Mine Decommissioning & Reclamation Plan Executive Summary

November 2003





Brewery Creek Mine

VICEROY MINERALS CORPORATION

Viceroy Minerals Corporation

Brewery Creek Mine

Decommissioning & Reclamation Plan Executive Summary

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1.0 INTRODUCTION

Viceroy Minerals Corporation ("Viceroy") owns and operates the Brewery Creek Mine under Type 'A' Water Use License QZ96-007, including five subsequent amendments, and Quartz Mining Production Licence A99-001. Under QZ96-007, Viceroy is required to:

"… by December 31, 1998, submit to the Board a detailed decommissioning and reclamation plan and shall implement this plan should permanent closure occur. The plan shall include a complete and comprehensive report on the estimated decommissioning costs for the project, including a report which addresses the adequacy of the security component of this Licence."

The Yukon Water Board (YWB) granted an extension to the Licence and the company submitted a draft plan to the YWB in July 1999. Viceroy fulfilled its License obligations in September 2001 by submitting a final detailed *Decommissioning and Reclamation Plan, Volumes I - IV* (DRP). The reclamation and closure tasks outlined in the DRP are currently being implemented. Subsequent to the plan submission, the Department of Indian Affairs and Northern Development (DIAND) concluded that the DRP required an environmental assessment under the Canadian Environmental Assessment Act (CEAA) and a comprehensive study was initiated in September 2001. The comprehensive study report (CSR) and positive determination under the Yukon Environmental Assessment Act (EAA) was received in August 2003. During that 24-month time period, Viceroy has effectively implemented the majority of the reclamation and closure plan measures as required in Water License QZ96-007.

This *Decommissioning and Reclamation Plan Executive Summary* is presented as a summary of the *September 2001 Decommissioning and Reclamation Plan,* Volumes I-IV and technical supporting documents that have previously been filed with the Board. In addition, this summary incorporates other reports resulting from the EAA review, and presents mitigation requirements contained in the CSR as proposed terms and conditions for the Water and Quartz Mining Licences.

2.0 SCOPE

2.1 GENERAL PHILOSOPHY

The philosophy followed in developing the DRP was to work towards a passive or "walk-away" closure. This involves an orderly winding down of operations and mitigation of environmental concerns coupled with long-term monitoring and adaptive management so that, eventually, the company can safely cease management of the site with confidence that it's environmental obligations have been fulfilled and its liability is ended.

In developing the DRP Viceroy has emphasized that the following issues are addressed:

- Protection of public health and safety;
- Minimizing or preventing adverse environmental impact;
- Provide a land use that allows the mine site to continue to be productive in a manner consistent with, although not necessarily identical to local and pre-mining land use;
- Concurrent reclamation as far as practical;
- Release of heap effluent solution suitable for direct discharge to Laura Creek;
- Follow-up monitoring and contingency plans; and
- A "passive" (i.e. no active site management) closure plan.

To ensure that the objectives of the DRP are achieved, Licence performance standards and objectives are proposed as measurable criteria to determine the success of the DRP.

3.0 PROJECT BACKGROUND

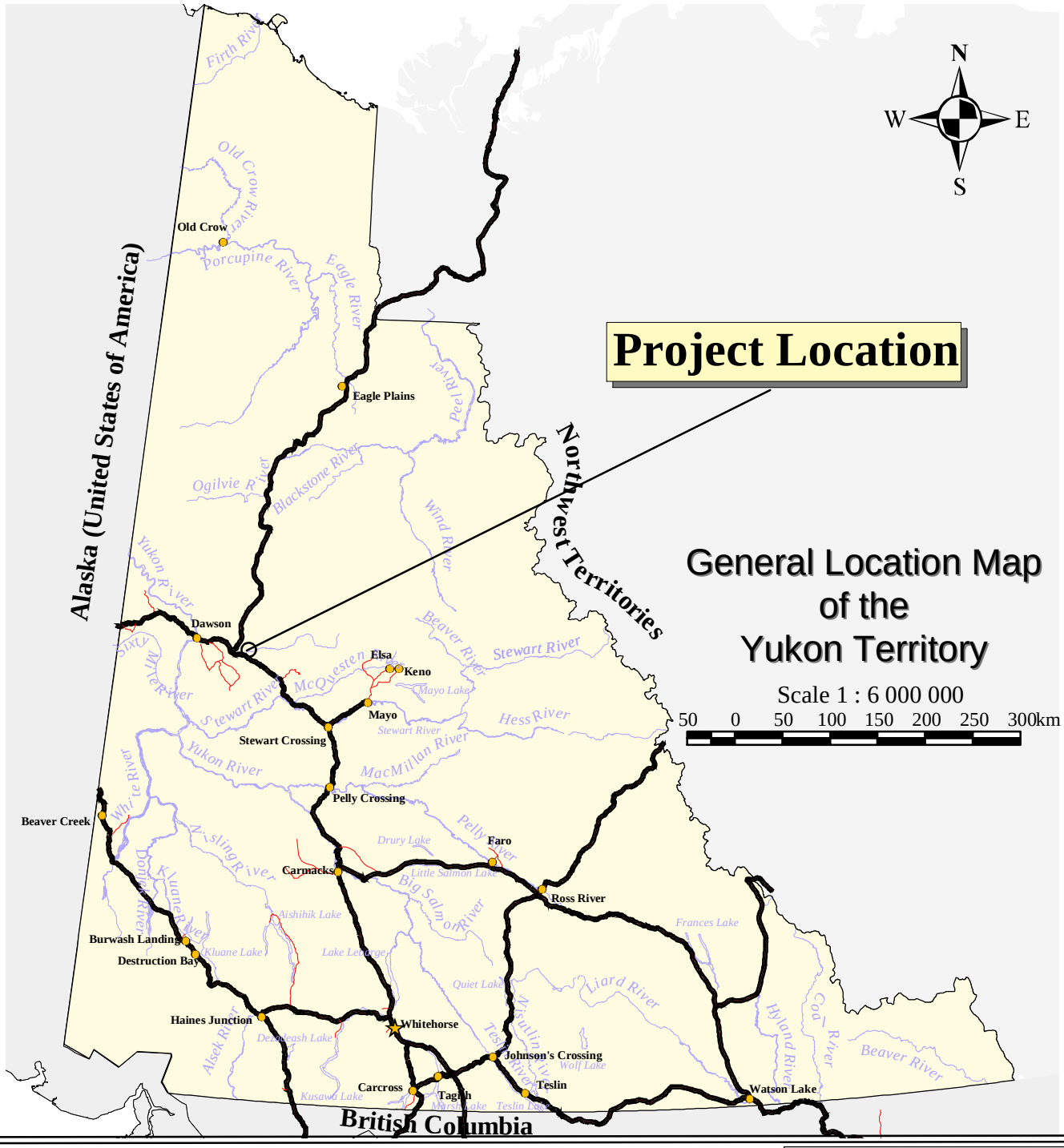
3.1 GENERAL

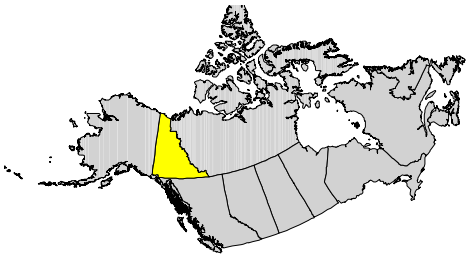
Brewery Creek Mine, owned and operated by Viceroy Minerals Corporation, is located in central Yukon as shown in Figure 3-1. A Project Overview was submitted in November of 1993, followed by submission of a 5 volume Initial Environmental Evaluation (IEE) Report in July of 1994 (Steffen, Robertson and Kirsten, 1994a). An Addendum to the IEE (3 volumes) was submitted in December of 1994 (Steffen, Robertson and Kirsten, 1994b). At the same time, an application for a Type "A" Water License was submitted to the Yukon Territory Water Board in October of 1994 (3 volumes)(Steffen, Robertson and Kirsten, 1994c). An amendment to the Water Licence application was submitted in April of 1995 (5 volumes) (Loki Gold Corporation, 1995). Public YWB sponsored hearings were held in May of 1995, and a Type "A" Water Licence was issued by DIAND in August of 1995. Construction commenced immediately following receipt of the Licence, and continued into 1996. Viceroy Resource Corporation and Loki Gold Corporation merged in 1996 resulting in the current owner and operator of the Brewery Creek Mine; Viceroy Minerals Corporation (Viceroy or the "Company"). The first ore was loaded onto the pad in August of 1996, and the first gold poured in November of 1996. Mining continued on a seasonal basis from April 1996 to September 2000. Mining ceased in September 2000 due to continued depressed gold prices. Processing and gold recovery continued uninterrupted through December 2001. Full scale reclamation and closure began in May 2002.

3.2 LICENCE HISTORY

The following provides a summary of the Water Use and Quartz Mining Licence history for the Brewery Creek Mine:

- Water Licence QZ94-003 issued in August 1995;
- Water Licence QZ94-003 amended by QZ96-007 issued in August 1997;
- Water Licence (Amendment application #1) QZ98-032, to extend the DRP submission date, issued in May 1999;





VICEROY MINERALS CORP.
BREWERY CREEK MINE

Brewery Creek Project General Location

Drawn By: NS	Figure 3-1
Checked By: DDC	Date: Nov 12, 2003
Our File: D:\Project\Viceroy\VIC-03\ArcMap\mxd\General Location	

- Water Licence (Amendment application #2) QZ98-038, to revise the heap leach pad liner design, issued in June 1999;
- Yukon Quartz Mining Licence A99-001, issued under the Yukon Quartz Mining Act in June 1999;
- Water Licence (Amendment application #3) QZ98-038, to revise heap leach pad ore cushion specifications, issued in October 1999;
- Water Licence (Amendment application #4) QZ01-050, to incorporate heap leach pad land application system, issued in June 2002;
- Water Licence (Amendment application #5) QZ02-056, to revise a licence security payment, issued in November 2002; and
- Water Licence (Amendment application #6) QZ03-060, to correct licensee name, revise heap leach pad direct discharge and selenium requirements, which is presently before the YWB for consideration.

The above noted licence applications were subjected to various environmental assessments and screenings and positive determinations were made. The present Water Licence and Quartz Mining Licence amendment requests are supported by the Yukon Government's (YG) CSR issued in August 2003.

3.2.1 Location and Access

The project site is located 55 km due east of Dawson City, Yukon (NTS map sheet 116 B/1 at latitude 64°02' north and longitude 138°15' west). The site is road accessible from Dawson City via a 26- km gravel road that connects to the Dempster Highway.

The South Klondike River Ditch road is a public road and maintained by the YG. Viceroy operates and maintains a 7-km section of gravel road from the Ditch Road to the mine site. This section of access road is planned for eventual closure pending discussions with local community and First Nations requests.

3.3 OPERATIONS OVERVIEW

The Brewery Creek Mine has been a seasonal mining operation that employs conventional heap leach technology to extract gold from non-crushed (run-of-mine) ore. The mine is comprised of eight shallow, largely oxidized gold deposits along a 7-kilometre corridor. A total of 9.458 million tonnes of ore has been placed on the leach pad. Seasonal mining occurred predominantly from early April through October. Leaching and gold recovery was carried out on a continuous year round basis. An overview of the Brewery Creek Mine is shown in Figure 3-2.

Development of the Brewery Creek deposit commenced in late 1995. Production mining commenced in 1996 with construction of 158,000 m^2 area of double lined heap leach pad, placement of ore onto the heap leach pad, construction and commissioning of the gold recovery plant and process ponds, and construction of maintenance, warehousing, administrative, camp, and ancillary facilities. Since then, ongoing pad expansions were carried out each summer through 1999 to provide adequate space for ore stacking.

Mining operations ceased in September 2000 with gold recovery continued uninterrupted through December 2001. The company began closure related heap water management and site reclamation activities in May 2002.

Figure 3-2
Property Overview



4.0 MINING OPERATIONS

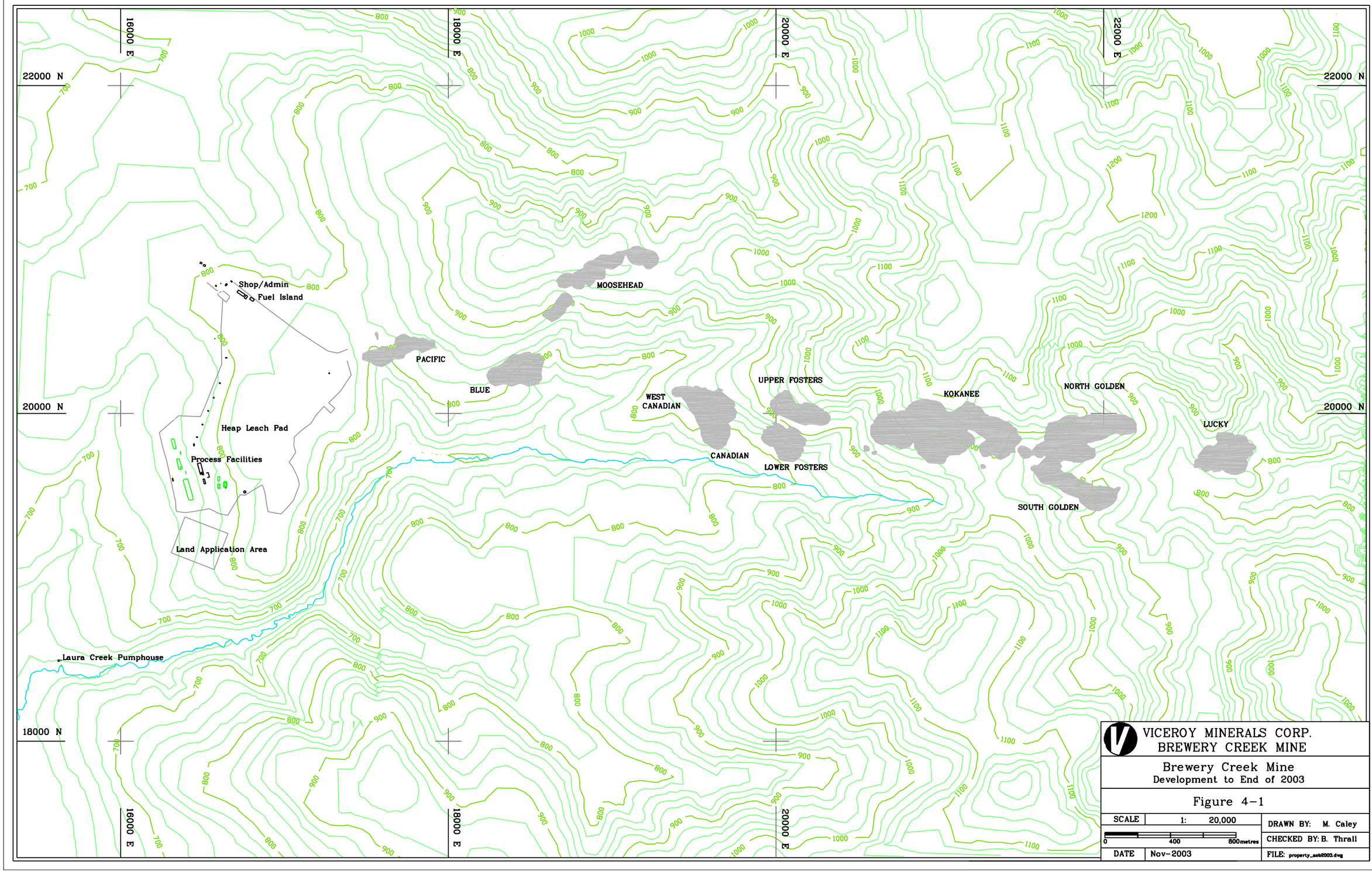
This section specifically deals with the open pit mining areas, the associated waste rock storage areas (WRSA's), haul roads and reclamation activities to date.

4.1 OVERVIEW

Development of the Brewery Creek ore body has been achieved by conventional open pit mining methods. Eight economic ore deposits were identified at the time of the initial environmental assessment in 1994. The following eight separate open pits were mined from 1996 – 2000.

- The Pacific Pit
- The Blue Pit
- The Moosehead Pit
- The Canadian Pits
- The Fosters Pits
- The Kokanee Pits
- The Golden Pits
- The Lucky Pit

The location of the eight deposits is shown in Figure 4-1. A chronology of pit development is included in Table 4-1.



VICEROY MINERALS CORP.
BREWERY CREEK MINE

Brewery Creek Mine
Development to End of 2003

Figure 4-1

SCALE	1: 20,000	DRAWN BY: M. Caley
0 400 800 metres		CHECKED BY: B. Thrall
DATE	Nov-2003	FILE: property_ash2003.dwg

Table 4-1 Brewery Creek Mine - Chronology of Open Pit

MINING AREA	DEVELOPMENT SCHEDULE
Pacific Zone	
Pacific Pit	Mining commenced 1999 and was completed during 2000.
Blue Zone	
Blue Pit	Commenced mining of the Blue Open Pit in May of 1997. Did not mine in 1998. Commenced mining again in 1999 and completed in 2000.
Canadian Zone	
West Canadian Pit	Commenced mining of West Canadian Open Pit in June of 1996. Completed mining in July of 1996.
Canadian Pit	Commenced mining of Canadian Open Pit in June of 1996. Completed mining in May of 1997
Moosehead Zone	
Moosehead Pit	Mining commenced and was completed in 2000.
Fosters Zone	
Upper Fosters Pit	Commenced mining of the Upper Fosters Open Pit in October of 1995. Material mined in 1995 was stockpiled until 1996. Completed mining in August of 1997.
Lower Fosters Pit	Started stripping for Lower Fosters Open Pit in September of 1998. Minimal overburden removal in 1999. No activity in 2000.
Kokanee Zone	
Kokanee Phase 1 Pit	Commenced mining of the Kokanee Phase 1 Open Pit in October of 1996. Completed mining in May of 1997.
Kokanee Phase 2 Pit	Commenced mining of the Kokanee Phase 2 Open Pit in May of 1997. Completed mining in 1998.
Kokanee Phase 3 Pit	Commenced mining of the Kokanee Phase 3 Open Pit in October of 1998. Completed mining in 1999.
Kokanee Phase 4 Pit	Commenced mining of the Kokanee Phase 4 Open Pit in July of 1998. Completed mining in May of 1999.
Golden Zone	
North Golden Pit	Commenced mining of the North Golden Open Pit in August of 1997. Completed mining in June of 1999
South Golden Pit	Commenced mining of the South Golden Open Pit in September of 1998. Completed mining in 1999.
Lucky Zone	
Lucky Pit	Commenced mining of the Lucky Open Pit in July of 1999 and completed in 2000.

4.2 RECLAMATION MEASURES

4.2.1 Final Development

The Canadian, West Canadian, Kokanee Phase 1, 2 and 4, North Golden, Moosehead, Blue and Lucky pits were either completely or partially backfilled. The Pacific, Kokanee Phase 3, South Golden and Lower Fosters (not fully developed) pits were not backfilled due to scheduling limitations (i.e. timing or backfill went to another pit area). There are external WRSA's associated with two of the open pits: the Blue and Canadian pits.

Overburden from mining operations was used for construction of haul roads and stream crossings on site. The overburden used in the haul roads was LAQM (limonitic altered quartz monzonite) that is non-acid generating and not a source of leachable metals.

Overburden deposition in WRSA's is summarized in Table 4-2. Design plans for the individual open pits and WRSA was presented in the *September 2001 Decommissioning and Reclamation Plan Volume III.* These design plans were followed during closure implementation.

As-built drawings of the mine area as of October 2003 are attached in Appendix A. Selected photographs of reclamation works are found in Appendix H.

Table 4-2 Overburden Deposition Plan

	OVERBURDEN DISPOSAL AREA			
Pit	**Backfill Pit**	**WRSA**	**Road**	**Schedule**
Lucky	Lucky North Golden		Lucky	1999 & 2000
Blue	Blue	Blue external dump	Blue pit access roads	Commenced mining in 1997 – completed in 1999 & 2000
Pacific	Blue	Blue external dump	Blue pit access roads	Completed in 2000
Canadian	Lower Canadian Pit/West Canadian Pit	Canadian external dump	Haul Road Development	Completed in May 1997
West Canadian		Canadian external dump		Completed in June 1996
Kokanee (K1)	Upper Canadian/Upper Fosters		Haul Road Development	Completed in May 1997
Kokanee (K2)	Canadian/Upper Fosters/Kokanee K1 & K2	Canadian external dump	Haul Road Development	Completed in 1998
Kokanee (K3)	Kokanee K1, K2, & K4 North Golden		Lucky	Completed in 1999
Kokanee (K4)	Kokanee K1 & K2 North Golden	Canadian external dump		Completed in May 1999
Upper Fosters		Canadian external dump	Haul Road Development	Completed in August 1997
Lower Fosters		Canadian external dump		Minimal activity in 1999
North Golden	Upper Fosters/Upper Canadian/Kokanee (K1 & K2) North Golden	Canadian external dump	Haul Road Development (Golden & Lucky)	Completed in May 1999
South Golden	North Golden		Lucky	Completed in 1999

4.2.2 Reclamation of Open Pits and WRSA's

4.2.2.1 Closure Issues and Objectives

A set of reclamation and terrestrial standards has been developed in conjunction with YG Energy Mines and Resources and the local First Nation. The mine area disturbance at Brewery Creek has been reclaimed to the standards developed. The reclamation and terrestrial standards are summarized in the following sections.

4.2.2.2 Reclamation and Terrestrial Standards

Terrestrial Reclamation Standards for the Brewery Creek Mine

Global Objectives

1. The protection of health and safety of public and area fauna by the elimination of unacceptable health hazards.
2. Reclaiming for future use the areas where infrastructures (buildings, chemical and fuel storage, roads, sediment ponds, solution treatment facilities, tailings facilities, waste rock storage areas, heap leach pads, open pits) are located.
3. Absence or mitigation in the production and circulation of substances that could damage the receiving environment.
4. The restoration of the site to a condition that is visually acceptable to the community.
5. In the long term, eliminating the need for monitoring and maintenance.

Terrain Stability

Objective: Protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.

2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose (pit walls) must demonstrated to be stable
4. Access to pit walls is restricted where they pose a threat to safety

Erosion Control

Objective: To support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes (pit walls)
4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Pit ponds are in place where water could collect
7. Pit ponds decants are in place

Re-vegetation

Objective: To protect wildlife habitat through the reestablishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area

5. Plant material does not show uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

Roads and Trails

Objective: Full decommissioning of access corridors when they are no longer required

General Standards:

1. Removal of culverts pipes and rock drains
2. Stabilization of banks, road fills and cuts
3. Installation of diversion berms on steep slopes
4. Reclamation of the surface and seeding
5. Ensure road cuts are stable and access is restricted where there is a safety hazard
6. Access to be restricted with appropriate signage for areas posing a safety risk

4.2.2.3 Revegetation

The Brewery Creek Mine has retained a revegetation specialist to conduct revegetation studies and assist with and provide recommendations for ongoing revegetation at the mine. Reclamation and revegetation activities have been ongoing at the mine site since initial production began.

Over 180 ha of recontoured slopes were seeded and fertilized in 2002 – 2003. Based on the recommendation of the company's specialist, the application rate of seed for these programs was 25 kg/ha and 300 kg/ha of fertilizer. The decreased application rate was recommended as a means to promote invasion of natural species such as willow. The seed mix used in the majority of revegetated slopes is summarized below:

- 36% Violet Wheatgrass
- 14% Sheep Fescue

- 14% Northern Fescue
- 11% Fowl Bluegrass
- 11% Glaucous Bluegrass
- 7% Tickle Grass
- 7% Legumes

In addition, to the reclamation seed mixture, a program of shrub propagation has also been undertaken at the mine site. Local willows waddles and stalks have been planted in select areas to encourage shrub invasion on the site.

A summary of the status of the mine area components as it pertains to the reclamation and terrestrial standards is shown in Table 4-3.

Table 4-3 Mine Reclamation Component Status

	Mine Reclamation Components- % completion (As of October 2003)			
MINE AREA	**RECONTOURING TERRAIN STABILITY**	**REVEGETATION**	**WATER MANAGEMENT EROSION CONTROL**	**COMMENTS**
Pacific	100%	100%	0%	Pit overflow channel not complete
Blue	100%	100%	95%	Monitor revegetation
Blue WRSA	100%	100%	95%	0.5 meter cover complete August 2003
Moosehead	90%	90%	95%	Backfilling and covering of landfill site not complete
Canadian	100%	100%	95%	Monitor revegetation
Fosters	100%	100%	95%	Monitor revegetation
Kokanee	90%	90%	0%	Minor resloping on remaining GM area, pit overflow channel not complete
Golden	100%	90%	95	Seeding required 2 ha east end of backfilled pit
Lucky	100%	100%	95%	Monitor revegetation
Haul Roads	50%	0%	0%	Safety berms removed, requires covering roadway with overburden and revegetation
Stream Crossings	15%	0%	0%	Lucky Haul road crossing removed, 6 others remain
Cells 8-10	100%	100%	100%	Monitor revegetation
Leach Pad	100%	100%	50%	80,000 m^3 growth media (GM) placed (0.25 meters), revegetated September 2003, containment dike notch still required
Access Road	0%	0%	0%	Access road from Lee Creek remains, final reclamation determined with consultative process

All of the mine areas require ongoing erosion control and maintenance seeding/fertilizing. This is covered in the long-term closure period and accounts for the 95% complete level.

4.2.2.4 Stream Channel Crossings

Reclamation measures to remove fill material and culverts located in major stream crossings have been provided for in the DRP. Sufficient material will be excavated to ensure that precipitation and runoff events can pass freely through these draws and long-term stability and erosion control is maintained. Complete removal of the material to achieve this objective is not necessary, given the grade of the catchment slopes and specific drainage contours. It is also important that the design of the stream crossings allows for light vehicle and equipment access. Long-term monitoring and maintenance access is an important consideration in the design of the stream crossings. The need for equipment such as a backhoe for maintenance repairs of drainages, erosion control, etc needs to be considered in the design. The following design considerations will be used in the engineering designs of the stream crossings of the haul roads:

- 200-year peak instantaneous design event (44 mm in 30 minutes);
- Maintaining light vehicle and small equipment access through the crossing;
- Rock armor and rip/rap to stabilize crossing and prevent erosion;
- A minimum of 5 meters of width at the bottom of the crossing; and
- 2H:1V side slope contours on the inside of the stream crossing.

Clearwater Consultants has prepared design parameters for the six stream crossings requiring removal along the main haul road. The total material requiring removal in the 6 stream crossings is 56,740 m3. A final design for each of the stream crossings will be prepared and submitted prior to excavation and construction of the stream channel crossings.

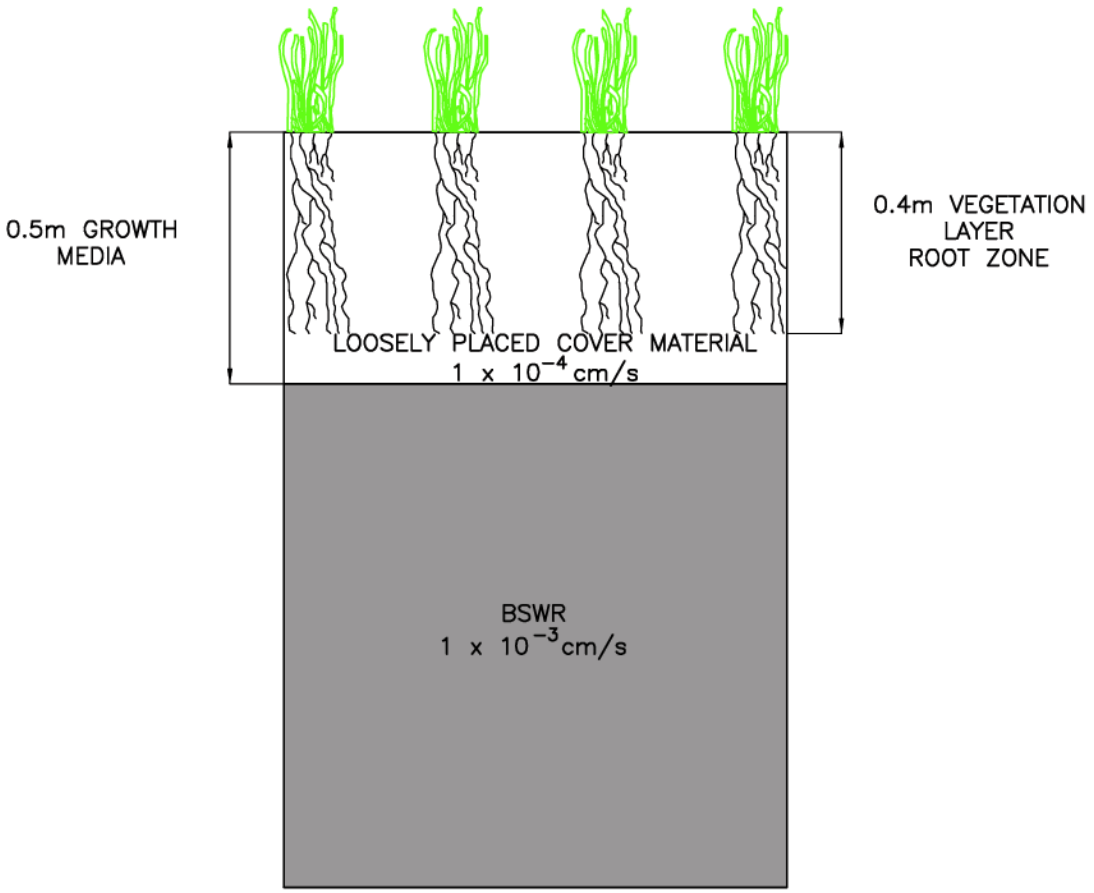
4.2.2.5 Blue WRSA

Concerns have been raised regarding the long-term ARD potential of the Blue WRSA. Viceroy requested Knight Piesold to reassess the ARD data available for the Blue WRSA and provide details for a field program to be conducted in 2002. The objective of the field program is to gather the necessary data to answer any remaining uncertainty regarding the long-term ARD potential of the Blue WRSA. Please refer to *Attachment 4, Volume IV September 2001 Decommissioning and Reclamation Plan* for the Knight Piesold assessment and details of the 2002 field program. The 3 monitoring wells recommended in the field program were installed in June 2002. The remainder of the field program was completed in August 2002. Further to the August 2002 field program, SRK Consulting was retained to further assess the ARD and metals

leaching potential of the Blue WRSA. The results of the assessment are included in Appendix B. This assessment indicated that the Blue WRSA is a relatively small facility, is geochemically stable, and that water quality is not expected to worsen significantly in the future. Worst-case chemistry predictions indicate that the South Klondike River will not be detectably impacted by water originating from the Blue WRSA. An engineered cover has been installed to reduce infiltration into the waste rock and wells have been installed to monitor groundwater downgradient of the WRSA.

A second field program to test the solubility of metals from the Blue WRSA was conducted under the direction of SRK Consulting. Additional samples were obtained from the Blue WRSA in September 2003 and a program of sequential leaching was initiated. The results of the program will be used to finalize the potential for metals release from the Blue WRSA and subsequent downstream effects. An outline of the testing program is also included in Appendix B.

BGC Engineering was retained to design an appropriate soil cover for the Blue WRSA. Based on all of the available information, including the recent geochemical assessment, the most appropriate soil cover for the Blue WRSA is a 0.5-meter storage and release cover. BGC has estimated that a 0.5-meter storage and release cover will result in an average annual infiltration of 16%. A 0.5 m storage and release cover was completed over the Blue WRSA in August 2003 (Figure 4-2). The cover was revegetated in October 2003. In addition, a test cover was constructed in the Blue WRSA to verify the infiltration rates estimated by the BGC design. The cover construction was supervised by BGC Engineering and completed in September 2003. A construction records report for the Blue WRSA infiltration test cover is attached in Appendix D. A BGC Engineering characterization of the Blue WRSA and cover design is contained in Appendix C.





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SCALE:	AS SHOWN	DESIGNED:	RJW
DATE:	NOV. 2002	CHECKED:	
DRAWN:	CSM	APPROVED:	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
Vancouver, BC Phone: (604) 684 5900

PROJECT: BREWERY CREEK MINE

TITLE: BLUE WRSA SOIL COVER DESIGN

CLIENT:	PROJECT No.	DWG. No.	REV.
VICEROY MINERALS CORPORATION	0270-001-03	FIGURE 4-2	0

4.2.2.6 Post Closure Access

Future land use patterns are an important consideration for road reclamation since roads can be catalysts for desired and undesirable land use practices. This is an objective that is best established by the First Nation and community rather than the mining company. Viceroy is prepared to implement either a plan that closes off the road network once it is no longer in use for monitoring or hand the road network over for the community to manage once successful closure is achieved. The company will facilitate a community based decision including First Nations, Dawson City and the registered trap line holders for the purposes of establishing long-term access to the Brewery Creek Mine. It must be noted that access for the purpose of post closure monitoring and maintenance will be required for a 15-year period. For purposes of the reclamation cost estimate the road network was reclaimed.

As-built drawings of the reclaimed mine area, including on site haul roads, as of October 2003 are attached in Appendix A. In addition, photographs of various examples of recent reclamation are included in Appendix H.

5.0 HEAP LEACH AND PROCESS FACILITIES

5.1 ORE PROCESSING

The Brewery Creek Mine is operated as a conventional run-of-mine heap leach facility where "leachable" gold is extracted from low grade oxidized ores. Ore is delivered to the leach pad without any crushing or other size reduction processes. Gold is extracted from this ore by leaching with a weak cyanide bearing alkaline solution (~35 - 50 ppm CN) delivered onto the heap through a combination of irrigation style solution drip emitters and open spray nozzles. Cyanide addition and leaching continued through December 2001. Heap detoxification was initiated in May 2002 and completed in August 2002. Solutions from the leach pad are actively managed.

A total of 311,000 m^2 of total pad area has been completed encompassing Cells 1-7. A total of 9,458,000 tonnes of ore have been stacked on the leach pad at the end of the 2000 mining season.

Table 5-1 Leach Pad Tonnage Summary

Year (End of)	Expansion Area (m^2)	Total Area (m^2)	Total Ore On Pad (tonnes)
1996	158,000	158,000	1,765,803
1997	59,500	217,500	3,565,958
1998	12,000	229,000	5,955,246
1999	82,000	311,000	8,218,067
2000	0	311,000	9,458,000
2001	0	311,000	9,458,000
2002	0	311,000	9,458,000
2003	0	311,000	9,458,000

5.2 LEACH PAD AND POND DESIGN AND STABILITY

5.2.1 Liner System

The entire heap leach area and the uphill face of the containment dike is lined with a double composite liner with an integral leak detection and recovery system (LDRS). The heap leach

pad liner system is constructed in several layers to provide for containment of the leach solution, leak detection, collection and recycle. Other pertinent heap leach pad and process pond design specifications are discussed in detail in the following Water Licence supporting documents: *"Brewery Creek Mine Design Criteria Report (Loki Gold Corporation, 1995. Appendix 15), Brewery Creek Project Technical Specifications" (Loki Gold Corporation, 1995. Appendix 18), "Brewery Creek Project Construction Quality Assurance Manual" (Loki Gold Corporation, 1995. Appendix 14)* and *"Viceroy Minerals Corporation Design Modification Report for the Brewery Creek Mine Leach Pad Liner" (Sitka Corp., 1999).*

5.3 DECOMMISSIONING & RECLAMATION

5.3.1 Overview

This section presents a series of measures and activities implemented for decommissioning and reclamation of the heap and long-term heap effluent solution management.

5.4 HEAP CLOSURE COMPONENTS

The activities associated with closure of the Brewery Creek heap leach pad can be divided into 5 components or separate unit processes, namely;

1. Effluent Treatment and Release
2. Heap Detoxification
3. Heap Cover and Revegetation
4. Secondary Contingency Processes
5. Long-term Heap Effluent Treatment and Release

The specific objectives and approach in achieving each of the above activities are discussed in the following sections. As part of the company's assessment of decommissioning measures for the heap leach pad, a number of options were investigated and a detailed testing program initiated. The options investigated and the results of the testing program are included in the *September 2001 Decommissioning and Reclamation Plan, Volumes I-IV* which was previously submitted to the YWB.

5.4.1 Effluent Treatment and Release

The first component listed in the heap closure categories is effluent treatment and release. The primary reasons for effluent treatment and release include:

- Solution management requirements after cessation of mining and continued leaching;
- Implementation and transition from leaching into detoxification and long-term effluent treatment strategies;
- Solution management during the period of improving heap effluent water quality after heap treatment; and
- Release of the heap draindown volume after heap treatment.

A detailed and comprehensive technical document was submitted outlining the proposed process for heap solution drain down, treatment and land application of heap effluent solution utilizing hydrogen peroxide for cyanide removal and metal hydroxide precipitation followed by land application of the treated solutions for final polishing of effluent. The *March 2001 Effluent Treatment and Land Application Water License Submission* document presented an approach for water management using a 3-stage water treatment system followed by land application for final treatment and release. The *Effluent Treatment and Land Application Water License Amendment #4* was granted in July 2002 through licence amendment application QZ01-050. Approximately 35,000 m^3 of treated heap effluent was land applied in 2002 and a further 80,000 m^3 in 2003. The water quality criteria for the land application system are summarized in the following table.

Table 5-2 Compliance Standards for Effluent Treatment and Land Application

PARAMETER	CRITERIA 1 (END OF PIPE – BC-28)	CRITERIA 2 (5 METER LYSIMETERS, BC-68,69)
WAD CN	0.25	0.125
Total CN	2.0	1.00
Ammonia as N	15.0	7.5
Copper	0.5	0.1
Arsenic	0.5	0.25
Antimony	1.0	0.5
Mercury	0.005	0.0025
Zinc	0.5	0.25
Selenium	0.75	0.30
Lead	0.2	0.1
Aluminum	1.0	3.0
Bismuth	0.5	0.25
Cadmium	0.1	0.05
Chromium	0.5	0.25
Iron	1.0	5.0
Manganese	2.0	6.0
Molybdenum	0.5	0.25
Nickel	0.8	0.25
Silver	0.1	0.05

A number of lysimeter stations are installed within the land application area. Soil pore water is sampled from the lysimeters and analyzed for parameters of concern. Performance of the land application system in 2002 – 2003 met conditions in the water license. The land application system is licensed for a total of 400,000 m^3 of solution release. The intent of the land application system is an interim measure to manage solution prior to long-term solution release and passive post closure. The land application system was not permitted as a system intended for perpetual use during the post closure phase. A simplified process flowsheet for the effluent treatment and land application system is presented in Figure 5-1.

Figure 5-1 Effluent Treatment Plant & Land Application Flowsheet



Criteria 2

Lysimeters/Groundwater

Criteria 1

"end of pipe"

Heap Effluent from Ponds



5.4.2 Heap Detoxification

The second component of heap closure process is heap detoxification. Various methods or processes to achieve the detoxification objectives can be used including fresh water rinsing, natural degradation through continued recirculation, cyanide destruction with strong oxidizers such as hydrogen peroxide and detoxification through biological processes. An extensive testing program has been completed at the Brewery Creek site. The results of the testing program are included in the *September 2001 Decommissioning and Reclamation Plan, Volume I-IV* submitted to the YWB. One of the test programs completed was a large-scale column program (LSC) designed to compare the effectiveness of three detoxification processes, namely; natural degradation, peroxide detoxification and in-situ bacteria detoxification. Based on the results of the large-scale column test program and successful full-scale application at other sites employing heap leach technology, Viceroy selected an in-situ bacteria process for detoxification. The in-situ nutrient technology offers the best approach for final closure and decommissioning of the Brewery Creek heap.

5.4.2.1 In-Situ Bacteria Detoxification

Viceroy retained the services of Green World Science (GWS), presently ARCADIS, to assist in the design, operation and assessment of the in-situ test program. GWS has extensive experience and success in applying their patented nutrient technology at numerous heap leach sites. The GWS nutrient technology has been applied to over 100,000,000 tonnes of spent ore on heaps throughout the United States.

With the in-situ bacteria detoxification process, a supply of nutrients consisting of sugars, alcohols, fats and proteins is designed and mixed based on the specific nature and level of contaminants in the Brewery Creek process solution. The liquid supply of nutrients is continuously added to the recirculating heap solution until a pre-determined amount of nutrient addition has been satisfied. The existing strains and cultures of bacteria already present in the process solution and spent ore are used in conjunction with the nutrients supplied to promote the reduction of cyanide and metal-cyanide compounds through bacteria reduction processes.

Approximately 68,000 kg of molasses concentrate-based sugar syrup and 31,000 kg. of phosphoric acid was added to the heap recirculating solution between May – August 2002. An additional 15,000 kg as added in July 2003.

5.4.2.2 Heap Effluent Water Quality

Actual performance results of the heap detoxification program are summarized in Table 5-3. The water quality of the heap effluent met land application discharge quality standards (Criteria 1) within 2 months after treatment with nutrients. The effluent discharge standards used for direct discharge to the land application area are those listed as Criteria 1 (Table 5-2) established in the *Effluent Treatment and Land Application Water Licence Submission*. In addition, water licence amendment application QZ03-060 was submitted to the YWB in July 2003 to allow direct discharges of treated heap solutions to Laura Creek. The discharge criteria for selenium was requested to be changed from 0.75 mg/l to 0.25 mg/l. Once heap detoxification was complete, the heap recirculating volume was gradually drained down in a controlled manner. The final heap draindown moisture % is approximately 2.1%.

