between 1997 and 2006, dissolved sulphate levels typically ranged from 1.5 mg/l to 2.0 mg/l. In 2006, they spiked to 54.2 mg/l. In 2008, levels ranged between 6.2 and 21.1 mg/l. It should be noted that the flow at this site is very low, averaging less than 1 liter per second.

Historically, nitrogen (as nitrate plus nitrite) levels have been low (near or below MDL of 0.005 mg/l). In 2008, levels remained below the MDL.

Total copper values at this site have generally decreased over time, from a high of 0.046 mg/l in 2000 to a low of 0.0098 mg/l in May of 2007. In 2008, total copper levels fluctuated slightly between 0.013 and 0.023 mg/l.

2.4. GROUNDWATER MONITORING

Groundwater sampling and analysis was conducted in accordance with sub-section 3.1 of Effluent Permit PE 11678. The calibration, sampling, filtering, preservation and shipping procedures used for the monitoring program are outlined in the "Quality Assurance/ Quality Control Manual 2003". Field pH, temperature and conductivity were measured at the time of sampling using a WTW Multimeter.

In 1995, groundwater-monitoring wells (series 95) were installed in the vicinity of the open pits and mill site. Two of these wells (95R-4, 95R-5) continue to be monitored. In 1996, in order to monitor aquifers in both surficial deposits and bedrock, the B.C. Ministry of Water, Land and Air Protection requested the establishment of additional monitoring wells downslope of the pit, rock disposal site and Tailings Storage Facility (TSF). In conjunction with these 'downslope' wells, background wells were established upslope of any potential impacts by mining activities. Nine groundwater-monitoring locations were established in 1996. Six of these sites are multi-level, consisting of "A" (deep) wells and "B" (shallow) wells, while the remaining three sites monitor a single depth. A commitment to install three additional multi-level monitoring locations along the southeast embankment of the *Tailings Storage Facility* was made in 1996. These wells were subsequently installed in 2000. The locations of the monitoring wells are shown in Figure 2.

Objectives of the groundwater-monitoring program include the following (Knight Piésold Ltd., 1996):

- To determine the direction and volume of groundwater flow from the mine site and other disturbed areas to receiving waters.
- To identify the locations of all surficial and deep groundwater aquifers underlying the mine site and their points of discharge to surface water.

- To establish background groundwater quality in aquifers prior to mine development; and
- To calculate seepage and groundwater contamination dilution ratios in surface receiving waters in order to minimize impacts.

Prior to drawing water from each well, freatic water levels are recorded during each purging and sampling event (Section 2.6.8). Samples are drawn and then submitted to ALS Laboratory Group for water chemistry analysis, including: *physical parameters* (turbidity, total suspended solids, total dissolved solids, and hardness); *anions and nutrients* [alkalinity, sulfate, nitrate, nitrite, and ammonia (N)]; and *dissolved metals*.

2.4.1. 95R-4 (SPRINGER PIT WELL)

95R-4 is located at the 10 km board on the Bootjack Forest Service Road. Table 2.1 summarizes the results of the water quality data from 2008 for this well. Figures 2.1-1 and 2.1-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Nitrogen (as nitrate plus nitrite) peaked at the end of 2002 at nearly 0.04 mg/l, but has since dropped back to below minimum detection limit (0.005 mg/l) Since November 2000 dissolved sulphate levels have remained below the mean baseline value of 17.4 mg/l. In 2008 it rose slightly above to 18.4 mg/l. Finally, dissolved metal concentrations remained relatively stable throughout the monitoring period of 1995 thru 2008

2.4.2. 95R-5 (LOWER SOUTHEAST ROCK DISPOSAL SITE WELL)

95R-5 is located along Polley Lake Forest Service Road, northwest of the east rock disposal site and immediately east of the northeast zone soil stockpile location. Table 2.2 summarizes the results of the water quality data from 2008 for this well. Figures 2.2-1 and 2.2-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Until June 2005, nitrogen levels (as nitrate plus nitrite) were characteristically below the minimum detection limit of 0.005 mg/l. Since then the levels have been increasing, peaking in 2007 at 3.31 mg/l and then dropping in 2008 to 1.66 mg/l. Dissolved sulphate levels have been steadily increasing since August 2004. This year's sampling found levels to be at 310 mg/l. In comparison, typical historic levels fluctuated around 20 mg/l. Since June 2004, dissolved copper levels have been rising steadily, reaching their highest levels to date in June of this year (0.00162 mg/l). Historically, dissolved iron levels have fluctuated significantly between a low of 0.027 mg/l and a high of 0.639 mg/l. Since 2005, levels have steadily dropped to historic lows seen this year (0.015 mg/l). Other dissolved metal concentrations remained relatively stable throughout the monitoring period of 1995 thru 2008. In order to more closely monitor parameters that have shown increasing trends, this site will be sampled twice annually instead of once.

2.4.3. GW96-1A (TAILINGS STORAGE FACILITY NORTH WELL – DEEP)

GW96-1a is located downslope of the seepage collection pond of the Perimeter Embankment. Table 2.3 summarizes the results of the water quality data from 2008 for this well. Figures 2.3-1 and 2.3-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Nitrogen (as nitrate plus nitrite) has fluctuated over the monitoring period peaking briefly at 0.19 mg/l in 2004. Since then, levels have dropped back down and remained low. Dissolved sulphate values have remained very consistent throughout the monitoring period, fluctuating between 45 mg/l and 60 mg/l except for one sample in 2006, which had a much lower level of 24 mg/l. Dissolved copper levels were fluctuating considerably with relatively high levels being seen in 2001 (0.042 mg/l), 2004 (0.008 mg/l), and 2007 (0.00699 mg/l), but have returned to lower levels in 2008 (0.00086 mg/l as a high for 2008). All other dissolved metal concentrations remained relatively even throughout the monitoring period of 1997 thru 2008.

2.4.4. GW96-1B (TSF NORTH WELL – SHALLOW)

GW96-1b is located down slope of the seepage collection pond of the Perimeter Embankment. Table 2.4 summarizes the results of the water quality data from 2008 for this well. Figures 2.4-1 and 2.4-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Nitrate plus nitrite has remained stable at or below the baseline value of 0.041 mg/l since 2000. Generally, dissolved sulphate concentrations have been steady ranging around 30 mg/l; however, in August of 2006 sulphate concentrations rose to around 65 mg/l. Other dissolved metal concentrations rose in 2006 and then dropped right back down in 2007 and 2008. The water in this well likely includes seepage from the Perimeter Embankment Seepage Pond.