Table 5-3
Brewery Creek Mine
Heap Effluent Detoxification Water Quality

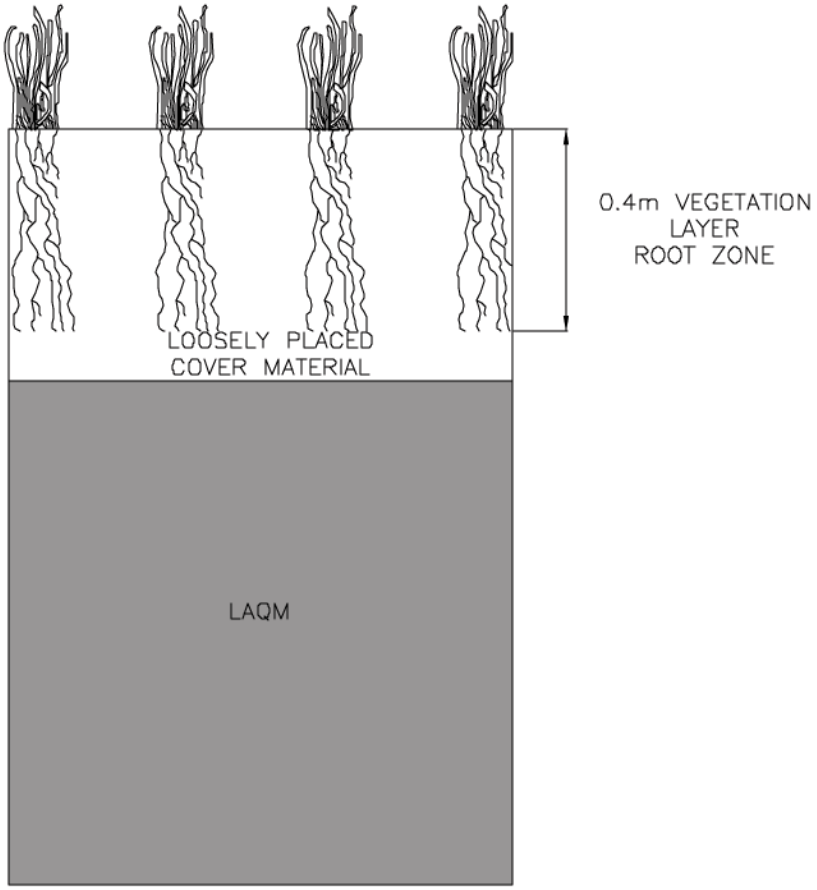
Heap Detoxification began on May 31, 2002

		14-Dec-01	19-Feb-02	14-Mar-02	1-May-02	23-May-02	12-Jun-02	25-Jun-02	3-Jul-02	31-Jul-02	27-Aug-02	4-Sep-02	27-Sep-02	31-Oct-02	29-Dec-02	30-Jan-03	30-Apr-03	15-May-03	16-Jun-03	24-Jun-03	18-Jul-03	29-Aug-03	29-Sep-03
General Parameters																							
Conductivity	umhos/cm	2940	3170	3090	2720	3012							3630										
Total Dissolved Solids	ppm	2326	2430	2460	2290	2624							2680				2480						
Hardness CaCO3	ppm	405.4	480.0	465	410	444							563				586						
pH		9.31	8.90	8.74	8.14	8.71	8.65	8.5	8.6				7.72		7.93	7.83	7.84						
Total Suspended Solids	ppm	<0.1	16.00	1	33	1							2				9						
Dissolved Anions																							
Alkalinity-Total CaCO3	ppm	82.5	13.9	40.2	41.1	42.8							55.5				50.2						
Chloride Cl	ppm	51.7	42.6	40.6	37	41.5							43.3				39.1						
Sulphate SO4	ppm	539	499	507	439	484							488				483						
Nutrients																							
Ammonia Nitrogen N	ppm	17.8	14.3	10	10.3	10.7	9.70	8.0	7.1	3.1	3.6	3.0	1.4	0.58	0.1	0.08	1.3	1.9	0.98	0.49	0.16	0.19	0.06
Nitrate Nitrogen N	ppm	263	274	292	276	307	305	318	315	345	333	346	360					465		443	438	464	342
Nitrite Nitrogen N	ppm	12.0	7.2	6.16	3.6	4.8							5.8										
Cyanides																							
Free Cyanide CN	ppm	4.60	0.11	< 0.10	<0.10	<0.10	<0.10	<.10	<.10	<.10	<.10	<.10	<.10										
Total Cyanide CN	ppm	6.95	1.94	1.6	1.21	1.09	1.02	0.87		0.85	0.77	0.84	0.89		0.825	0.954			0.694	0.712	0.46	0.43	0.685
Cyanate CNO	ppm	5.80																					
Thiocyanate SCN	ppm	3.60	1.07	0.67	0.5	0.58																	
WAD Cyanide CN	ppm	5.11	1.35	1.09	0.3	0.41	0.38	0.20	0.15	0.31	0.32	0.24	0.21	0.17	0.119	0.36		0.376	0.316	0.168	0.05	0.123	0.106
Total Metals																							
Aluminum T-Al	ppm	<0.2	< 0.05	0.16	1.64	0.14	0.65						0.037										
Antimony T-Sb	ppm	0.80	0.8	0.7	0.3	0.58	0.64						0.62										
Arsenic T-As	ppm	1.00	0.79	0.78	0.42	0.62	0.72	0.68	0.56	0.55	0.44	0.46	0.42	0.40	0.34	0.36	0.39	0.44	0.389	0.365	0.43	0.39	0.42
Barium T-Ba	ppm	0.090	0.083	0.085	0.17	0.08	0.10						0.12										
Beryllium T-Be	ppm	<0.005	< 0.003	< 0.003	<0.003	<0.003	<.001						< 0.001										
Bismuth T-Bi	ppm	<0.2				<0.001	<.001						< 0.001										
Boron T-B	ppm	<0.1	< 0.01	< 0.01	0.010	<0.01	<.05						< 0.05										
Cadmium T-Cd	ppm	<0.01	< 0.025	< 0.025	<.025	<0.025	<.0002						< 0.0002										
Calcium T-Ca	ppm	139.0	177.0	184	153	183	167.29						260										
Chromium T-Cr	ppm	<0.01	< 0.03	< 0.03	<.03	<0.03	0.001						< 0.001										
Cobalt T-Co	ppm	1.25	1.16	1.15	0.96	1.09	1.12						1.15										
Copper T-Cu	ppm	0.36	0.14	0.11	0.06	0.035	0.14						0.005	0.005	0.003	0.004	0.004						
Iron T-Fe	ppm	0.13	0.11	0.06	1.42	0.49	0.44						0.92										
Lead T-Pb	ppm	<0.05	< 0.03	0.11	<.03	<0.03	<.001						< 0.001										
Lithium T-Li	ppm	0.010				0.002	0.01						0.003										
Magnesium T-Mg	ppm	7.8	9.1	9.48	9.31	10.3	9.19						16.2										
Manganese T-Mn	ppm	0.023	0.035	0.04	0.076	0.18	0.07						0.48										
Mercury T-Hg	ppm	0.029	0.011	0.014	0.0055	0.0059	0.013	0.0044	0.0024	0.001	0.0017	0.0015	0.0012	0.00057	0.00023	0.0002	0.00072	0.0026	0.002	0.00161	0.0022	0.00099	0.00024
Molybdenum T-Mo	ppm	0.14	0.07	0.05	0.06	0.05	0.07						0.048										
Nickel T-Ni	ppm	0.32	0.16	0.13	0.14	0.1	0.17						0.041										
Phosphorus T-P	ppm	<0.3	< 0.4	< 0.4	<.4	0.16	0.16						0.43										
Potassium T-K	ppm	6.0	3.7	5.3	51.5	5.4	14.38						6.24										
Selenium T-Se	ppm	0.20	0.191	0.191	0.162	0.175	0.18	0.209	0.18	0.20	0.17	0.17	0.18	0.19	0.17	0.18	0.14	0.19	0.184	0.19	0.2	0.22	0.16
Silicon T-Si	ppm	2.23	4.2	4.1	9.1	4.13	4.73						4.06										
Silver T-Ag	ppm	<0.01	< 0.03	< 0.03	<.03	<0.03	0.0001						< 0.0001										
Sodium T-Na	ppm	455.0	434	371	338	442	408.00						40.8										
Strontium T-Sr	ppm	0.722	0.72	0.82	1.69	0.95	0.98						1.28										
Thallium T-Tl	ppm	<0.2				<0.0001	<0.0002						< 0.001										
Tin T-Sn	ppm	<0.03	< 0.03	< 0.03	0.03	<0.001	<0.001						< 0.001										
Titanium T-Ti	ppm	<0.01	< 0.006	< 0.006	0.054	<0.001	<0.001						< 0.001										
Vanadium T-V	ppm	<0.03	< 0.01	< 0.01	<.01	0.002	0.001						< 0.001										
Zinc T-Zn	ppm	0.209	< 0.005	0.007	<.005	0.02	0.04						0.037										

5.4.2.3 Heap Cover and Revegetation

The construction of a soil cover followed by revegetation of the detoxified heap is the third component of the overall heap closure process. The *September 2001 Decommissioning and Reclamation Plan, Volume II* outlined the design details for the engineered heap soil cover. In 2003, the heap leach pad was recontoured, 80,000 m^3 of growth media applied and the area revegetated. A current as-built of the leach pad that shows the final reclaimed heap as of October 2003 is included in Figure 5-4. The objective of the cover is to reduce the infiltration of precipitation runoff into the heap so that the volume of effluent requiring further passive secondary treatment and/or release to the environment is likewise reduced. Secondly the growth media provides an environment for successful revegetation.

Viceroy retained the services of BGC Engineering to design a soil cover using the known quantities of argillite, sediments and growth media on the leach pad or immediately adjacent to the leach pad. A copy of the BGC Engineering Design Report was previously submitted (*September 2001 Decommissioning and Reclamation Plan, Volume II, Appendix H)*. Approximately 80,000 m^3 of growth media was hauled and placed on the leach pad over the period of June – August 2003. The growth media was uniformly spread over the entire surface of the heap and resulted in an average thickness of 0.25 meters. This represents all of the available growth media stored adjacent to the heap. All other sources of growth media were utilized in other areas of mine reclamation.



.2m 0 .2m .4m .6m

SCALE: 1 : 15

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SCALE:	AS SHOWN	DESIGNED:	RJW
DATE:	JULY 2002	CHECKED:	
DRAWN:	GEJ	APPROVED:	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
Vancouver, BC Phone: (604) 684 5900

PROJECT: BREWERY CREEK MINE

TITLE: FINAL LEACH PAD SURFACE WITH COVER

CLIENT:	PROJECT No.	DWG. No.	REV.
VICEROY MINERALS CORPORATION	0270-001-02	FIGURE 5-2	0

5.4.2.4 Heap Cover Performance

The BGC design for the soil cover over the heap estimates an annual infiltration rate of 24%. The majority of the infiltration will occur in the spring and early summer months (April – June) and gradually decreases into the winter months. All of the secondary contingency measures and long-term release volumes have been estimated using a 30% infiltration factor. This provides additional conservatism in the long-term heap management program.

Effluent discharging from the leach pad will be monitored for flow and other chemical constituents. The flow monitoring will provide confirmation of the long-term release volumes and infiltration rates which can then be used to assess the performance of the soil cover.

5.4.2.5 Heap Revegetation

The company requested its Revegetation specialist to recommend a seed mix that would enhance water uptake and thereby reduce overall infiltration rates. The modified seed mix recommended for the leach pad is summarized below:

- 50% Violet Wheatgrass
- 20% Kentucky Bluegrass
- 20% Red Fescue
- 10% Alfalfa

The heap was revegetated in October 2003. Based on the recommendation of the company's Revegetation specialist, the application rate on the heap was increased to 75 kg/ha. The fertilizer application rate was 300 kg/ha. Heap revegetation will be monitored as part of the long-term monitoring and maintenance program.

5.4.3 Secondary Contingency Processes

The fourth component of the heap detoxification process is the inclusion of various contingency measures in the event the primary detoxification process (in-situ reduction) is not stable in the long-term. An adaptive management plan will be used to monitor the physical and chemical stability of the leach pad. Should effluent discharge monitoring or other physical monitoring (effluent volumes and infiltration rate) indicate that solutions emanating from the heap are not

meeting performance standards, then detailed plans for contingency measures will be developed, submitted to the YWB and the contingency implemented. The Brewery Creek Mine has or will implement the following contingency measures:

1. Heap Cell Monitoring Program
2. Heap Cell Solution Segregation
3. Lined Process Ponds
4. Effluent Treatment and Land Application
5. Biological Treatment Cell (BTC)
6. Pumpback Solution to the Heap
7. Intensive Evaporation

Each of these contingency measures is briefly described in the following sections.

5.4.3.1 Heap Cell Monitoring Program

A heap cell monitoring program is proposed as a response measure to identify the area of the heap that is exceeding the performance criteria. For example, if water discharge standards are not being met, a single parameter (As, Se) from a single cell within the heap may be the only barrier from meeting the performance criteria.

5.4.3.2 Heap Cell Solution Segregation

The current heap piping network allows segregation of each of the 7 cells and the drainage from one cell can be redirected and isolated from the drainage of the remaining cells. This contingency measure greatly reduces the amount of solution that could potentially require management and provides additional contingency through reduced solution volumes requiring secondary treatment.

5.4.3.3 Lined Process Ponds

The 3 lined process ponds, with a total capacity of 150,000 m^3, are valuable resources that provide significant storage capacity until the long-term heap detoxification standard is achieved. The pregnant pond will serve as the buffer and receiving pond for heap effluent. Any suspended solids in the heap effluent will be settled in the pregnant pond. The pregnant pond

will also serve as a buffering pond for the BTC. Once direct surface water discharge quality is achieved, the pregnant pond can be directly released into Laura Creek. Once long-term passive release of effluent solution has been met, the liners will be removed from the ponds and the side slopes will be scarified and revegetated. The ponds will remain in place however and will serve as long-term settling and collection ponds for heap effluent until monitoring indicates chemical stability of heap effluent.

5.4.3.4 Effluent Treatment and Land Application

The land application system is a contingency measure that can be implemented if the direct surface water standard is not met. If Criteria 1 effluent discharge standards are not being met, the effluent treatment portion of the system can be used to meet Criteria 1, followed by land application. If Criteria 1 is met but direct surface water discharge is not, the land application portion of the system can continue to be used. The land application system was constructed in July 2002 and has successfully operated for 2 seasons. It should be noted that the land application area has a finite capacity of 400,000 m^3 for treatment and metals attenuation and is considered an active care system.

5.4.3.5 Biological Treatment Cell (BTC)

The BTC has been offered as a contingency treatment system that can be implemented if effluent solution is not meeting direct release criteria. In this regard, the BTC will be built if the effluent solution has not met direct surface water discharge standards. The BTC is an anaerobic biological system that reduces parameters of concern within a lined containment system. Substantial testwork has been completed to demonstrate the effectiveness of a BTC as a secondary contingency treatment system and is reported in the *2001 Decommissioning and Reclamation Plan, Volumes II & IV*.

As noted earlier, an adaptive management plan (AMP) was prepared for the leach pad should a contingency system be required (Appendix G). Based on leach pad physical and chemical monitoring performance, the AMP would be implemented should the heap not met expected performance standards. The AMP would include engineering design details for the BTC. All of the design requirements will be adequately assessed by a professional engineer and the requisite detailed design drawings will be completed prior to actual construction. These design details will be submitted to the YWB prior to construction. Conceptual design details for the

BTC were reported in the *2001 Decommissioning and Reclamation Plan, Volumes IV, Attachment 9.*

5.4.3.6 Pumpback Solution to the Heap

A contingency measure previously proposed is the ability to pumpback effluent from the ponds to the heap. It is recognized that this contingency measure does not release solution but rather it provides temporary "storage" capacity and volume in much the same fashion as additional process pond capacity. As part of this contingency measure, a sprinkler system will be re-established over the surface of the reclaimed heap to provide immediate pumpback capabilities from the process ponds.

5.4.3.7 Intensive Evaporation

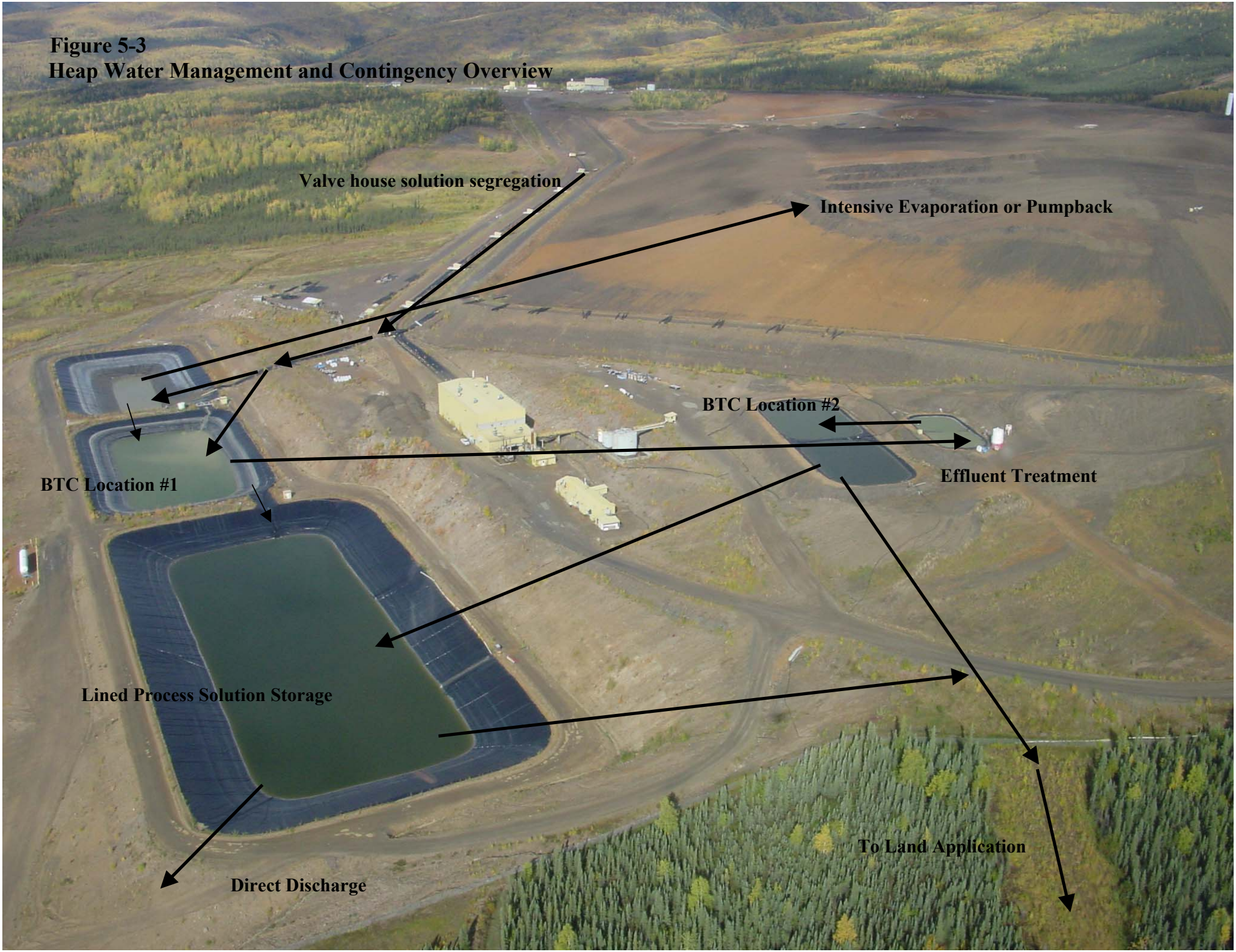
The use of intensive evaporation is provided as a contingency measure. Although it is recognized that evaporation does not improve water quality conditions from the heap, it does eliminate water that might require secondary treatment and release. The process facility has the capability of evaporating 100% of the expected annual heap drainage volume (based on 30% infiltration) after the heap has been revegetated.

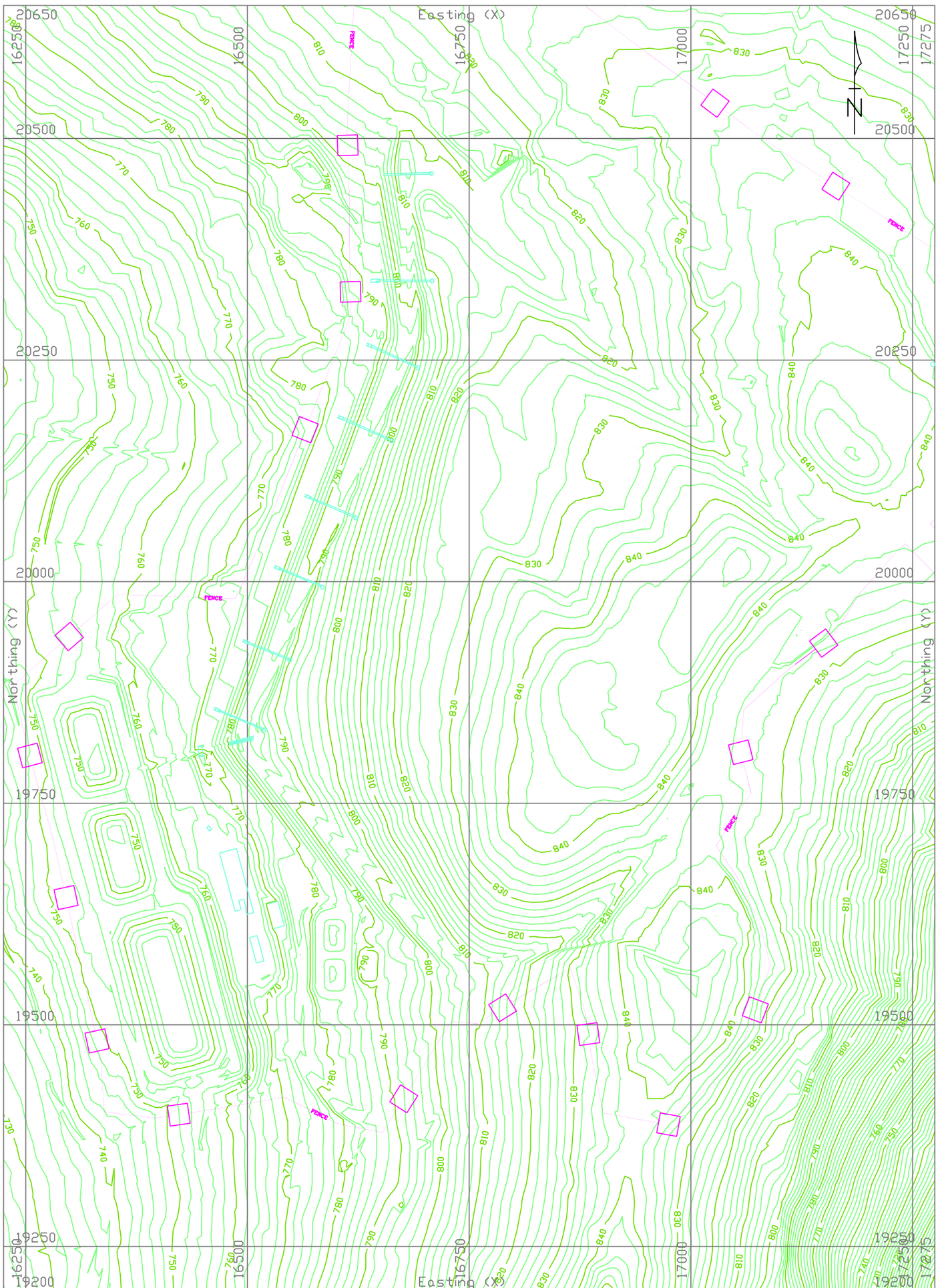
All of the above contingency measures will be left in place until it has been demonstrated that the heap effluent is stable in the long-term. A flow diagram for the water management of the heap including all of the contingency measures is included as Figure 5-3.

5.4.3.8 Heap Drilling Program

The detoxified heap was drilled and sampled in September 2003. A total of 41 holes were drilled across the heap on a uniform grid pattern. The leach pad sampling grid was presented in the *2001 Decommissioning and Reclamation Plan, Volume IV, Attachment 6.* Both composite and individual samples were collected. The heap solids testing program is focused on demonstrating the elimination of the driving force for instability of metals. The single cause of soluble metals emanating from the Brewery Creek heap is the free reactive cyanide. Therefore a procedure that tests for the occurrence of free cyanide “hot spots” will be conducted. The determination of successful heap detoxification will be based around both effluent water quality and responses to potential heap instability.

Figure 5-3
Heap Water Management and Contingency Overview





Legend	REVISIONS NO	DATE	MADE BY	DESCRIPTION
Heap contours represent ROM resloped surface	1			
	2			
	3			
	4			
	5			
	DATE	DRAWN BY	CHECKED	APPROVED
	11/07/03	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Leach Pad & Adjacent Areas
Development to End of 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:4000	Figure 5-4

e:\B_C\asbuilts2003\lp_asb2003.dwg

5.4.4 Long-Term Heap Effluent Treatment and Release

The final step or phase in the closure process for the heap is the long-term release of heap effluent solution. There are essentially two pathways for release of heap effluent solution. The first is through land application if the heap effluent does not meet direct surface water discharge standards. The land application system is already in-place and demonstrated. The land application system however has a finite release volume of 400,000 m^3 and was not permitted as a long-term passive release system. It is viewed as a long-term contingency measure. The second release mechanism is direct release into surface waters. Long-term release of heap effluent was the original approach assessed for Brewery Creek and continues to be the proposed long-term solution management approach. The surface water discharge criteria in QZ96-007 were inadvertently removed from the licence during the approval of the land application amendment. Reinstatement of these standards is an important component of the Brewery Creek closure planning process and is presently being considered by the YWB as part of licence amendment application QZ03-060. The company is requesting adoption of a site-specific selenium criteria for inclusion in the direct surface discharge standards.

5.4.4.1 Site Specific Selenium Criteria

A *Site Specific Selenium Report* was submitted to YG and to the YWB as part of the CSR and licence amendment application QZ03-060. The report was an addendum to the DRP and was submitted in February 2003. As such, the site specific selenium criteria for effluent discharge from process waters and for local receiving waters received a positive assessment and determination in the CSR. Specific details on the selenium criteria can be found in the DRP addendum report. The company is proposing a site-specific selenium criteria of 0.25 mg/l (end of pipe) be adopted. This is based on an in-stream selenium criteria of 0.0038 mg/l compared to the current CCME guideline of 0.001 mg/l. CCME guidelines recognize and accept site-specific criteria above the guidelines.

Baseline information was collected during late summer 2003 from the Laura Creek wetland. A new monitoring station was established and data collected on wetland water quality, stream sediments, benthos, vegetation, macrophytes and phyphton. Baseline fish tissue analysis has already been completed in 2001.

5.4.4.2 Long-Term Release Summary

The long-term release of solution from the heap consists of direct release into surface waters with land application and other contingency measures available in the event direct release standards are not achieved or maintained.

The following table summarizes the leach pad release standards for closure of the Brewery Creek Mine.

Table 5-4 Compliance Standards for Effluent Treatment and Land Application

PARAMETER	LAND APPLICATION	DIRECT RELEASE TO LAURA CREEK
pH	6.0 – 9.0	6.0 – 9.0
WAD CN	0.25	0.25
Total CN	2.0	2.0
Ammonia as N	15.0	5.0
Copper	0.5	0.5
Arsenic	0.5	0.5
Antimony	1.0	1.0
Mercury	0.005	0.005
Zinc	0.5	0.5
Selenium	0.75	0.25
Lead	0.2	0.2
Aluminum	1.0	1.0
Bismuth	0.5	0.5
Cadmium	0.1	0.1
Chromium	0.5	0.5
Iron	1.0	1.0
Manganese	2.0	2.0
Molybdenum	0.5	0.5
Nickel	0.8	0.5
Silver	0.1	0.1

In addition to the standards above, nitrate will be analyzed for both land application and direct surface water release. A monitoring and follow-up program will be implemented to ensure that the conclusions arising from the site specific selenium report prove accurate. This includes monitoring in receiving waters for water quality, benthic invertebrates and fish. An AMP with triggers for action will be developed should the site specific criteria be observed to contribute to unforeseen selenium levels in Laura Creek and the South Klondike River.

6.0 BUILDINGS AND INFRASTRUCTURE

6.1 PROJECTED DEVELOPMENT TO END OF MINE LIFE

The removal and reclamation of the ancillary and support facilities remaining at the Brewery Creek Mine is discussed in this section.

6.1.1 Buildings

The following section provides a description of the buildings and structures that make up the Brewery Creek mine site. The description has been separated into the mine yard and the Adsorption-Desorption Recovery (ADR) plant site.

6.1.1.1 Mine Yard

The following structures are located in the area commonly referred to as the mine yard (see DRP Volume III, Drawing J4-2 in Appendix J4) that is located inside the main entrance gate at the terminus of the site access road:

- The warehouse and maintenance shop building with an adjacent vehicle wash pad
- The mine operations and engineering building – **Sold and off site at end of 2001**
- The administration building – **Sold and off site at end of 2001**
- The environmental trailer – **Sold and off site at end of 2001**
- The surface shop building
- The accommodation camp buildings – **Sold and off site at end of 2001**
- The exploration office and core shack facility

Each of the remaining site facilities is briefly described in the following sections.

6.1.1.2 Warehouse and Maintenance Shop Building

The warehouse and maintenance shop building measures approximately 52.4 m by 15.8 m and contains 3 heavy equipment maintenance bays and a warehouse on the lower level with office space for maintenance employees on the upper level. The building is a steel frame building with steel cladding on both walls and roof. A 20-tonne overhead crane is used to service heavy equipment inside the maintenance bays. The floor of the maintenance shop building is a concrete slab on grade, with a concrete apron in front of the maintenance bay doors. A 19.2-m by 11.6-m bermed concrete pad constructed on the east side of the maintenance shop serves as a vehicle wash pad.

6.1.1.3 Surface Shop

The surface shop is an Atco style steel frame foldaway building with steel clad walls and roof. The building is approximately 12.2 m by 9.1 m installed on a concrete floor. Directly to the west of the surface shop is a 455 m^3 (100,000-imp. gallon) steel water tank. The surface shop will be used during post closure monitoring and maintenance activities and dismantled when no longer required.

6.1.1.4 Exploration Office and Core Shack

The exploration office and core shack facility is a wood frame and truss building with approximate dimensions of 9.8-m by 12.5-m. This facility contains offices for the exploration staff, and facility to log core. Adjacent to the core shack facility are two shipping containers with a metal roof constructed over the trailers. This 12.2-m by 7.6-m facility is used to store exploration equipment and samples.

6.1.1.5 ADR Plant Site

The following structures are located in the area commonly referred to as the Adsorption-Desorption Recovery ("ADR") Plant Site.

- The ADR plant building
- The assay lab
- The valve houses

The entire mine yard, heap leach pad, ADR plant and solution pond area is surrounded by a 1.8- m high-galvanized steel mesh fence.

6.1.1.6 ADR Plant

The recovery plant for the Brewery Creek Project is a carbon ADR facility located adjacent to the process ponds. The ADR plant building is an engineered steel frame building with approximate dimensions of 70-m by 21-m. The wall and roof panels are conventional steel cladding with internal insulation. The building floor is a conventional floating slab concrete floor with concrete foundations under the major equipment and tankage. The ADR building also houses the power plant and used oil incinerator.

6.1.1.7 Assay Lab

The assay lab building is located immediately to the southeast of the ADR plant and is a pre-engineered steel frame building, approximately 29.3-m long by 8.5-m wide. The building walls and roof panels are conventional steel sheeting. The building is constructed on a floating concrete slab foundation.

6.1.1.8 Valve Houses

There are seven modular valve houses installed at the base of the heap leach along the west containment dike. Each of the seven heap leach cells is equipped with a modular valve house. These modular units are constructed on steel I beams with concrete foundations. Each valve house measures approximately 3.4 m by 3.7 m. Each valve house contains the heap effluent discharge piping along with the valving for the LDRS system.

6.1.1.9 Lime Silo

There is a 100-tonne lime storage silo located at the northeast corner of the heap leach pad area (northwest corner of future Cell 10 for the heap leach pad). This storage silo is a pre-engineered bolted steel silo approximately 36-m high.

6.1.2 Power Supply Facilities

Power for the Brewery Creek mine site is supplied by two Cummings 1100-kW diesel fired generators housed in the ADR plant building. Electrical power generated by these units powers the entire mine site including administration, maintenance and camp facilities. A smaller 230 kw generator is installed for long-term requirements once solution recirculation has ceased. This generator will remain in-place for operation of the contingency measures.

6.1.3 Water Supply Facilities

The mine draws its freshwater from one of two sources: Laura Creek or groundwater well BC-23. The major components of the system are:

- The Laura Creek pump house, containing a 13.6 m^3 (3000 imperial gallon) holding tank, and two 150 HP electric centrifugal pumps. The pump house is a 6.1-m by 8.2-m wood building constructed on a concrete foundation and floor slab;
- 1.6 km of buried 150 mm pipeline from the Laura Creek pump house to the freshwater storage tank;
- A submersible pump installed in groundwater well BC-23. The well is contained within a 3.2-m by 2.6-m well pump house of wood construction with a concrete foundation and floor slab;
- A 637 m^3 (140,000 imperial gallon) steel storage tank, located approximately 300-m east of the ADR plant.

6.1.4 Fuel and Reagent Storage Facilities

6.1.4.1 Mine Yard Area

A bermed fuel tank area exists directly east of the surface maintenance shop/warehouse building. The concrete containment berm measures 14.9 m by 25 m and contains a 396 m^3 (87,400 imperial gallon ["ig"]) tank for diesel, a 37.4 m^3 (8,300 ig) tank for gasoline and a 22.5 m^3 (5,000 ig) tank for used oil.

Directly east of this fuel tank area is a 22.6 m by 17.7m lined and bermed area which houses all petroleum products (pails, drums and cubes) and any special waste generated on site. Glycol in 1,000 litre cubes, hydraulic tractor fluid in 1,200 litre cubes, and oil in 1,200 litre cubes are stored in this area.

A 67.5 m^3 (15,000 ig) propane tank is located on a 17.1 m by 3.1 m concrete slab behind the administration building.

6.1.4.2 ADR Plant Area

The ADR plant fuel tank area is located behind the plant and lab, and is a bermed concrete area 28.6-m by 13.1-m that contains a 486 m^3 (108,000 ig) tank for the collection of used oil, as well as a 743 m^3 (165,200 ig) diesel tank and a 25.2 m^3 (5,600 ig) tank to contain antiscalant. Directly above the fuel tank is a fuel off loading building located on a 2.4-m by 3.4-m concrete pad. A 67.6 m^3 (15,000 ig) propane tank is located south of the ponds. The tank sits on concrete pedestals. Within the ADR building are two 4.5 m^3 (1,000 ig) tanks for diesel, and one 4.5 m^3 (1,000 ig) tank for used oil.

6.1.5 Waste Storage and Disposal

The mine yard has one septic system (permits #536 and #1493) that contains two sewage holding tanks (27 m^3 (6,000 ig) and a secondary 4.5 m^3 [1,000 ig]) which feed into an 18-m by 40-m absorption bed. A septic system located northwest of the ADR plant is utilized by the ADR plant and the assay lab.

6.1.6 Reclamation Standards

Reclamation standards have been developed in conjunction with YG Energy Mines and Resources. The specific reclamation standards pertaining to the site facilities is summarized in the following sections.

Buildings and Infrastructure

Objective: Removal of all structures and re-establishment of vegetation mat. Removal of all hazardous material

General Standards:

1. Structures removed
2. Waste from dismantling is removed from the site and reused or stored in an authorized waste disposal site
3. All buried support infrastructures (tanks, pipes, underground services, etc.) should be removed or decommissioned in a safe, acceptable manner. All buried infrastructure remaining will be identified on site closure maps.
4. All non-toxic waste may be disposed of in an approved waste disposal site. The location and contents of disposal sites will be identified and recorded
5. All hazardous material is removed from the site.
6. In all areas where fuel and chemicals were stored and handled at the site, the soil has been tested for contaminants, and treated if required
7. Mining equipment, ore processing equipment, and heavy machinery has been removed from the site
8. After being emptied, decommissioned septic tanks are either removed or completely filled with gravel, sand, earth or inert material
9. Foundations covered with self sustaining vegetation
10. Contaminated soils dealt with
11. The rehabilitation of all petroleum products sites used for storage of fuels and lubrication shall comply with Handling of Fuel Products
12. No hazardous materials remaining on site

7.0 POST CLOSURE MONITORING AND MAINTENANCE

The following section describes how the Brewery Creek site will be operated once the final closure is complete and the long-term effluent treatment, discharge and monitoring systems have been established. During this post closure period the mine will continue to discharge through direct surface water via precipitation runoff that passes through the waste rock storage sites, pits and ultimately from the heap itself. Consequently the Brewery Creek Mine will require a Water Use Licence during the subsequent period following the permanent cessation of production mining and final closure of the associated facilities. The primary purpose during the post closure period will be monitoring and maintaining as required, various aspects of the site decommissioning and reclamation to ensure that closure objectives are being met.

7.1 SITE MANAGEMENT DURING POST-CLOSURE

7.1.1 Organisational Structure

Environmental monitoring during the post-closure phase will transition from a site based environmental person to a contract position on an as needed basis. The amount of environmental monitoring (frequency and quantity) is expected to decline once closure of the heap has been accomplished and the draindown solutions treated. Environmental monitoring during the post-closure period will decrease commiserate with the amount of activity until this becomes a seasonal part-time monitoring position. Once reclamation of the heap has been completed and the long-term effluent treatment and release systems are established, environmental monitoring is expected to diminish to the point where it can be achieved by periodic visits to the site.

7.1.2 Security and Access

The heap leach and processing facilities at the Brewery Creek Mine site are presently fenced to protect wildlife from inadvertently coming into contact with the process solutions.

Entry onto the Brewery Creek mine site is controlled by a locked gate installed across the main access road into the mine. This system will be continued through the post closure period. Company or contract personnel will continue to have access to the site for monitoring or maintenance requirements.

The existing wildlife protection fencing system will be removed once detoxification of the final heap draindown solution is complete and the long-term effluent release systems established. At that point the majority of site infrastructure will have been removed and the only remaining activity will be ongoing site monitoring and maintenance of the completed reclamation work.

7.1.3 Environmental Management System

An environmental management system (EMS) is a defined "system" or process of measuring and documenting compliance with environmental standards and for seeking continuous improvement at a facility such as the Brewery Creek Mine. An environmental management system utilizes training, environmental monitoring, audits, inspections and other tools to measure and manage actual environmental performance against established written standards.

The Brewery Creek operation employs such tools in working to maintain and improve environmental performance. This program will be continued into the post closure period of the mine life. Several of the key components of the environmental management system are presented in the following sub-sections.

7.1.4 Inspections and Monitoring

The environmental management system currently in place at the Brewery Creek Mine employs several types of scheduled periodic inspections to ensure that the facility is meeting environmental performance objectives and complying with appropriate regulatory standards:

- Periodic inspections of key components of the mine site to monitor environmental performance;
- Scheduled water quality and biological sampling and inspection tours of the local receiving water streams;
- Scheduled environmental tours of the workplace to look for environmental hazards and assess waste management activities;
- Scheduled groundwater sampling using piezometers and wells; and
- Annual inspections by a qualified geotechnical engineer of waste rock storage areas, the heap leach and associated retention dikes and the heap leach process solution ponds for physical stability.

With the exception of the last item, these programmed inspections are conducted by the site based environmental personnel. The geotechnical inspections are carried out during the summer months when the surface and sides of the various rock fill structures are not obscured by snow. It is anticipated that the number and frequency of inspection tours will diminish once the heap leach has been fully decommissioned.

The environmental monitoring program proposed for the 15 years of the post closure monitoring and maintenance period is summarized in Table 7-1. The monitoring program presented in Table 7-1 is based on 3 periods of monitoring: post closure years 1-5; years 6-10 and years 11-15. Table 7-1 lists the monitoring station locations, the types of monitoring requirements at each station (surface water quality, groundwater quality, effluent, stream sediments, benthic invertebrates and physical monitoring), and monitoring frequency. Table 7-2 outlines the monitoring parameters for the types of monitoring to be conducted at each station location. .

The location of sampling stations is summarized in Figure 7-1. The results of the post closure monitoring program will be assessed on an ongoing basis to determine if any negative trends in water quality or other biological or physical parameters are occurring. If the results indicate that there are no negative environmental impacts, then the frequency schedule and length of post closure monitoring and maintenance would continue as proposed. Adaptive management plans will be put in place to respond to any negative trends observed through the post closure monitoring.

7.1.5 Adaptive Management Plans (AMP)

An AMP is a component of the company's EMS and a management tool designed to provide a response to unforeseen or contingency events. There are a number of contingency measures that the company has proposed as part of the DRP. These include contingency plans for the leach pad effluent, as described previously, and the Blue WRSA. An AMP will be used as a framework to guide the assessment of the reclamation measures and its effectiveness and a mechanism for the orderly implementation of responses. This framework encompassing active company management as part of the EMS would include:

- Routine inspection, and environmental monitoring and maintenance of reclamation components;
- routine assessment of monitoring and performance data;
- triggers and thresholds for appropriate levels of responses that could be implemented; and planned contingency measures, including engineering designs where appropriate;
- An AMP has been developed for the leach pad and is included in Appendix G;
- An AMP will be developed for the Blue WRSA, if required; and
- An AMP for lower Laura Creek site specific selenium monitoring will be developed and submitted to the YWB.

It is expected that the water and quartz mining licences will specify performance standards and objectives for assessing reclamation success at the mine site. Proposed performance standards and objectives for the mine are included in Appendix F. Active inspection and environmental monitoring will be conducted to ensure reclamation success. Performance standards or objectives that are exceeded would trigger development of an AMP including submission of contingency plans and designs as appropriate.

7.1.6 Study Plans

The company is presently undertaking a number of on site studies to further refine reclamation design parameters, and track reclamation measure performance and effects. These studies include:

- Additional geochemical sampling and follow-up test work at the Blue WRSA (Appendix B) to assess the long-term geochemical characteristics of waste rock. The sampling program was completed in October 2003 under the direction of a professional geologist. Laboratory testwork is presently underway at BC Research. The results from the follow-up test work will be presented when available;
- Test results from heap solids drilling and analyses of free CN and metals to assess heap detoxification. A final detoxification report will be compiled;
- Monitoring of the infiltration test cover in the Blue WRSA to assess cover performance; and
- Monitoring in the Laura Creek wetlands to assess effects to water and aquatic resources resulting from direct discharge from the leach pad.

The company will assess study results and use the information to assess reclamation performance and the need for the possible development of AMP's.

7.2 REPORTING

During the post-closure period, it is expected that reporting on all environmental monitoring and management issues at the Brewery Creek Mine site will continue to be directed to the YWB and YG in accordance with the requirements of the Water Use Licence, Quartz Mining Licence, land tenure permits, leases and other operating permits and approvals. It is expected that quarterly and annual reporting will continue until it can be demonstrated through the monitoring results that the reclamation objectives have been achieved.

Viceroy will also continue to liaise with the regulatory agencies, Dawson First Nation and the local community on environmental issues relating to the decommissioning and reclamation of the Brewery Creek Mine site.

7.3 LONG TERM MAINTENANCE

Provisions for maintenance of reclamation tasks such as erosion control and maintenance seeding have been included as part of the long-term closure requirements. Based on physical inspections and monitoring, maintenance works will be planned for and conducted as required to meet closure performance standards and objectives.

Table 7-1
Viceroy Minerals Corporation
Brewery Creek Mine
Post Closure Monitoring Schedule

Frequency Description

Q	Quarterly
SA	Semi-annual
A	Annual
QWA	Quarterly when active
AWA	Annual when active
BA	Bi annual
NLA	No longer active

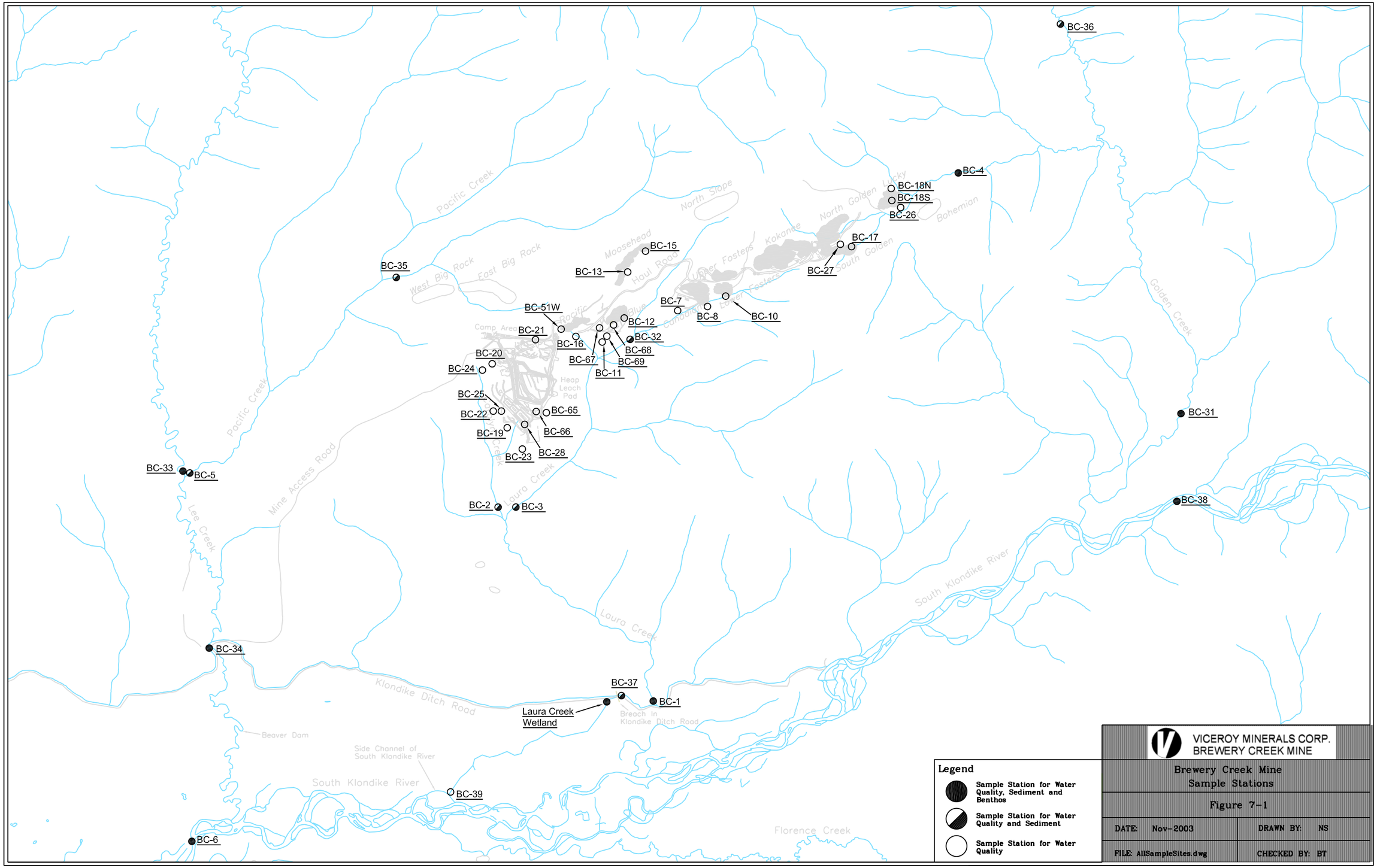
		UTM LOCATION (m) ZONE 7		TYPE/STATION ID					YEAR 1-5 FREQUENCY						YEAR 6-10 FREQUENCY						YEAR 11-15 FREQUENCY					
SITE	DESCRIPTION	Northing	Easting	Surface Water	Groundwater	Effluent	Sediment	Benthos	Surface Water	Groundwater	Effluent	Sediment	Benthos	Other	Surface Water	Groundwater	Effluent	Sediment	Benthos	Other	Surface Water	Groundwater	Effluent	Sediment	Benthos	Other
BC-01	Laura Ck., 50 m u/s from Ditch Road	7,099,630	634,420	BC-01			W5	B3	Q			A	BA		SA						A					
BC-02	Carolyn Ck. u/s from Laura Ck.	7,101,970	633,250	BC-02			W15		Q			A			SA						A					
BC-03	Laura Ck. above Carolyn Ck.	7,102,570	632,345	BC-03			W4B		Q			A			SA						A					
BC-04	Lucky Ck. d/s from Lucky Pit	7,107,640	639,180	BC-04			W13	B7	Q			A	BA		SA						A					
BC-05	Pacific Ck. u/s from confl. with Lee Ck.	7,103,130	627,610	BC-05			W11		Q			A			SA						A					
BC-06	South Klondike d/s from confl. with Lee Ck.	7,097,460	627,400	BC-06			W9	B5	Q			A	BA		SA						A					
BC-07	Canadian Waste Dump	7,105,520	634,890			BC-07					NLA						NLA						NLA			
BC-08	Canadian Pit and Dump	7,105,610	635,350			BC-08					NLA						NLA						NLA			
BC-09	Fosters Pit and Dump (Upper)					BC-09					Q						SA						A			
BC-10	Kokanee Pit and Dump	7,105,760	635,620			BC-10					Q						SA						A			
BC-11	Blue Waste Dump	7,105,050	633,740			BC-11					Q						SA						A			
BC-12	Blue Pit	7,105,420	634,090			BC-12					Q						SA						A			
BC-13	Moosehead West Waste Dump	7,106,120	634,150			BC-13					Q						SA						A			
BC-14	Moosehead East Waste Dump					BC-14					Q						SA						A			
BC-15	Moosehead Pit discharge	7,106,430	634,420			BC-15					Q						SA						A			
BC-16	Pacific Gulch - 300m above Laura	7,105,140	633,350	BC-16					Q						SA						A					
BC-17	Golden Pit and Dump	7,106,510	637,560			BC-17					Q						SA						A			
BC-18S	Lucky Pit and Dump - south end	7,107,220	638,180			BC-18S					Q						SA						A			
BC-18N	Lucky Pit and Dump - north end	7,107,410	638,160			BC-18N					Q						SA						A			
BC-19	Piezometer RC94-843	7,103,750	632,290		BC-19					Q						SA						A				
BC-20	Piezometer RC94-844	7,104,710	632,070		BC-20					Q						SA						A				
BC-21	Piezometer RC95-1354	7,105,070	632,740		BC-21					Q						SA						A				
BC-22	Piezometer RC95-1357	7,104,000	632,066		BC-22					Q						SA						A				
BC-23	Piezometer RC95-1370	7,103,410	632,500		BC-23					Q						SA						A				
BC-24	Piezometer RC95-1400	7,104,630	631,920		BC-24					Q						SA						A				
BC-25	Piezometer RC96-1608	7,104,000	632,215		BC-25					Q						SA						A				
BC-26	Piezometer RC97-2024	7,107,120	638,320		BC-26					Q						SA						A				
BC-27	Piezometer RC97-2026	7,106,550	637,380		BC-27					Q						SA						A				
BC-28	Effluent solution to land application area	7,103,800	632,540			BC-28					MWA						MWA						MWA			
BC-31	Golden Ck. above confl. with South Klondike	7,104,030	642,340	BC-31			W2	B2	A			A	BA													
BC-32	Laura Ck. below exploration camp	7,105,100	634,170	BC-32			W3		A			A														
BC-33	Lee Ck. above Pacific Ck.	7,103,240	627,420	BC-33			W6A	B6	A			A	BA													
BC-34	Lee Ck. at Ditch Road	7,100,380	627,710	BC-34			W7	B1	A			A	BA													
BC-35	Pacific Ck. NW of W. Big Rock	7,106,010	630,650	BC-35			W14		A			A														
BC-36	Golden Ck. above confl. with Lucky Ck.	7,109,860	640,500	BC-36			W16		A			A														
BC-37	Laura Ck. at Ditch Road	7,099,700	633,960	BC-37			W5A		A			A														
BC-38	South Klondike u/s from confl. with Golden Ck.	7,102,670	642,250	BC-38			W8	B4	A			A	BA													
BC-39	Lower Laura Ck., 90 m u/s confluence with S. Klondike	7,098,230	631,340	BC-39					Q						SA						A					
BC-51W	Pacific Pit - west side	7,105,240	633,130			BC-51W					Q						SA						A			
BC-60	Land Application Soil Sample Sites											AWA						AWA						AWA		
BC-65	Land Application Piezometer	7,102,140	633,990							QWA						QWA						QWA				
BC-66	Land Applicaion Piezemeter	7,100,660	634,710							QWA						QWA						QWA				
BC-67	Blue WRSA Piezometer	7,105,280	633,710							Q						A						A				
BC-68	Blue WRSA Piezometer	7,105,310	633,920							Q						A						A				
BC-69	Blue WRSA Piezometer	7,105,150	633,820							Q						A						A				
	Geotechnical Inspections													A												
	Revegetation Monitoring													A						BA						
	Cover Monitoring													A						BA						

Table 7-2
Viceroy Minerals Corporation
Brewery Creek Mine

Monitoring Parameters

Monitoring Type	pH	TSS	SO4-	NH3	NO4	T CN	WAD CN	33-Element ICP T Metals	33-Element ICP D Metals	TOC	LOI	Sieve Analysis
Surface Water	x	x	x	x	x	x	x	x	x[1]			
Groundwater	x	x	x	x	x	x	x		x			
Effluent	x	x	x	x	x			x				
Sediments								x		x	x	x
Benthos								x				
Land Application Lysimeters	x			x	x	x	x	x				

Note: Dissolved ICP metals for station BC-8 only



Legend

- Sample Station for Water Quality, Sediment and Benthos
- Sample Station for Water Quality and Sediment
- Sample Station for Water Quality

VICEROY MINERALS CORP.
BREWERY CREEK MINE

Brewery Creek Mine
Sample Stations

Figure 7-1

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8.0 ESTIMATE OF DECOMMISSIONING AND RECLAMATION COSTS

The present Water Licence outlines the security provisions for the Brewery Creek Mine. This includes posting security in the amount of $8,060,000. Viceroy and the YG have negotiated a Reclamation Security Release Agreement (RSRA) as a means of ensuring that security posted under the water licence for reclamation can be returned to the company. As part of this agreement, the company had an independent engineering assessment of the present outstanding closure liability and associated reclamation costs. This assessment was completed in September 2003 and incorporates reclamation works that the company has completed on the site over the past number of years.

The results of this assessment are provided in Appendix E and are used to support the company's licence amendment request for reducing the required licensed security for reclamation.

9.0 CLOSURE PERFORMANCE STANDARDS AND OBJECTIVES

9.1 GENERAL APPROACH

This section describes the closure performance standards and objectives and design criteria that will be used to ensure that decommissioning and reclamation measures, as outlined in the DRP, meet the overall closure objectives for the Brewery Creek Mine. These standards and objectives will ensure that:

- Measurable performance standards are set to ensure that closure measures are successfully implemented;
- Mine reclamation component performance can be monitored and performance tracked;
- Maintenance measures or contingency plans can be implemented if reclamation component performance is not achieved;
- Both the company, regulatory agencies and the public will know when closure measures have been successfully implemented and are functioning in the long term as intended; and
- The company will know when its reclamation liability obligations have been fulfilled.

As discussed in the previous sections, overall closure plan objectives were established and measurable performance standards or criteria outlined to guide the implementation and performance of closure measures for various mine components. It is fully intended that measurable performance standards and objectives be established in key project authorizations (Water Use Licence and Quartz Mining Licence) to ensure that closure performance is achieved.

Table 9-1 presents a general overview of the measurable performance standards and objectives, along with monitoring or follow up programs for the various mine components scheduled for closure. The performance standards are presented in three categories: water/chemical stability, physical stability and revegetation. Monitoring and potential follow-up programs are also outlined where required. It should be noted that both the Water Use and Quartz Mining Licences already contain performance based standards and criteria and monitoring programs that the company has met during operation of the Brewery Creek Mine.

Many of these standards and monitoring programs will continue to be used during closure. Additional standards or objectives are specifically proposed for closure.

Appendix F describes the specific performance standards, criteria and objectives for each mine component, including the pits, WRSAs, stream crossing and water management structures, heap leach pad, infrastructure and buildings, haul roads and trails, and main access road.

Table 9-1 Brewery Creek Mine Performance Standards, Criteria and Objectives

Mine Component	Performance Standards & Objectives				
	Water / Chemical Stability	**Physical Stability**	**Revegetation**	**Monitoring**	**Follow Up Program**
Open Pits	• Existing/amended Water License Effluent Standards for direct discharge; • Receiving Water Quality Objectives – CCME Freshwater Aquatic Life Guidelines – South Klondike River (new).	• Engineering designs for open pits as presented in DRP; • Terrestrial Reclamation Standards for terrain stability and erosion control; exceptions noted in Figures 1-10 DRP, Volume IV, Attachment 1.	• Terrestrial reclamation standards for revegetation.	• Closure Monitor Program for effluent discharge and receiving waters (surface and groundwater water quality, sediment, benthos, flows); Routine physical and revegetation monitoring and geotechnical inspection.	• Review of YWB Annual Report. Assessment and maintenance if required.
Waste Rock Storage Areas (WRSA)	• Existing/amended License Effluent Standards for direct discharge; • Receiving Water Quality Objectives – CCME Freshwater Aquatic Life Guidelines – South Klondike River (new).	• Engineering designs for WRSA; • WRSA Slopes 2.5H:1V; exceptions noted in Figures 1-10 DRP, Volume IV, Attachment 1; • Terrestrial Reclamation Standards for terrain stability and erosion control.	• Terrestrial reclamation standards for revegetation.	• Closure Monitor Program for effluent discharge and receiving waters (surface and groundwater water quality, sediment, benthos, flows); Routine physical and revegetation monitoring and geotechnical inspection.	• Review of YWB Annual Report. Assessment and maintenance if required.
Blue WRSA	• Further Geochemical Assessment and test program underway; • Groundwater Quality Objectives – Contaminated Sites Regulations - Aquatic Life (new).	• Cover Design – BGC Report (Appendix C). Design infiltration rate criteria at 19%; • Lysimeter construction- BGC Report (Appendix D).		• Geochemical Assessment Study; and lysimeter monitor program.	• Adaptive Management Plan (AMP) for Blue WRSA based on geochemical assessment, lysimeter monitoring, and closure monitoring program. Exceedances of water/chemical, physical stability criteria trigger development of AMP.
Stream Crossings & Diversion Ditches	• Existing/amended License Effluent Standards for direct discharge; • Receiving Water Quality Objectives – CCME Freshwater Aquatic Life Guidelines – South Klondike River (new).	• Engineering design criteria for diversions and stream crossings. DRP, Volume IV, Attachments 1 and 2 – CCL-BCM4; • Terrestrial Reclamation Standards for terrain stability and erosion control.	• Terrestrial reclamation standards for revegetation.	• Routine physical and revegetation monitoring and geotechnical inspection.	• YWB Annual Report. Assessment and maintenance if required.
Heap Leach Pad	• Existing/amended License Effluent Standards for direct discharge; • Existing Water License Land Application Standard for discharge to land; • Receiving Water Quality Objectives – CCME Freshwater Aquatic Life Guidelines – South Klondike River & lower Laura Creek (new); • Heap Solids Standard for Free CN (new).	• Engineering designs for heap cover - DRP, Volume IV, Att.13 and containment dyke breach & cell 7 GCL Liner, DRP, Volume IV, Attachment 5 (FS 1.3); • Design infiltration rate criteria net 24% average conditions; • Terrestrial Reclamation Standards for terrain stability and erosion control.	• Terrestrial reclamation standards for revegetation.	• Closure Monitor Program for effluent discharge and receiving waters (surface and groundwater water quality, sediment, benthos, flows); Routine physical and revegetation monitoring and geotechnical inspection; • Lower Laura Creek monitoring program for Se.	• AMP for heap (Appendix G); • AMP for Lower Laura Creek monitoring program for Se. Exceedances in site specific Se criteria at lower Laura Creek trigger implementation of AMP.
Infrastructure and Buildings	• Infrastructure and buildings removed – Not Applicable.	• Terrestrial Reclamation Standards for terrain stability and erosion control.	• Terrestrial reclamation standards for revegetation.	• Infrastructure and Buildings Removed – Not Applicable; • Physical Inspection.	• YWB Annual Report and assessment if required.
Haul Road and Trails	• See Stream Crossings.	• Engineering criteria, DRP, Volume I, Section 4.3.5.3; • Terrestrial Reclamation Standards for terrain stability and erosion control.	• Terrestrial reclamation standards for revegetation.	• Routine physical and revegetation monitoring.	• YWB Annual Report and assessment if required.
Main Access Road	• See Stream Crossings.	• Options for closure to be determined with community; • Physical inspection.	• Options for closure to be determined with community; • Physical inspection.	• Routine physical and revegetation monitoring.	• Not applicable.

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX A

FINAL RECLAMATION PLANS – MINING AREAS

Easting (X)

Northing (Y)

Pacific Pit

Blue Pit

N

MAP SCALE (METRIC)

0 10 20 40 60 80

METERS

REVISIONS	NO	DATE	MADE BY	DESCRIPTION
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11/06/03	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

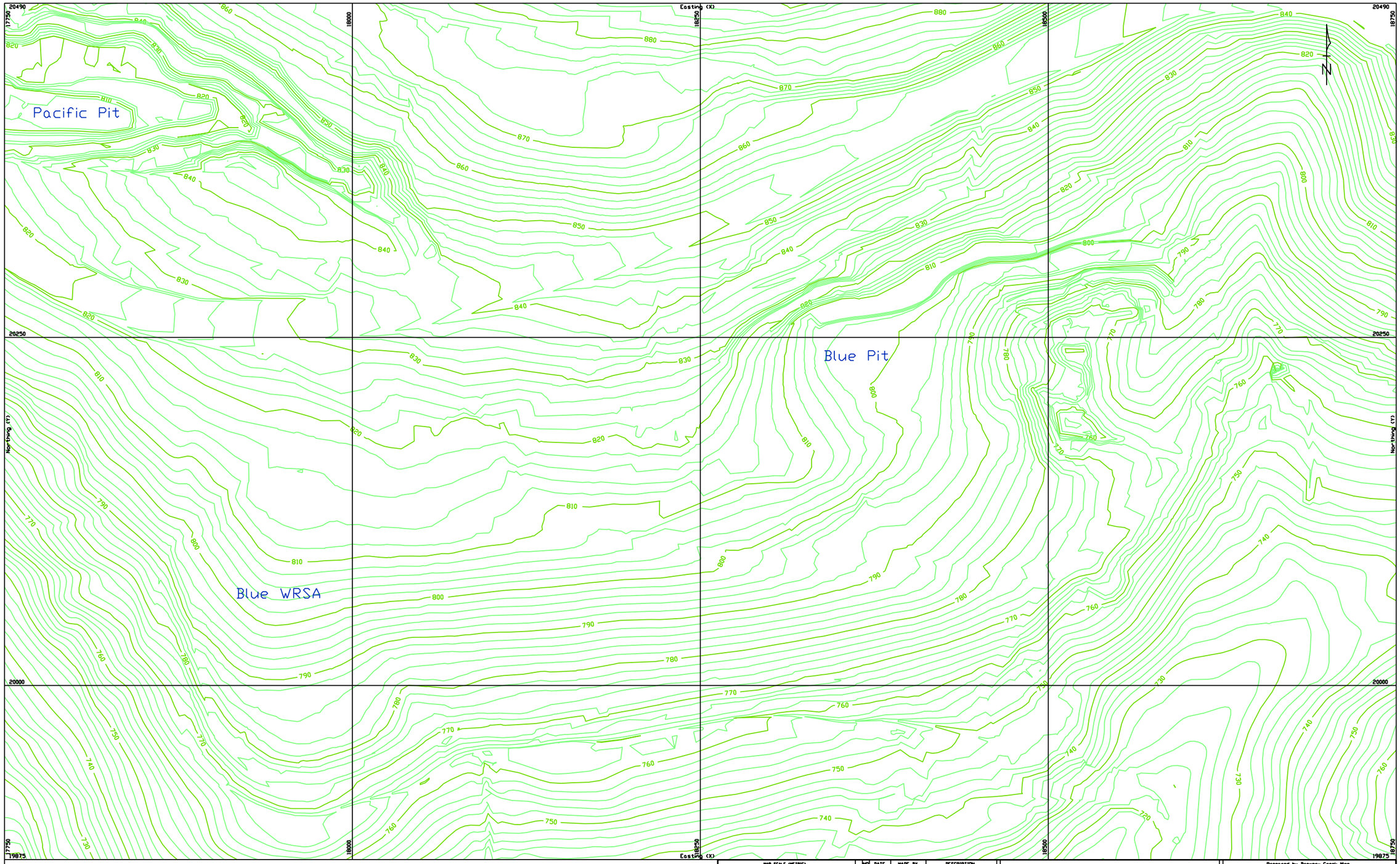
OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Pacific Pit & Adjacent Areas
Development to End 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
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MAP SCALE (METRIC)

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11/06/2003	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

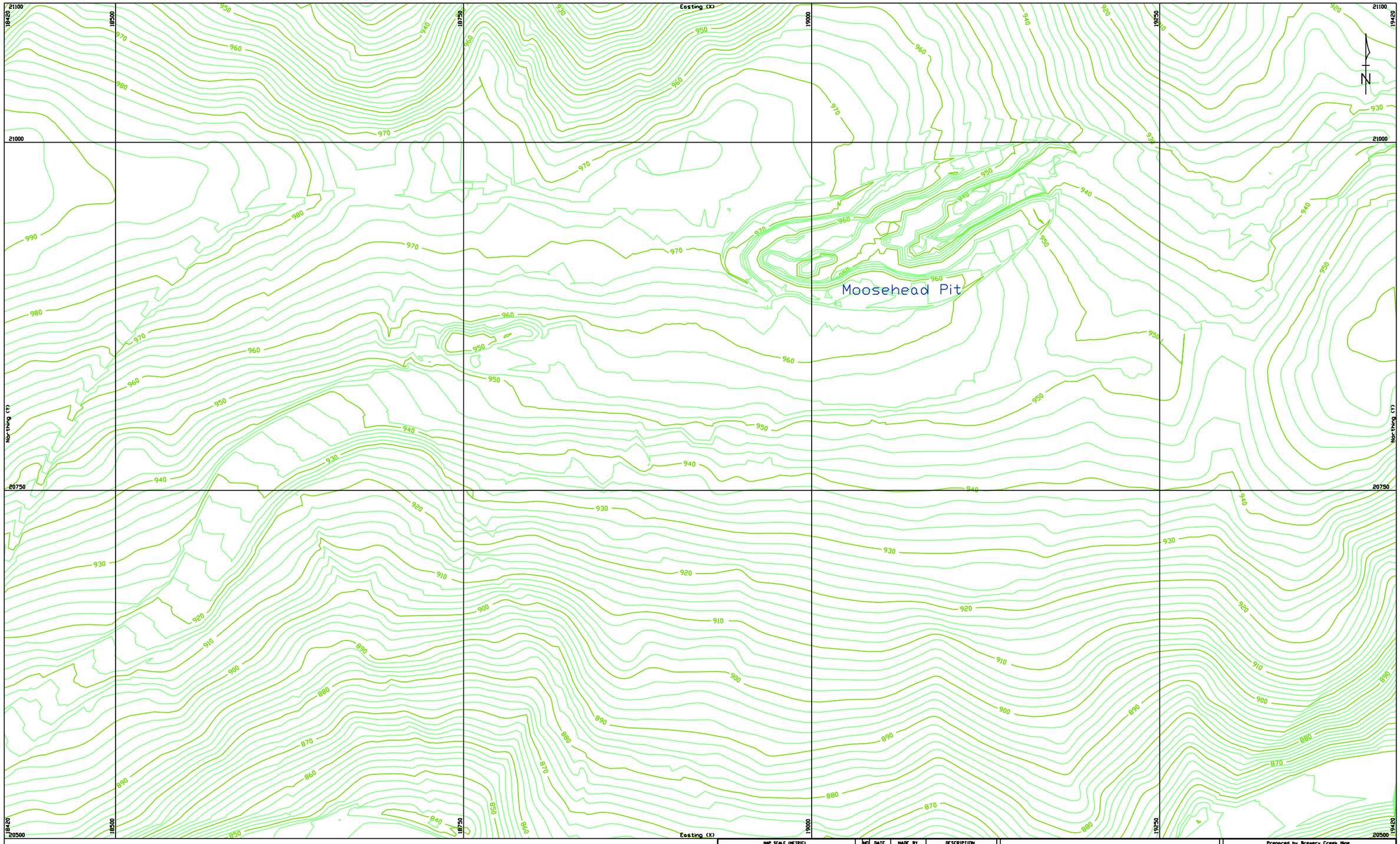
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Minesite	Engineering

Prepared by Brewery Creek Mine

Blue Pit & Adjacent Areas
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11/06/2003	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

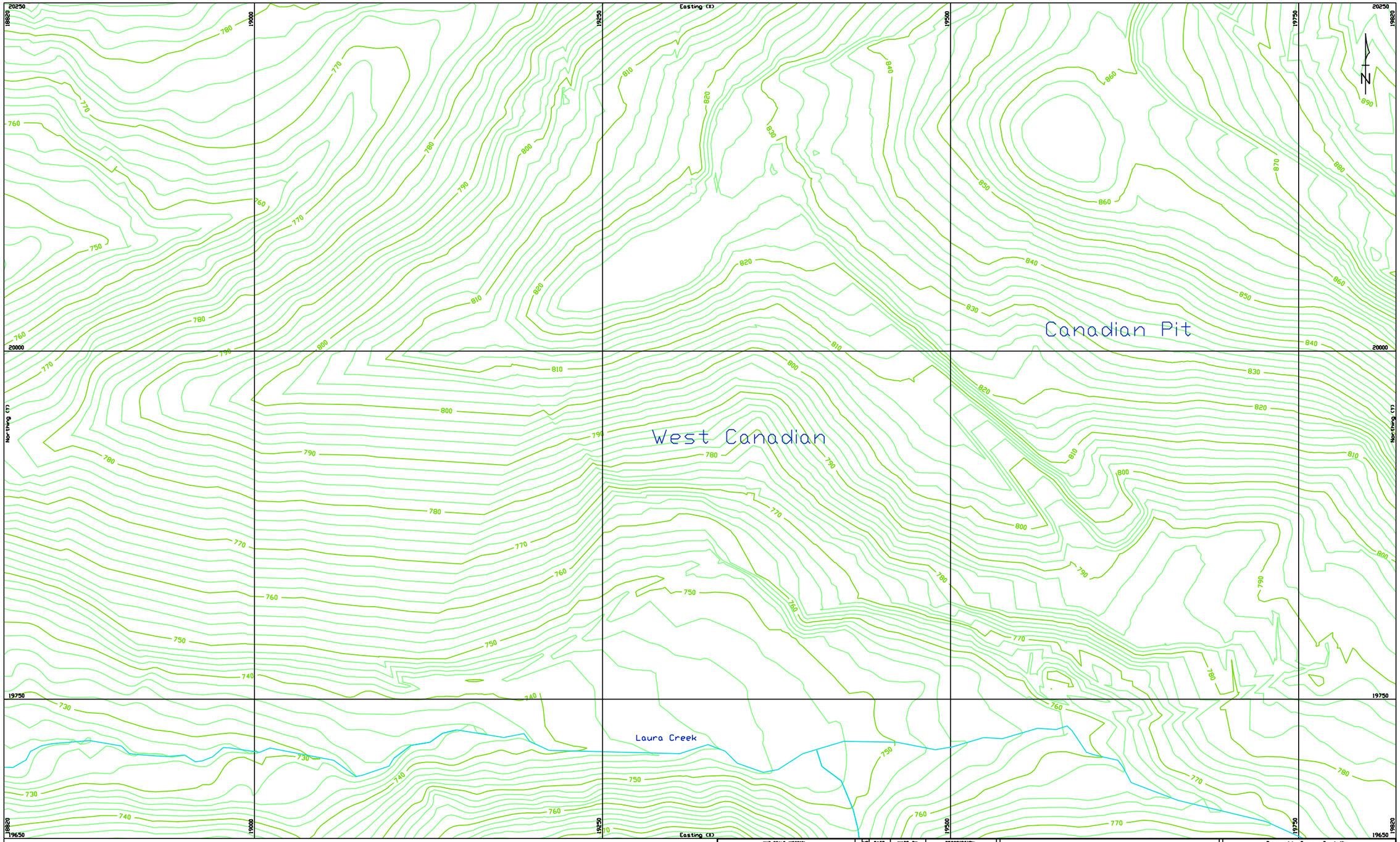
OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Moosehead Pit & Adjacent Areas
Development to End 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:2500	Appendix A - Figure 3

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Viceroy Minerals Corporation

Brewery Creek Mine

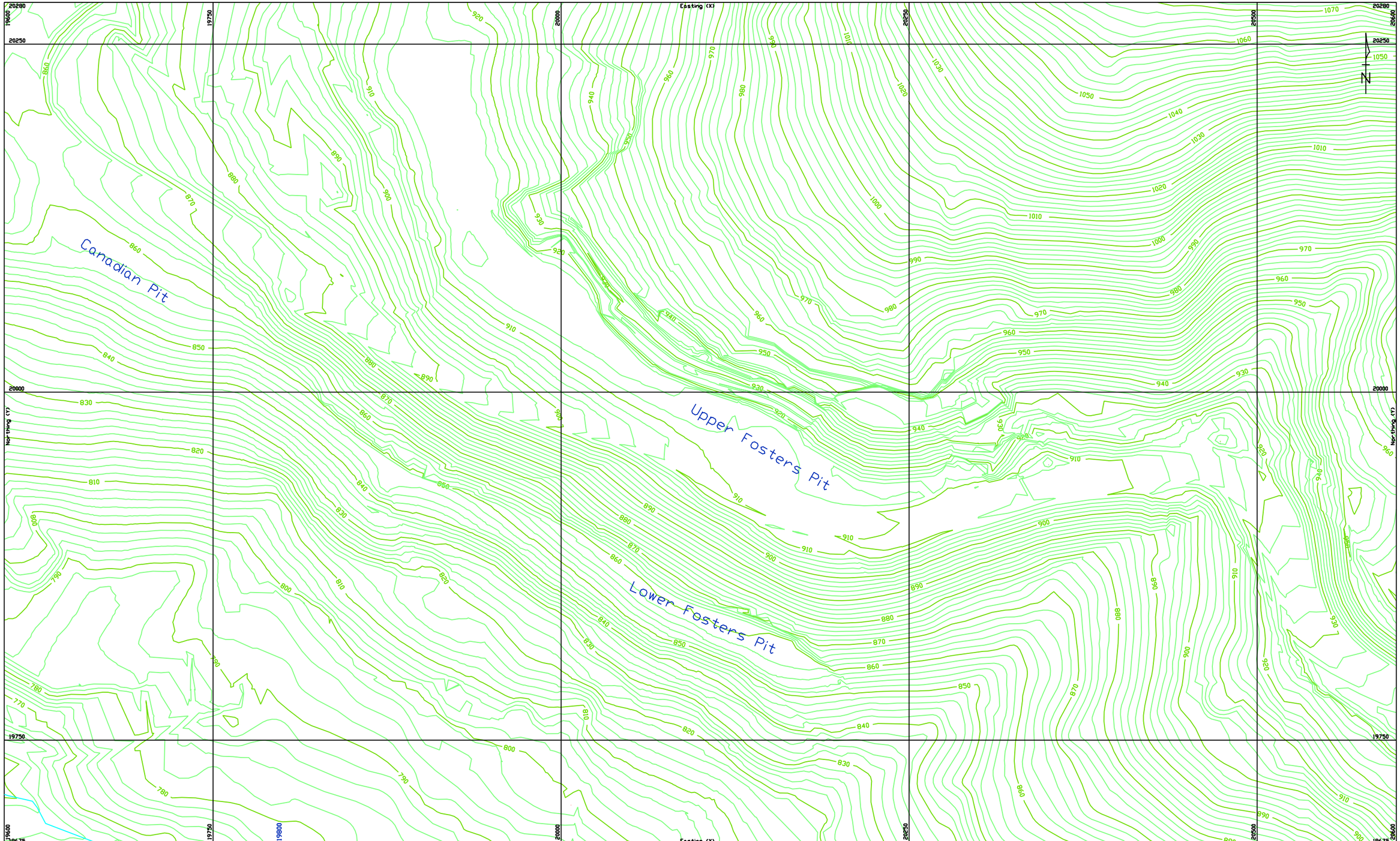
OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Canadian Pit & Adjacent Areas
Development to End of 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:2500	Appendix A - Figure 4

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11/05/03	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

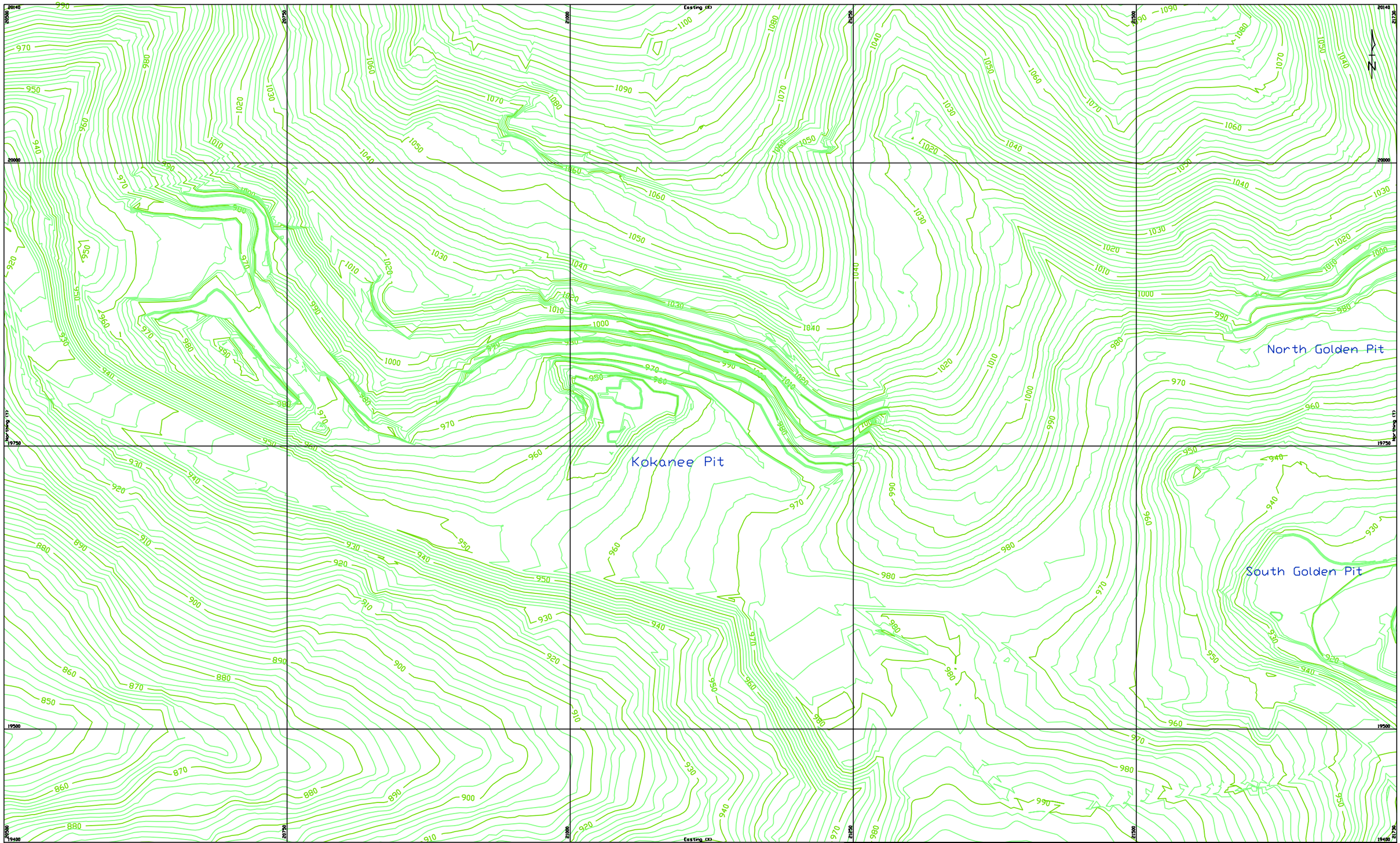
OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Upper and Lower Fosters Pits
Development to End of 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:2500	Appendix A - Figure 5

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11/05/2003	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Kokanee Pit and Adjacent Areas
Development to End 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:3000	Appendix A - Figure 6

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Kokanee Pit

North Golden Pit

South Golden Pit

Easting (X)

N

MAP SCALE (METRIC)

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METERS

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DATE	DRAWN BY	CHECKED	APPROVED
11/05/2003	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

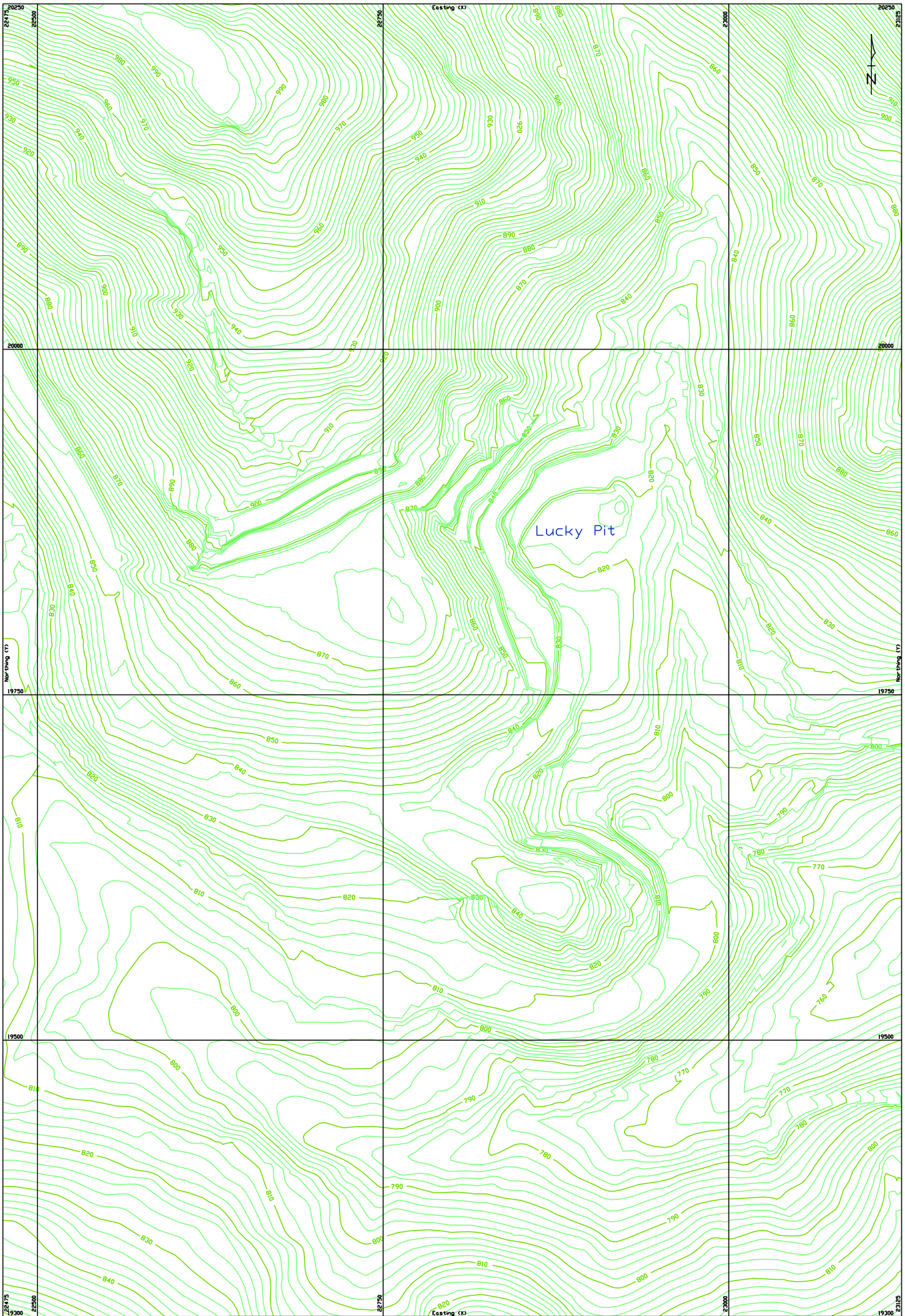
OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Golden Pit and Adjacent Areas
Development to End 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:3000	Appendix A - Figure 7

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MAP SCALE (METRIC)

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DATE	DRAWN BY	CHECKED	APPROVED
11/05/03	M. Caley	B. Thrall	B. Thrall

Viceroy Minerals Corporation

Brewery Creek Mine

OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Lucky Pit & Adjacent Areas
Development to End 2003

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-03	1:2500	Appendix A - Figure 8

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VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX B

GEOCHEMICAL ASSESSMENT
BLUE WASTE ROCK STORAGE AREA
BREWERY CREEK MINE

PREPARED BY SRK ENGINEERING CONSULTANTS

Viceroy Minerals Corporation

GEOCHEMICAL ASSESSMENT
BLUE WASTE ROCK STORAGE AREA
BREWERY CREEK MINE

Prepared for:

VICEROY MINERALS CORPORATION
Suite 900-570 Granville Street
Vancouver, BC V6C 3P1

Prepared by:



Project Reference Number:
SRK 1CV001.01

August 2003

1CV001.01

GEOCHEMICAL ASSESSMENT
BLUE WASTE ROCK STORAGE AREA
BREWERY CREEK MINE

Prepared for:

VICEROY MINERALS CORPORATION
Suite 900-570 Granville Street
Vancouver, British Columbia
V6C 3P1
CANADA

Prepared by:

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.
Suite 800, 1066 West Hastings St
Vancouver, B.C. V6E 3X2
Tel: (604) 681-4196 • Fax: (604) 687-5532
E-mail: vancouver@srk.com Web site: www.srk.com

AUGUST, 2003

SUMMARY

Viceroy Minerals Corporation (VMC) is in the process of decommissioning the Brewery Creek Mine. Gold ore was mined from several small pits resulting in construction of waste rock piles on the valley slopes above Laura Creek. Concerns have been raised by the regulatory agencies that water such as snowmelt and rainfall in contact with one of these piles containing approximately 1.1 million tonnes of waste rock (the Blue Waste Rock Storage Area, or Blue WRSA) could have an impact on water quality in Laura Creek. The main concern is acid rock drainage (ARD), a particular type of mine waste runoff that may carry high concentrations of metals. Being aware of this concern, VMC took a proactive approach and, in 2003, placed an engineered soil cover on the WRSA to limit infiltration into the waste rock and installed wells to monitor groundwater chemistry. In this context, this report describes an assessment of the chemical characteristics of the Blue WRSA and predictions of downstream water quality in Laura Creek and the South Klondike River.