2.4.5. GW96-2A (TAILINGS STORAGE FACILITY EAST WELL – DEEP)

Well GW96-2a is located approximately 900 m southeast of the GW96-1 monitoring wells and was commissioned to monitor potential groundwater effects from the Tailings Storage Facility on Hazeltine Creek. Table 2.5 summarizes the results of the water quality data from 2008 for this well. Figures 2.5-1 and 2.5-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Although nitrogen (as nitrate plus nitrite) has historically fluctuated over the entire monitoring period from 1997 to 2008, levels appear to be gradually dropping and the amplitudes of the fluctuations decreasing. in 2008, nitrogen levels have remained below minimum detection limits. 2008 dissolved sulphate levels remained stable at approximately 24 mg/l. Most dissolved metal concentrations remained relatively even throughout the monitoring period of 1997 thru 2008. The exceptions were aluminum and iron, which peaked briefly in 2007.

2.4.6. GW96-2B (TAILINGS STORAGE FACILITY EAST WELL – SHALLOW)

GW96-2b is located approximately 900m Southeast from the GW96-1 monitoring wells and was commissioned to monitor potential groundwater effects from the Tailings Storage Facility on Hazeltine Creek. Table 2.6 summarizes 2008 water quality-sampling results for this well. Figures 2.6-1 and 2.6-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Historically, nitrogen levels (nitrate plus nitrite) have generally fluctuated with low amplitude around the method detection limit of 0.005 mg/l. This trend continued through 2008. Since November 2002, sulphate levels have been steadily rising, reaching their highest levels this year, at 40.7 mg/l. Dissolved molybdenum levels rose to 0.009 mg/l in 2008 from their historical norms below 0.006 mg/l. All other dissolved metal concentrations remained low in 2008.

2.4.7. GW96-3A (TSF SOUTHEAST WELL – DEEP)

GW96-3a is located down slope of the seepage collection pond of the Main Embankment. Table 2.7 summarizes the 2008 water quality-sampling results for this well. Figures 2.7-1 and 2.7-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraphs.

Over the monitoring period of 1997 to 2008 field pH has fluctuated significantly between 6.6 and 12.5. This parameter has been graphed with dissolved aluminum, in order to show the relationship between the levels of dissolved aluminum and pH in any given sample.

In 2008, concentrations of nitrogen (as nitrate plus nitrite), dissolved sulphate and dissolved molybdenum briefly peaked in June before returning to normal low levels. Dissolved sulphate has fluctuated significantly over the monitoring period of 1997 to 2008, ranging from 25 mg/l to 322 mg/l. In 2008, the sulphate levels peaked at 229 mg/l in June, and then dropped to 41.3 mg/l in November. .

Dissolved copper levels have continued to fluctuate but show a decreasing trend since December of 2003. 2008 levels were around 0.0014 mg/l.

It should be noted that this well has a very slow recharge rate, and in some cases, it is not possible to purge the well more than once in order to collect a sample in a timely manner. As a result, the results from this well should be viewed with caution and should be evaluated in connection with data from other wells in the vicinity of the TSF.

2.4.8. GW96-3B (TSF SOUTHEAST WELL – SHALLOW)

GW96-3b is located down slope of the seepage collection pond of the Main Embankment. Table 2.8 summarizes the 2008 water quality-sampling results for this well. Figures 2.8-1 and 2.8-2 present graphs of selected parameters from samples taken between 1997 and 2008. A few key parameters are discussed in the following paragraph.

With the exception of two spikes, one in late 1999, and another in June 2007, nitrate plus nitrite levels have fluctuated little, remaining at or near the method detection limit of 0.005 mg/l. Dissolved sulphate has remained relatively even, showing a slight increasing trend since October 2005, rising to 8.65 mg/l. Since 2006, dissolved iron has been fluctuating up to ten-fold between a low of 0.015 mg/l and 0.14 mg/l. All other dissolved metal concentrations remained relatively stable throughout the monitoring period of 1997 thru 2008.

2.4.9. GW96-4A (TSF SOUTHWEST WELL – DEEP)

GW96-4a is located down slope of the south and main embankments. Table 2.9 summarizes the 2008 water quality-sampling results for this well. Figures 2.9-1 and 2.9-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraphs.

Nitrogen (as nitrate plus nitrite) had remained very stable, at or below the method detection limit of 0.005 mg/l; however, since August 2006 there has been a slight upward trend peaking in November of this year at 0.0213 mg/l. Dissolved sulphate has remained stable since 1999, keeping near or below 5 mg/l. 2008 values were 2 mg/l and 2.3 mg/l.

With only one exception (late 2002), dissolved copper has remained below 0.0024 mg/l. Dissolved aluminum levels spiked briefly in May 2008 to 0.094 mg/l before dropping to historically normal levels in November (0.003 mg/l).

2.4.10. GW96-4B (TSF SOUTHWEST WELL – SHALLOW)

GW96-4b is located down slope of the south and main embankments. Table 2.10 summarizes the 2008 water quality-sampling results for this well. Figures 2.10-1 and 2.10-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraphs.

Nitrogen levels (as nitrate plus nitrite) have remained below the mean baseline of 0.013 mg/l, with only two exceptions - one in 1999 when it reached a detected level of 0.031 mg/l and one in 2005 when it reached 0.02 mg/l. In 2008 nitrogen levels remained low. With the exception of a brief spike to 8mg/l, dissolved sulphate levels have remained at or below the mean baseline of 2.5 mg/l for the entire monitoring period.

Throughout the early monitoring period (to 2001), dissolved copper had typically remained close to the mean baseline level of 0.0005 mg/l. However, since late 2001, copper has been fluctuating regularly between a 2002 high of 0.0022 mg/l and a low of 0.00018 mg/l in 2008. Dissolved molybdenum levels remained relatively low in 2008 while dissolved iron levels fluctuated markedly, continuing their historical pattern.

2.4.11. GW96-5A (TAILINGS STORAGE FACILITY CONTROL WELL – DEEP)

GW96-5a is located at the north end and upstream of the TSF and is monitored as a control site. Table 2.11 summarizes the 2008 water quality-sampling results for this well. Figures 2.11-1 and 2.11-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraphs.

Nitrogen levels (as nitrate plus nitrite) peaked at 0.267 mg/l in 1998, but since that time and through 2008, levels have fluctuated below 0.08 mg/l. In 2008, dissolved sulphate continued to be found at low levels (+/-5 mg/l), well below the baseline of 15 mg/l. In 2001, a November sample spiked up to 115 mg/l; however, this data point is expected to be a sampling or analytical data error, as it is one order of magnitude larger than the more typical values measured from this well.

Dissolved copper has typically remained close to (most often below) the mean baseline of 0.004 mg/l throughout the monitoring period. However, one sample in 2002 showed an increase to 0.0071 mg/l. Dissolved copper values for 2008 were both less than the baseline level of 0.004 mg/l. With the exception of a single spike in dissolved aluminum and iron in August 2004, all other dissolved metal concentrations appear to have, remained relatively stable throughout the monitoring period of 1997 thru 2008.