Acid rock drainage results from weathering of mine wastes containing minerals of iron, sulphur and other potential contaminants such as arsenic, copper and zinc. Reaction of these minerals with oxygen and water in the atmosphere produces acidic water containing these elements. Often, other minerals (carbonates) are present that can naturally neutralize the acid and at the same time totally or partially remove the potential contaminants from the acid water. If the acid neutralizing minerals are present in sufficient quantities, ARD will never be observed. At lower quantities these minerals delay the appearance and reduce the severity of ARD. ARD varies significantly from site-to-site depending in the volume and reactivity of wastes and proximity to the receiving environment. The Blue WRSA is a very small facility with limited potential for impact when compared with much larger sites in the Yukon Territory such as the Faro Mine where waste rock volumes are one or two orders-of-magnitude greater and waste rock is considerably more reactive.

In the Blue WRSA, the minerals that are the source of ARD are present generally at low concentrations, along with low concentrations of the acid neutralizing minerals. In 2002, samples collected from ten test pits in the WRSA showed that nearly all the waste rock that would be expected to be acidic, was in fact already acidic. A small component of the waste rock contained acid neutralizing minerals that may be delaying the appearance of ARD.

These findings are important for the assessment of current and future risk of water quality effects. They demonstrate that the current conditions in the Blue WRSA are a good indication of future conditions, and therefore that the water quality in the future can be predicted using

sampling results obtained in 2002. The data indicate that the acidity of the waste rock will remain stable and not worsen significantly in the future. This is in sharp contrast with mine wastes that contain higher amounts of acid neutralizing minerals. At these mines, prediction of future conditions is more complicated and order-of-magnitude increases in metal and acid load may be observed in the future.

Modelling was used to show that the water currently moving inside the Blue WRSA has a range of possible characteristics. On balance the water may be acidic or alkaline. This indicated that two cases (acidic and non-acidic water from the WRSA) should be considered when evaluating the future effect on water quality in Laura Creek and South Klondike River. Current water quality of Laura Creek does not reflect any influence from the Blue WRSA because groundwater in contact with the WRSA is not yet likely to have reached Laura Creek.

Future water quality in Laura Creek and the South Klondike River was predicted in two steps. The first step considered what happens when water from the Blue WRSA mixes with groundwater before entering Laura Creek. Some chemical effects were expected because the groundwater can neutralize acid water from the Blue WRSA. These effects were estimated using a chemical model.

The second step evaluated mixing of groundwater from the area of the Blue WRSA with Laura Creek water. This calculation used a simple dilution assumption for three seasons of the year (winter low flow, spring high flow and summer moderate flow). The calculations showed that in spring and summer, the effect of the Blue WRSA was undetectable and that existing conditions exceed CCME water quality levels. For winter conditions, copper concentrations in Laura Creek were predicted to marginally exceed the CCME recommended levels for protection of the freshwater aquatic environment. Very marginally elevated arsenic and antimony concentrations were predicted. Mixing of Laura Creek with the South Klondike River produced no detectable effect on the South Klondike River at any time of the year.

The main conclusions from this assessment are that the Blue WRSA is a relatively small facility, is geochemically stable, and that water quality is not expected to worsen significantly in the future. Worst case chemistry predictions indicate that the South Klondike River will not be detectably impacted by water originating from the Blue WRSA. An engineered cover has been installed to reduce infiltration into the waste rock and wells have been installed to monitor groundwater downgradient of the WRSA. No further mitigation measures are warranted based on the results of this study. VMC has in place a monitoring program to assess infiltration into the WRSA and downgradient water quality.

1CV001.01

GEOCHEMICAL ASSESSMENT
BLUE WASTE ROCK STORAGE AREA
BREWERY CREEK MINE

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1CV001.01

GEOCHEMICAL ASSESSMENT
BLUE WASTE ROCK STORAGE AREA
BREWERY CREEK MINE

1.0 INTRODUCTION

1.1 Background

Viceroy Minerals Corporation (VMC) is in the process of decommissioning the Brewery Creek Mine, located 57 km east of Dawson City, Yukon Territory. Gold ore was mined from several small pits located along a sulphide mineralized trend in argillites, shales, greywackes and conglomerates of the Earn Group intruded by quartz monzonite. Most of the pits extracted oxide-type ores with low potential for acid generation due to the prior removal of sulphide minerals by natural weathering processes. The exception was the Blue Zone which occurred in partially oxidized graphitic shales containing sulphide minerals (primarily pyrite and arsenopyrite). Concerns have been raised by the regulatory agencies that approximately 1.1 million tonnes of waste rock generated from the Blue Zone is a current or potential source of acidic and/or metal-bearing water that could cause downstream impact to Laura Creek if not mitigated. On the advice of Dr. Ward Wilson (University of British Columbia), VMC pro-actively designed and has constructed a cover over the waste rock to reduce infiltration (BGC 2002). The cover was placed in 2003.

SRK Consulting was retained by VMC to:

- re-evaluate the available geochemical data for the Blue Waste Rock Storage Area (WRSA);
- estimate if the Blue WRSA could be a source of acid drainage; and
- predict the possible impacts of water originating from the Blue WRSA on Laura Creek at BC-1 and the South Klondike River at BC-6.

1.2 Available Information

Existing geochemical data was provided by VMC, and included:

- 2001 Decommissioning and Reclamation Plan – Appendix D Rock Geochemistry
- Blue Waste Rock Dump, 2002 Geochemical Investigation Program. Prepared by AMEC Earth and Environmental Limited (AMEC 2002).
- Seepage monitoring results for the Blue Pit and Blue Waste Rock Storage Area.

Regulatory correspondence and comments on the Blue WRSA were provided by Bill Slater (Government of Yukon Territory), and included:

- Letter dated January 17, 2003 from M.J. Brodie (Brodie Consulting) to Bud McAlpine (DIAND) regarding "Brewery Creek Mine - Review of Mine Decommissioning & Reclamation Plan"
- Letter dated January 31, 2003 from Benoit Godin (Environment Canada) to Derek Fraser (Environment Directorate) regarding "2001 Decommissioning and Reclamation Plan - Volume IV - Supplemental Plan Information"
- Brewery Creek Mine Reclamation Cost Estimate. Draft report prepared by Brodie Consulting for Yukon Government Water Resources Division, June 2002 (date uncertain).

SRK also received excerpts from Yukon Government Draft EAA Comprehensive Study Report dated July 28, 2003 from Dan Cornett (Access Mining Consultants Ltd).

1.3 Structure of this Report

This report is divided into two main sections:

- Section 2.0 describes the geochemical characteristics of the Blue Waste Rock Storage Area (Blue WRSA).
- Section 3.0 describes prediction of pore water chemistry for the Blue WRSA and the effects of mixing of the pore water with downgradient groundwater and surface water.

2.0 GEOCHEMICAL CHARACTERISTICS OF THE BLUE WRSA

2.1 Discussion of Geochemical Database Validity

The Appendix D report summarized results from 59 acid-base accounting (ABA) tests conducted between 1994 and 1998, 43 ABA tests on blast holes cuttings conducted in 1999, 32 shake flask tests, and 17 humidity cells.

AMEC (2002) provided results for acid-base accounting and shake flask tests conducted on 62 samples collected from ten test pits excavated in the Blue WRSA by Bruce Geotechnical Consultants in 2002 (BGC 2003). SRK's review of the geochemical data focused primarily on these data because they provide a direct indication of the current *in situ* geochemical characteristics of the waste rock as compared to the earlier static and kinetic tests that were conducted on drill core samples and pit wall chip samples.

Ten test pits, evenly distributed over the top surface of the WRSA, were excavated using a backhoe (Figure 1). Samples were collected from a maximum depth of 7 m. This was not the full thickness of the WRSA; however, sampling from the top surface would have resulted in collection of fine waste rock at the crest. Deeper rock would be expected to be coarser and have a lesser contribution to the overall reactivity. Based on SRK's experience elsewhere, the sampling program was suitable for a waste rock storage area of this size and range of geological and geochemical characteristics.

AMEC (2002) reported results for acid-base accounting and shake flask procedures. Sample preparation and analysis followed non-standard protocols which led to some limitations in the data. For example, the rock samples were crushed whole rather than sieved, and the shake flask tests involved a much shorter leaching time than generally used. These effects are discussed further in Sections 2.2 and 2.3, below. However, SRK believes that the data are useful, and that the procedures used do not fundamentally alter the overall conclusions and interpretation.

The kinetic testing provided useful supporting information on the onset of acid generation and the potential release of contaminants. However, a detailed re-interpretation of the kinetic test database to obtain release rates was not believed to be necessary.

2.2 Acid Generation Potential

Potential for acid generation is indicated by the relative amounts of acid potential (AP) and neutralization potential (NP). Actual acidity due to stored oxidation products is indicated by the pH of the samples.

Acid potential is usually calculated based on sulphide sulphur because the sulphate sulphur component of total sulphur is usually in the form of non-acidic sulphate minerals including, for example, barite and gypsum. In the case of oxidized rock, this assumption may not be correct because iron sulphates formed by oxidation of iron sulphide are a source of acidity when dissolved. Barite is present in the sedimentary host rocks at Brewery Creek and has not been evaluated by analysis of total barium but gypsum does not appear to be common at Brewery Creek. Acid-base accounting (ABA) on samples of waste rock confirmed that sulphur as sulphate concentrations are negatively correlated with pH of the rock (Figure 2(a)) showing that acid sulphate salts are present. Therefore, SRK has conservatively assumed that total sulphur represents AP though this may be an overestimation if barite or secondary gypsum is present.

Neutralization potential (NP) can be estimated based on total NP and carbonate. Total NP was typically much greater than carbonate NP (except at levels above about 10 kg $CaCO_3$/t) probably because the waste rock is clay-rich. Carbonate is probably a better indicator of neutralization potential. Carbonate NP was generally below 3 kg $CaCO_3$/t, and poorly correlated with pH (Figure 2(b)) except at higher carbonate NPs and paste pHs. These results indicate that neutralization potential is limited.

The paste pH of the samples followed a trimodal distribution. Approximately 13% of samples had pHs of less than 4.1, and 14% had pHs less than 5. The balance (73%) had pHs from 5 to 7.6. These results indicate that 27% of the 62 samples were already acidic at the time of sampling. The method of crushing samples prior to measuring pH may have resulted in slightly higher pHs than actually present due to exposure of acid neutralizing minerals inside particles by crushing. However, the three pH modes or categories are consistent with expected geochemical behaviour and therefore the overall proportions would not be expected to change if a different method for pH determination were to be used.

Figure 3 summarises estimates of initial potential for acid generation in terms of NP(Carbonate)/AP(Total Sulphur) and actual acidity (paste pH). Different colours show the range of sulphur concentrations. Shadows on symbols show samples with

carbonate NP exceeding 3 kg $CaCO_3$/t. The dashed line at NP/AP=2 indicates a generic criterion for acid generation potential. Several points are apparent:

- Samples with higher sulphur concentrations (square symbols), which are predicted to be acid generating have already become acidic (as shown by the lower paste pHs).
- Most samples with very low sulphur concentrations (diamond symbols) have NP/AP<2, negligible NP and higher pHs. These samples are not expected to generate significant acid due to the very low AP.
- The samples shown as triangles span sulphur concentrations from 0.08% to 0.34% and are expected to generate acid due to NP/AP less than 2 (except one sample). The pHs of the samples ranged from 4.2 to 6.9 indicating that some were already acidic while others may generate acid in the future. Only one of these samples had significant carbonate NP.

The finding that waste rock that is at most four years old has already progressed to the end point of weathering (ie stable long term high or low pH) is consistent with the humidity cell test results. The delay to the onset of acid generation (shown by low pH and elevated sulphate) in these tests was typically measured in weeks or months (Figure 4).

The results indicate that the majority of waste rock in the Blue WRSA has either already generated acid, or will not generate acid due to low AP. A small proportion (less than 10%) is not currently acidic but may generate acid in the future. The implication is that contaminant releases from waste rock could increase slightly in future but only by a factor of 30% (i.e. by about a third as much as is already acidic). The order-of-magnitude increases in contaminant release that can be observed at sites with much higher AP and NP materials are not likely to occur here.

The overall conclusion is that the waste rock is geochemically stable and that current conditions can be used to predict future behaviour.

2.3 Leachable Metals

Leachable metals were determined on crushed samples leached for 15 minutes (AMEC 2002). The leachates were analysed for a metal scan. The leaching duration

was brief compared to the typical 24 hour or more duration. However, crushing of the samples probably ensured that readily-soluble acid sulphate salts were available and easily dissolved. Furthermore, the short duration of leaching limited the reaction of the leachate with less soluble acid buffering components of the rock. Due to the high solubility of the acid sulphate salts, and the lack of significant buffering capacity, the test results are a useful indicator of soluble load.

Titratable acidity, sulphate concentration and pH of the leachates were not determined. In order to interpret the data, these parameters were estimated as follows:

- Titratable acidity was calculated from the leachable concentrations of aluminum and iron. These metals are typically the main source of acidity in these types of waters.

- Sulphate was conservatively estimated from the ion balance by assuming that it is the only anion. For acidic samples, this is a reasonable assumption though at higher pHs bicarbonate would also be present.

- Paste pH from the ABA tests was used to estimate pH of the leachates.

The leachate data were examined primarily to evaluate correlations with pH. The following relationships were found:

- Greater concentrations at lower pHs for Al, As, Cd, Co, Cu, Fe, Mn (weak), Ni Se (weak), U, Zn, Sulphate;
- Greater concentrations at higher pHs for As, Sb, Hg, Mo, K, Na, V; and
- No correlation with pH for Ca, Mg.

These observations are largely consistent with expected behaviour. The elements more mobile at lower pHs are those present as cations in solution (with a few exceptions). Concentrations of these elements can increase by orders of magnitude as the pH decreases from 4 to less than 3. Elements forming oxyanions are more mobile at higher pHs. The exceptions for this group are potassium and sodium. These elements are components of jarosite that is stable at low pHs, and are therefore less leachable at low pHs.

The strong correlation of metal concentrations for all critical parameters indicates that leachable metal load can be predicted using pH groups. Average metals loads (in mg/kg) were calculated for pH less than 4.1, between 4.1 and 5.0, and greater than 5. These groups correspond to the trimodal distribution of paste pHs.

3.0 WATER QUALITY PREDICTIONS

3.1 Overall Approach

The overall objective of geochemical modelling was to make estimates of the range of possible concentrations of regulated parameters in Laura Creek and the South Klondike River. Three steps were used to make these estimates:

1. The pore water chemistry within the waste rock was estimated.

2. The chemistry of groundwater moving toward Laura Creek was estimated.

3. Water quality at BC-1 (Laura Creek) and South Klondike River (BC-6) was estimated.

Methods and results for each step are provided in the following sections.

3.2 Estimate of Waste Rock Pore Water Chemistry

3.2.1 Methods

As was described in Section 2.2, it is believed that the water chemistry is primarily controlled by the presence of acidic oxidation products produced by weathering of the waste rock prior to disposal. As a drop of water moves through the waste rock, the oxidation products are dissolved, with concentrations in the water being determined by overall availability, the rate at which the secondary minerals can be dissolved, and the maximum possible concentration in solution (i.e. the chemical saturation limit). The conservative approach is to assume that all soluble load leached in a laboratory shake flask test can be dissolved under field conditions. In practice, a component of the "total" soluble load is unavailable under field conditions because the laboratory sample is artificially crushed and agitated for leaching. The rate and maximum solubility factors are less easily defined but are important because they influence the maximum realistic concentrations that can be observed in pore water. Two approaches

were used to obtain a range of water chemistries for subsequent evaluation of mixing with downgradient groundwater and surface water.

The first approach (Approach "A") used the assumption that accumulated weathering products in the waste rock represented four to five years of weathering. The annual accumulation can be estimated as roughly one fourth of the soluble load. Approach "A" assumes that all of the annual production of soluble contaminants is leached each year (i.e. a rough balance between generation and flushing). It was also assumed that all of the waste rock is flushed by infiltration. In practice, coarse components of the rock will not provide the same soluble load as the fine components, and flow paths may be expected to form resulting in some parts of the rock remaining unflushed. The pore water concentration was obtained by dividing the annual estimated load released by the annual infiltration predicted for the recently constructed cover (19% of total precipitation, BGC 2002).

The chemistry in pore water (C_i in mg/L) for a parameter i is estimated by:

$$C_i = (M.f.D).(m_s/t)/(A.P.I.1000)$$

Where:

- M = Mass of rock (kg)
- f = Fraction of rock flushed (100%)
- D = Maximum reactive fine particle size (100%)
- m_s = Total soluble load (mg/kg)
- t = Storage time (4 years)
- A = Area of WRSA (m^2)
- P = Total Precipitation (m per year)
- I = Infiltration into waste rock (19%)

The second approach (Approach "B") used a higher water volume to obtain lower water concentrations for comparison with Approach "A". It was assumed that the load was dissolved in the water volume represented by the volume of pores in the rock. It was also assumed that the fraction of rock flushed (f) was 50% and that 50% of the rock mass (D) provides the entire dissolved load (that is, 25% of the total rock mass contributes to water chemistry).

The chemistry in pore water (C_i in mg/L) for a parameter i is estimated by:

$$C_i = (M.f.D).(m_s)/\{(M/\rho).V_p.1000\}$$

Where

ρ = Density of rock (2000 kg/m^3)

V_p = Pore volume (30%)

The difference between these two estimates is roughly a factor of 25. Approach "A" yields concentrations that are roughly twenty-five times those of Approach "B". Approach "A" is "reasonable worst case".

The water chemistry obtained by these simple mass loading calculations was then evaluated using the aqueous chemical equilibrium speciation model MINTEQA2 (Allison et al 1991) to determine if the estimated concentrations would exceed the solubility of any common secondary minerals (for example, iron and aluminum sulphates and hydroxides, gypsum and malachite). If solubility controls were identified, MINTEQA2 was used to re-calculate the water chemistry assuming that these minerals would precipitate.

Concentrations were calculated using m_s for each pH group as describe in Sections 2.2 and 2.3. For the highest pH group, the input to MINTEQA2 assumed that dolomite was present in order to estimate alkalinity. The concentrations obtained were then weighted according to the proportions indicated by sampling (see Section 2.2). The final weighted concentrations were then input into MINTEQA2 to check for solubility constraints.

The resulting estimates of equilibrated concentrations were compared to monitoring data for seep BC-11 located 50 m from the toe of the waste rock dump (Figure 1), concentrations observed in laboratory tests and concentrations in pit wall seeps. These data provide an indication of actual achievable concentrations under field conditions, which are a factor of equilibrium mineral solubility and the rate of dissolution.

3.2.2 Results

Table 1 summarizes results of these calculations. The first three lines in the summary for Approaches "A" and "B" indicates the estimated pore water compositions for each pH group following MINTEQA2 adjustment for solubility constraints. For the lowest pH group, no solubility constraints were identified, and the indicated concentrations

are the raw mass weighted values. For the intermediate and high pH group, concentrations of iron, aluminum and sulphate decreased due to solubility constraints.

The final line in each of the approach summaries in Table 1 shows the estimated effect of mixing these waters in proportion to the distribution of paste pHs. For Approach "A", the estimated acidity was calculated to exceed the MINTEQA2-calculated alkalinity, therefore the pore water is predicted to be acidic with a pH of 3.9. For Approach "B", the estimated alkalinity was found to significantly exceed the estimated acidity. This implies that the pore water is non-acidic.

It is useful to compare the various estimated pore water concentrations with data from laboratory tests and field monitoring as shown as "Observed Maximum Concentrations" in Table 1. The estimated concentrations for "Approach A" acidic pore water are typically of the same order-of-magnitude as maximum concentrations in acidic waters from laboratory tests and pit wall seeps. This indicates that the calculated concentrations are reasonable based on actual data.

Data for seep BC-11 are also shown in Table 1. Although the pH of the mixed pore water estimate for Approach "B" is comparable to the seep at BC-11, BC-11 is otherwise considerably more dilute than the pore water estimate. It is unclear to what degree BC-11 reflects waste rock pore water and can therefore be used to calibrate the modeling results. Nitrate concentrations at BC-11 have increased from 12 to 41 mgN/L since monitoring began in 2000 which probably indicates increasing influence from the waste rock. Sulphate concentrations have remained relatively stable but are much lower than would be expected for the rock. It is concluded that BC-11 possibly indicates natural runoff with some effect of runoff from the WRSA.

In summary, Approaches "A" and "B" indicate that the chemistry of pore water in the waste rock dump ranges from acidic (probably worst case) to alkaline. These results were carried through subsequent calculations.

3.3 Chemistry of Groundwater Moving Toward Laura Creek

3.3.1 Methods

Monitoring wells BC-67, -68 and -69 in the vicinity of the Blue WRSA (Figure 1) indicated that groundwater is strongly alkaline due to contact with dolomite-bearing rocks (AMEC 2002). Mixing of the alkaline groundwater with water originating from

the waste rock dump was simulated using Geochemist's Workbench (GWB, Bethke 1998). This model uses the same general type of equilibrium calculation as MINTEQA2, but allows mixing of waters to be evaluated more easily. The two versions use slightly different thermodynamic databases, so results for individual parameters may not be identical. Also, GWB does not include antimony and cadmium as basis species, so only dilution of these elements could be simulated.

Mixing of pore water with natural groundwater was assumed to occur in a ratio of 1:5 which represents the approximate catchment areas of the Blue WRSA and other upgradient and downgradient land above Laura Creek in the vicinity of the Blue WRSA.

In the GWB runs, secondary precipitation was assumed to occur as the pore water mixed with groundwater. Precipitation was again only permitted for secondary minerals that can be reasonably expected to form under field conditions. These included:

- Aluminum hydroxide;
- Ferric hydroxide;
- Gypsum;
- Carbonates of calcium, copper and zinc;
- Manganese oxide; and
- Scorodite (ferric arsenate).

Most of the above are secondary minerals that are commonly observed at mine sites and can be expected to form in shallow groundwater. Scorodite was used in the modelling to represent the precipitation of ferric arsenates. Scorodite is the most soluble of the ferric arsenate type minerals, and arsenic concentrations calculated using this method are likely to be highly conservative. Selenium is an important element at Brewery Creek, but it was not allowed to precipitate due to uncertainty about its mineralogical form.

GWB re-calculates the solution chemistry following precipitation of the secondary minerals. The solution chemistry predicted by the model was assumed to indicate the possible chemistry of groundwater recharge and bank seepage into Laura Creek.

3.3.2 Results

Results of the mixing calculation are provided in Table 2. Mixing of the acidic pore water obtained with Approach "A" resulted in a groundwater pH of 6.3 at Laura Creek. As a result, concentrations lower than that predicted by dilution alone were predicted for aluminum, copper, iron, manganese and zinc.

Mixing of Approach "B" water chemistry with groundwater characterized by monitoring well BC-67 using GWB indicated negligible attenuation effects because the waters are very similar. Some malachite (basic copper carbonate) precipitation was predicted due to the higher alkalinity of the groundwater.

3.4 Prediction of Downstream Water Quality

3.4.1 Methods

The final step was to use a simple dilution calculation to mix bank seepage from the Blue WRSA with Laura Creek water. This calculation was completed for three average flow regimes representing winter low flow (i.e. worst case for dilution), spring (best case) and summer low flow. Water chemistry for Laura Creek and South Klondike River used in the dilution calculations was obtained from 2002 monitoring data so that predictions for the effect of the Blue WRSA on surface water were additive to any other existing impacts. Total metal concentrations were used in the calculations to allow direct comparison to CCME Guidelines for the Protection of Freshwater Aquatic Life (CCME 2002).

GWB could have been used to perform these calculations but precipitates predicted to be formed are not necessarily removed from the water column but remain part of the total metal load. Use of dilution alone to estimate concentrations is conservative because secondary minerals would be expected to precipitate on the stream bed.

Predicted concentrations in Laura Creek at BC-1 and South Klondike River downstream of Laura Creek (Figure 5) were compared to CCME levels.

3.4.2 Results

The results of the calculations are described below.

- **Winter Low Flow (Table 3).** For Approach "A", the predicted copper concentrations were 0.04 mg/L, or an order of magnitude above the CCME level. Predicted arsenic and antimony concentrations marginally exceeded the CCME levels. Marginal selenium effects were predicted for Laura Creek and the South Klondike River but these were again due to detection limit at the CCME level. The predicted cadmium concentrations were well above the very low CCME level of 0.000017 mg/L, but this was a function of the detection limit used for the water analysis (0.0002 mg/L). For Approach "A" (Table 1), most parameters were estimated to be very close to CCME.

- **Spring High Flow Conditions (Appendix A).** Due to the naturally elevated suspended solids levels in Laura Creek and the Klondike River, concentrations of several parameters (primarily aluminum and iron) exceeded CCME levels. As a result, predicted concentrations of these elements with the effect of the Blue WRSA also exceeded CCME levels. Baseline arsenic, copper, cadmium and selenium concentrations also exceeded CCME levels and as a result were predicted to exceed CCME levels when the effect of the Blue WRSA was included. However, due to the high dilution observed at this time of the year, the Blue WRSA was not predicted to have any detectable effect on Laura Creek or the South Klondike River.

- **Summer Moderate Flow Conditions (Appendix A).** Predicted effects for summer moderate flow conditions (August) were comparable to the spring high flow conditions. Mercury concentrations are predicted to exceed CCME levels in the South Klondike River. This is a result of background levels exceeding CCME in the river.

Overall, the dilution modeling using conservative Approach "A" indicates that copper concentrations in Laura Creek may exceed CCME levels by about an order of magnitude. Antimony and arsenic may also marginally exceed CCME levels. Due to the very low cadmium CCME level, it was not possible to evaluate possible cadmium impacts.

4.0 CONCLUSIONS

The following are concluded:

- An extensive geochemical database of static and kinetic test results has been collected and provided a sound basis for geochemical assessment of the Blue WRSA.

- The majority of waste rock is predicted to be potentially acid generating, but the sulphide content of most of the rock (about three-quarters) is probably too low to generate significant acidity.

- The results indicate that the majority of waste rock in the Blue WRSA has either already generated acid during exposure prior to disposal, or will not generate acid due to low AP. The waste rock is therefore geochemically stable and current conditions can be used to predict future behaviour.

- Modelling of pore water chemistry using the assumption that dissolution of oxidation products is controlling the chemistry indicates that pore water may on balance be acidic (conservative worst case prediction) or non-acidic. Therefore, two cases were carried through subsequent calculations to evaluate the possible effects of acidic leachate from the Blue WRSA.

- Alkaline groundwater beneath the Blue WRSA is expected to have a significant buffering effect on pore water, removing iron and aluminum. Copper was predicted to be only partially removed if the pore water is acidic.

- The effect of groundwater originating from the Blue WRSA is expected to be insignificant during spring and summer.

- During winter low flow conditions, copper concentrations in Laura Creek at BC-1 were predicted to exceed CCME levels by about an order-of-magnitude. However, this already occurs naturally at other times of the year. Concentrations of arsenic and antimony were the only other parameters that also marginally exceeded CCME levels.

- The Blue WRSA was predicted to have no detectable effect on the South Klondike River.

- The effect of the cover placed on the WRSA will be to reduce infiltration (BGC 2002) and therefore slow down and limit flushing of oxidation products.

Additional mitigation measures to further reduce infiltration or limit oxygen availability in the waste rock are not believed to be necessary.

This report, **1CV001.01 - Geochemical Assessment, Blue Waste Rock Storage Area, Brewery Creek Mine** has been prepared by:

STEFFEN, ROBERTSON AND KIRSTEN (CANADA) INC.

Stephen Day, M.Sc., P.Geo.
Principal Geochemist

Daryl Hockley,M.Eng., P.Eng.
Principal, Review

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TABLES

TABLE 1
Estimates of Pore Water Chemistry
Blue WRSA

Type	Comment	Proportions %	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO_4 mg/L	Zn mg/L
Approach "A" Estimates													
Modelled Estimated Pore Water	pH<4	13%	36	1	23	4	491	414	129	0.005	2.9	6272	90
	4<pH<5	14%	5	1.4	2	0.05	4	0.1	32	0.005	0.2	2452	8
	pH>5	74%	0.01	9	5	0.05	0.7	0.01	0.59	0.005	0.2	2023	2
	Modelled (pH~3.9)	100%	5	7	7	0.5	62	52	21	0.005	0.6	2614	14
Approach "B" Estimates													
Modelled Estimated Pore Water	pH<4	13%	26	0.04	0.9	0.15	20	161	5	0.0002	0.1	2005	3.6
	4<pH<5	14%	1	0.1	0.1	0.002	0.2	0.0	1	0.0002	0.01	651	0.3
	pH>5	74%	0.01	0.4	0.2	0.002	0.03	0.01	0.12	0.0002	0.01	286	0.1
	Modelled (pH~7.9)	100%	0.004	0.3	0.3	0.021	0.8	0.00	0.4	0.0002	0.04	550	0.56
Observed Maximum Concentrations													
Humidity Cells	pH<3 (except As and Sb)		78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)		28	0.24	5	0.05	8	101	2	0.0008	0.04	3	3
BC-11	Neutral pH		0.623	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		26	1.40	4.9	0.09	0.75	180	4	-0.00005	0.014	1230	5.48

TABLE 2
Results of Pore Water and Groundwater Mixing

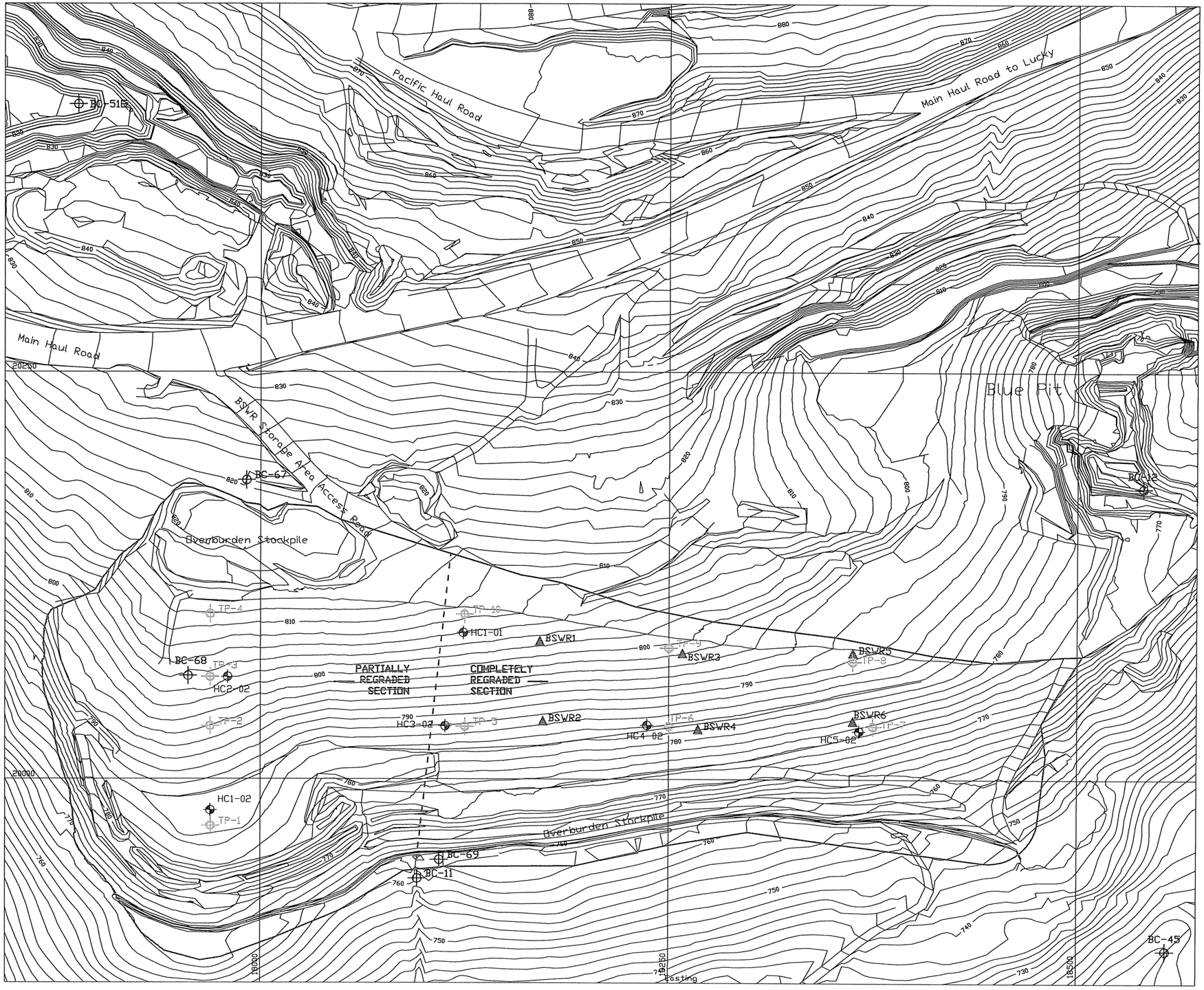
Type	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO_4 mg/L	Zn mg/L
Upgradient Groundwater (BC-67)	0.019	0.014	0.087	0.0014	0.003	0.21	0.31	-0.0001	-0.001	24	0.052
Approach "A" Estimates											
Pore water (pH~3.9)	5	7	7	0.5	62	52	21	0.005	0.6	2614	14
Predicted Groundwater	0.0007	1.4	0.28	0.1	1.8	1.8	1	0.001	0.02	456	0.50
Approach "B"											
Pore water (pH~7.9)	0.004	0.3	0.3	0.021	0.8	0.00	0.4	0.0002	0.04	550	0.56
Predicted Groundwater	0.0060	0.05	0.11	0.004	0.10	0.2	0.3	0.00004	0.008	97	0.14

TABLE 3
Summary of Downstream Dilution Calculations
Winter Low Flow Conditions

Type	Comment	Flow m^3/mo	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO4 mg/L	Zn mg/L
Regulatory Guidelines													
Old Water License (QZ96-007)			1	1	0.5	0.1	0.2	1	0.8	0.005	0.05	-	0.5
CCME			0.1	0.02	0.005	0.000017	0.002	0.3	-	0.0001	0.001	100	0.03
Current Conditions													
Laura Creek BC-1	December 2002 WQ	90000	0.076	0.003	0.003	<0.0002	<0.001	0.1	0.033	<0.00002	<0.001	**163**	<0.005
South Klondike BC-6	December 2002 WQ	14351000	0.006	<0.001	<0.001	<0.0002	<0.001	<0.05	0.002	<0.00002	<0.001	76	<0.005
Approach "A"													
Predicted Blue Area Groundwater			0.0007	1.4	0.28	0.1040	1.8	1.8	1.0	0.0009	0.02	456	0.50
Downstream Dilution Calculation	Laura Creek at BC-1		0.08	**0.03**	**0.008**	**0.002**	**0.04**	0.1	0.1	0.00004	**0.001**	**172**	0.01
	South Klondike		0.01	0.0012	0.001	**0.0002**	0.001	0.05	0.002	0.00002	**0.001**	76	0.005
Approach "B"													
Predicted Blue Area Groundwater			0.006	0.054	0.114	0.004	0.102	0.173	0.330	0.000	0.008	97	0.137
Downstream Dilution Calculation	Laura Creek at BC-1		0.08	0.0041	**0.005**	**0.0003**	**0.003**	0.1	0.04	0.00002	**0.001**	**165**	0.0077
	South Klondike		0.006	0.001	0.001	**0.0002**	0.001	0.05	0.002	0.00002	**0.001**	76	0.005

Notes
1. The "CCME" level for sulphate is the interim BC Guideline
2. Bold indicates concentrations at or exceeding CCME

FIGURES



CLIENT:

VICEROY MINERALS CORPORATION

LEGEND:

HC1-02	HYDRAULIC CONDUCTIVITY TESTING LOCATIONS (BGC - OCT 2001, AUG 2002)
BSWR1	BLUE SEDIMENT WASTE ROCK SAMPLING LOCATIONS (BGC - OCT 2001)
BC-11	WATER MONITORING SAMPLING POINT (INSTALLED BY BREWERY CREEK MINE)
TP1	TEST PIT LOCATIONS (BGC - AUG 2002)
——	EXTENT OF BLUE SEDIMENT WASTE ROCK STORAGE AREA

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
0	NOV/02		CSM	RJW	RJW

SCALE:	AS SHOWN
DATE:	JULY 2003
DRAWN:	CSM
DESIGNED:	RJW
CHECKED:	RJW
APPROVED:	RJW

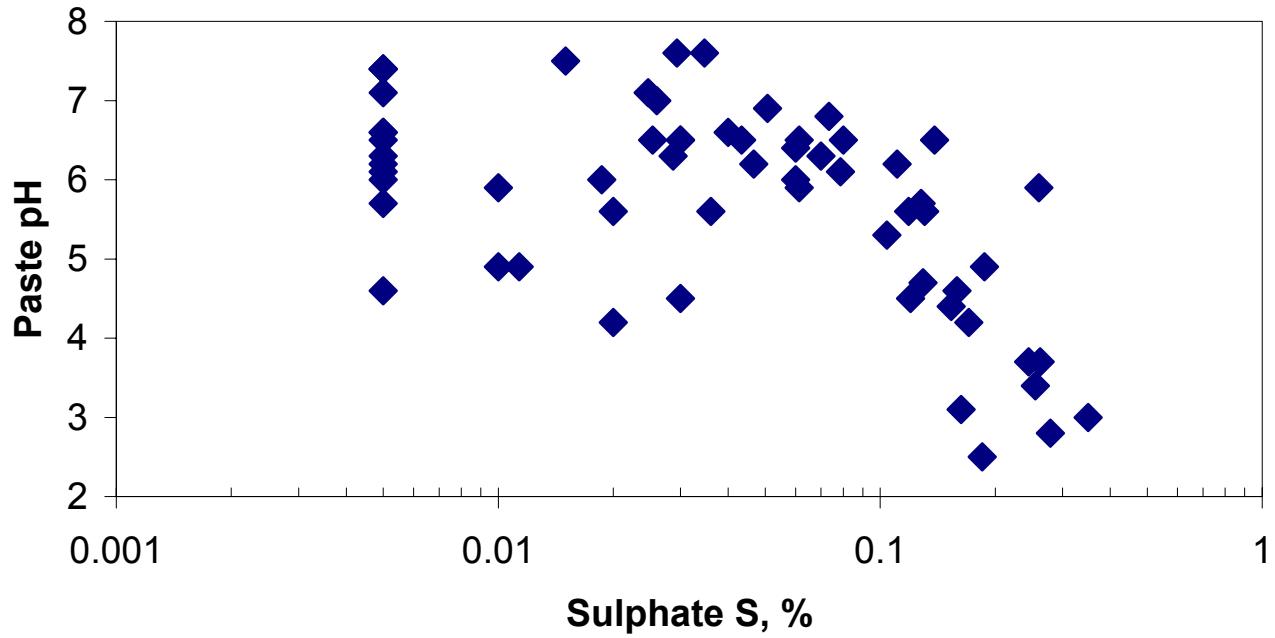
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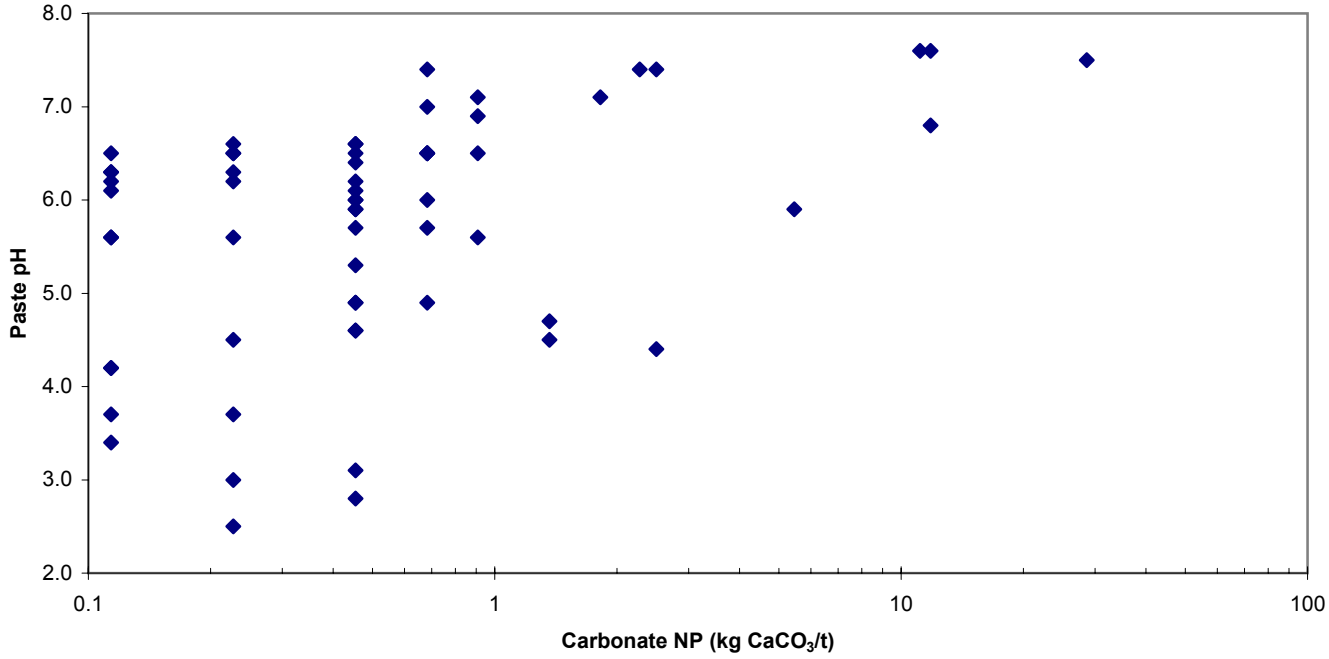
PROJECT No.	DWG. No.	REV.
0270-001-04	FIGURE 1	1

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
Vancouver, BC Phone: (604) 684 5900

(a) Paste pH vs Sulphur as Sulphate



(b) Paste pH vs Carbonate NP



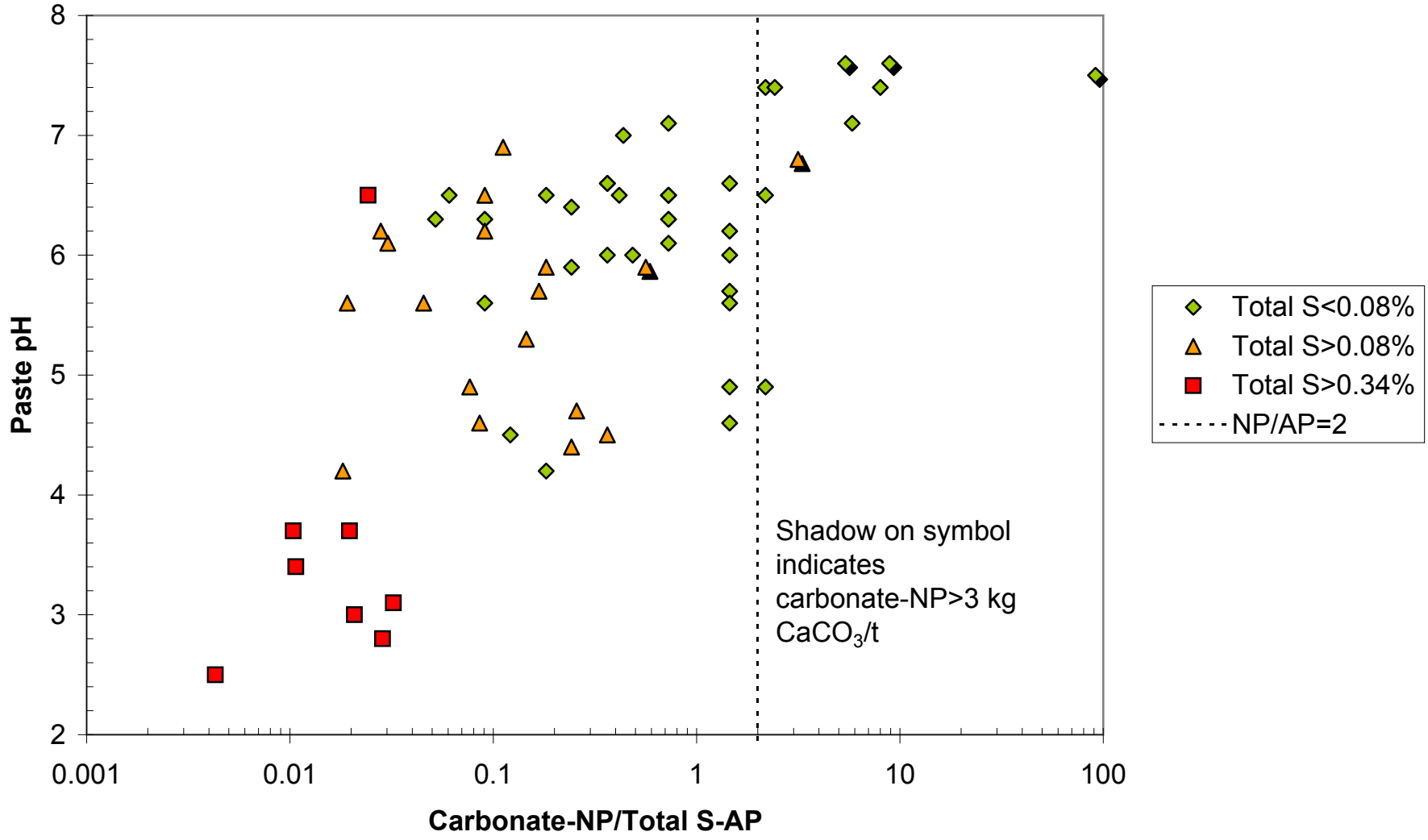
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Geochemical Assessment, Blue Waste Rock Dump, Brewery Creek Mine

Paste pH vs Sulphate and Carbonate NP

Project	Date	Approved	Figure
1CV001.01	Aug-03		2



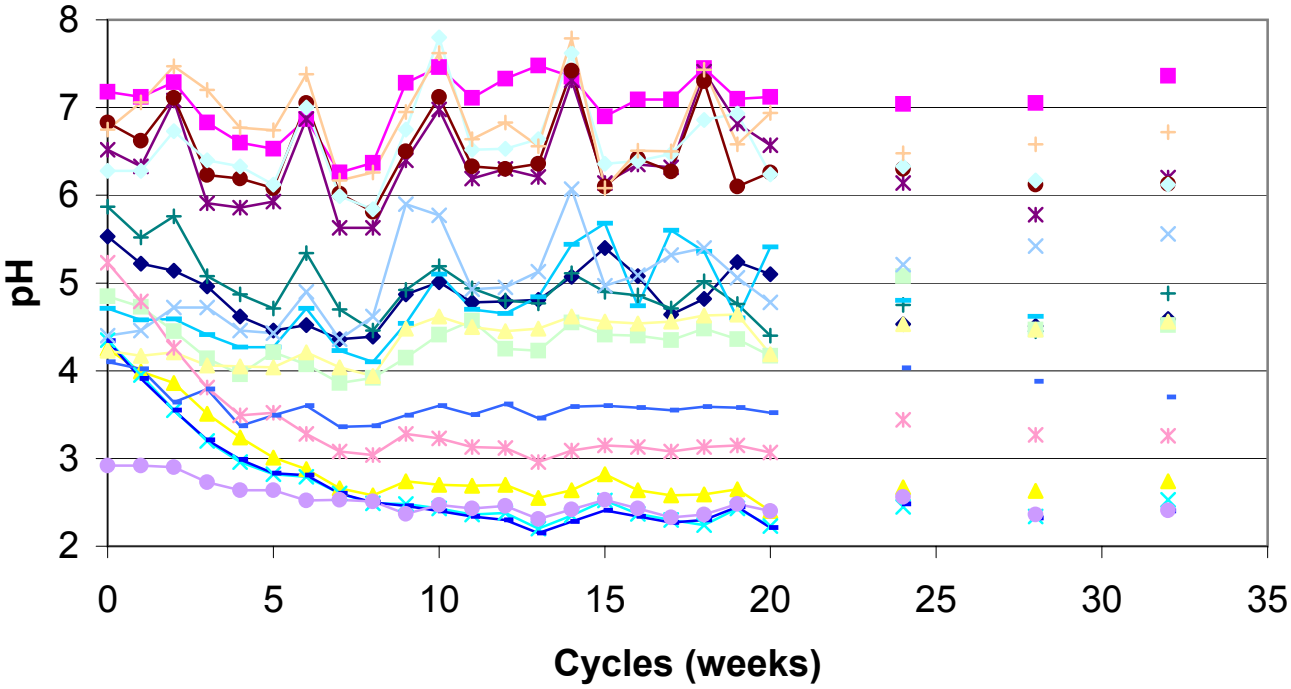
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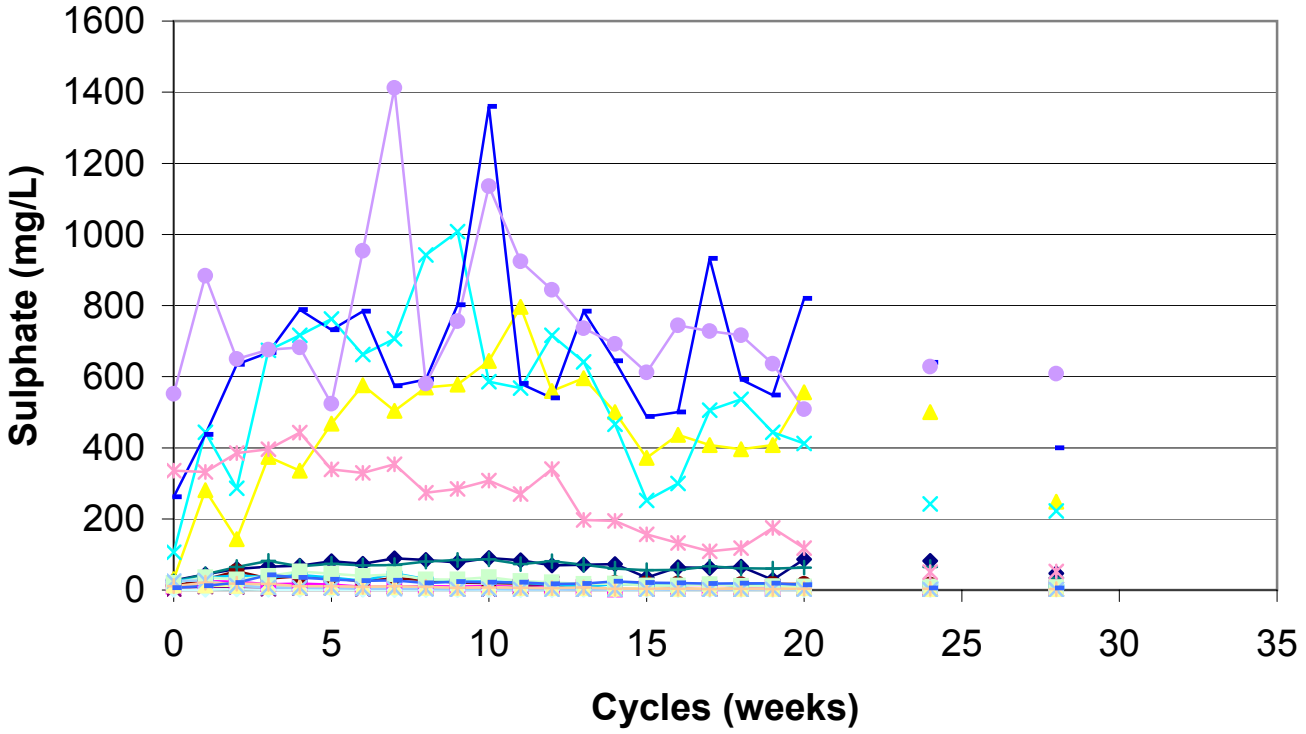
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Geochemical Assessment, Blue Waste Rock Dump, Brewery Creek Mine

Carbonate NP/AP vs Paste pH

Project	Date	Approved	Figure
1CV001.01	Aug-03		3





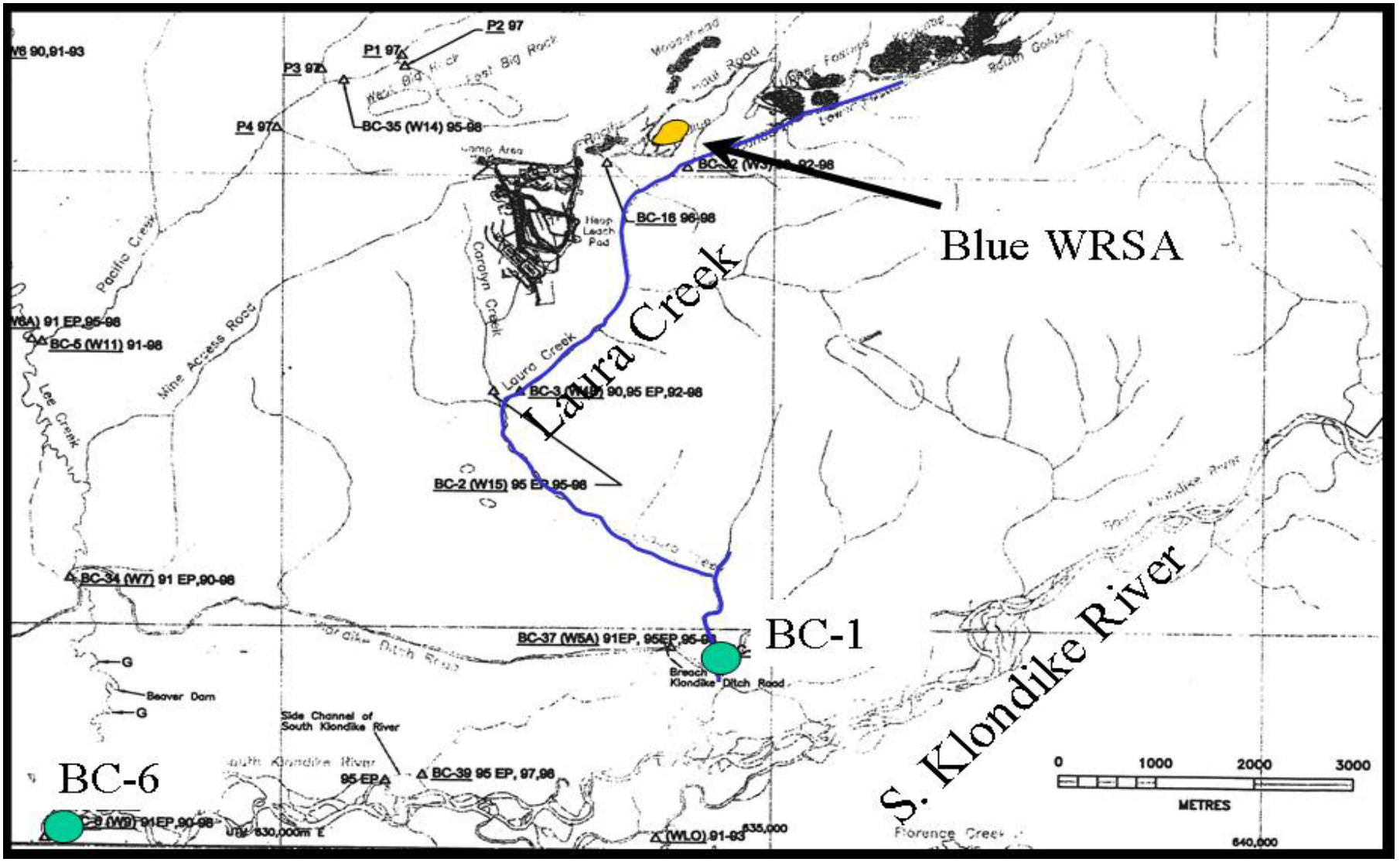
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Geochemical Assessment, Blue Waste Rock Dump, Brewery Creek Mine

Examples of Humidity Cell Results

Project	Date	Approved	Figure
1CV001.01	Aug-03		4



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Geochemical Assessment, Blue Waste Rock Dump, Brewery Creek Mine

Drainage Network and Monitoring Points

Project	Date	Approved	Figure
1CV001.01	Aug-03		5

APPENDIX A
Additional Summaries of Loading Calculations

TABLE A.1
Summary of Estimated and Measured Contaminant Concentrations
Approach "A" - Spring Flow Conditions

Type	Comment	Flow m^3	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO_4[1] mg/L	Zn mg/L
Regulatory and Baseline													
Old Water License			1	1	0.5	0.1	0.2	1	0.8	0.005	0.05	#N/A	0.5
CCME			0.1	0.02	0.005	0.000017	0.002	0.3	#N/A	0.0001	0.001	100	0.03
Laura Creek BC-1	June 2002 WQ	889000	**1.17**	0.005	**0.01**	**0.0003**	**0.031**	**1.78**	0.086	<0.00003	**0.001**	36.3	0.023
South Klondike BC-6	June 2002 WQ	247991000	**0.25**	<0.001	0.001	<0.0002	**0.002**	**0.37**	0.014	<0.00002	<0.001	29.1	<0.005
Blue Dump													
Modelled Estimated Pore Water	pH<4	44	36	1	23	4	491	414	129	0.005	2.9	6272	90
	4<pH<5	49	5	1.4	2	0.0	4	0.1	32	0.005	0.2	2452	8
	pH>5	257	0.01	9	5	0.05	0.7	0.01	0.59	0.005	0.2	2023	2
	Modelled (pH~3.9)	350	5	7	7	0.5	62	52	21	0.005	0.6	2614	14
Observed Maximum Concentrations													
Humidity Cells	pH<3 (except As and Sb)		78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)		28	0.24	5	0.05	8	101	2	0.0008	0.04	3	3
BC-11	Neutral pH		0.623	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		26	1.40	4.9	0.09	0.75	180	4	-0.00005	0.014	1230	5.48
Downstream Predictions													
Geochem Mixing Calculations	Seep into Creek pH 7.5		0.0007	1.3	0.3	0.10	1.8	1.8	1.0	0.0008	0.02	456	0.50
Dilution Calculation	Laura Creek at BC-1		**1.17**	0.01	**0.01**	**0.000**	**0.03**	**1.8**	0.1	0.00003	**0.001**	37	0.02
	South Klondike at BC-6		**0.25**	0.0010	0.00	**0.0002**	**0.002**	**0.4**	0.014	0.00002	**0.001**	29	0.005

Notes
1. The "CCME" level for sulphate is the interim BC Guideline
2. Bold indicates conentrations at or exceeding CCME

TABLE A.2
Summary of Estimated and Measured Contaminant Concentrations
Approach "B' - Spring Flow Conditions

Type	Comment	Flow m^3	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO4 mg/L	Zn mg/L
Regulatory and Baseline													
Old Water License			1	1	0.5	0.1	0.2	1	0.8	0.005	0.05	#N/A	0.5
CCME			0.1	0.02	0.005	0.000017	0.002	0.3	#N/A	0.0001	0.001	100	0.03
Laura Creek BC-1	June 2002 WQ	889000	**1.17**	0.005	**0.01**	**0.0003**	**0.031**	**1.78**	0.086	<0.00003	**0.001**	36.3	0.023
South Klondike BC-6	June 2002 WQ	247991000	**0.25**	<0.001	0.001	<0.0002	**0.002**	**0.37**	0.014	<0.00002	<0.001	29.1	<0.005
Blue Dump													
Modelled Estimated Pore Water	pH<4	44	26	0.04	0.9	0.15	20	161	5	0.0002	0.1	2005	3.6
	4<pH<5	49	1	0.1	0.1	0.002	0.2	0.0	1	0.0002	0.01	651	0.3
	pH>5	257	0.01	0.4	0.2	0.002	0.03	0.01	0.12	0.0002	0.01	286	0.1
	Modelled (pH~7.9)	350	0.004	0.3	0.3	0.021	0.8	0.00	0.4	0.0002	0.04	550	0.56
Observed Maximum Concentrations													
Humidity Cells	pH<3 (except As and Sb)	-	78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)	-	28	0.24	5	0.05	8	101	2	0.0008	0.04	3	3
BC-11	Neutral pH		0.6	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		26	1.40	4.9	0.09	0.75	180	4	-0.00005	0.014	1230	5.48
Downstream Predictions													
Geochem Mixing Calculations	Seep into Creek pH 7.5		0.0060	0.0507	0.11	0.004	0.1	0.17	0.33	0.00003	0.008	97	0.14
Dilution Calculation	Laura Creek at BC-1		**1.2**	0.0051	**0.01**	**0.0003**	**0.03**	**1.8**	0.0867	0.00003	**0.0010**	37	0.02
	South Klondike at BC-6		**0.3**	0.0010	0.0010	**0.0002**	**0.002**	**0.4**	0.0143	0.00002	**0.0010**	29	0.01

Notes
1. The "CCME" level for sulphate is the interim BC Guideline
2. Bold indicates conentrations at or exceeding CCME

TABLE A.3
Summary of Estimated and Measured Contaminant Concentrations
Approach "A" - Summer Flow Conditions

Type	Comment	Flow m^3	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO4 mg/L	Zn mg/L
Regulatory and Baseline													
Old Water License			1	1	0.5	0.1	0.2	1	0.8	0.005	0.05	#N/A	0.5
CCME			0.1	0.02	0.005	0.000017	0.002	0.3	#N/A	0.0001	0.001	100	0.03
Laura Creek BC-1	August 2002 WQ	676000	**0.6**	0.005	**0.005**	<0.0002	**0.004**	**1.26**	0.046	<0.00002	<0.001	61.7	0.008
South Klondike BC-6	August 2002 WQ	99951000	**0.17**	<0.001	0.001	<0.0002	**0.008**	**0.34**	0.021	**0.00025**	<0.001	41.9	0.008
Blue Dump													
Modelled Estimated Pore Water	pH<4	44	36	1	23	4	491	414	129	0.005	2.9	6272	90
	4<pH<5	49	5	1.4	2	0.0	4	0.1	32	0.005	0.2	2452	8
	pH>5	257	0.01	9	5	0.05	0.7	0.01	0.59	0.005	0.2	2023	2
	Modelled (pH~3.9)	350	5	7	7	0.5	62	52	21	0.005	0.6	2614	14
Observed Maximum Concentrations													
Humidity Cells	pH<3 (except As and Sb)		78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)		28	0.24	5	0.05	8	101	2	0.0008	0.04	3	3
BC-11	Neutral pH		0.623	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		26	1.40	4.9	0.09	0.75	180	4	-0.00005	0.014	1230	5.48
Downstream Predictions													
Geochem Mixing Calculations	Seep into Creek pH 6.0		0.0007	1.2	0.3	0.09	1.8	1.8	1.0	0.0008	0.02	456	0.50
Dilution Calculation	Laura Creek at BC-1		**0.60**	0.01	**0.01**	**0.000**	**0.01**	**1.3**	0.0	0.0000	**0.001**	63	0.01
	South Klondike at BC-6		**0.17**	0.0011	0.00	**0.0002**	**0.008**	**0.3**	0.021	**0.0002**	**0.001**	42	0.008

Notes
1. The "CCME" level for sulphate is the interim BC Guideline
2. Bold indicates conentrations at or exceeding CCME

TABLE A.4
Summary of Estimated and Measured Contaminant Concentrations
Approach "B" - Summer Flow Conditions

Type	Comment	Flow m^3	Al mg/L	Sb mg/L	As mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Mn mg/L	Hg mg/L	Se mg/L	SO4 mg/L	Zn mg/L
Regulatory and Baseline													
Old Water License			1	1	0.5	0.1	0.2	1	0.8	0.005	0.05	#N/A	0.5
CCME			0.1	0.02	0.005	0.000017	0.002	0.3	#N/A	0.0001	0.001	100	0.03
Laura Creek BC-1	August 2002 WQ	676000	**0.6**	0.005	**0.005**	<0.0002	**0.004**	**1.26**	0.046	<0.00002	<0.001	61.7	0.008
South Klondike BC-6	August 2002 WQ	99951000	**0.17**	<0.001	0.001	<0.0002	**0.008**	**0.34**	0.021	**0.00025**	<0.001	41.9	0.008
Blue Dump													
Modelled Estimated Pore Water	pH<4	44	26	0.04	0.9	0.15	20	161	5	0.0002	0.1	2005	3.6
	4<pH<5	49	1	0.1	0.1	0.002	0.2	0.0	1	0.0002	0.01	651	0.3
	pH>5	257	0.01	0.4	0.2	0.002	0.03	0.01	0.12	0.0002	0.01	286	0.1
	Modelled (pH~7.9)	350	0.004	0.3	0.3	0.021	0.8	0.00	0.4	0.0002	0.04	550	0.56
Observed Maximum Concentrations													
Humidity Cells	pH<3 (except As and Sb)	-	78	0.18	35	0.4	13	514	58	0.0096	0.2	1360	10
Shake Flasks	pH<3 (except As and Sb)	-	28	0.24	5	0.05	8	101	2	0.001	0.04	3	3
BC-11	Neutral pH		0.623	0.02	0.02	0.0010	0.02	0.18	0.03	0.00008	0.03	124	0.02
Blue Pit Seeps	pH<3 (except As and Sb)		26	1.40	4.9	0.09	0.75	180	4	-0.00005	0.014	1230	5.5
Downstream Predictions													
Geochem Mixing Calculations	Seep into Creek pH 6.0		0.0060	0.05	0.11	0.004	0.1	0.17	0.33	0.00003	0.008	97	0.14
Dilution Calculation	Laura Creek at BC-1		**0.60**	0.0051	**0.005**	**0.0002**	**0.004**	**1.3**	0.05	0.00002	**0.001**	62	0.008
	South Klondike at BC-6		**0.17**	0.0010	0.0010	**0.0002**	**0.008**	**0.3**	0.02	**0.0002**	**0.001**	42	0.008

Notes
1. The "CCME" level for sulphate is the interim BC Guideline
2. Bold indicates conentrations at or exceeding CCME

SRK Consulting
Engineers and Scientists

Tel: 604.681.4196
Fax: 604.687.5532

MEMORANDUM

DATE: August 12, 2003

TO: Brad Thrall, ALM Group

CC: Clynton Nauman, ALM Group
Dan Cornett, Access

FROM: Stephen Day, SRK

PROJECT: 1CV001.01

RE: Blue WRSA
Follow-up Testing Program

Brad,

This memorandum describes details of sample collection for the proposed follow-up testing described in our report.

SEQUENTIAL LEACHING TEST

1. The main needs for this test are 100 kg samples of waste rock type material. It is important that:

    - More rather than less this amount is collected.
    - Rock pieces larger than about an inch are removed during sampling. This can be done with a sieve during sampling.

2. Target areas for sampling are the BGC test pit locations. The following are suggested:

    - **Low pH**: TP2 2 to 3 m (shale), TP6 0 to 1 m (olive rock).
    - **Mid-range pH**: TP2 6 to 7 m (partly shale), TP4 4 to 5 m (mixed olive grey rock/shale)
    - **Neutral pH**: TP3 2 to 3 m (olive grey rock), TP8 0 to 2 m, 4 to 5 m (olive rock, orange stain). TP9 1 to 4 (olive/olive-brown rock).

    Two samples from each pH group are needed (total 6 samples, each 100 kg).

3. Actual sampling intervals should be based on the geological description, field rinse pH and reaction with dilute HCl as an indicator. Units described by BGC as "shale" are most likely acidic. The pH method involves screening a small amount of sample using a 2 mm screen, then shaking with an approximately equal weight of water for one minute. The leachate obtained is tested for pH and conductivity.

4. When a suitable interval has been identified, the sample can be collected.

5. If sampling is performed using an auger, it may be necessary to composite several intervals to obtain the sample.

EFFECT OF MIXING WITH GROUNDWATER

6. This procedure will involve mixing of simulated pore water created in the previous procedure with actual groundwater.

7. The groundwater sample should be collected from BC-67. If water is not available from this well, BC-68 can be used or as a third choice BC-69.

8. The volume of sample required is 4 L. The sample should be collected to minimize headspace in the bottle, and kept cold but not filtered or acidified. A separate sample collected at the same time should be obtained for analysis of general water quality parameters and dissolved metals.

ATTENUATION TEST

9. The attenuation test will involve application of simulated groundwater to two columns containing typical overburden from the slopes downgradient from the Blue WRSA.

10. The overburden sample(s) can be collected from test pits or road cuts. Each sample should be approximately 12 kg.

11. The simulated groundwater will be prepared by mixing actual groundwater from BC-67 with simulated pore water. Approximately 20 L of groundwater is needed.

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX C

BLUE SEDIMENT WASTE ROCK STORAGE AREA
CHARACTERIZATION REPORT

PREPARED BY: BGC ENGINEERING INC.

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

BGC Engineering Inc
500 - 1045 Howe Street,
Vancouver, B.C., Canada, V6Z 2A9
Telephone (604) 684-5900
Facsimile (604) 684-5909

VICEROY MINERALS CORPORATION

BREWERY CREEK MINE

BLUE SEDIMENT WASTE ROCK STORAGE AREA CHARACTERIZATION REPORT

FINAL REPORT

DIGITAL COPY

PROJECT NO.: 0270-001-04
DATE: JULY 30, 2003

DISTRIBUTION LIST:
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

#500-1045 Howe Street
Vancouver, B.C.
Canada V6Z 2A9
Tel: 604.684.5900
Fax: 604.684.5909

Project No. 0270-001-04
Date: July 30, 2003

Mr. Brad Thrall
ALM Group
601 West Broadway – Suite 400
Vancouver, B.C. V5Z 4C2

Re: Brewery Creek Mine - Blue Sediment Waste Rock Storage Area Characterization Report

Dear Mr. Thrall:

Please find attached our above referenced report dated July 30, 2003. The report has been issued in final form based on your review comments received on July 28, 2003 of our draft report issued on July 17, 2003.

Should you have any questions or comments, please do not hesitate to contact me at the number listed above.

Yours truly,
BGC Engineering Inc.
per:

Ruben J. Wallin, P.Eng.
Project Manager

cc.
encl. Report
RJW/

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LIMITATIONS OF REPORT

This report was prepared by BGC Engineering Inc. (BGC) for the account of Viceroy Minerals Corporation. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be based on it are the responsibility of such Third Parties. BGC Engineering Inc. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

As a mutual protection to our client, the public, and ourselves, all reports and drawings are submitted for the confidential information of our client for a specific project and authorization for use and / or publication of data, statements, conclusions or abstracts from or regarding our reports and drawings is reserved pending our written approval.

1.0 Introduction

Viceroy Minerals Corporation (VMC) is proceeding with the implementation of the closure plan for the blue sediment waste rock (BSWR) storage area at Brewery Creek Mine (BCM) in 2003. As part of the closure plan, VMC has proposed to place a 0.5 m layer of growth media (GM) over the storage area in order to reduce infiltration into the BSWR. In 2002, BGC Engineering Inc. (BGC) was directed by VMC to:

- Evaluate the performance of the soil cover system (i.e. infiltration) proposed by VMC during an average precipitation year; and
- Evaluate the performance of the soil cover system (i.e. infiltration) proposed by VMC during the 100-year snow pack.

The results of the soil cover system evaluation are presented in the BGC report dated November 27, 2002 titled Brewery Creek Mine – Blue Sediment Waste Rock Storage Area Soil Cover Design Report - Final Report (BGC, 2002).

Section 2.0 of this report summarize the two field investigations (i.e. October 2001 and August 2002) and the laboratory testing that were conducted in order to characterize the BSWR storage area. Characterization of the storage area was required in order for BGC to evaluate the soil cover system proposed by VMC. Section 3.0 provides a summary of the characteristics of the BSWR storage area. Conclusions and recommendation are provided in Section 0.

2.0 Background

2.1 Site Description

BCM is located approximately 57 km east of Dawson City, Yukon Territory at an elevation of approximately 850 m above sea level. The mean annual precipitation at the site is about 329 mm (Clearwater Consultants Ltd., 2002a), of which approximately 38% occurs as snow and 62% occurs as rainfall. Pan evaporation measured at BCM for the period of May through September, typically the non-freezing period at the site, averages approximately 552 mm (Clearwater Consultants Ltd., 2002a). Lake evaporation for the period of May through September has been estimated to average approximately 390 mm (Clearwater Consultants Ltd., 2002b). The site can be described as semi-arid as pan evaporation exceeds precipitation on an average annual basis.

The BSWR storage area, which was constructed on a hillside, occupies an area of approximately 10 ha and contains about 0.87 Mt of waste rock. Removal of overburden (i.e. organic and silt material) was undertaken prior to the deposition of waste rock in the storage area, with the overburden material being stockpiled both at the top, and along the bottom of the area as shown in Figure 1. The waste rock dump was constructed by end-dumping material from haul trucks, resulting in the development of three separate benches as shown in Figure 1. Deposition of waste rock in the storage area was completed in 2000.

During the summer of 2001, the majority of the storage area was re-graded using a dozer to a final slope of approximately 3:1 as shown in Figure 2 and Photo 1. Based upon observations made in the field, re-grading of the storage area appears to have disturbed the alternating fine/coarse material layering, which often forms during the end dumping of waste rock. As a result, the soil properties of the upper portion of the waste rock appear to be more uniform in the sections of the storage area that have been re-graded, compared to those areas where re-grading was not required (i.e. the area located in the vicinity of test pits TP1 to TP4) as shown on Figure 2 and Photo 1.

Flow of surface water in the vicinity of the BSWR storage area is intermittent, occurring as the result of snowmelt and/or rainfall at the site. A significant portion of the surface runoff that occurs in the vicinity of the BSWR storage area flows away from the area, due to the natural topography of the site. However, water has been observed to flow along the access road located at the top of the storage area, subsequently being directed over the waste rock in the vicinity of test pits TP8 and TP7. Surface erosion of the waste rock, as a result of concentrated flow, has been observed in this section of the storage area. As part of the closure plan for the storage area, VMC has proposed to re-grade the access road thus preventing water from being channelled over the waste rock following closure (personnel communication Thrall 2002).

BGC understands that no significant seepage has been observed by VMC from the BSWR storage area in the past (personnel communication Thrall 2002). In addition, measurements taken from groundwater well BC-69 in 2002, which is installed immediately below the storage area (refer to Figure 2), indicated that the water table is located approximately 35 m below the base of the waste rock (personnel communication Thrall 2002). As a result, it is believed that groundwater seepage from the native ground into the BSWR storage area is limited. Thus, following closure, it is anticipated that infiltration due to direct precipitation, will be the only significant source of water for the BSWR storage area.

2.2 Field Investigations

2.2.1 October 2001 BSWR Storage Area Field Investigation

A field investigation was undertaken by BGC in October of 2001 in order to:

- Collect representative samples of BSWR for laboratory testing; and
- Measure the insitu hydraulic conductivity of the BSWR.

2.2.1.1 Sample Collection

Representative samples of BSWR were collected by BGC from six different locations on the completely re-graded section of the storage area as shown in Figure 2. The six 20-L grab samples were combined into one large composite sample, from which 60-L of material was split and submitted for laboratory testing.

2.2.1.2 Insitu Hydraulic Conductivity Testing

As part of the field investigation the insitu hydraulic conductivity of the BSWR was assessed using a 1 m diameter fixed ring infiltrometer (Bouwer, 1986). The results of the single field test, undertaken on the completely re-graded section of the storage area as shown on Figure 2, indicate that the BSWR has an insitu hydraulic conductivity of 2 x 10^{-3} cm/s.

2.2.2 August 2002 BSWR Storage Area Field Investigation

A field investigation was undertaken by BGC in August of 2002 in order to:

- Excavate test pits in the BSWR storage area to characterize the physical and geochemical properties of the waste rock;
- Measure the hydraulic conductivity of the BSWR in the field.

2.2.2.1 Test Pits

Ten test pits were excavated in the BSWR storage area during the August 2002 field program. The location of the test pits is shown in Figure 2. A total of 62 samples of waste rock were collected at various depths in the test pits starting from the surface, typically at 1.0 m intervals. The temperature of each sample was recorded during collection. The collected samples were split in the field (i.e. 2 sample bags for each waste rock sample) and immediately placed into sealed plastic sample bags. The sample bags (i.e. 128 sample bags) were then promptly transported to the on-site laboratory.

One set of samples (i.e. Split A - 62 samples) was stored for future geochemical testing (AMEC, 2002). Geochemical analysis of the samples was not undertaken by BGC.

The other set of samples (i.e. Split B – 62 samples) was shipped to the analytical laboratory at Golder Associates in Burnaby, British Columbia for grain size analysis. Prior to shipping, the moisture content of all 62 samples was determined by BGC at the on-site laboratory. The test pits logs are provided in Appendix A, and include the temperature and moisture content of the samples measured by BGC at the site. Photos of the test pits are presented in Photos 2 to 11.