2.4.12. GW96-5B (TSF CONTROL WELL – SHALLOW)

GW96-5b is located at the north end and upstream of the *Tailings Storage Facility* and is monitored as a control site. Table 2.12 summarizes the results of the water quality data from 2008 for this well. Figures 2.12-1 and 2.12-2 present graphs of selected parameters from 1998 to 2001 and for 2006. This well had been damaged in 2001 and no samples could be collected between 2002 and 2005. Although this well was repaired in 2006 and sample collection had resumed, recent (mid 2007) construction of a ditch upslope of the well, has intercepted flow into this shallow well. Since construction of the ditch, the well has not produced enough water to provide another sample.

2.4.13. GW96-6 (SOUTHEAST ROCK DISPOSAL SITE WELL)

GW96-6 was located down slope of the east rock disposal site. No water samples were collected in 2008 because the well was deactivated in the fall of 2006. Figures 2.13-1 and 2.13-2 present graphs of selected parameters from 1997 to 2006.

2.4.14. GW96-7 (SOUTHEAST SEDIMENT POND WELL)

GW96-7 is located down slope of the Mill Site, half way down the tailings access road (near the booster pump station). Table 2.14 presents the 2008 water quality-sampling results for this well. The well is sampled on an annual basis. Figures 2.14-1 and 2.14-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Historically, nitrogen concentrations (as nitrate plus nitrite) have remained relatively stable, fluctuating only mildly between 0.005 mg/l and 0.014 mg/l; however, beginning in 2006, levels began increasing. In 2007 the nitrogen levels increased to 0.34 mg/l, the highest level detected to date at this site. 2008 values dropped down to 0.0091 mg/l. Dissolved sulphate concentrations have remained constant with levels only fluctuating slightly between 18 and 31 mg/l. All dissolved metal concentrations remained relatively flat throughout the monitoring period of 1997 thru 2008.

2.4.15. GW96-8A (BOOTJACK FOREST SERVICE RD. @ 11 K WELL – DEEP)

GW96-8a is located on Bootjack Forest Service Road at 10.75 km. Table 2.15 summarizes the results of the water quality data from 2008 for this well. Figures 2.15-1 and 2.15-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

In 2008, Nitrogen levels (as nitrate plus nitrite) remained low (below 0.1 mg/l), continuing the historical trend. Dissolved sulphate levels have also continued to remain low, fluctuating very little. All dissolved metal concentrations remained relatively stable throughout the monitoring period of 1997 thru 2008.

2.4.16. GW96-8B (BOOTJACK FSR @ 11 K WELL – SHALLOW)

GW96-8b is located on Bootjack Forest Service Road at 10.75 km. Table 2.16 summarizes the 2008 water quality-sampling results for this well. Figures 2.16-1 and 2.16-2 present graphs of selected parameters from 1997 to 2008. A few key parameters are discussed in the following paragraph.

Until 2003, nitrogen (as nitrate plus nitrite) regularly fluctuated, reaching a high of 0.153 mg/l in 1998 and lows below the minimum detection limit (0.005 mg/l) in 2001, 2002, and 2003. Since then, nitrogen levels have been gradually trending lower than 0.12 mg/l. 2008 levels were 0.06 mg/l. Dissolved sulphate has narrowed its fluctuating range somewhat, moving from lows of 2 mg/l and highs of 13 mg/l to a tighter range of 8 mg/l to 11.2 mg/l since July of 2000. Dissolved copper and molybdenum levels have remained low, fluctuating very little over the entire monitoring period, while aluminum and iron have shown some fluctuations but remain low.

2.4.17. GW96-9 (TSF SOUTHEAST PRESSURE WELL)

GW96-9 was located south of the Main Embankment. This well was deactivated in the spring of 2006 and as such no samples were taken in 2008. Figures 2.17-1 and 2.17-2 present graphs of selected parameters from 1997 to 2005.

This well was established in order to sample a near-surface aquifer. Its deactivation was discussed with Ministry of Environment staff and a decision was made to replace it with either another well (outside of the *Tailings Storage Facility* final toe) or with a surface water sampling station. Surface water samples will be taken twice per year from the ditch originating from the South Dam, which reports to the Main Embankment Seepage Collection Pond.

2.4.18. GW00-1A (TSF NORTHWEST WELL – DEEP)

GW00-1a is located downstream of the South Embankment at the TSF. Table 2.18 summarizes the results of the water quality data from 2008 for this well. Figures 2.18-1 and 2.18-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

With the exception of two samples, one taken in 2004 (0.007 mg/l) and one in 2007 (0.0093 mg/l), nitrogen (as nitrate plus nitrite) has consistently remained at or below the method detection limit of 0.005 mg/l. This trend continued into 2008. Dissolved sulphate showed an initial decreasing trend from 330 mg/l in 2000 to 187 mg/l in 2005. Since then, it has been rising gradually, reaching 245 mg/l in November of this year. In 2008, dissolved iron levels rose to above 0.07 mg/l, reaching a high of 0.094 mg/l. Aluminum levels also rose in 2008 to a new high of 0.18 mg/l before dropping back down to 0.0973 mg/l. Since August 2004, copper levels have shown a general trend downward, decreasing from 0.0033 mg/l to a low of 0.00025 in October 2007. 2008 copper values increased to 0.0013 mg/l. Molybdenum levels have remained flat between 0.016 and 0.024 mg/l.

2.4.19. GW00-1B (TSF NORTHWEST WELL – SHALLOW)

GW00-1b is located downstream of the South Embankment at the TSF. Table 2.19 summarizes the 2008 water quality-sampling results for this well. Figures 2.19-1 and 2.19-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

In 2008, this well showed significant sharp increases for five of the six parameters shown in Figures 2.19-1 and 2.19-2. Nitrogen levels (as nitrate plus nitrite) increased at least ten-fold to 0.0778 mg/l from their historic norms below the minimum detection limit of 0.005 mg/l. Dissolved sulphate levels rose to 123 mg/l, also more than ten times greater than historic norms of below 10 mg/l. Dissolved aluminum levels rose from their historic range of 0.0019 to 0.079 mg/l to a high of 0.422 mg/l. Dissolved copper levels rose from their historic norms of between 0.0004 and 0.0019 mg/l to 0.0108 mg/l. Dissolved iron levels rose eight-fold above their historic range to 0.809 mg/l before dropping partly to 0.375 mg/l. This well will be monitored closely in 2009 to confirm whether these increases were an anomaly or an initial indication that a new contaminant source has developed upslope.