2.2.2.2 Insitu Hydraulic Conductivity Testing

As part of the field investigation hydraulic conductivity testing was conducted at various locations on the BSWR storage area using a Guelph Permeameter (Soilmoisture Equipment Corporation, 1986). The location of the five tests is shown in Figure 2. The results of the August 2002 field-testing indicated that the hydraulic conductivity of the BSWR varied between 4 x 10^{-3} cm/s to 2 x 10^{-5} cm/s as shown in Table 1. Based upon the results of the field investigation, the average hydraulic conductivity (i.e. the arithmetic mean) of the BSWR storage area was calculated to be approximately 1 x 10^{-3} cm/s. The variation in the hydraulic conductivity of the BSWR is likely due to differences in the degree of compaction (i.e. compaction as a result of re-grading) and differences in the grain size of the material across the storage area.

Table 1 - BSWR Storage Area Field Hydraulic Conductivity Testing

Test Number	Material Description	Hydraulic Conductivity (cm/s)
HC1-01	BSWR – re-graded	2×10^{-3}
HC1-02	BSWR – original surface	2×10^{-3}
HC2-02	BSWR – re-graded	2×10^{-5}
HC3-02	BSWR – re-graded	9×10^{-5}
HC4-02	BSWR – re-graded	4×10^{-5}
HC5-02	BSWR – re-graded	4×10^{-3}

2.3 Laboratory Testing Program

2.3.1 October 2001 Samples

Representative samples of BSWR collected during the October 2001 field program were submitted to Advanced Field and Lab Testing in Saskatoon, Saskatchewan by BGC for soil properties testing. The following soil properties were determined for these samples:

- Specific gravity (ASTM D 854-92 & ASTM D C127-88 (Re-approved 1993));
- Grain size (ASTM D 422-95);
- Dry density versus water content (ASTM D 698-91);
- Soil water characteristic curve (Fredlund et al., 1993); and
- Saturated hydraulic conductivity (ASTM D 5865 –95).

The results of the test work for the BSWR are presented in Appendix B.

2.3.1.1 Soil Water Characteristic Curve

Tempe pressure plate cells are a common laboratory method used to measure the soil water characteristic curve (SWCC) of a material (Fredlund et al., 1993). However, the size of a conventional tempe pressure cell makes it difficult to test materials containing large particles. Accordingly, the SWCC for the BSWR sample was measured based on the fraction of material passing 6.35 mm as summarized in Table B1-4. Since water contents could only be determined up to a matric suction of 100 kPa with this method, BGC used the soil database program SoilVision (SoilVision, 2001) to predict the shape of the SWCC, based upon the laboratory data, to a matric suction of 1,000,000 kPa (i.e. oven dry). The SWCC for the bulk BSWR material was then estimated by adjusting the predicted SWCC based on the relative density of fine (i.e. < 6.35 mm) versus coarse (i.e. > 6.35 mm) material in the sample. The estimated SWCC for the BSWR (i.e. in the field) is shown in Figure 3.

2.3.1.2 Hydraulic Conductivity

The saturated hydraulic conductivity of the BSWR was determined using a constant-head permeability test (ASTM D 5856-95). The BSWR was placed in the permeameter at a density estimated to be representative of loosely placed material (i.e. dozer compaction) in the field.

Three permeability tests were conducted on a single sample resulting in measured hydraulic conductivities of 2.8 x 10^{-3} cm/s, 2.9 x 10^{-3} cm/s, and 3 x 10^{-3} cm/s as shown in Table A1-5. The average hydraulic conductivity (i.e. the arithmetic mean) of the BSWR was calculated to be approximately 3 x 10^{-3} cm/s based upon the results of the test work. The laboratory results appear reasonable when compared to the results of the August 2002 field program, which indicated that the BSWR had an average hydraulic conductivity (i.e. arithmetic mean) of approximately 1 x 10^{-3} cm/s (i.e. HC1-02 to HC5-02).

2.3.2 August 2002 Samples

Based upon the test pits logs, BGC selected 15 of the 62 samples (Split B-62 Samples), a minimum of one sample per test pit, for grain size analysis. The samples were selected in order to provide grain size information on the various lithologic profiles observed in the BSWR storage area (refer to Appendix B). The results of the grain size testing conducted by Golder Associates in Burnaby, B.C. for each sample are provided in Appendix C. The grain size distribution of all 15 samples is presented in Figure 4.

Geochemical testing was undertaken by AMEC on a duplicate set of samples (Split A-62 Samples).

3.0 Characterization of the BSWR Storage Area

The BSWR storage area contains a relatively small quantity of waste rock (i.e. less than 1 Mt). Field observations, insitu sampling and laboratory test results show that the typical structure associated with end dumped waste rock consists of coarse and fine interbedded materials with a rubble zone of coarse cobbles and boulders found at the base of each bench.

Unsaturated conditions prevail through the entire profile of the waste rock system. Due to unsaturated flow conditions, preferential pathways for liquid water flow predominate in the finer grained materials with greater than 40% passing the 4.75 µm sieve (i.e. see particle size distributions for samples obtained from TP1 at 2m and TP7 at 1m) compared to the coarse poorly graded materials with low a silt and sand content (i.e. see particle size distributions for samples obtained from TP3 at 3m and TP8 at 1m). Re-grading of the benches has disrupted the interbedded structure at the crest along with sealing of the exposed rubble zone at the toe of the upper two benches. Temperatures within the dump were observed to be cool at approximately 10 ^{o} C or near ambient air temperatures. Regional infiltration is expected to be relatively low due to semi-arid conditions that prevail during the summer months. The depth to groundwater in the valley slope below the BSWR is approximately 35m indicating a deep vadose system prevails, which is consistent with low surface infiltration.

4.0 Conclusions and Recommendations

4.1 Conclusions

Oxidation rates and oxygen consumption within the BSWR storage area are expected to be low based on the cool temperatures observed in the test pits during the excavation. Barrier

type cover systems offer little benefit in reducing oxygen concentrations within waste rock profiles with low intrinsic oxidation rates and thus a barrier type cover is not recommended for the BSWR storage area. The primary objective of the cover system for the BSWR storage area should be directed at the minimization of surface infiltration. The preferred option would be the construction of a store/release cover system given the topography and net negative surface water balance (i.e. Potential Evaporation greater than Precipitation). Maintaining the integrity of a compacted barrier type cover would be difficult given the cold climate, freeze/thaw cycles and deep frost penetration.

4.2 Recommendations

Based upon the results of the field and laboratory investigations the following recommendations are made regarding the BSWR storage area:

- Prior to placement of the soil cover it is recommended that re-grading of the BSWR storage area be completed (i.e. the area located in the vicinity of test pits TP1 to TP4) in order to improve the uniformity of the material. A positive sloping grade to ensure water shedding and that water does not pond at any location on the surface of the final cover must be ensured.
- Prior to placement of the soil cover, it is recommended that re-grading of the access road located at the top of the BSWR storage area be completed to prevent water from being channelled (i.e. concentrated flow) over the storage area following closure.
- In general, the cover design outlined in the BGC report dated November 27, 2002 is recommended.
- Rapidly establishing a healthy vegetative canopy is critical to ensuring cover performance with respect root-water extraction during the summer months and the minimization of infiltration. In addition, vegetation is also required to control erosion. The selection of seed must be consistent with the growth media moisture conditions and climate while allowing opportunity for natural succession.
- Instrumentation to monitor net infiltration with the installation of a large surface lysimeters at a suitable location at the time of cover placement is recommended.

BGC Engineering Inc.
Per:

Ruben J. Wallin, M.Eng., P.Eng.
Project Manager

Ward Wilson, Ph.D., P.Eng., P.Geo.
Senior Consultant

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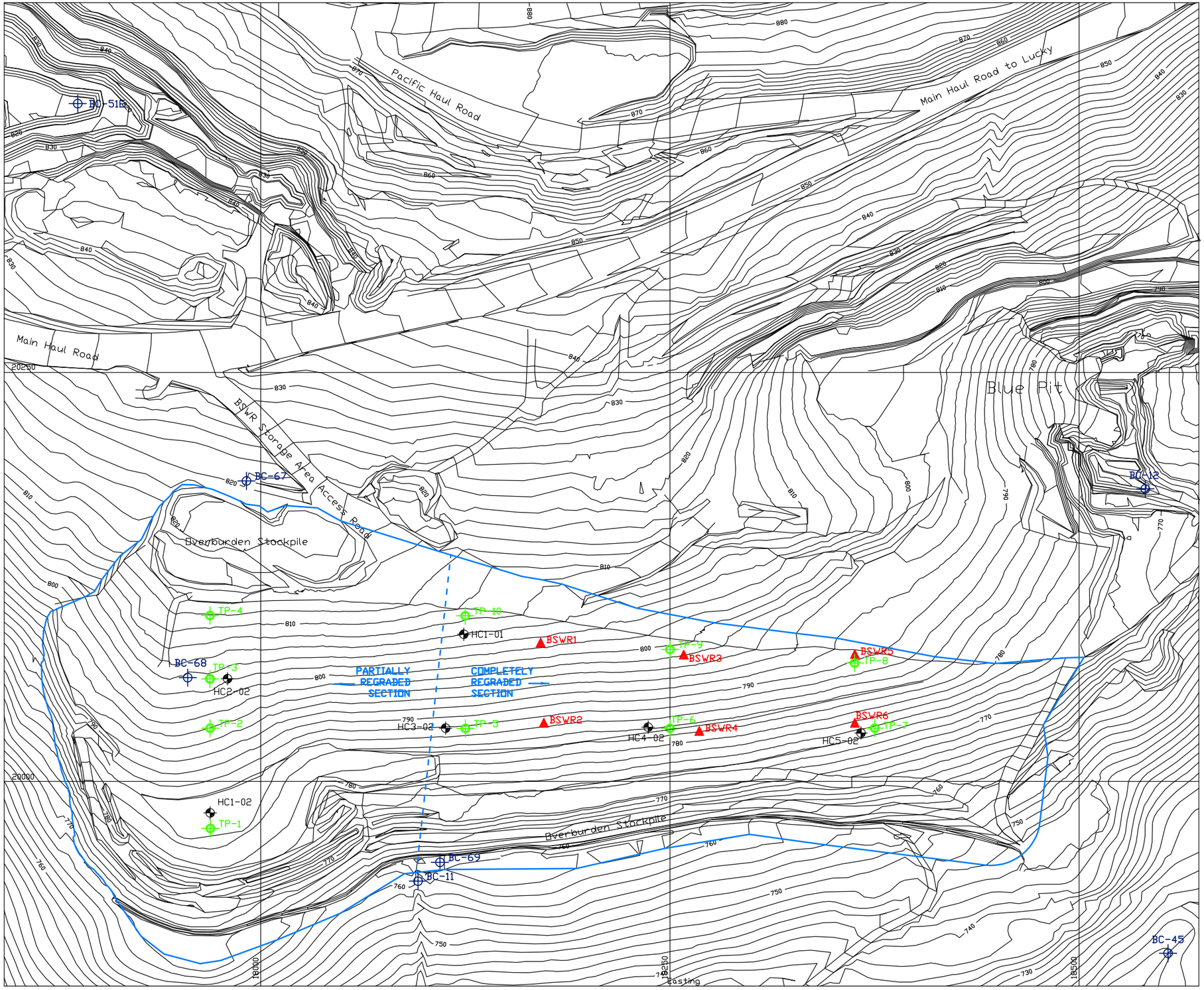
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CLIENT:

VICEROY MINERALS CORPORATION

LEGEND:

HC1-02	HYDRAULIC CONDUCTIVITY TESTING LOCATIONS (BGC - OCT 2001, AUG 2002)
BSWR1	BLUE SEDIMENT WASTE ROCK SAMPLING LOCATIONS (BGC - OCT 2001)
BC-11	WATER MONITORING SAMPLING POINT (INSTALLED BY BREWERY CREEK MINE)
TP1	TEST PIT LOCATIONS (BGC - AUG 2002)
	EXTENT OF BLUE SEDIMENT WASTE ROCK STORAGE AREA

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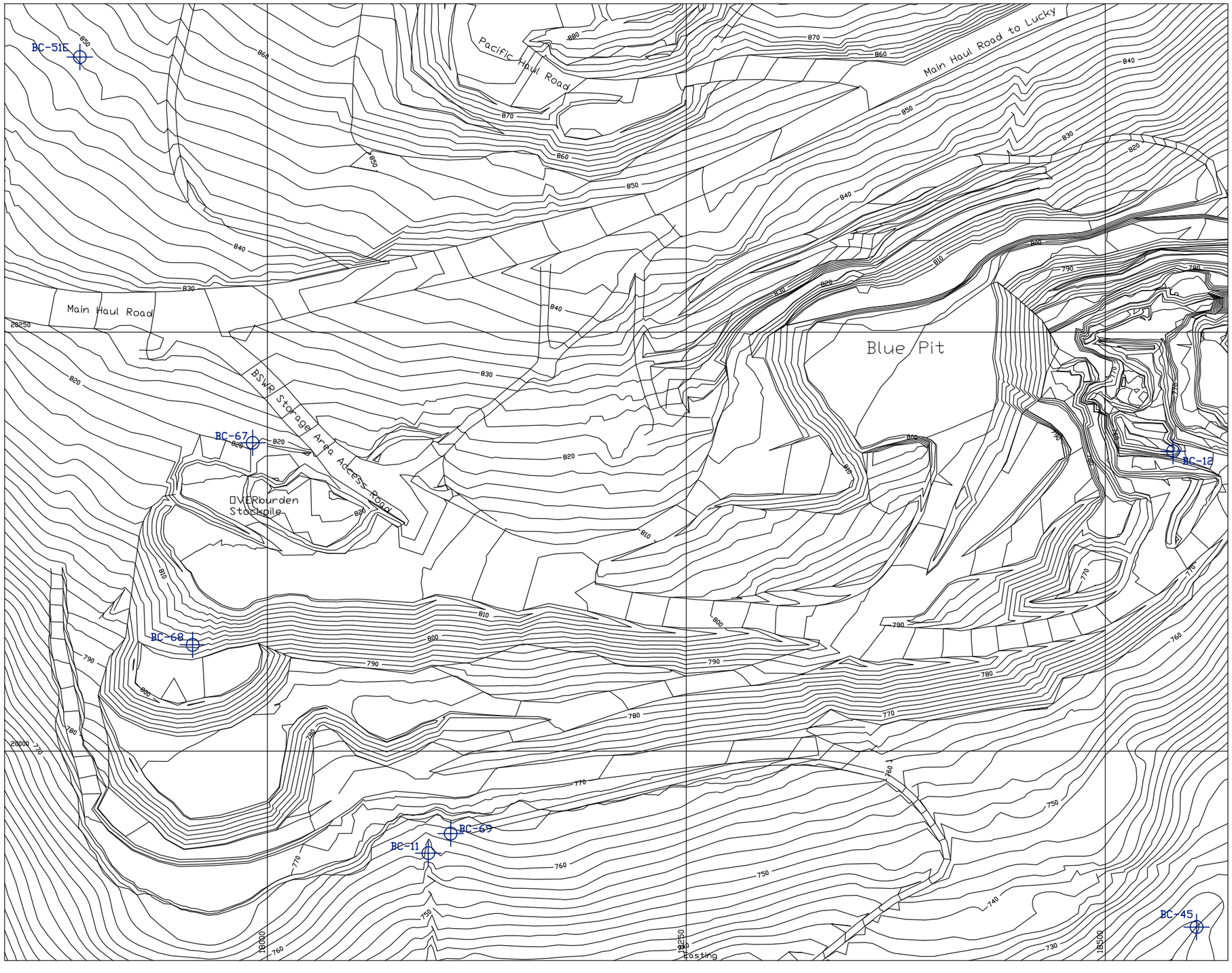
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DATE:	JULY 2003
DRAWN:	CSM
DESIGNED:	RJW
CHECKED:	RJW
APPROVED:	RJW

PROJECT: BREWERY CREEK MINE

TITLE: BLUE SEDIMENT WASTE ROCK STORAGE AREA SURFACE AFTER RE-GRADING IN 2001

PROJECT No.	DWG. No.	REV.
0270-001-04	FIGURE 1	1

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CLIENT:

VICEROY MINERALS CORPORATION

LEGEND:

BC-11 — WATER MONITORING SAMPLING POINT (INSTALLED BY BREWERY CREEK MINE)

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REV.	DATE	REVISION NOTES	DRAWN	CHECKED	APPROVED
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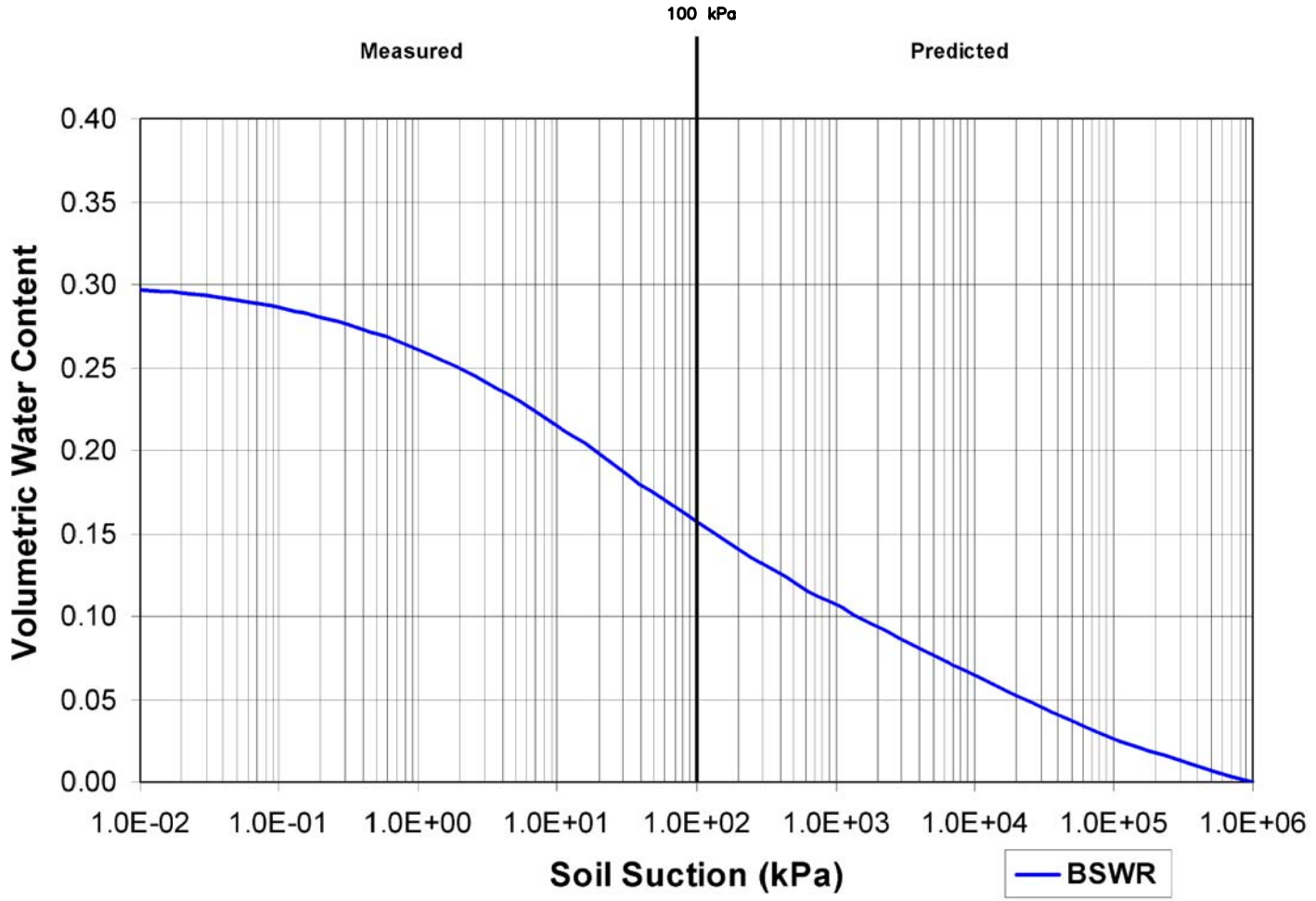
SCALE:	AS SHOWN
DATE:	JULY 2003
DRAWN:	CSM
DESIGNED:	RJW
CHECKED:	RJW
APPROVED:	RJW

PROJECT: BREWERY CREEK MINE

TITLE: BLUE SEDIMENT WASTE ROCK STORAGE AREA SURFACE PRIOR TO RE-GRADING IN 2001

PROJECT No.	DWG. No.	REV.
0270-001-04	FIGURE 2	1

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PROJECT: BREWERY CREEK MINE

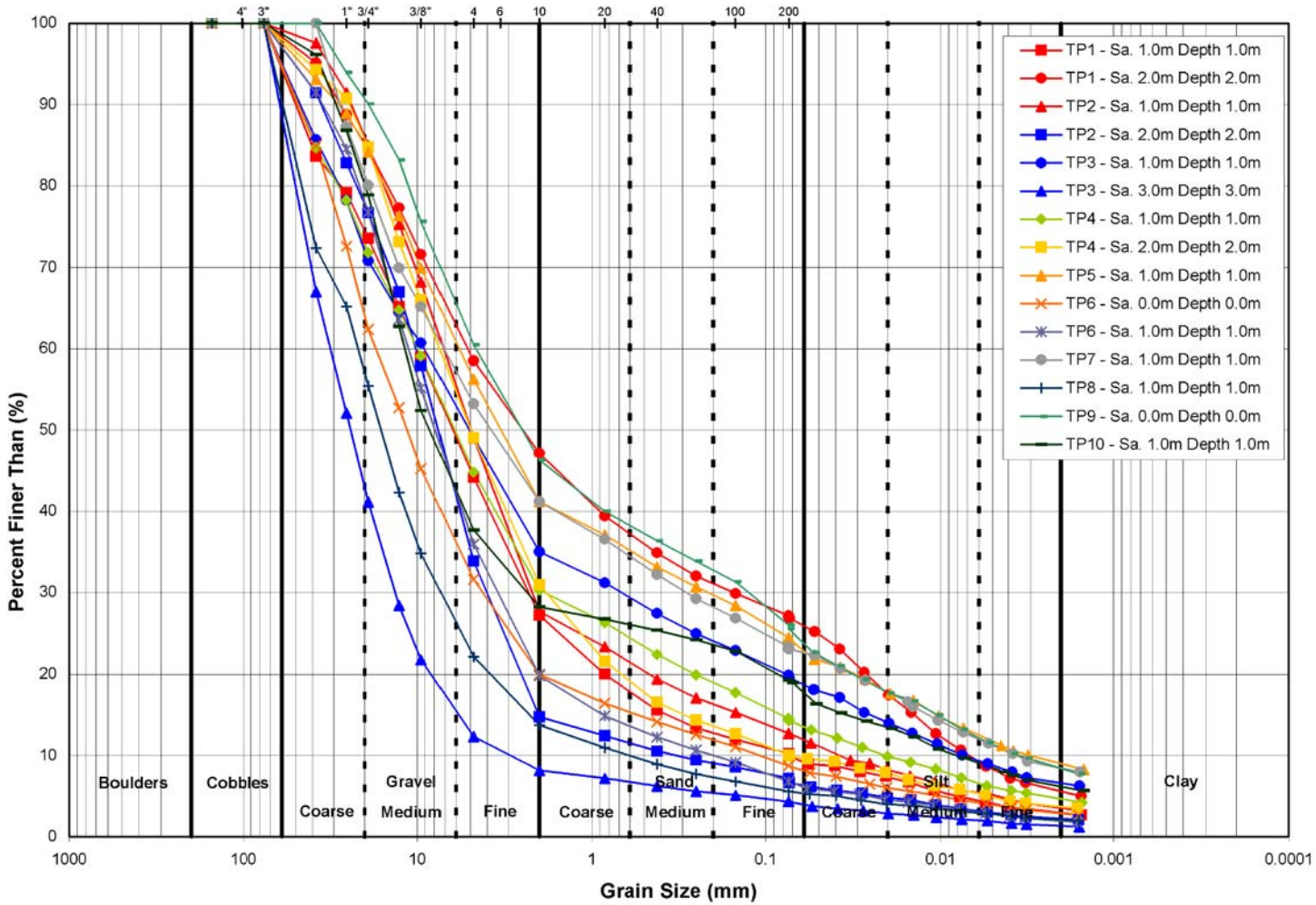
TITLE: SOIL WATER CHARACTERISTIC CURVE FOR BSWR

CLIENT: VICEROY MINERALS CORPORATION

PROJECT No.: 0270-001-04

DWG. No.: FIGURE 3

REV.: 1



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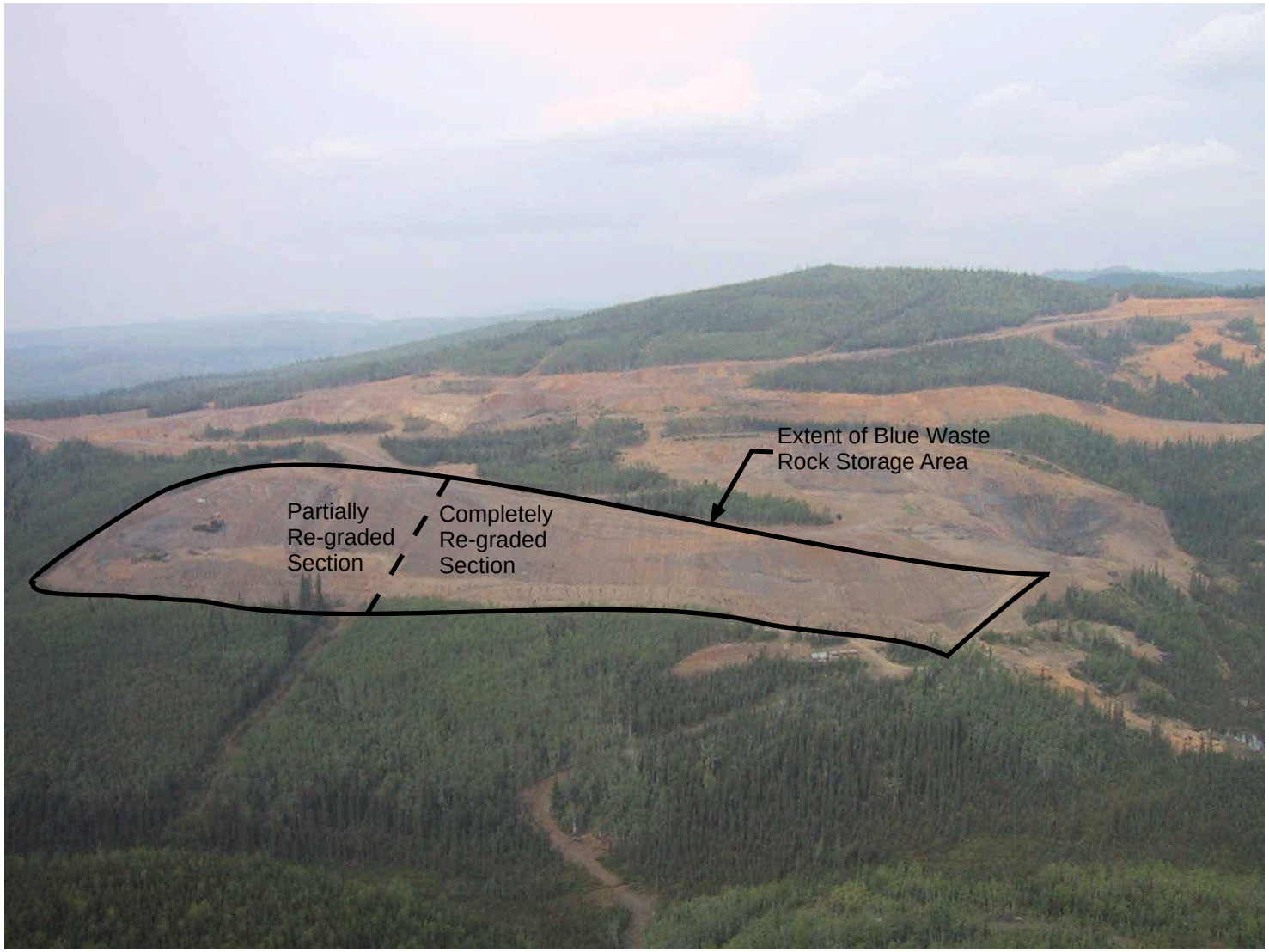
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PROJECT: BREWERY CREEK MINE

TITLE: GRAIN SIZE DISTRIBUTIONS

CLIENT:	PROJECT No.	DWG. No.	REV.
VICEROY MINERALS CORPORATION	0270-001-04	FIGURE 4	0



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REFERENCED DRAWING DESCRIPTION			TITLE BLUE SEDIMENT WASTE ROCK STORAGE AREA - SURFACE AFTER RE-GRADING IN 2001
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REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 1		
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REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 2		
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REFERENCED DRAWING DESCRIPTION		Vancouver, BC Phone: (604) 684 5900	TITLE TEST PIT 3
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REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 4		
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DATE:	DRAWN
JULY 03	CSM

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PROJECT: BREWERY CREEK MINE

TITLE: TEST PIT 5

CLIENT: VICEROY MINERALS CORPORATION

PROJECT No.	DWG. No.	REV.
0270-001-04	PHOTO 6	0



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REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 6		
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REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 7		
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DATE: JULY 03	DRAWN CSM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY Vancouver, BC Phone: (604) 684 5900	PROJECT BREWERY CREEK MINE		
REFERENCED DRAWING DESCRIPTION			TITLE TEST PIT 9		
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DATE: JULY 03	DRAWN CSM	BGC ENGINEERING INC.	PROJECT	BREWERY CREEK MINE	
REFERENCED DRAWING DESCRIPTION		AN APPLIED EARTH SCIENCES COMPANY	TITLE	TEST PIT 10	
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		CLIENT VICEROY MINERALS CORPORATION	PROJECT No. 0270-001-04	DWG. No. PHOTO 11	REV. 0

APPENDIX A - Test Pit Logs – August 2002 Field Investigation

BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP1

TEST PIT LOCATION: 19962.5N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (SM). Olive-brown, very moist, well graded (waste rock). Original storage area traffic surface.						
2	**Gravel and Sand**, trace silt and clay (GM). Olive, moist, well graded, maximum particle size 200 mm (waste rock). Original end-dumping structure - coarse layer.		0.5 m	GS	9.4	7.6	7
3 / 1							
4			1.0 m	GS	10.3	6.7	1
5							
6 / 2							
7	**Gravel and Sand**, some silt and clay (SM). Olive-brown, moist to wet, well graded, stratified, maximum particle size 80 mm (waste - rock). Original end-dumping structure - fine layer.		2.0 m	GS	11.2	9.1	10
8			2.0 m(C)	GS			
9			2.0 m(S)	GS			
10 / 3	**Gravel and Sand**, some silt and clay, mixed with cobbles (GM). Olive-brown, moist, well graded (waste rock) mixed with cobbles - black, slightly moist, angular, (waste rock - shale). Original end-dumping structure - coarse layer.		3.0 m	GS	10.7	8.6	1
11			3.0 m(F)	GS			
12							
13 / 4	**Gravel**, some sand, trace silt and clay, mixed with cobbles (GP). Black-grey with yellow-green staining, moist, poorly graded, angular, stratified, maximum particle size 150 mm (waste rock - shale). Original end-dumping structure - coarse layer.		4.0 m	GS	7.4	6	16
14							
15							
16 / 5							

LOGGED BY: RW

SHEET: 1 of **2**

BGC Engineering Inc.
500-1045 Howe Street
Vancouver, B.C.
V6Z 2A9

BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP1

TEST PIT LOCATION: 19962.5N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	**Gravel and Sand**, trace silt and clay (GM). Black with olive-brown staining, wet with free water, well graded, blocky, maximum particle size 100 mm (waste rock - shale). Original end-dumping structure - fine layer.		5.0 m	GS	6.9	10.3	
18							
19							
6 / 20	**Gravel**, sandy, trace silt and clay (GM). Black-grey with yellow-orange staining, moist, well graded, angular (waste rock and/or original ground - shale).		6.0 m	GS	5.5	12.3	
21							
22							
7 / 23	END OF HOLE = 7.0 m						
24							
25							
26							
8 / 27							
28							
29							
9 / 30							
31	GS = Grab Sample						
32							
10							

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SHEET: 2 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP2

TEST PIT LOCATION: 20032.6N/17969.1E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (SM). Olive-brown, moist, well graded, laminated (waste rock).						
2	**Gravel and Sand**, trace silt and clay (SM). Olive-brown, moist, well graded (waste rock) mixed with black, moist, angular (waste rock - shale).		0.5 m	GS	9.6	8.4	43
3 / 1							
4			1.0 m	GS	13	8.8	32
5	**Gravel**, some sand, trace silt and clay (GP). Black with yellow-green staining, slightly moist, poorly graded, blocky, angular (waste rock - shale).						
6 / 2							
7			2.0 m	GS	13.2	6.1	6
8							
9							
10 / 3	**Gravel and Sand**, some silt and clay (GM). Olive-brown, moist, well graded (waste rock).		3.0 m	GS	7.8	8.7	36
11							
12							
13 / 4							
14			4.0 m	GS	6.9	9.6	
15							
16 / 5							

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SHEET: 1 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP2

TEST PIT LOCATION: 20032.6N/17969.1E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	**Gravel and Sand**, trace silt and clay, mixed with cobbles (GM). Olive to olive-brown, moist, well graded, maximum particle size 200 mm (waste rock) mixed with dark grey, moist (waste rock - shale). Test pit unstable and slumping.		5.0 m	GS	6.6	11.2	
18							
19							
20 (6)			6.0 m	GS	5.2	9.1	
21							
22							
23 (7)			7.0 m	GS	4.9	10.5	
24							
25	END OF HOLE = 7.50 m						
26 (8)							
27							
28							
29							
30 (9)							
31	GS = Grab Sample						
32							
(10)							

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SHEET: 2 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP3

TEST PIT LOCATION: 20062.7N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (GM). Olive-grey, moist, well graded (waste rock).						
			1.0 m	GS	12.7	9.7	
			2.0 m	GS	12.9	10.1	
10 / 3	**Gravel**, trace sand, silt, and clay (GP). Olive-brown, moist, poorly graded, maximum particle size 30 mm (waste rock).		3.0 m	GS	8.6	5.3	
12 / 4	**Gravel**, trace sand, silt, and clay, mixed with cobbles (GP). Olive-brown, moist, poorly graded, maximum particle size 300 mm (waste rock). Significant orange staining on cobbles. Original end-dumping structure - rubble zone.						
16 / 5							

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SHEET: 1 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP3

TEST PIT LOCATION: 20062.7N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	END OF HOLE = 5.0 m						
18							
19							
6 20							
21							
22							
7 23							
24							
25							
8 26							
27							
28							
29							
9 30							
31	GS = Grab Sample						
32							
10							

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SHEET: 2 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP4

TEST PIT LOCATION: 20101.5N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (SM). Olive-brown, moist, well graded (waste rock). Original storage area traffic surface.						
	Alternating layers of:						
	Gravel and Sand, some silt and clay (GM). Olive-brown with orange staining, moist, well graded layers (waste rock).		1.0 m	GS	11.2	9.2	
	Gravel and Sand, some silt and clay (GM). Black, moist, well graded, maximum particle size 150 mm (waste rock - shale). Original end-dumping structure - alternating fine waste rock layers. Angle of waste rock = 30°.		2.0 m	GS	10.6	9.7	
			3.0 m	GS	8.7	10	
			4.0 m	GS	6.8	8.8	
16 / 5							

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SHEET: 1 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

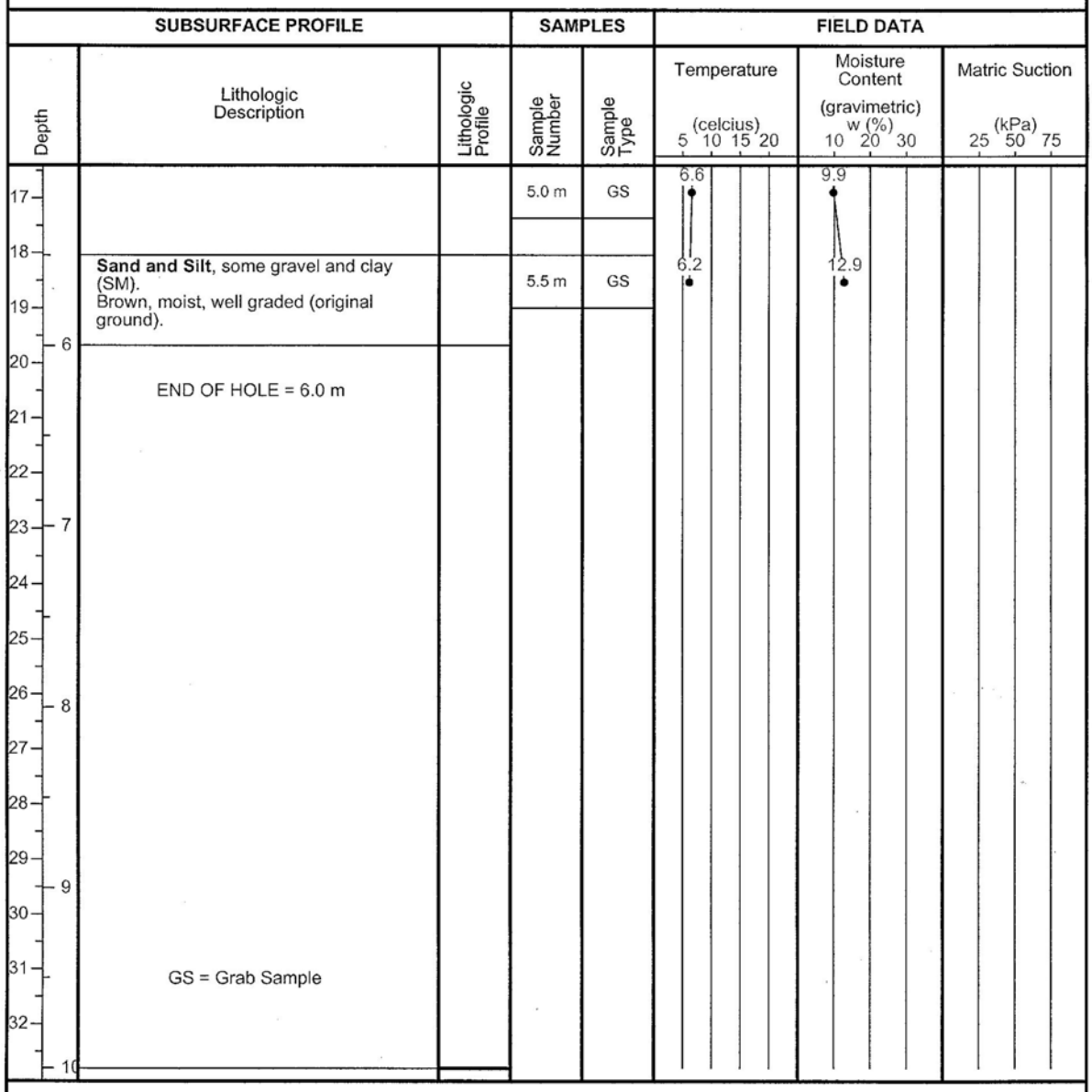
PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP4

TEST PIT LOCATION: 20101.5N/17969.0E

TEST PIT START DATE: August 15, 2002

TEST PIT END DATE: August 15, 2002



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SHEET: **2** of **2**

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP5

TEST PIT LOCATION: 20032.4N/18125.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
0 – 1	**Sand and Silt**, some clay, trace gravel (SM). Grey, moist, well graded, organic material (growth media).		0.0 m	GS	8.8	8.7	
2 – 3 / 1	**Gravel and Sand**, some silt and clay (SM). Olive to dark grey, moist, well graded, maximum particle size 80 mm (waste rock). Appears to be some mixing with growth media.		1.0 m	GS	9.2	9	
6 – 7 / 2			2.0 m	GS	9.4	9.7	
10 – 11 / 3	**Gravel**, some sand, trace silt and clay, mixed with cobbles (GP). Olive, slightly moist, poorly graded (waste rock - shale).		3.0 m	GS	4	5.7	
12 – 13 / 4	**Gravel**, some sand, trace silt and clay, mixed with cobbles (GP). Orange, slightly moist, poorly graded, (waste rock - shale).						
13 – 14 / 4	**Gravel**, some sand, trace silt and clay, mixed with cobbles (GP). Black with olive-orange staining, slightly moist, poorly graded (waste rock - shale).		4.0 m	GS	2.7	13.8	
16 / 5							

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SHEET: 1 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