2.4.20. GW00-2A (TAILINGS STORAGE FACILITY WEST WELL – DEEP)

GW00-2a is located downstream of the South Embankment at the TSF. Table 2.20 summarizes the 2008 water quality-sampling results for this well. Figures 2.20-1 and 2.20-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

Since briefly peaking twice, once in 2003 and once in 2005, nitrogen levels (as nitrate plus nitrite) have remained at or below the minimum detection limit of 0.005 mg/l. Between 2000 when monitoring began on this well, and October 2007, dissolved sulphate levels trended downwards from a high of 30 mg/l in 2000 to less than 7.07 mg/l in 2007. In 2008 dissolved sulphate rose slightly to 13.9 mg/l. In 2008, dissolved iron levels showed a sharp increase to 0.223 mg/l from recent lows of less than the minimum detection limit of 0.03 mg/l.

2.4.21. GW00-2B (TAILINGS STORAGE FACILITY WEST WELL – SHALLOW)

GW00-2b is located downstream of the South Embankment at the TSF. Table 2.21 summarizes the 2008 water quality-sampling results for this well. Figures 2.21-1 and 2.21-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

In 2007 and 2008, nitrogen levels (as nitrate plus nitrite) have fluctuated between 0.01 mg/l and somewhere below the minimum detection limit of 0.005 mg/l. No increasing or decreasing trends are noted at this time. Dissolved sulphate levels have remained below the baseline level of 18.5 mg/l measured in November 2000 and have fluctuated very little. All dissolved metal concentrations remained relatively stable throughout the monitoring period of 2000 thru 2008.

2.4.22. GW00-3A (TSF SOUTHWEST WELL – DEEP)

GW00-3a is located downstream of the South Embankment at the TSF. Table 2.22 summarizes the 2008 water quality-sampling results for this well. Figures 2.22-1 and 2.22-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

Except for one sample collected in 2005 (0.017 mg/l), nitrogen levels (as nitrate plus nitrite) have remained at or below the method detection limit of 0.005 mg/l. A high level (104 mg/l) of dissolved sulphate was detected in this well in 2001 but since then levels have been considerably lower, fluctuating moderately between 4.2 and 22 mg/l. In 2008, dissolved aluminum levels rose to a high 0.0224 mg/l.

All other dissolved metal concentrations remained relatively stable throughout the monitoring period of 2000 thru 2008.

2.4.23. GW00-3B (TSF SOUTHWEST WELL – SHALLOW)

GW00-3b is located downstream of the South Embankment at the TSF. Table 2.23 summarizes the 2008 water quality-sampling results for this well. Figures 2.23-1 and 2.23-2 present graphs of selected parameters from 2000 to 2008. A few key parameters are discussed in the following paragraph.

Nitrogen levels (as nitrate plus nitrite) rose from the method detection limit of 0.005 mg/l in 2000 to a high of 0.012 mg/l in 2003 and 0.019 in 2005. Through 2006 and early 2007 concentrations remained at or below the method detection limit of 0.005 mg/l before rising again in October to 0.0135 mg/l and then returning to lower levels in 2008. Dissolved sulphate levels have decreased from a high of 12 mg/l in 2000 to approximately 6 mg/l in 2008. All dissolved metal concentrations remained relatively flat throughout the monitoring period of 2000 thru 2006 but in 2007, aluminum and iron levels increased dramatically by more 30 to 40 times respectively before returning to their historic low level norms in 2008.

2.4.24. GW05-01 (WIGHT PIT/POLLEY LAKE INTERFACE WELL)

GW05-01 is located between the Wight Pit and Polley Lake. It was established in 2005 to capture groundwater as it moved from Polley Lake towards the Wight Pit. The captured groundwater is continuously pumped and returned to Polley Lake. Table 2.24 summarizes the results of water quality data for this well between 2005 and 2008. Figures 2.24-1 and 2.24-2 present graphs of selected parameters during the monitoring period. A few key parameters are discussed in the following paragraph.

Nitrogen levels (as nitrate plus nitrite) have ranged from below the method detection limit of 0.005 mg/l and 0.836 mg/l. Dissolved sulphate levels have increased to a high of 162 mg/l in 2008 while historically ranging between 62.7 mg/l and 111 mg/l. Dissolved aluminum showed a significant and sharp increase in November of this year, rising to a high of 0.0943 mg/l from normal levels of below 0.002 mg/l. Dissolved copper and iron levels also rose in 2008. Dissolved copper rose to 0.0043 mg/l while iron rose to 0.059 mg/l.

2.5. CLIMATOLOGY

Mount Polley's Effluent Permit (PE 11678) requires the collection of detailed meteorology data. The main objective of this data collection program is to provide site-specific precipitation and evaporation data for use in water balance prediction. To meet the permit requirements, Mount Polly operates an automated weather station, which records temperature (at 3 meter elevation) and precipitation at half hour intervals. Evaporation is measured using a standard Class A evaporation pan. In 2008, the weather station circuitry failed causing the data logger to malfunction. The unit was sent away for repair but during this time, no temperature and rainfall data was collected (May 5 to July 21). 2008 was a relatively dry year; only 598 mm of precipitation fell at the site versus a yearly average of 742 mm. Total evaporation for 2008 was 312 mm versus the annual average of 423 mm.

2.5.1. TEMPERATURE – MINIMUM, MAXIMUM AND AVERAGE

Figures 4.1 through 4.3 present Mount Polley's 2008 temperature data. Monthly minimum, maximum, and average temperatures as well as daily average temperature are shown. The lowest monthly mean temperature was –11.15 degrees Celsius recorded in December. The maximum monthly mean temperature likely occurred in July but the exact value is not know because the weather station was not functioning during that time. Data obtained off the internet (http://www.theweathernetwork.com) indicates that the community of Likely experienced the highest maximum and highest minimum temperatures in the month of July.

2.5.2. PRECIPITATION

2008 was a relatively dry year in the Mount Polley area. Although the month receiving most rainfall was May (66mm), this number is an estimate taken from the internet (URL:www.weathernetork.com) for the nearby community of Likely. Only slightly less rain fell in the months of July (56 mm), August (60.6 mm), October (58.4 mm) and November (62 mm). The driest non-freezing month was September, which obtained only 25mm or rainfall. Rainfall data are presented as bar graphs in Figures 4.4 through 4.6.

2.5.3. EVAPORATION

Evaporation data for the period of April 17 to October 7 (non-freezing period) is presented in Figure 4.7. Total evaporation for 2008 amounted to 312 mm versus an annual average of 423 mm. July experienced the greatest amount of evaporation at 81.6 mm. and October had the lowest level at under 15 mm.

2.5.4. WATER BALANCE

Table 4 (2 pages) contains the updated water balance spreadsheet for the 2008 period. A review of the water balance is included in the Annual Tailings Inspection report, presented in Appendix 1. An annual water balance spreadsheet for the Mount Polley Mine site was first developed in 2005 in order to facilitate water planning and predict water surplus or deficit volumes after the resumption of the operations in 2005. Each year, the spreadsheet is updated by adding new development areas (including Springer Pit, Wight Pit and the Northeast rock disposal site), updating precipitation estimates, and modifying other aspects of the water balance to match the new mine plan. On December 31st, 2008 the inventory of water stored in the *Tailings Storage Facility* was 3.11 M m3.

2.6. HYDROLOGY AND HYDROGEOLOGY

In 2008 hydrological monitoring included calibration of staff gauges and recording of staff gauge measurements (during non-freezing months) at six surface water monitoring sites (W1a, W4, W5, W7, W8 and W12) situated in the vicinity of the Mount Polley mine site (see Figure 2 for site locations). It also included continuous monitoring of water levels at W7, W8, and Edney Creek near its confluence with Hazeltine Creek (Ditch Road bridge crossing) using pressure transducers installed in 2007.

Discharge curves (Figures 3.1 through 3.7) have been generated for each site for each year in which sufficient data was collected to develop the curves. This year, sufficient data was collected for three sites (W4, W7 and W8). These curves are generated from calculated flow levels based on staff gauge readings and applying a stage-discharge formula developed in previous years for each monitoring station. Unfortunately, the pressure transducer data collected at sites W7, W8 and Edney Creek cannot be used to develop discharge curves because ice overlying the stream and weir has an effect on the stage discharge relationship.

Over the past few years, water level and flow data collected at W7, including continuous water level data recorded on a Water Survey of Canada analog chart recorder established in 1995, have indicated a series of distinctive shifts in the stage-discharge relationship. In anticipation of requiring accurate and up-to-date discharge data to support an application to discharge effluent to Hazeltine Creek (W7), a study was initiated at W7 to determine the cause of these shifts and to quantify them. The study included a retrospective examination of historical data along with an intensive flow monitoring program from the time the creek was sufficiently free of ice and snow (early April) through the peak flow period in May. Knight-Piésold Consulting was retained to analyze the historical and current data and produce a letter report, (attached herewith as Appendix 11) identifying the nature of the shifts. The report concluded that the shifts were largely a result of the staff gauge being forced up by frost-heaving. The report also identified weir leakage and placement of a geotextile fabric over the weir as contributing factors to the curve shifts.

2.6.1. SITE W1A – UPPER MOREHEAD CREEK

Figure 3.1 shows the flow measurement comparisons from 1997 to 2008. Three staff gauge readings recorded during 2008 are plotted on the graph.

2.6.2. SITE W3A – MINE DRAINAGE CREEK AT MOUTH

From 1995 through 1999 water volumes were monitored on this creek at site W3, which is located just downstream from the mine site. Starting in 2001, water volumes were monitored from a new location on this creek, labeled W3a. This location is at the end of the creek, immediately before it empties into Bootjack Lake. Figure 3.2 shows the flow measurement comparisons for monitoring site W3, with data from 1995 and 1997 to 2001 and the flow measurement comparisons for monitoring site W3a between 2001 and 2008. No flow data was collected in 2008.

2.6.3. SITE W4 – NORTH DUMP CREEK

Figure 3.3 shows the flow measurement comparisons from 1995 and from 1997 to 2007. A new staff gauge was installed and calibrated at this site, but to date there is not enough flow data to develop a discharge curve, and as such no flow data was graphed for 2008. The data indicates that in recent years flows recorded at this station remained high through the summer monitoring period whereas in previous years they dropped off considerably during the summer. This may be a consequence of the expansion of the waste rock dump upslope, which may be acting to distribute the catchment's flows more evenly throughout the year.

2.6.4. SITE W5 – BOOTJACK CREEK ABOVE HAZELTINE CREEK

Figure 3.4 shows the flow measurement comparisons from 1995 and 1997 to 2007. Water volumes were recorded to be very low in 2007, as the staff gauge location had become buried in organic debris. The staff gauge at this site was reestablished and calibrated in 2008. Staff gauge readings were recorded in 2008, but to date there is not enough flow data to create a discharge curve and as such no flow data was graphed for 2008.

2.6.5. SITE W7 – UPPER HAZELTINE CREEK

Figure 3.5 shows the flow hydrographs for 1995 and from 1997 to 2008. Hazeltine Creek is a continuous flow monitoring station, with flows being measured when temperatures are above freezing. These curves are based on tabulated monthly averages corrected for shifts in the curves, which were developed from this year's flow validation study (see Section 2.6 above). It is evident from Figure 3.5 that 2008 peak flows were above average historical flows. Post-peak flows in 2008 are shown to drop to zero. This however is not the case.

Due to ongoing leakage through the weir and the lack of intensive "validation" flow monitoring data for summer and winter months, an accurate understanding of the stage/discharge relationship through those months is not possible. Mount Polley anticipates replacing the weir in 2010.

2.6.6. SITE W8 – NORTHEAST EDNEY CREEK TRIBUTARY

Figure 3.6 shows the flow measurement comparisons from 1995 and 1997 to 2008. The discharge curve for 2008 is not atypical of historical discharges.

2.6.7. SITE W12 – 6K CREEK AT ROAD

Figure 3.7 shows the flow measurement comparisons from 1997 to 2008.

2.6.8. GROUNDWATER STATIC WATER LEVELS

Figure 3.8 presents graphs of static water levels for wells 95R-4 and 95R-5, for the period 1996 to 2008.

Static water levels in 95R-4 have been consistently around 11 meters, with only one exception in June 2000, when it was at 0 meters. In comparison, SWLs in well 95R-5, have been shifting between 0 meters and 2 meters, with no specific trend. In 2008, however, the static water levels appear to have dropped significantly, to 4.4 m. Mount Polley will monitor this during the next round of ground water sampling.

Figure 3.9 presents graphs of static water levels for wells GW96-1a/1b, GW96-2a/2b, GW96-3a/3b and GW96-4a/4b for the period 1996 to 2008.

SWLs in well GW96-1a have predominantly fluctuated between 15 meters and 20 meters, but have dropped to as low as 40 meters (Spring 2001) and risen to as high as 2.5 meters in the summer of 2001. By comparison, levels in well GW96-1b have been very consistent at 13 meters, with only 3 occasions where the level rose to near 0 meters (June of 2001, 2004 and 2008).

In well GW96-2a, SWLs have typically been observed at approximately 30 meters, with a few exceptions. In 2001, 2003 and 2007, the SWLs rose to 5, 12, and 6 metres respectively, before dropping back to 30 metres by the next sampling session. Over the years, SWLs in well GW96-2b have been very consistent at 15 meters, with brief rises to nearly 5 meters in 2001, 2003 and 2004. In 2008, the static water level in well GW96-2a showed a brief rise to 24 metres.

In well GW96-3a, the SWLs have fluctuated wildly, with a range of 42 meters to nearly 0 meters. In 2008 fluctuation was only between 2 and 6 meters. In comparison, SWLs in well GW96-3b have been very consistent remaining at or near 0 meters.

Static water levels in well GW96-4a have ranged between zero and four. Levels in 2008 remained in this range. Static water levels in well GW96-4b have mirrored those of its twin well GW96-4a, fluctuating with a similar pattern at slightly greater depths. This trend has continued in 2008.