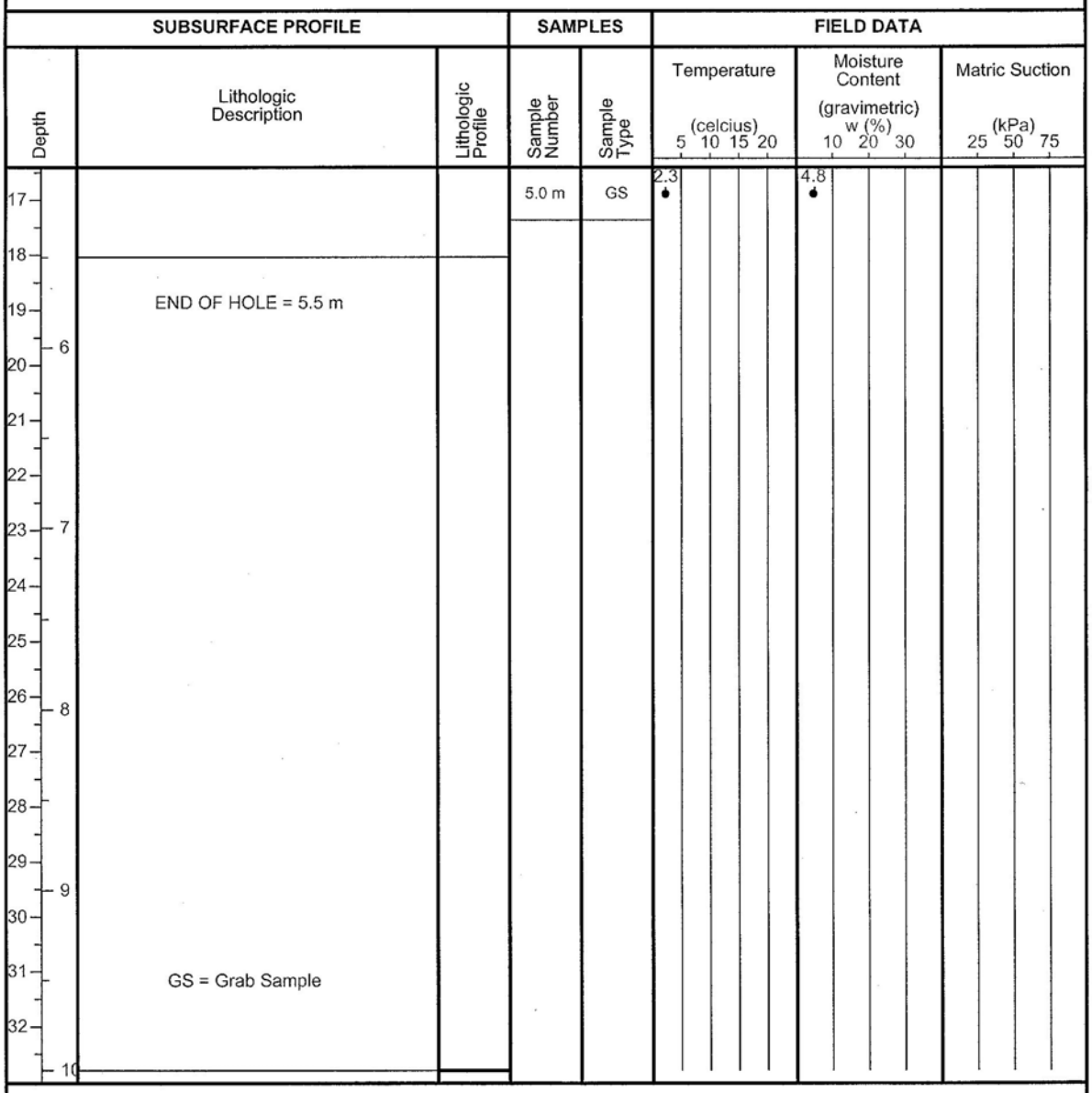
PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP5

TEST PIT LOCATION: 20032.4N/18125.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002



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SHEET: **2** of **2**

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP6

TEST PIT LOCATION: 20032.5N/18250.0E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
0 – 1 / 0 – 1	**Gravel**, sandy with trace silt and clay, mixed with cobbles (GM). Olive, moist, well graded, maximum particle size 150 mm (waste rock).		0.0 m	GS	8.8	7.5	
3 – 4 / 1 – 2	**Gravel**, sandy with trace silt and clay, mixed with cobbles (GM). Olive, moist, well graded, maximum particle size 25 mm (waste rock) mixed with cobbles - black with olive staining, slightly moist, angular, maximum partilce size 100 mm (waste rock - shale).		1.0 m	GS	9.2	7.9	
6 – 10 / 2 – 3	**Gravel**, sand with trace silt and clay, mixed with cobbles (GP). Olive, moist, poorly graded, maximum particle size 25 mm (waste rock) mixed with cobbles - black, slightly moist, angular, maximum particle size 100 mm (waste rock - shale).		2.0 m	GS	9.4	8	
			3.0 m	GS	4	12.3	
12 – 13 / 4	**Sand and Silt**, some gravel and clay (SM). Brown-orange, moist, well graded, maximum particle size 30 mm (possibly original ground). Test pit unstable and slumping.		3.5 m	GS	2.7	11.6	
13 / 4	END OF HOLE = 4.0 m						
	GS = Grab Sample						
16 / 5							

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SHEET: 1 of 1

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP7

TEST PIT LOCATION: 20032.6N/18375.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (SM). Olive-grey to black, moist, well graded (waste rock).		0.0 m	GS	9.7	10.9	
3 / 1	**Gravel and Sand**, some silt and clay (SM). Olive to olive-brown, wet, well graded (waste rock).		1.0 m	GS	10.2	11.7	
7 / 2	**Gravel and Sand**, some silt and clay (SM). Olive-brown, moist, well graded (waste rock).		2.0 m	GS	9.4	11.6	
10 / 3			3.0 m	GS	6.1	9.6	
13 / 4	**Gravel**, sandy, trace silt and clay, mixed with cobbles (GM). Olive, moist, well graded, blocky (waste rock) mixed with cobbles - black with olive and redish-brown staining, slightly moist, angular (waste rock - shale). Original end-dumping structure - angle of waste rock = 34°.		4.0 m	GS	4.1	7.7	
16 / 5							

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SHEET: 1 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP7

TEST PIT LOCATION: 20032.6N/18375.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	**Gravel**, sandy, trace silt and clay, mixed with cobbles (GM). Olive, moist, well graded, blocky (waste rock) mixed with cobbles - olive to olive-brown, slightly moist, angular (waste rock). Wooden blasting stake and wire observed in waste rock. Original end-dumping structure.		5.0 m	GS	4.2	6	
18							
19							
6 / 20	END OF HOLE = 6.0 m						
21							
22							
7 / 23							
24							
25							
8 / 26							
27							
28							
9 / 29							
30							
31	GS = Grab Sample						
32							
10							

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SHEET: 2 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP8

TEST PIT LOCATION: 20072.4N/18362.9E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
0–3 / 0–1	**Gravel,** some sand, trace silt and clay (GP). Olive, moist, poorly graded, blocky, angular, maximum particle size 100 mm (waste rock).		0.0 m	GS	10.4	8.1	
3–6 / 1–2	**Gravel**, some sand, trace silt and clay (GP). Olive with orange staining, wet, poorly graded, blocky, angular (waste rock).		1.0 m	GS	10.8	8.1	
6–9 / 2–3	**Gravel**, sandy, trace silt and clay, mixed with cobbles (GM). Black with orange-yellow staining, moist, well graded, blocky, angular (waste rock - shale).		2.0 m	GS	9.8	7.9	
9–12 / 3–4	**Gravel**, sandy, trace silt and clay (GM). Olive, wet, well graded, blocky (waste rock) mixed with gravel - black, moist, angular (waste rock -shale).		3.0 m	GS	8.1	11.2	
12–15 / 4–5	**Gravel and Sand**, some silt and clay, mixed with cobbles (GM). Olive-brown, moist, well graded, maximum particle size 200 mm (waste rock).		4.0 m	GS	3.9	10.3	

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SHEET: 1 of **2**

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

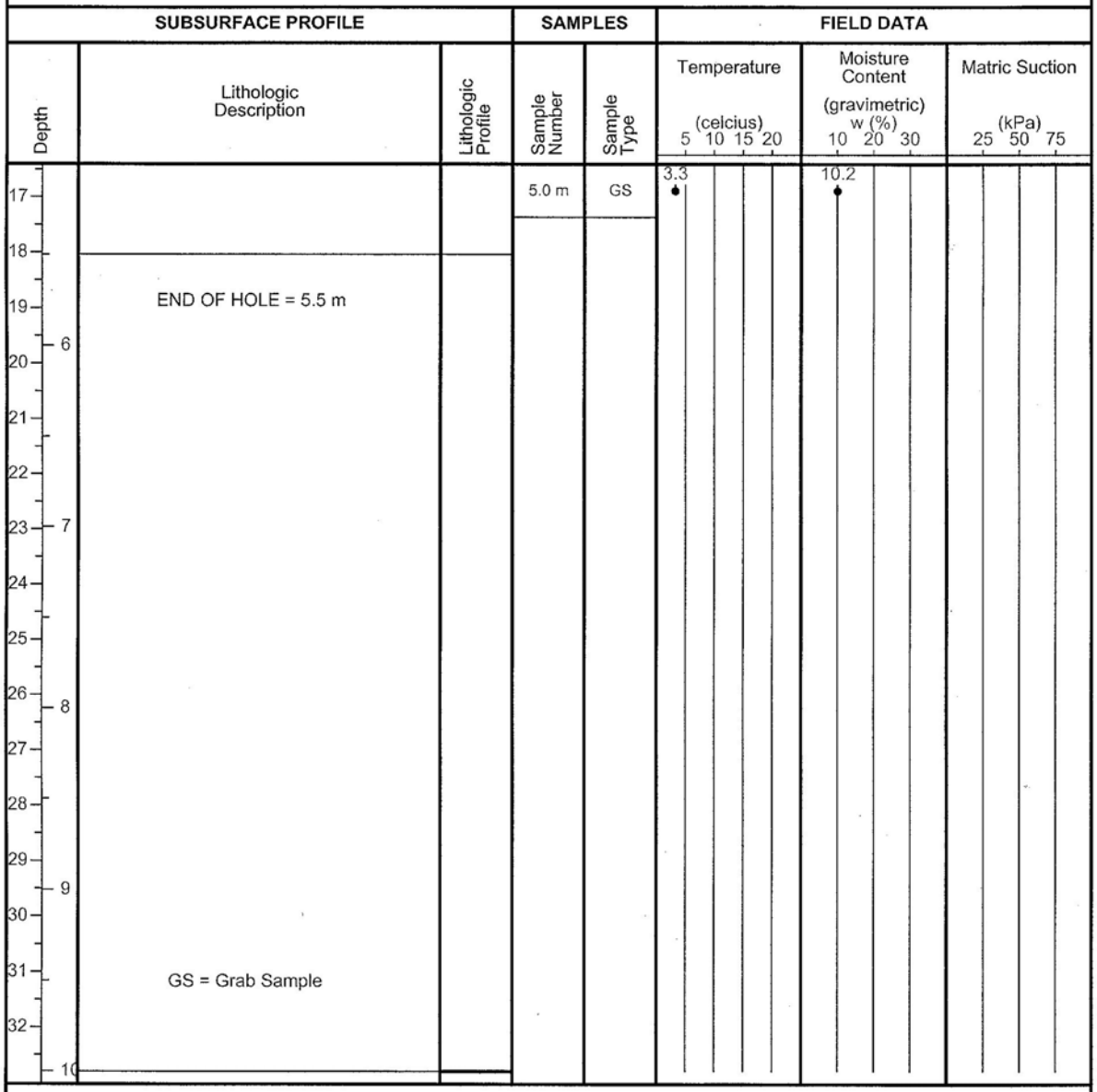
PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP8

TEST PIT LOCATION: 20072.4N/18362.9E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002



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SHEET: 2 of 2

BGC Engineering Inc.
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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP9

TEST PIT LOCATION: 20085.5N/18250.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel and Sand, some silt and clay (SM). Dark olive-grey, moist, well graded, maximum particle size 40 mm (waste rock).		0.0 m	GS	10.3	10.4	
3 / 1	**Gravel**, some sand, trace silt and clay mixed with cobbles (GP). Olive, moist, poorly graded (waste rock). Boulder at 1.5 m.		1.0 m	GS	9.8	8.1	
6 / 2	**Gravel**, some sand, trace silt and clay mixed with cobbles (GP). Olive, slightly moist, poorly graded, stratified (waste rock).		2.0 m	GS	7.7	5.5	
10 / 3	**Gravel and Sand**, some silt and clay (SM). Olive-brown, moist, well graded, maximum particle size 50 mm (waste rock).		3.0 m	GS	7.3	8.8	
13 / 4			4.0 m	GS	5	7.5	
15 / 5	**Sand and Silt**, some gravel and clay (SM). Brown-orange, wet, well graded, organic material (original ground).		4.5 m	GS	4.7	10.5	

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SHEET: 1 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP9

TEST PIT LOCATION: 20085.5N/18250.1E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	END OF HOLE = 5.0 m						
18							
19							
20 – 6							
21							
22							
23 – 7							
24							
25							
26 – 8							
27							
28							
29 – 9							
30							
31	GS = Grab Sample						
32 – 10							

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SHEET: 2 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP10

TEST PIT LOCATION: 20101.3N/18124.9E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth (ft / m)	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
0 / 0	Ground Surface						
	Gravel, sandy with some silt and clay (GM). Dark olive-grey, moist, well graded, angular, maximum particle size 50 mm (waste rock).		0.0 m	GS	10.4	9.5	
1 / 1	**Gravel**, sandy with some silt and clay (GM). Dark olive-grey, wet with free water, well graded, angular, maximum particle size 40 mm (waste rock).		1.0 m	GS	10.8	9.7	
2 / 2	**Gravel**, sandy with some silt and clay (GM). Dark olive-grey, moist, well graded, angular, maximum particle size 50 mm (waste rock).		2.0 m	GS	10.3	8.8	
3 / 3	**Gravel and Sand**, with some silt and some clay (SM). Olive-brown, wet with free water, well graded, maximum particle size 50 mm (waste rock).		3.0 m	GS	8.1	6.9	
4 / 4	**Gravel**, sandy with some silt and some clay with cobbles/boulders (GM). Olive-brown, moist, well graded, maximum particle size 400 mm (waste rock).		4.0 m	GS	6.6	7.4	
5 / 5	**Sand and Silt**, some gravel and clay (SM). Brown-orange, wet, well graded, organic material (original ground).		4.5 m	GS	4.5	13.8	

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SHEET: 1 of 2

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BGC PROJECT: 0270-001-03

PROJECT TITLE: Blue Sediment Waste Rock Storage Area

PROJECT LOCATION: Brewery Creek Mine, Yukon Territory

RECORD OF TEST PIT: TP10

TEST PIT LOCATION: 20101.3N/18124.9E

TEST PIT START DATE: August 16, 2002

TEST PIT END DATE: August 16, 2002

SUBSURFACE PROFILE			SAMPLES		FIELD DATA		
Depth	Lithologic Description	Lithologic Profile	Sample Number	Sample Type	Temperature (celcius) 5 10 15 20	Moisture Content (gravimetric) w (%) 10 20 30	Matric Suction (kPa) 25 50 75
17	END OF HOLE = 5.0 m						
18							
19							
6 20							
21							
22							
7 23							
24							
25							
8 26							
27							
28							
29							
9 30							
31	GS = Grab Sample						
32							
10							

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SHEET: 2 of 2

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APPENDIX B - BSWR Laboratory Data – October 2001 Field Investigation

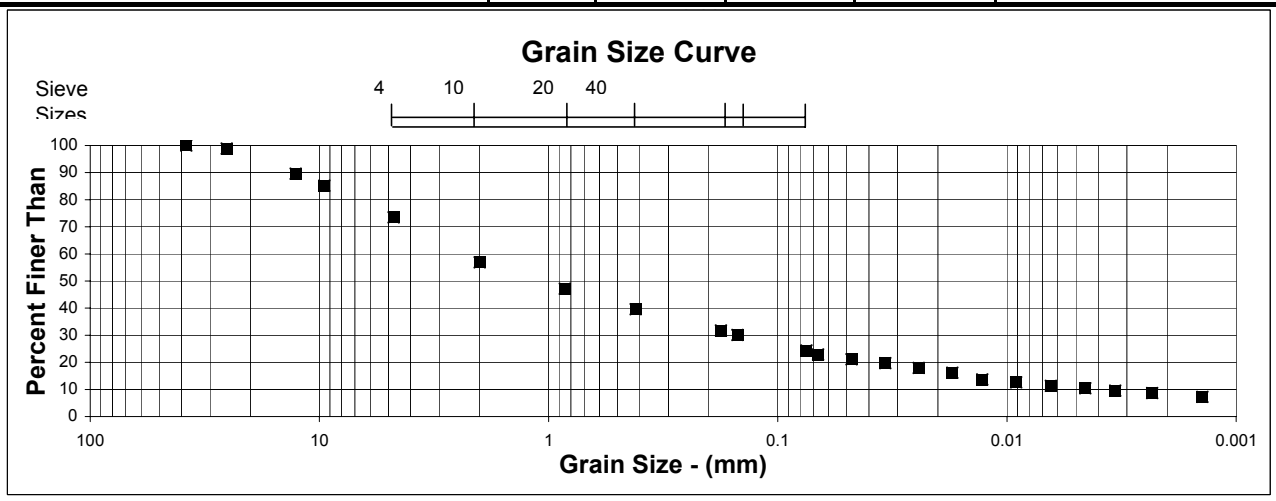
Table B-1: Blue Sediment Waste Rock Grain Size Distribution

ADVANCED FIELD AND LAB TESTING SOIL TESTING LABORATORY GRAINSIZE TEST				PROJECT	Brewery Creek Mine		
				SITE			
				HOLE	BSWR	DEPTH	Surface
				TECHNICIAN		DP	
Specific Gravity (Gs):			2.72				
Calgon Density Correction (Cc):			4				
Hyrometer Meniscus Correction (Mc):			0.5				

DATE / TIME mm/dd/yy hh:mm:ss	ELAPSED TIME (sec)	TEMP (C)	R'h	d (mm)	% Finer (%)	Comments		
10/25/01 8:11:00	0							
10/25/01 8:11:15	15					min	hours	
10/25/01 8:11:30	30	22.0	16.0	0.0667	22.93	0.5		
10/25/01 8:12:00	60	22.0	15.0	0.0477	21.15	1		
10/25/01 8:13:00	120	22.0	14.2	0.0340	19.72	2		
10/25/01 8:15:00	240	22.0	13.2	0.0243	17.95	4		
10/25/01 8:19:00	480	22.0	12.2	0.0173	16.17	8		
10/25/01 8:26:00	900	22.0	10.8	0.0128	13.67	15		
10/25/01 8:41:00	1800	22.0	10.2	0.0091	12.61	30	0.5	
10/25/01 9:12:00	3660	22.0	9.5	0.0064	11.36	61	1	
10/25/01 10:14:00	7380	22.0	9.0	0.0046	10.47	123	2	
10/25/01 11:57:00	13560	22.0	8.5	0.0034	9.58	226	4	
10/25/01 16:11:00	28800	22.0	8.0	0.0023	8.69	480	8	
10/26/01 6:27:00	80160	22.0	7.2	0.0014	7.27	1336	22	

Mechanical Sieve Results on Material ABOVE #200 Sieve Size

		Sieve #	Wt. Retain	Diameter	% Finer	
Initial Dry Sample Mass (g)	4029	2		50.8	100.0	
Before Hydrometer		1.5	0	38.1	100.0	
		1	45	25.4	98.9	note: 1 rock
		1/2	374	12.7	89.6	
		3/8	178	9.53	85.2	
		4	472	4.75	73.5	
		10	667	2.000	56.9	
Hydrometer Dry Sample Mass (g)	50.57	20	8.65	0.850	47.2	
Equivalent Sample Mass (g)	88.86	40	6.71	0.417	39.6	
(Hydrometer Mass/% passing # 10)		80	6.97	0.177	31.8	
		100	1.48	0.150	30.1	
		200	5.1	0.075	24.4	



Method: ASTM D422-95

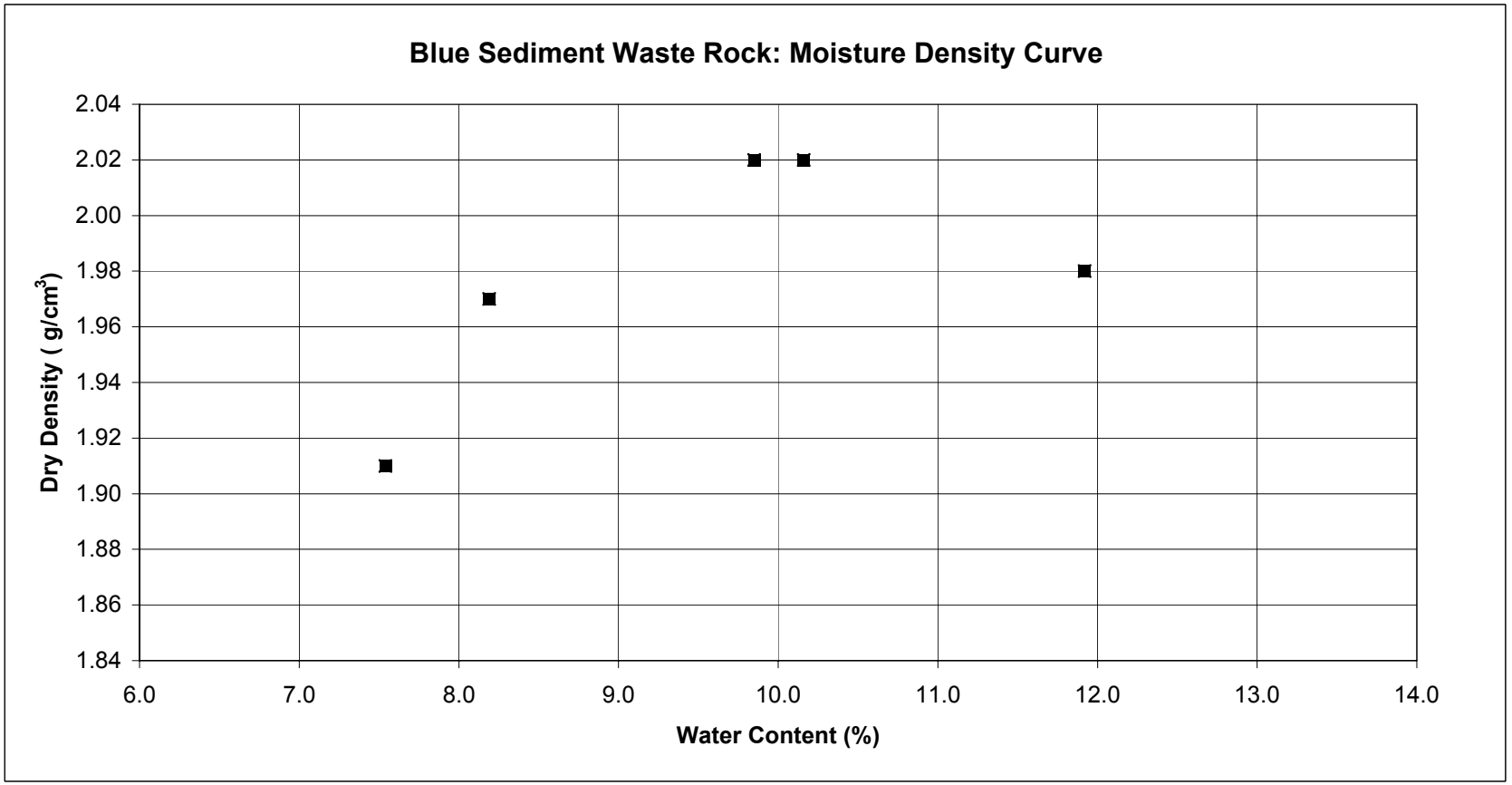
Table B-2: Blue Sediment Waste Rock Specific Gravity Data

Size Fraction	Particle Size	Specific Gravity
Fine Fraction	< 4.75 mm	2.72
Coarse Fraction	> 4.75 mm	2.60
Bulk Sample	All	2.69

Method: ASTM D854-92 & ASTM C127-88 (Reapproved 1993)

Table B-3: Blue Sediment Waste Rock Moisture Density Data

Point	Water Content (%)	Dry Density (g/cm3)
1	7.5	1.91
2	8.2	1.97
3	9.9	2.02
4	10.2	2.02
5	11.9	1.98



Method: ASTM D698-91 Procedure B

Table B-4: Blue Sediment Waste Rock Soil Water Characteristic Curve Data

Suction (kPa)	Gravimetric Water Content	Gravimetric Water Content (%)
0.10	0.1824	18.24
1.00	0.1782	17.82
2.00	0.1732	17.32
4.00	0.1540	15.40
8.00	0.1400	14.00
10.00	0.1372	13.72
20.00	0.1273	12.73
30.00	0.1230	12.30
40.00	0.1204	12.04
80.00	0.1091	10.91
100.00	0.1056	10.56

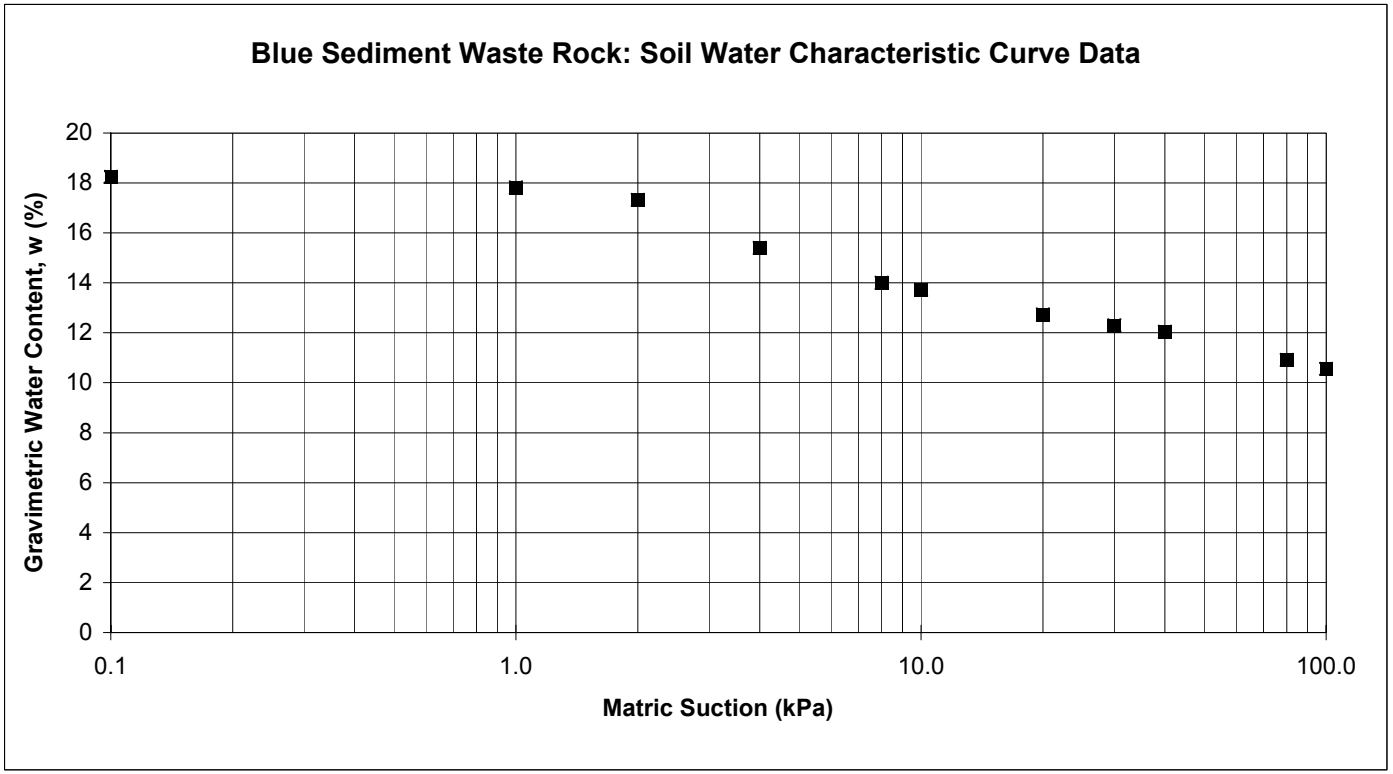


Table B-5: Blue Sediment Waste Rock Hydraulic Conductivity Data

Constant Head Test: Measurement of Hydraulic Conductivity

Project: Brewery Creek Mine **Date:** Feb. 24, 2002 **By:** DP

Sample: **Blue Sediment Waste Rock**
Compaction: 6" sample @standard compaction

Permeant:	Tap water	**Water Content Test**	
Density of Permeant:	1.00 g/cm^3	**Tare & wet soil:**	207.22 g.
Permeant temperature (T_{test}):	16.1 ^{O}C	**Tare & dry soil:**	200.69 g.
Viscosity correction (R_T):	1.106	**Water:**	6.53 g.
		Tare:	106.89 g.
Sample Diameter:	15.20 cm	**Dry soil:**	93.80 g.
Sample Height:	11.50 cm	**Molding %w/c:**	6.96%
Cross Sectional Area:	181.5 cm^2		
Sample Volume:	2086.8 cm^3		
Mold weight:	431 g	**Dry Density - ρ_d:**	1.849 g/cm^3
Mold and wet soil:	4559 g	**Spec. Gravity - G_S:**	2.70
Wet soil weight:	4128 g	**Void ratio - e:**	0.46
Dry soil weight:	3859 g	**Porosity - n:**	32%
Water:	269 g	**Saturation - S**	41%

Date	Time		Elapsed Time	Elapsed Time	t_2-t_1	Tare	Tare & water	Water	Q	K at T_{test}	K at T=20^{O}C
(d-m-y)	Hour	Min.	min	sec	sec	g	g	cm^3	cm^3/sec	cm/sec	cm/sec
Change in Head:	***30 mm***		***2.61 gradient***								
24-Feb-02	14	15	0	0	-	-	-	-	-	-	
24-Feb-02	14	15.5	0.5	30	30	0.00	35	35	1.167	2.46E-03	2.73E-03
24-Feb-02	14	16	1	60	30	35.00	73	38	1.267	2.68E-03	2.96E-03
24-Feb-02	14	17.0	2	120	60	73.00	144	71	1.183	2.50E-03	2.76E-03
									Average	**2.57E-03**	**2.84E-03**
Change in Head:	***30 mm***		***2.61 gradient***								
24-Feb-02	14	18	0	0	-	-	-	-	-	-	
24-Feb-02	14	18.5	0.5	30	30	0.00	37	37	1.233	2.61E-03	2.88E-03
24-Feb-02	14	19	1	60	30	37.00	74	37	1.233	2.61E-03	2.88E-03
24-Feb-02	14	19.5	1.5	90	30	74.00	112	38	1.267	2.68E-03	2.96E-03
24-Feb-02	14	20.5	2.5	150	60	112.00	186	74	1.233	2.61E-03	2.88E-03
24-Feb-02	14	21	3	180	30	186.00	222	36	1.200	2.54E-03	2.80E-03
									Average	**2.63E-03**	**2.91E-03**
Change in Head:	***50 mm***		***4.35 gradient***								
24-Feb-02	16	47	0	0	-	-	-	-	-	-	
24-Feb-02	16	48.0	1	60	60	161.00	277	116	1.933	2.45E-03	2.71E-03
24-Feb-02	16	49.0	2	120	60	277.00	411	134	2.233	2.83E-03	3.13E-03
24-Feb-02	16	50.0	3	180	60	411.00	547	136	2.267	2.87E-03	3.18E-03
24-Feb-02	16	52.0	5	300	120	547.00	811	264	2.200	2.79E-03	3.08E-03
24-Feb-02	16	57.0	10	600	300	811	1457	646	2.153	2.73E-03	3.02E-03
									Average	**2.73E-03**	**3.02E-03**