Figure 3.10 presents the static water levels for wells GW96-5a/5b, GW96-6, GW96-7, GW96-8a/8b and GW96-9 for the period 1996 to 2008.

GW96-5a static water levels have predominantly fluctuated between 5 meters and 0 meters, dropping as low as 13 meters in the winter of 2001 and to 5.4 in 2008. GW96-5b static water levels have fluctuated consistently between 3 meters and 0 meters. In 2001 this well was damaged, and then repaired in 2006, however, in 2007, a ditch located upslope of the well intercepted its surface flow and in no longer a viable well.

Static water levels in well GW 96-6 have most often been recorded near the surface, however some significant brief drops have been encountered to as deep as deep as 15 metres.

Well GW96-7 static water levels have consistently measured between two and four metres. In 2001 it briefly dropped to 5.25 metres. 2008 levels rose to above ground level (10 cm above ground in PVC housing pipe).

Static water levels in wells GW96-8a and GW96-8b have always been at ground level (0 meters), and this trend continued in 2008.

Static water levels in well GW96-9 have ranged from 0 meters down to nearly 2.5 meters. The most recent readings in 2006 were approximately 0.2 meters. Groundwater well GW96-9 was deactivated in the spring of 2006 during the commencement of the *Tailings Storage Facility* stage 5-construction phase, as it was within the final toe design of the dam. This 6.1m deep well was established to capture a near surface aquifer and was a supplemental well to wells GW96-3a/b and GW96-4a/b. There will not be any future samples for this well.

Figure 3.11 presents graphs of static water levels for wells GW00-1a/1b, GW00-2a/2b and GW00-3a/3b for the period 2000 to 2008.

During each sampling event, static water levels in well GW00-1a have consistently dropped with each of the three purges. This indicates that insufficient time is being allowed for well re-charge. In 2009, recharge time will be increased from 24 to 48 hours. Once the appropriate recharge period is determined, the cyclic fluctuations in the static water levels will likely be eliminated or significantly reduced. It is anticipated that levels will subsequently measure between 1 and 3 metres. Currently, static water levels fluctuate between one and three metres on the first purge to as low as 8.5 metres on the third purge. In well GW00-1b, static water levels have historically fluctuated between 0.5 and 3 metres. This trend continued into 2008.

Static water levels in wells GW00-2a and 2b have remained relatively flat over the entire monitoring period, with small fluctuations exhibited between 3 and 6 meters. In 2006, well GW00-2b exhibited a brief drop in the SWL to 8.9 metres.

The static water levels in well GW00-3a have fluctuated somewhat, with the majority of the samples between 4 meters and 6 meters, but with several samples in 2002 and 2007 as low as 19 meters. As for well GW00-3b, the static water level has been very consistent remaining within the range of 4 to 6 meters.

2.7. RECLAMATION RESEARCH – 2008

The objective of the reclamation research program is to develop the methods, materials and protocol for achieving end land use objectives defined in the Mount Polley Reclamation Plan. The primary end land use objectives are wildlife habitat and commercial forestry. Secondary objectives include cattle grazing, hunting, guide-outfitting, trapping and outdoor recreation.

2.7.1. TREE GROWTH PLOTS

Appendix 2 contains the 2008 Annual Reclamation Research Report by R. Meister. Data for this report was collected in 2007, however, the analysis and summary was not completed until May of 2008. This report studies the effects of varying soil depth, amendments, slope, and competing vegetation on the survival and growth of lodgepole pine and Douglas-fir trees on Mount Polley's 1170 elevation rock disposal site. Although the tree plots were established in 1998 and 2000, it is still early to make final conclusions; however, at this time we can say that:

- Soil amendments of 15cm in depth are sufficient to *establish* seedlings;
- It is evident that growth on these sites requires a minimum of soil amendment for successful growth;
- Mortality on biosolids treatments is higher, more so for Douglas-fir on the 2000 trial and lodgepole pine on the 1998 trial;
- Trees planted on biosolids placed on top of waste rock significantly responded in growth over trees planted only on waste rock;
- Vegetation competition is a significant factor in seedling survival and growth; and
- Tree height increases with increasing soil depth to 40cm whereas no increase is seen with 65cm soil amendment.

Continued research on the operational research trials on the 1170 rock disposal site will be maintained, and re-evaluated in 2010 to determine optimum soil thickness creating a suitable medium for tree growth given the primary reclamation objectives of wildlife habitat and commercial forestry.

2.7.2. AQUATIC ASSESSMENT HIGHLIGHTS – 2008

Environmental initiatives conducted by the Mount Polley Mine in 2008 included a number of studies that were part of a Technical Assessment in support of an application to allow discharge of wastewater to Hazeltine Creek (under the Waste Discharge Regulation of the British Columbia *Environmental Management Act*). These key initiatives included:

1. Toxicity testing to support the development of site-specific water quality objectives for copper and cadmium in Hazeltine Creek;
2. Toxicity testing on sulphate using the freshwater amphipod, *Hyalella azteca;*
3. Participation in a consortium supporting the re-development of the national water quality guideline for cadmium; and
4. Continued refinement of a strategy for effluent discharge to Hazeltine Creek.

All of these initiatives, which are discussed in the following subsections (2.7.2.1 to 2.7.2.4), were undertaken to support the identification of the potential impacts associated with the proposed effluent discharge and to serve as the technical information upon which to base the development of plans to mitigate (eliminate) potential impacts. A brief overview of each of these key initiatives is provided in the sections that follow, including a description of the initiative and a summary of associated results.

2.7.2.1. Toxicity Testing for Site-Specific Water Quality Objectives for Copper and Cadmium

Copper and cadmium were previously identified as two metals for which site-specific evaluations should be conducted and to potentially develop site-specific water quality objectives (SSWQO) for the protection of aquatic life in Hazeltine Creek. An SSWQO is a numerical concentration or narrative statement that is established to protect a designated water use at a specific site. Based on site-specific considerations, particularly of water chemical characteristics that might be expected to limit the bioavailability and toxicity of divalent metals (particularly copper), it was decided to pursue a procedure for the development of an SSWQO called the Water-Effect Ratio Procedure (e.g., BCMELP 1997; CCME 2003).

A Water Effect Ratio test involves an evaluation of the toxicity of a contaminant of interest (in this case, copper) in water collected from the site, compared with similar tests conducted in clean laboratory-prepared water. The Water Effect Ratio (WER) is used as a measure of the effect of site water characteristics on toxicity, and is calculated by dividing the LC50 for the material of interest in site water by the result obtained in laboratory water. Essentially it tests the relative bioavailability of the spiked element in site water. If site water contains higher concentrations of any number of ligands that might bind copper (e.g., dissolved organic carbon), or of other elements that might compete with copper for uptake (e.g., hardness which represents the concentrations of calcium and magnesium), copper might be expected to be less bioavailable and therefore less toxic (e.g., Borgmann 1983; Winner 1985; Meador 1991; Welsh et al. 1996). In such a case, generic guidelines would be over-protective because they represent cases of higher bioavailability than exist at the site of interest.

In the case of cadmium, testing conducted in April 2007 returned WERs that were all near 1 (see 2007 Annual Report). This suggested that Hazeltine Creek water did not have a substantial effect on cadmium toxicity (relative to laboratory water); testing was discontinued.

With respect to copper, WER testing in 2007 concluded with a recommendation for continued testing in 2008 at a greater frequency using the cladoceran (water flea), *Ceriodaphnia dubia*, in order to better understand seasonal variability in copper's bioavailability and toxicity in Hazeltine Creek. To this end, Mount Polley conducted nine (9) Water Effect Ratio tests in 2008 to support development of an SSWQO for copper in Hazeltine Creek.

Results of the 2008 WER tests are provided in a table found in Appendix 5. The results varied considerably, with ratios ranging from 1.9 to 30.2. The data suggests a seasonal trend of higher WER values in the winter/spring, and lower values in the summer.

2.7.2.2. Toxicity testing on sulphate using the freshwater amphipod, Hyalella azteca.

The following is a summary of the results presented in a two (2) reports prepared by Nautilus Environmental for Mount Polley Mine. The reports, titled Toxicity testing on sulphate using the freshwater amphipod, *Hyalella azteca* can be found in Appendix 6a and 6b.

Nautilus Environmental conducted toxicity tests for Mount Polley evaluating the acute effects of sulphate on the survival of the freshwater amphipod, *Hyalella azteca*. The exposures were conducted in site water collected from station W7, and were prepared by the addition of sulphate salts into the samples. The W7 samples were collected on March 26th and on October 22nd 2008.

The 96-h LC50 value (with 95% confidence limits) was 480.1mg/l sulphate for the sample taken on March 26th, and 628.5 mg/l for the sample taken on October 22nd. The lowest effect concentration (LEC) for each of two samples was 44.1 mg/l and 360 mg/l respectively. Three more samples will be taken in 2009 to better define the LEC.

2.7.2.3. Cadmium Consortium

The Mount Polley Mine is part of a consortium, established in 2007, that is assisting Environment Canada to expedite a revision of the National (Canadian) water quality guideline for the protection of aquatic life for cadmium. The current national guideline for cadmium is hardness dependent according to the equation $10^{\{0.86[\log(\text{hardness})]-3.2\}}$ and was derived by dividing a lowest recorded toxicity value of 0.17 ug/l (Biesenger and Christensen 1972) by a safety factor of 10. It is notable that the national guideline for cadmium was adopted as the BC working guideline (BCMOE 2006b). Substantial advances made in the understanding of the aquatic toxicity of metals, including cadmium, the general improvement in toxicity methodology, as well as the sheer volume of available data on the aquatic toxicity of cadmium, suggest that taking the lowest available toxicity datum and dividing it by 10 is not a defensible approach to guideline development (it is unnecessarily over-protective). Accordingly, Environment Canada recently drafted a new "Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life". Mount Polley is financially supporting (in conjunction with several other mines and Canada's Science Horizons program) the application of the protocol for the development of a new national water quality guideline for cadmium. It is anticipated that the results will be available in 2009 and that some additional time will be required for national ratification. The document is currently undergoing internal review.

2.7.2.4. Refinement of a Strategy for Discharge

As indicated previously, many of the evaluations conducted by Mount Polley in 2007 and 2008 were implemented based on a preliminary discharge strategy and generally conservative (worse than expected) estimates of discharge volume and quality. Technical assessments undertaken in 2007 and 2008 were used to refine the strategy for effluent discharge (i.e., Mount Polley is taking an iterative approach). Fundamental considerations driving the strategy for effluent discharge are the maintenance of water quality that is fully protective of aquatic life and the avoidance of any detrimental physical effect. The current concept for discharge involves the treatment of effluent in an anaerobic biologic retention system followed by an engineered wetland and then release at a rate proportional to the flow of Hazeltine Creek. Site-Specific Water Quality Objectives for copper and sulphate, in conjunction with maximum permissible flows, are being used to guide the strategy.

2.7.3. BIOSOLIDS PROGRAM

In 1999 the Ministry of Environment issued Mount Polley Mining Corporation a permit to import biosolids from the Greater Vancouver Regional District for the purposes of mine site reclamation (Permit PE15968). After initial receipt and stockpiling of the biosolids shipments in 2000, the program was suspended. Biosolids shipments recommenced in 2007 (see 2007 Annual Report for summary of 2007 analysis and shipment data).

<u>Summary of 2008 Biosolids Deliveries</u> (see Appendix 7 for analysis results)

Biosolids Source: Annacis Island Wastewater Treatment Plant, Class A cake
Period of deliveries: September 28 to November 19, 2008
Total tonnage: 3,875 bulk tonnes (1,174 dry tonnes)
Delivered to: Wight Pit rock dump area
Biosolids quality confirmation: all biosolids delivered to Mount Polley in 2008 meet the Organic Matter Recycling Regulation criteria for Class A biosolids

New (received in 2008), and composite (combined 2000, 2007 and 2008) samples were collected and analyzed in October 2008. The results of the analyses are presented in Table 2.27.

2.7.4. GENOMICS SCIENTIFIC RESEARCH PROPOSAL

In the latter part of 2007 Mount Polley partnered with the University of British Columbia on a proposal submission to Genome British Columbia. Genome B.C. is a research organization that invests in and manages large-scale genomics and proteomics research projects and science and technology platforms focused on various areas of strategic importance including the environment. The overall objective of the proposed research is to develop genomics tools that will be used to monitor microbial communities and metabolic processes in passive water treatment systems used in the mining industry. The significance of this work will be to improve the performance of passive treatment systems and to discover organisms, pathways and/or enzymes that can be exploited in innovative future applications for the mining industry. The contributions to new science will include (i) cultivation-independent genomic surveys of ML and ARD treatment systems never before performed and (ii) new information on the interrelationship between nutrient supplies and microbial processes within high metal and/or sulphate environments.

In 2008, the project was approved, funding was received and work commenced. During the summer, Mount Polley constructed an operational scale anaerobic biological reactor for field-testing but it was not commissioned (see Appendix 4 for Bioreactor construction report). Additionally, several column cell tests were initiated at UBC to evaluate potential blends of various organic materials to effectively remove parameters found at Mount Polley.

3.0 MINING PROGRAM

A detailed Mine Plan was presented in the Reclamation and Closure Plan submitted to MEM and approved under Permit M-200.

3.1. SURFACE DEVELOPMENT TO DATE

3.1.1. AREAS OF DISTURBANCE TO END OF 2008

At the end of 2008 the total disturbed area in all categories was 824.80 hectares. Surface areas of the various disturbed reclamation units are outlined in Table 3.2 and are detailed by mine component in Table 3.1.

Figure 3 provides a detailed depiction of all disturbance areas overlain on an updated (as of 2008) aerial orthophoto mosaic.

3.2. SURFACE DEVELOPMENT IN 2008

In 2008, the waste dumps increased by 22.5 ha, pit areas increased by 22 ha and road disturbance area increased by approximately 30.5 ha. The tailings ponds had no significant increase in disturbance. The dam was raised from 951 to 954m with no increase in its footprint.

3.3. PROJECTED SURFACE DEVELOPMENT FROM 2009 TO 2013

3.3.1. AREAS OF DISTURBANCE

Tables 3.3 and 3.4 illustrate the projection of further disturbance for the next five years and mine life.

3.3.2. SALVAGING AND STOCKPILING OF SURFICIAL MATERIALS

Soil salvage is a critical component of reclamation planning, as it will provide the soil material necessary to reclaim the mine site for desired end land uses. In 1997 Mount Polley prepared a Soil Salvage and Stockpile Protocol, SSSP-97, which addressed site-specific criteria relating to soil management.

In 2008, approximately 45,739 m^3 of soil was salvaged from both the Wight pit and the Springer pit, which contributes to a total of 3,200,000 m^3 in storage held at Mount Polley (Table 3.5). This amount over 695 ha (total area disturbed minus pits and stockpiles) yields a nominal 46cm (vertical equivalent) of soil in storage for each hectare disturbed.

3.3.3. DRAINAGE CONTROL / PROTECTION OF WATERCOURSES

In 2008 Mount Polley constructed a long ditch (described in section 2.2.4) to mitigate the potential of site drainage from entering the Polley Lake system. Additionally towards the end of the year Mount Polley Environmental staff submitted a permit application to the Ministry of Environment for the transfer of Tailings supernatant to the Cariboo and Bell pits.

3.4. TEST HEAP LEACH

The initial site grading for the Test Heap Leach Pad construction program at Mount Polley Mine commenced in August 2006. Construction and stacking of ore was completed by August 1st 2007. The first full year that the Test Heap Leach Pad was operational was in 2008.

The Test Heap Leach Pad has a high integrity low permeability double liner system constructed over the entire leach pad area. The double liner system for the pad area contains the following components from bottom to top:

- 150 mm Prepared Subgrade (Zone F);
- 500 mm Soil Liner (Zone S);
- 60-mil smooth HDPE Inner and Outer Liners with a Geonet between them; and
- 100 mm diameter cpt pipe runs continuously in an East-West direction with a spacing of 6 metres between pipes and covered with a 1000 mm Protective/Drainage Layer

The Test Heap Leach Pad also contains a Leak Collection and Recovery System (LCRS) for monitoring of solution leakage between the inner and outer GeoSynthetic liners. An initial 24-hour hydrostatic test was completed to evaluate the integrity of the inner liner. The results of the hydrostatic test indicate that the leakage rate through the inner liner is below a theoretical leakage rate, which has been determined by conservatively assuming that one hole or defect is present per acre of liner area. Results of the successfully completed hydrostatic test were reviewed by Knight Piésold, and reported on in the 2007 Annual Environmental and Reclamation Report.

The pad consists of four (4) quadrants; 1 and 2 contain a sulphur/oxide ore mix and 3 and 4 only contain oxide ore. Quadrant 1 was the focus of the 2008-leaching program. In 2008 a total of 286.6 kg of total copper was recovered using an electro-winning plant, which amounts to 0.04% overall recovery. The electro- winning process has been unable to remove the majority of copper from solution due to the limited ability to process the entire flow. Future plans for the test heap leach include the use of an iron cementation process that will encourage precipitation of copper and production of iron sulphate. This method of copper recovery has been used industrially since the 12th century. Iron waste will be provided from the local machine shops in Williams Lake as well as the mines own source of spent ball mill charge.

Appendix 9: *2008 Chronological Series of Events at the Research Test Leach – Mount Polley Mine* contains a summary of monthly reports for the Test Heap Leach Pad. The following table shows the annual analytical data for well GW95-R5 (down stream of the leach pad location). Table 1 of Appendix 9 shows the volume of leachate that was returned to the heap from between the inner and outer GeoSynthetic liners. No reagents, sulphur or sulphuric acid were added to the leachate in 2008.

Three (3) samples representing 200,000 tonnes of ore placed onto the leach pad were analyzed for ABA. The Neutralizing Potential Ratio results were 2.22, 4.69 and 2.33.

Groundwater Quality from Well GW95–R5.

Parameter	Units	Collection Date	
		21-Jun-07	25-Jun-08
Field pH	pH units	7.61	7.545
Field Temp	degrees C	6.8	7.1
Field Conductivity	uS/cm	569	925
Alkalinity Total	mg/l	193	198
Sulfate	mg/l	168	310
Nitrate + Nitrite	mg/l	3.31	1.66
Ammonia - N	mg/l	0.0083	0.0025
Hardness	mg/l	404	533
Dissolved Aluminum	mg/l	0.001	0.0026
Dissolved Arsenic	mg/l	0.00054	0.0006
Dissolved Barium	mg/l	0.0148	0.0267
Dissolved Calcium	mg/l	121	155
Dissolved Copper	mg/l	0.00068	0.00162
Dissolved Iron	mg/l	0.015	0.015
Dissolved Lead	mg/l	0.00005	0.00005
Dissolved Magnesium	mg/l	24.9	35.6
Dissolved Manganese	mg/l	1.41	1.19
Dissolved Molybdenum	mg/l	0.0246	0.0169
Dissolved Nickel	mg/l	0.0005	0.0005
Dissolved Potassium	mg/l	0.89	1.01
Dissolved Selenium	mg/l	0.001	0.001
Dissolved Silicon	mg/l	7.29	7.2
Dissolved Sodium	mg/l	7.55	8.3
Dissolved Strontium	mg/l	0.342	0.418
Dissolved Zinc	mg/l	0.001	0.001

4.0 FUTURE RECLAMATION PROGRAMS

4.1. RECLAMATION RESEARCH FOR THE FUTURE

In addition to the projects outlined in section 2.7, future reclamation research will include test pads that were initiated in 2008 to determine if:

- The addition of char to soil increases the retention of soil constituents;
- The addition of char and biosolids increases soil productivity and moisture retention; and
- The placement of a soil cap (cover) over Springer waste rock influences the mobility of chemical constituents during leaching.

5.0 RECLAMATION COST UPDATE

A detailed reclamation cost update for the end of 2008 has been completed. The summary tables and detailed categories of disturbance can be found in APPENDIX 10 - RECLAMATION BOND COSTING – 2008.

6.0 REFERENCES

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