Method: ASTM D5856-95

APPENDIX C - Grain Size Distribution Data – August 2002 Field Investigation

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP1	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.4	
	Total Weight	4252.9	Before Wash	55.0	Total -200	20.7	
			After Wash	34.7	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	695.2	16.3			16.3	38.1	83.7
1"	191.1	4.5			4.5	25.4	79.2
3/4"	238.5	5.6			5.6	19.1	73.6
1/2"	355.7	8.4			8.4	12.7	65.2
3/8"	266.6	6.3			6.3	9.52	58.9
#4	628.1	14.8			14.8	4.76	44.2
#10	719.9	16.9			16.9	2.00	27.2
#20			14.6	26.5	7.2	0.840	20.0
#40			8.9	16.2	4.4	0.420	15.6
#60			4.5	8.2	2.2	0.250	13.4
#100			2.9	5.3	1.4	0.149	11.9
#200			3.5	6.4	1.7	0.074	10.2
Pan			20.7	37.6	10.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	24.0	20.0		-3.77	20.2	0.0735	9.9
1	22.0	20.0		-3.77	18.2	0.0570	8.9
2	21.6	20.0		-3.77	17.8	0.0404	8.7
4	20.2	20.0		-3.77	16.4	0.0288	8.0
8	19.0	20.0		-3.77	15.2	0.0205	7.5
15	17.5	20.0		-3.77	13.7	0.0151	6.7
30	15.4	20.0		-3.77	11.6	0.0108	5.7
60	13.8	20.2		-3.75	10.1	0.0077	4.9
120	12.5	20.2		-3.75	8.8	0.0055	4.3
240	11.1	20.6		-3.69	7.4	0.0039	3.6
360	10.7	21.0		-3.63	7.1	0.0032	3.5
1565	9.1	20.1		-3.63	5.5	0.0015	2.7
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP1	
Sch#	176	**Project :**	0270-001-03		**Sample :**	2.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	2.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.2	
	Total Weight	4333.5	Before Wash	55.0	Total -200	31.8	
			After Wash	23.4	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	210.9	4.9			4.9	38.1	95.1
1"	277.2	6.4			6.4	25.4	88.7
3/4"	184.0	4.2			4.2	19.1	84.5
1/2"	312.1	7.2			7.2	12.7	77.3
3/8"	246.3	5.7			5.7	9.52	71.6
#4	566.7	13.1			13.1	4.76	58.5
#10	493.2	11.4			11.4	2.00	47.1
#20			9.0	16.4	7.7	0.840	39.4
#40			5.3	9.6	4.5	0.420	34.9
#60			3.3	6.0	2.8	0.250	32.1
#100			2.5	4.5	2.1	0.149	29.9
#200			3.2	5.8	2.7	0.074	27.2
Pan			31.8	57.8	27.3		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	35.5	20.0		-3.77	31.7	0.0731	26.9
1	33.5	20.0		-3.77	29.7	0.0525	25.2
2	31.0	20.0		-3.77	27.2	0.0378	23.1
4	27.6	20.0		-3.77	23.8	0.0274	20.2
8	24.3	20.0		-3.77	20.5	0.0198	17.4
15	21.8	20.0		-3.77	18.0	0.0147	15.3
30	18.7	20.0		-3.77	14.9	0.0106	12.7
60	16.3	20.2		-3.75	12.6	0.0076	10.6
120	14.0	20.2		-3.75	10.3	0.0055	8.7
240	12.2	20.6		-3.69	8.5	0.0039	7.2
360	11.5	21.0		-3.63	7.9	0.0032	6.7
1568	9.5	20.1		-3.63	5.9	0.0015	5.0
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP2	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.3	
	Total Weight	3486.3	Before Wash	55.0	Total -200	25.2	
			After Wash	31.1	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	85.5	2.5			2.5	38.1	97.5
1"	212.0	6.1			6.1	25.4	91.5
3/4"	226.1	6.5			6.5	19.1	85.0
1/2"	337.8	9.7			9.7	12.7	75.3
3/8"	247.7	7.1			7.1	9.52	68.2
#4	666.6	19.1			19.1	4.76	49.1
#10	744.0	21.3			21.3	2.00	27.7
#20			8.7	15.8	4.4	0.840	23.3
#40			7.9	14.4	4.0	0.420	19.4
#60			4.5	8.2	2.3	0.250	17.1
#100			3.6	6.5	1.8	0.149	15.3
#200			5.1	9.3	2.6	0.074	12.7
Pan			25.2	45.8	12.7		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
1	27.0	19.2		-3.88	23.1	0.0552	11.5
3	22.7	19.2		-3.88	18.8	0.0328	9.4
5	22.0	19.2		-3.88	18.1	0.0255	9.0
8	20.5	19.2		-3.88	16.6	0.0204	8.3
15	18.9	19.2		-3.88	15.0	0.0150	7.5
30	17.3	19.2		-3.88	13.4	0.0107	6.7
60	15.3	19.2		-3.88	11.4	0.0077	5.7
120	14.5	20.0		-3.77	10.7	0.0055	5.3
240	12.9	20.0		-3.77	9.1	0.0039	4.5
360	12.0	20.0		-3.77	8.2	0.0032	4.1
1440	10.3	20.0		-3.77	6.5	0.0016	3.3
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP2	
Sch#	176	**Project :**	0270-001-03		**Sample :**	2.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	2.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.6	
	Total Weight	4229.6	Before Wash	55.0	Total -200	27.1	
			After Wash	28.5	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	362.1	8.6			8.6	38.1	91.4
1"	363.4	8.6			8.6	25.4	82.8
3/4"	260.1	6.1			6.1	19.1	76.7
1/2"	412.5	9.8			9.8	12.7	66.9
3/8"	381.1	9.0			9.0	9.52	57.9
#4	1016.9	24.0			24.0	4.76	33.9
#10	810.6	19.2			19.2	2.00	14.7
#20			8.7	15.8	2.3	0.840	12.4
#40			7.1	12.9	1.9	0.420	10.5
#60			4.0	7.3	1.1	0.250	9.4
#100			3.3	6.0	0.9	0.149	8.5
#200			5.0	9.1	1.3	0.074	7.2
Pan			27.1	49.3	7.3		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	29.0	19.5		-3.84	25.2	0.0730	6.7
1	27.0	19.5		-3.84	23.2	0.0551	6.1
2	25.5	19.5		-3.84	21.7	0.0394	5.7
4	24.0	19.5		-3.84	20.2	0.0281	5.3
8	22.0	19.5		-3.84	18.2	0.0202	4.8
15	20.9	19.5		-3.84	17.1	0.0148	4.5
30	18.6	19.5		-3.84	14.8	0.0106	3.9
60	16.8	19.5		-3.84	13.0	0.0076	3.4
120	15.3	20.0		-3.77	11.5	0.0054	3.1
240	13.8	20.2		-3.75	10.1	0.0039	2.7
360	13.1	20.5		-3.70	9.4	0.0032	2.5
1440	11.5	20.0		-3.70	7.8	0.0016	2.1
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP3	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.7	
	Total Weight	3093.2	Before Wash	55.0	Total -200	31.2	
			After Wash	25.5	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	443.6	14.3			14.3	38.1	85.7
1"	229.7	7.4			7.4	25.4	78.2
3/4"	229.3	7.4			7.4	19.1	70.8
1/2"	197.7	6.4			6.4	12.7	64.4
3/8"	114.5	3.7			3.7	9.52	60.7
#4	361.4	11.7			11.7	4.76	49.0
#10	433.1	14.0			14.0	2.00	35.0
#20			6.0	10.9	3.8	0.840	31.2
#40			5.9	10.7	3.8	0.420	27.5
#60			3.9	7.1	2.5	0.250	25.0
#100			3.3	6.0	2.1	0.149	22.9
#200			4.7	8.5	3.0	0.074	19.9
Pan			31.2	56.7	19.9		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	35.0	19.5		-3.84	31.2	0.0735	19.6
1	32.5	19.5		-3.84	28.7	0.0530	18.1
2	31.0	19.5		-3.84	27.2	0.0379	17.1
4	28.1	19.5		-3.84	24.3	0.0273	15.3
8	26.0	19.5		-3.84	22.2	0.0196	14.0
15	24.0	19.5		-3.84	20.2	0.0145	12.7
30	22.0	19.5		-3.84	18.2	0.0104	11.4
60	19.8	19.5		-3.84	16.0	0.0075	10.1
120	18.0	20.0		-3.77	14.2	0.0053	9.0
240	16.4	20.2		-3.75	12.7	0.0038	8.0
360	15.2	20.5		-3.70	11.5	0.0031	7.2
1440	13.6	20.0		-3.70	9.9	0.0016	6.2
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP3	
Sch#	176	**Project :**	0270-001-03		**Sample :**	3.0 m	
Lab Work:	rd	**Location:**	Yukon Territory		**Depth :**	3.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.4	
	Total Weight	3611.7	Before Wash	55.0	Total -200	28.4	
			After Wash	28.0	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	1191.0	33.0			33.0	38.1	67.0
1"	539.4	14.9			14.9	25.4	52.1
3/4"	396.3	11.0			11.0	19.1	41.1
1/2"	459.2	12.7			12.7	12.7	28.4
3/8"	239.2	6.6			6.6	9.52	21.8
#4	342.6	9.5			9.5	4.76	12.3
#10	150.2	4.2			4.2	2.00	8.1
#20			6.2	11.3	0.9	0.840	7.2
#40			6.7	12.2	1.0	0.420	6.2
#60			4.2	7.6	0.6	0.250	5.6
#100			3.5	6.4	0.5	0.149	5.1
#200			5.1	9.3	0.8	0.074	4.3
Pan			28.4	51.6	4.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
1	29.5	19.2		-3.88	25.6	0.0542	3.7
2	27.5	19.2		-3.88	23.6	0.0389	3.5
4	26.0	19.2		-3.88	22.1	0.0278	3.2
8	23.5	19.2		-3.88	19.6	0.0200	2.9
16	22.0	19.2		-3.88	18.1	0.0143	2.6
30	20.3	19.2		-3.88	16.4	0.0105	2.4
60	18.6	19.2		-3.88	14.7	0.0075	2.2
120	17.0	20.0		-3.77	13.2	0.0054	1.9
240	15.3	20.0		-3.77	11.5	0.0038	1.7
360	14.2	20.0		-3.77	10.4	0.0032	1.5
1440	12.4	20.0		-3.77	8.6	0.0016	1.3
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP4	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	2.4	
	Total Weight	3556.1	Before Wash	55.0	Total -200	26.4	
			After Wash	31.0	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	542.3	15.2			15.2	38.1	84.8
1"	230.5	6.5			6.5	25.4	78.3
3/4"	229.8	6.5			6.5	19.1	71.8
1/2"	251.4	7.1			7.1	12.7	64.7
3/8"	200.0	5.6			5.6	9.52	59.1
#4	508.9	14.3			14.3	4.76	44.8
#10	515.7	14.5			14.5	2.00	30.3
#20			7.2	13.1	4.0	0.840	26.3
#40			7.1	12.9	3.9	0.420	22.4
#60			4.6	8.4	2.5	0.250	19.9
#100			3.9	7.1	2.1	0.149	17.7
#200			5.8	10.5	3.2	0.074	14.5
Pan			26.4	48.0	14.5		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	30.0	20.0		-3.77	26.2	0.0735	14.3
1	27.9	20.0		-3.77	24.1	0.0547	13.1
2	26.0	20.0		-3.77	22.2	0.0392	12.1
4	24.0	20.0		-3.77	20.2	0.0281	11.0
8	21.9	20.0		-3.77	18.1	0.0202	9.9
15	20.6	20.0		-3.77	16.8	0.0148	9.2
30	19.0	20.0		-3.77	15.2	0.0106	8.3
60	17.1	20.2		-3.75	13.4	0.0076	7.3
120	15.2	20.2		-3.75	11.5	0.0054	6.2
240	14.2	20.6		-3.69	10.5	0.0039	5.7
360	13.6	21.0		-3.63	10.0	0.0032	5.4
1563	11.4	20.1		-3.63	7.8	0.0015	4.2
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP4	
Sch#	176	**Project :**	0270-001-03		**Sample :**	2.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	2.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.8	
	Total Weight	3460.5	Before Wash	55.0	Total -200	17.6	
			After Wash	38.2	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	197.3	5.7			5.7	38.1	94.3
1"	122.0	3.5			3.5	25.4	90.8
3/4"	207.2	6.0			6.0	19.1	84.8
1/2"	402.8	11.6			11.6	12.7	73.1
3/8"	247.4	7.1			7.1	9.52	66.0
#4	587.0	17.0			17.0	4.76	49.0
#10	625.4	18.1			18.1	2.00	31.0
#20			16.7	30.4	9.4	0.840	21.6
#40			8.9	16.2	5.0	0.420	16.5
#60			3.9	7.1	2.2	0.250	14.4
#100			3.0	5.5	1.7	0.149	12.7
#200			4.7	8.5	2.6	0.074	10.0
Pan			17.6	32.0	9.9		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	21.6	19.5		-3.84	17.8	0.0730	9.9
1	21.0	19.5		-3.84	17.2	0.0574	9.6
2	20.5	19.5		-3.84	16.7	0.0407	9.3
4	19.0	19.5		-3.84	15.2	0.0291	8.4
8	18.0	19.5		-3.84	14.2	0.0207	7.9
15	16.4	19.5		-3.84	12.6	0.0153	7.0
30	15.1	19.5		-3.84	11.3	0.0109	6.3
60	14.3	19.5		-3.84	10.5	0.0077	5.8
120	13.0	20.0		-3.77	9.2	0.0055	5.1
240	11.5	20.2		-3.75	7.8	0.0039	4.3
360	11.1	20.5		-3.70	7.4	0.0032	4.1
1440	10.0	20.0		-3.70	6.3	0.0016	3.5
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP5	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.3	
	Total Weight	3379.9	Before Wash	55.0	Total -200	32.4	
			After Wash	23.9	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	233.2	6.9			6.9	38.1	93.1
1"	141.3	4.2			4.2	25.4	88.9
3/4"	159.9	4.7			4.7	19.1	84.2
1/2"	265.7	7.9			7.9	12.7	76.3
3/8"	216.3	6.4			6.4	9.52	69.9
#4	462.5	13.7			13.7	4.76	56.2
#10	507.9	15.0			15.0	2.00	41.2
#20			5.5	10.0	4.1	0.840	37.1
#40			5.2	9.5	3.9	0.420	33.2
#60			3.3	6.0	2.5	0.250	30.7
#100			3.1	5.6	2.3	0.149	28.4
#200			5.2	9.5	3.9	0.074	24.5
Pan			32.4	58.9	24.3		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	36.5	20.0		-3.77	32.7	0.0725	24.3
1	33.2	20.0		-3.77	29.4	0.0526	21.8
2	31.9	20.0		-3.77	28.1	0.0376	20.8
4	29.9	20.0		-3.77	26.1	0.0270	19.4
8	27.5	20.0		-3.77	23.7	0.0194	17.6
15	26.4	20.0		-3.77	22.6	0.0143	16.8
30	23.8	20.0		-3.77	20.0	0.0103	14.8
60	21.7	20.2		-3.75	18.0	0.0074	13.3
171	18.9	20.2		-3.75	15.2	0.0044	11.2
240	18.0	20.6		-3.69	14.3	0.0038	10.6
360	17.2	21.0		-3.63	13.6	0.0031	10.1
1560	14.8	20.1		-3.63	11.2	0.0015	8.3
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP6	
Sch#	176	**Project :**	0270-001-03		**Sample :**	0.0 m	
Lab Work:	rd	**Location:**	Yukon Territory		**Depth :**	Surface	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.5	
	Total Weight	3314.6	Before Wash	55.0	Total -200	24.1	
			After Wash	32.4	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	497.7	15.0			15.0	38.1	85.0
1"	411.3	12.4			12.4	25.4	72.6
3/4"	338.5	10.2			10.2	19.1	62.4
1/2"	318.8	9.6			9.6	12.7	52.7
3/8"	248.8	7.5			7.5	9.52	45.2
#4	452.1	13.6			13.6	4.76	31.6
#10	385.3	11.6			11.6	2.00	20.0
#20			9.8	17.8	3.6	0.840	16.4
#40			6.3	11.5	2.3	0.420	14.1
#60			4.3	7.8	1.6	0.250	12.6
#100			4.1	7.5	1.5	0.149	11.1
#200			6.4	11.6	2.3	0.074	8.8
Pan			24.1	43.8	8.8		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
1	25.7	19.2		-3.88	21.8	0.0557	7.8
2	24.5	19.2		-3.88	20.6	0.0397	7.4
5	22.0	19.2		-3.88	18.1	0.0255	6.5
8	20.7	19.2		-3.88	16.8	0.0203	6.0
15	19.5	19.2		-3.88	15.6	0.0150	5.6
30	18.2	19.2		-3.88	14.3	0.0107	5.1
60	16.5	19.2		-3.88	12.6	0.0076	4.5
120	15.0	20.0		-3.77	11.2	0.0054	4.0
240	13.8	20.0		-3.77	10.0	0.0039	3.6
360	13.0	20.0		-3.77	9.2	0.0032	3.3
1440	11.3	20.0		-3.77	7.5	0.0016	2.7
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine	**Test Pit :**	TP6	
Sch#	176	**Project :**	0270-001-03	**Sample :**	1.0 m	
Lab Work:	rd	**Location:**	Yukon Territory	**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.5	
	Total Weight	2690.7	Before Wash	55.0	Total -200	20.0	
			After Wash	36.5	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	228.1	8.5			8.5	38.1	91.5
1"	187.1	7.0			7.0	25.4	84.6
3/4"	209.5	7.8			7.8	19.1	76.8
1/2"	353.9	13.2			13.2	12.7	63.6
3/8"	228.2	8.5			8.5	9.52	55.1
#4	516.2	19.2			19.2	4.76	36.0
#10	434.2	16.1			16.1	2.00	19.8
#20			13.7	24.9	4.9	0.840	14.9
#40			7.3	13.3	2.6	0.420	12.3
#60			4.5	8.2	1.6	0.250	10.6
#100			4.1	7.5	1.5	0.149	9.2
#200			6.6	12.0	2.4	0.074	6.8
Pan			20.0	36.4	7.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
1	20.5	19.2		-3.88	16.6	0.0576	5.9
2	19.5	19.2		-3.88	15.6	0.0410	5.6
4	18.5	19.2		-3.88	14.6	0.0292	5.2
8	16.8	19.2		-3.88	12.9	0.0208	4.6
15	15.9	19.2		-3.88	12.0	0.0153	4.3
30	14.7	19.2		-3.88	10.8	0.0109	3.9
60	13.2	19.2		-3.88	9.3	0.0078	3.3
120	12.0	20.0		-3.77	8.2	0.0055	2.9
240	10.8	20.0		-3.77	7.0	0.0039	2.5
360	10.2	20.0		-3.77	6.4	0.0032	2.3
1440	8.8	20.0		-3.77	5.0	0.0016	1.8
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP7	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	rd	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.8	
	Total Weight	1964.0	Before Wash	55.0	Total -200	32.0	
			After Wash	23.8	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	249.9	12.7			12.7	25.4	87.3
3/4"	141.7	7.2			7.2	19.1	80.1
1/2"	198.9	10.1			10.1	12.7	69.9
3/8"	93.4	4.8			4.8	9.52	65.2
#4	234.5	11.9			11.9	4.76	53.2
#10	236.8	12.1			12.1	2.00	41.2
#20			6.2	11.3	4.6	0.840	36.5
#40			5.8	10.5	4.3	0.420	32.2
#60			3.9	7.1	2.9	0.250	29.3
#100			3.2	5.8	2.4	0.149	26.9
#200			4.7	8.5	3.5	0.074	23.4
Pan			32.0	58.2	24.0		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	35.0	19.2		-3.88	31.1	0.0735	23.0
1	34.0	19.2		-3.88	30.1	0.0524	22.3
2	31.8	19.2		-3.88	27.9	0.0377	20.7
4	29.8	19.2		-3.88	25.9	0.0270	19.2
13	26.3	19.2		-3.88	22.4	0.0154	16.6
15	25.5	19.2		-3.88	21.6	0.0144	16.0
30	23.2	19.2		-3.88	19.3	0.0103	14.3
60	21.2	19.2		-3.88	17.3	0.0074	12.8
120	19.3	20.0		-3.77	15.5	0.0053	11.5
240	17.6	20.0		-3.77	13.8	0.0038	10.2
360	16.3	20.0		-3.77	12.5	0.0031	9.3
1440	14.5	20.0		-3.77	10.7	0.0016	7.9
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP8	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	rd	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.0	
	Total Weight	1734.0	Before Wash	55.0	Total -200	22.3	
			After Wash	33.7	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	479.8	27.7			27.7	38.1	72.3
1"	124.6	7.2			7.2	25.4	65.1
3/4"	168.3	9.7			9.7	19.1	55.4
1/2"	227.0	13.1			13.1	12.7	42.3
3/8"	130.2	7.5			7.5	9.52	34.8
#4	220.3	12.7			12.7	4.76	22.1
#10	146.1	8.4			8.4	2.00	13.7
#20			11.2	20.4	2.8	0.840	10.9
#40			8.1	14.7	2.0	0.420	8.9
#60			4.7	8.5	1.2	0.250	7.7
#100			3.7	6.7	0.9	0.149	6.8
#200			4.9	8.9	1.2	0.074	5.6
Pan			22.3	40.5	5.6		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
1	25.0	19.2		-3.88	21.1	0.0559	5.2
2	24.5	19.2		-3.88	20.6	0.0397	5.1
4	22.0	19.2		-3.88	18.1	0.0285	4.5
8	20.4	19.2		-3.88	16.5	0.0204	4.1
17	19.3	19.2		-3.88	15.4	0.0141	3.8
30	18.0	19.2		-3.88	14.1	0.0107	3.5
60	16.5	19.2		-3.88	12.6	0.0076	3.1
120	15.4	20.0		-3.77	11.6	0.0054	2.9
240	14.1	20.0		-3.77	10.3	0.0039	2.5
360	13.2	20.0		-3.77	9.4	0.0032	2.3
1440	12.0	20.0		-3.77	8.2	0.0016	2.0
							Jan-24-97

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP9	
Sch#	176	**Project :**	0270-001-03		**Sample :**	0.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	Surface	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.0	
	Total Weight	2806.0	Before Wash	55.0	Total -200	30.7	
			After Wash	25.3	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	0.0					38.1	100.0
1"	170.3	6.1			6.1	25.4	93.9
3/4"	108.8	3.9			3.9	19.1	90.1
1/2"	193.4	6.9			6.9	12.7	83.2
3/8"	210.7	7.5			7.5	9.52	75.7
#4	426.0	15.2			15.2	4.76	60.5
#10	396.4	14.1			14.1	2.00	46.3
#20			7.5	13.6	6.3	0.840	40.0
#40			4.3	7.8	3.6	0.420	36.4
#60			3.0	5.5	2.5	0.250	33.9
#100			3.0	5.5	2.5	0.149	31.3
#200			6.3	11.5	5.3	0.074	26.0
Pan			30.7	55.8	25.9		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	34.5	19.5		-3.84	30.7	0.0737	25.5
1	31.0	19.5		-3.84	27.2	0.0536	22.6
2	29.0	19.5		-3.84	25.2	0.0384	21.0
4	27.0	19.5		-3.84	23.2	0.0276	19.3
8	25.0	19.5		-3.84	21.2	0.0198	17.6
15	23.9	19.5		-3.84	20.1	0.0145	16.7
30	21.8	19.5		-3.84	18.0	0.0104	15.0
60	19.7	19.5		-3.84	15.9	0.0075	13.2
120	17.7	20.0		-3.77	13.9	0.0053	11.6
240	16.0	20.2		-3.75	12.3	0.0038	10.2
360	15.3	20.5		-3.70	11.6	0.0031	9.7
1440	13.0	20.0		-3.70	9.3	0.0016	7.7
							Jan-24-07

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	022-1322	**Client :**	Brewery Creek Mine		**Test Pit :**	TP10	
Sch#	176	**Project :**	0270-001-03		**Sample :**	1.0 m	
Lab Work:	RB	**Location:**	Yukon Territory		**Depth :**	1.0 m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.9	
	Total Weight	2580.0	Before Wash	55.0	Total -200	37.4	
			After Wash	18.5	Gs	2.70	(assumed)

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					152.4	100.0
3"	0.0					76.2	100.0
1 1/2"	99.8	3.9			3.9	38.1	96.1
1"	241.0	9.3			9.3	25.4	86.8
3/4"	204.3	7.9			7.9	19.1	78.9
1/2"	416.2	16.1			16.1	12.7	62.7
3/8"	268.1	10.4			10.4	9.52	52.3
#4	377.5	14.6			14.6	4.76	37.7
#10	245.1	9.5			9.5	2.00	28.2
#20			2.8	5.1	1.4	0.840	26.8
#40			2.7	4.9	1.4	0.420	25.4
#60			2.3	4.2	1.2	0.250	24.2
#100			2.7	4.9	1.4	0.149	22.8
#200			7.0	12.7	3.6	0.074	19.2
Pan			37.4	68.0	19.2		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (oC)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	41.0	20.0		-3.77	37.2	0.0698	18.9
1	36.0	20.0		-3.77	32.2	0.0515	16.3
2	33.8	20.0		-3.77	30.0	0.0370	15.2
4	31.8	20.0		-3.77	28.0	0.0266	14.2
8	30.0	20.0		-3.77	26.2	0.0191	13.3
15	28.0	20.0		-3.77	24.2	0.0141	12.3
30	25.0	20.0		-3.77	21.2	0.0102	10.8
60	22.8	20.2		-3.75	19.1	0.0073	9.7
185	19.5	20.2		-3.75	15.8	0.0043	8.0
240	18.6	20.6		-3.69	14.9	0.0038	7.6
360	17.4	21.0		-3.63	13.8	0.0031	7.0
1557	14.8	20.1		-3.63	11.2	0.0015	5.7
							Jan-24-97

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX D

BSWR LYSIMETER CONSTRUCTION FIELD REVIEW
BGC ENGINEERING

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

#500-1045 Howe Street
Vancouver, B.C.
Canada V6Z 2A9
Tel: 604.684.5900
Fax: 604.684.5909

Project No. 0270-001-04
Date: November 14, 2003

Mr. Brad Thrall
Principal – President
ALM Group
601 West Broadway – Suite 400
Vancouver, B.C.
V5Z 4C2

Re: BSWR Lysimeter Construction Field Review

Dear Sir:

Further to your request, BGC Engineering Inc. (BGC) is pleased to provide Viceroy Minerals Corporation (VMC) with this summary of our field review undertaken during the construction of the lysimeter at the Blue Sediment Waste Rock Storage Area (BSWR) at Brewery Creek Mine, Yukon Territory.

1.0 Introduction

The construction of a large surface lysimeter was undertaken to measure net infiltration and monitor the performance of the BSWR Storage Area cover as recommended in our report, "Brewery Creek Mine BSWR Storage Area Characterization Report" dated July 30, 2003 (BGC, 2003a).

The general design details for the large surface lysimeter are outlined in our memorandum, "Lysimeter Design - Brewery Creek Test Cover" issued on August 1, 2003 (BGC, 2003b).

Excavation of the lysimeter was initiated on September 11, 2003, and the construction of the lysimeter was undertaken from September 17 to 19, 2003. At the request of VMC, Mr. Greg Hunchuk of BGC was on site during the construction period. Photographs were taken by BGC during the field review. These are provided in Appendix 1.

The following is a summary of the observations recorded by BGC during construction.

2.0 Observations

The lysimeter was located approximately 200 m south of the junction of the Main Haul Road and the Blue Haul Road on the BSWR Storage Area to provide sufficient access for long-term monitoring (See VMC Drawing A1-002).

The excavation of the lysimeter began on September 11, 2003 and was completed on September 13, 2003. This work was overseen by VMC. Excavated growth material which had previously been placed over the waste rock pile was stockpiled adjacent to the pit. Excavated waste rock from the pit was stock piled separately from the growth material on the opposite side of the excavation. A sump was located on the centre of the downslope side of the lysimeter to serve as the inlet to the drainpipe. The base of the lysimeter excavation was sloped to facilitate seepage collection.

The construction of the lysimeter took place between September 17, and 19, 2003 using a Caterpiller 235C excavator. BGC was onsite during this phase of the project. The lysimeter measures approximately 11.2 m x 11.2 m (slope distance) between anchor trench crests. The base of the excavation is approximately 2.0 m deep across the entire lysimeter. The base of the excavation slopes at 3H: 1V, parallel to the surrounding grade. The excavation side slopes were measured to be approximately 1H: 1V. Key trenches approximately 0.2 m deep were excavated around the perimeter approximately 0.5 m set back from the edge of the excavation. The sump had measured dimensions of 1.2 m up-slope, 1.5 m cross-slope, and 0.3 m in depth. The base of the excavation was raked, and all material greater than 3 cm in diameter was removed.

A 2-in diameter PVC pipe was placed in the base of the excavation, starting at the sump and ending at the drain outlet location. The drainpipe trench was backfilled by hand and excavator. Approximately 6 cm of pipe was left above the sump location to be attached to the liner.

A 15 m by 15 m custom pre-fabricated 30-mil PVC liner, with a non-woven geotextile cushion layer on both sides, of the liner was placed in the excavation. The liner had a PVC boot installed using a chemical bonding agent in the sump area to be connected to the drainpipe. The boot and drainpipe were connected using a hose clamp sealed with silicone. The portion of the drainpipe located above the liner was perforated by drilling approximately 15, 3 mm diameter holes along its entire length. Drain rock ranging in diameter from 5 mm to 20 mm was filled was placed in the sump to top of the drainpipe. Geogrid followed by non-woven geotextile (0.9 m by 0.45 m) was placed over the drain rock.

The liner and geotextile were held in place using sandbags placed along the perimeter of the excavation until the key trenches were backfilled.

The excavation was then backfilled with uncompacted waste rock material that was stockpiled from the excavation to a depth of 0.5 m below the surrounding grade corresponding to the top of the surrounding waste rock surface. Stockpiled waste rock material from the lysimeter excavation was partially spread out on the adjacent growth cover and therefore additional waste rock was required to backfill the pit to the necessary grade. This material was borrowed from a small excavation in the waste dump located approximately 8 m upslope of the lysimeter. The 0.5 m thick cover of growth medium was re-established using the stockpiled material from the lysimeter excavation.

The lysimeter cover was lightly compacted to match the conditions of the surrounding material of the BSWR Storage Area by tamping with the excavator bucket and walking the excavator over the lysimeter surface. The finished grade was contoured to remove any surface undulations. The small excavation upslope of the lysimeter was backfilled to grade following the completion of the lysimeter.

Detailed surveying of the lysimeter during and after construction, as well as generation of as-built drawings were undertaken by VMC.

The completed lysimeter has the following dimensions:

- Lysimeter plan area: 121 m^2;
- Lysimeter surface area (measured along slope): 127 m^2;
- Volume of waste rock backfill: 81 m^3; and,
- Volume of growth medium: 41 m^3.

3.0 Conclusions

The lysimeter constructed during the period from September 17 to 19, 2003, generally conforms to the design and design intent as outlined in (BGC, 2003b). VCM personnel have indicated that the following points regarding the construction of the lysimeter have been addressed since the completion of BGC's site visit:

- Suitable marker posts have been located in the vicinity of the lysimeter to ensure vehicles do not travel over and damage the surface cover, affect the waste rock, or damage the drainpipe;
- A sufficiently sized drainage collection tank has been installed and connected to the drainpipe;
- The lysimeter cover surface was grass seeded in October of 2003 in conjunction with the seeding of the entire BSWR Storage Area. VMC should ensure that the vegetation established on the cover is consistent across the site and is documented .

It was recommended in our design report (BGC, 2003a), that the weather station be moved to the vicinity of the lysimeter. It is our understanding that this will be completed by VMC in time for the spring freshet.

VMC should establish inspection frequencies and monitory protocols for the lysimeter prior to the spring freshet.

4.0 Limitations of Report

This report was prepared by BGC for the account of VMC. The material in it reflects the judgement of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be based on it are the responsibility of such Third Parties. BGC Engineering Inc. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

As a mutual protection to our client, the public, and ourselves, all reports and drawings are submitted for the confidential information of our client for a specific project and authorization for use and / or publication of data, statements, conclusions or abstracts from or regarding our reports and drawings is reserved pending our written approval.

5.0 Closure

We trust that this meets you requirements at this time. Should you have any questions or comments, please do not hesitate to contact the undersigned.

BGC Engineering Inc.
Per:

Greg Hunchuk, E.I.T.
Project Consultant

Clint Logue, P.Geo., LG, LEG
Project Consultant

Iain Bruce, Ph.D., P.Eng., P.Geo.
President and Principal Consultant

APPENDIX I - Site Photographs



Photo 1: View looking at the eastern side of excavation prior to the construction of anchor trenches. Note the segregated pile of waste rock material.



Photo 2: View looking at the western side of excavation prior to the construction of anchor trenches. Note the segregated pile of growth medium material.

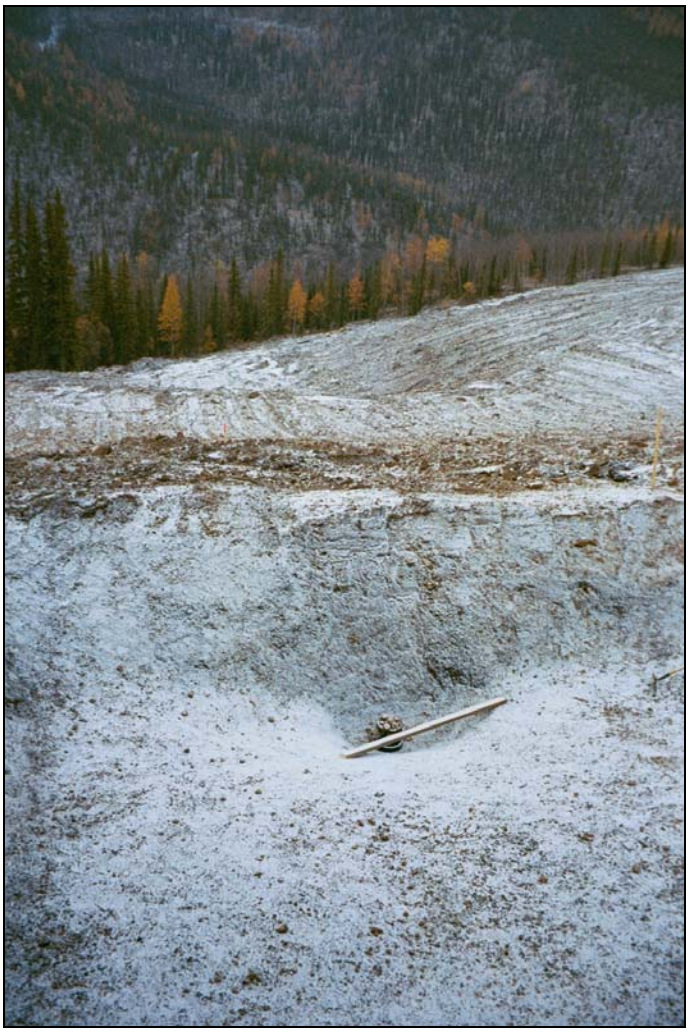


Photo 3: View looking at the southern wall of the excavation. Note the location of the sump in the bottom-centre of the pit.



Photo 4: View looking at the sump and the 2" PVC drain pipe.



Photo 5: View looking north from the drainpipe outlet point. Note that the collection tank has not yet been installed for the lysimeter.



Photo 6: View of the construction of the northern anchor trench.



Photo 7: View of the western and northern anchor trenches prior to raking.



Photo 8: View of the northern anchor trench after raking and the removal of rocks and woody pieces greater than 3 cm in size.



Photo 9: View looking at the northern wall of the pit at the first layer of geotextile fabric that overlies the bottom and sides of the pit and over the anchor trenches.



Photo 10: View looking at location of the sump. Note the geotextile fabric was cut so as to allow the drainpipe to be pushed through the geotextile.



Photo 11: View looking south. Placement of the 30-mil PVC liner over the geotextile fabric. Sandbags were used to temporally hold the PVC liner in the anchor trenches.



Photo 12: View of the sump. Note the plastic boot bonded to the PVC liner. A hole was cut in the boot and liner and the drainpipe was pushed through the hole. Silicone was applied to the join of the pipe and the plastic liner. A hose clamp was placed and t

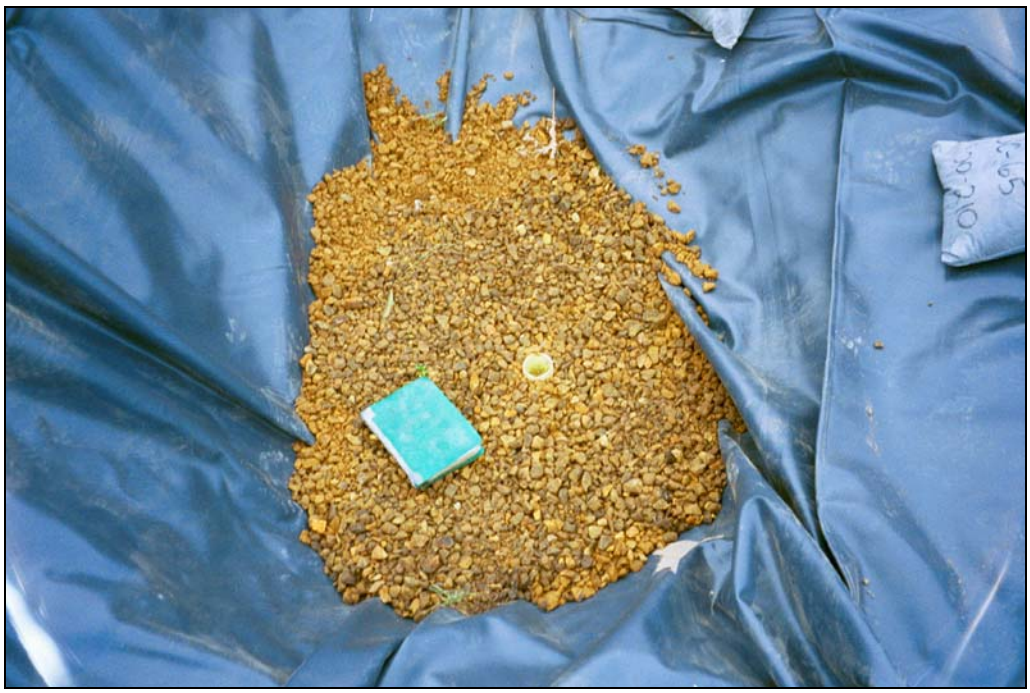


Photo 13: View of the sump. Coarse drain rock was placed in the sump up to the stick-up height of the PVC pipe.



Photo 14: View of the sump. A 90 cm by 45 cm piece of geo-grid mesh was placed over the drain rock and PVC pipe.



Photo 15: View of the sump. A piece of geotextile fabric was placed over the geo-grid mesh and the drain rock.



Photo 16: View of the sump. The remaining portion of the sump was infilled with drain rock up to the level of the base of the pit.



Photo 17: View of the pit looking south (downslope). A layer of geotextile fabric was placed over the liner. Sand bags were used to hold the geotextile and liner in place until the anchor trenches were backfilled.



Photo 18: View looking at the southern pit wall. Waste rock material is placed in the excavation up to a depth of approximately 1 m below surface.



Photo 19: View of southern pit wall. After the lower half of the pit was partially backfilled with waste rock material, growth media material was placed in the anchor trench. The excavator is tamping the material its bucket.



Photo 20: View of the northern pit wall. After the entire pit had been infilled with waste rock material up to a depth of 1 m below surface grade, growth media material was placed and tamped within all of the anchor trenches.

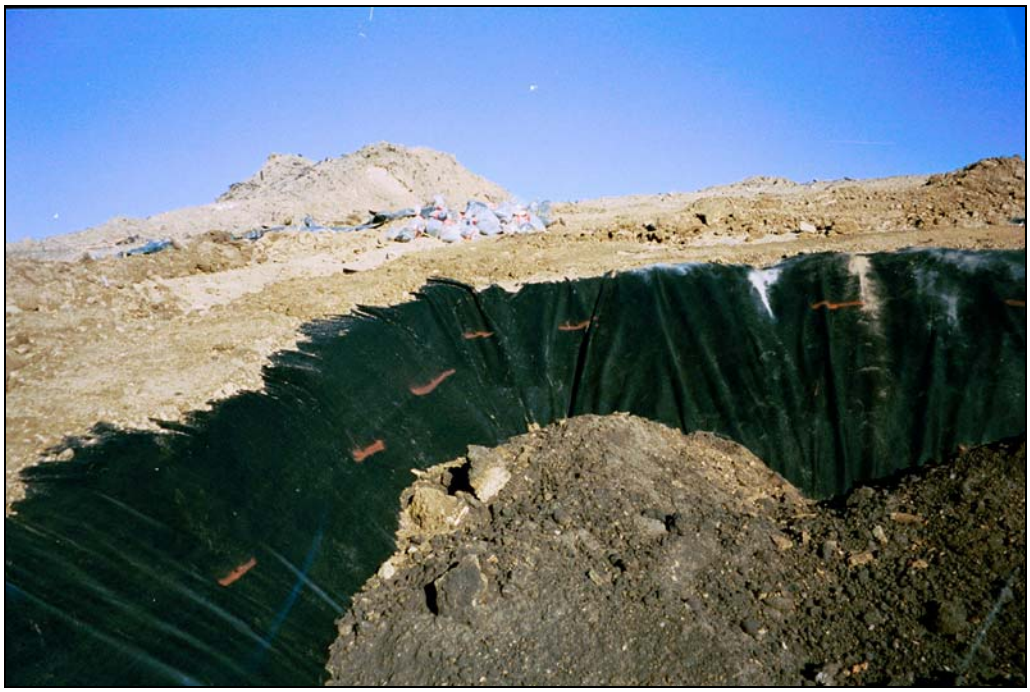


Photo 21: View of the northwest corner of the pit wall after northern anchor trench was infilled. Note survey marks on the walls of the pit. Marks indicate the grade to which waste rock material was to be placed (0.5 m vertical depth below surface grade).



Photo 22: View of the northeast corner of the pit. Backfilling waste rock material up to the required grade.



Photo 23: View of the northeast corner of the pit. Completion of the waste rock backfill.

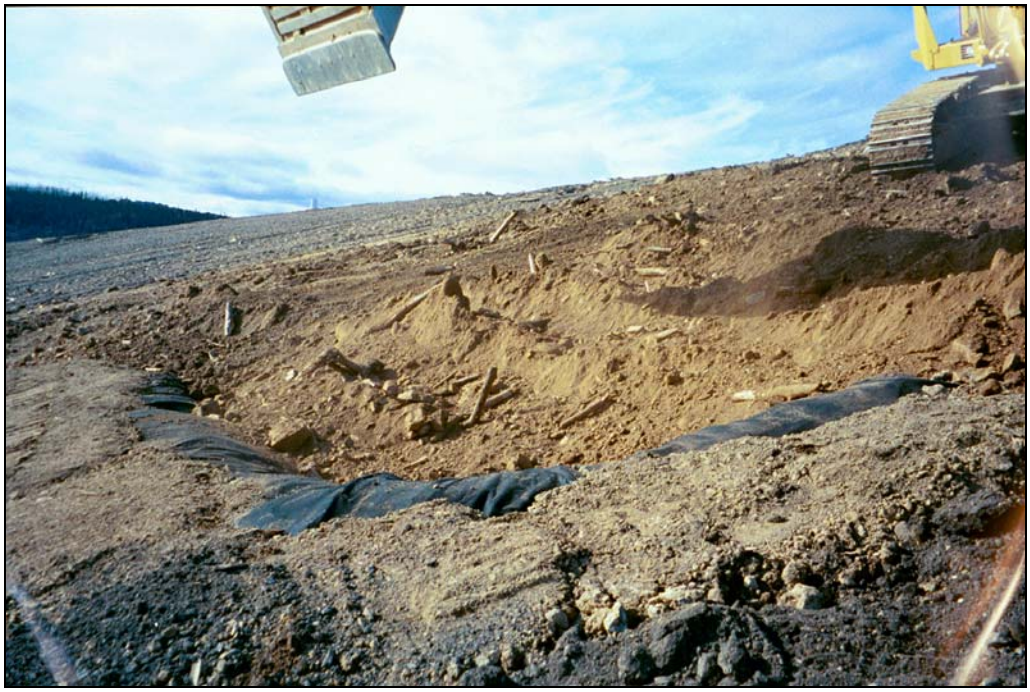


Photo 24: View of the southern side of the test cover. Placement of growth media cover over the waste rock material.



Photo 25: View of the western side of the test cover. The excavator walked over and tamped the growth media material with the bucket to partially compact the lysimeter cover so as to have similar character as the adjacent soil cover.



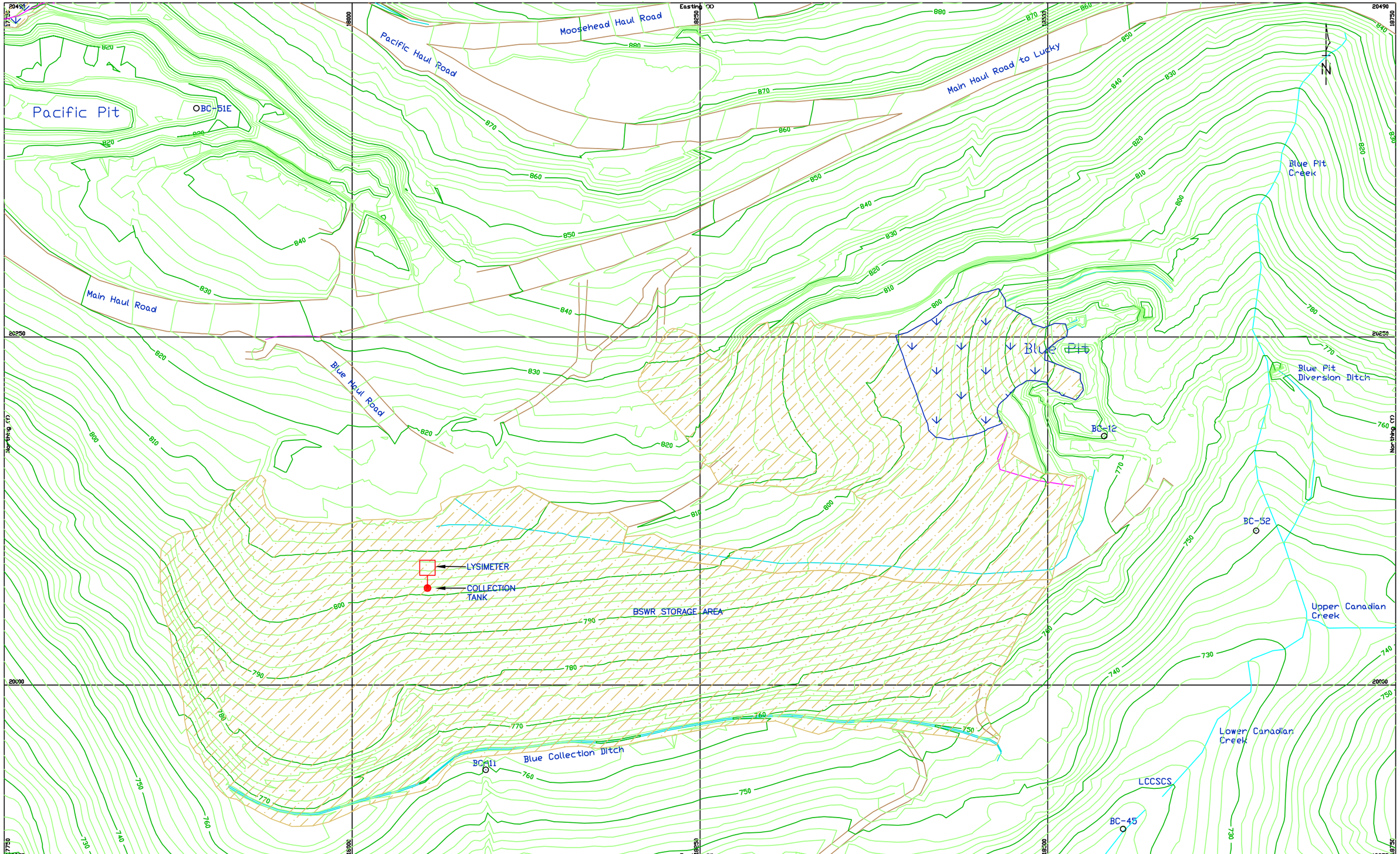
Photo 26: View looking at the northern portion of the test cover following partial compaction of the test cover.



Photo 27: View looking south from the northeast corner of the test cover following raking and grading of the test cover surface.



Photo 28: View looking north from the southern portion of the test cover following raking and grading of the cover surface.



Legend:

- BC-11 - Water Monitoring Sampling Point
- LCCSCS - Lower Canadian Creek Sedimentation Control Structure

- Resloped Area
- Arable Surface
- Growth Media
- Seeded Area

MAP SCALE (METRIC)

0 10 20 40 60 80

METERS

NO	DATE	MADE BY	DESCRIPTION
REVISIONS 1			
2			
3			
4			
5			
DATE	DRAWN BY	CHECKED	APPROVED
2/21/2002	M. Caley	S. Johnson	S. Johnson

Viceroy Minerals Corporation

Brewery Creek Mine

OFFICE	DEPARTMENT
Minesite	Engineering

Prepared by Brewery Creek Mine

Blue Pit & Adjacent Areas
Development to End of 2001

MAP INDEX NUMBER	SCALE	DRAWING NUMBER
BC-ENG-01	1:2500	A1-002

G:\B_C\Land\Water License\2001\Blue Plat2001.dwg

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX E

LIABILITY COST ASSESSMENT

PREPARED BY: SRK ENGINEERING CONSULTANTS

Outstanding Closure Liabilities at Brewery Creek Mine - September 2003



Report Prepared for

Viceroy Minerals Corporation

Report Prepared by

SRK Consulting
Engineers and Scientists

November 2003

Outstanding Closure Liabilities at Brewery Creek Mine - September 2003

Viceroy Minerals Corporation

Suite 900, 570 Granville Street
Vancouver, B.C. V6C 3P1

SRK Project Number 1CV001.02
November 2003

Steffen Robertson and Kirsten (Canada) Inc.
Suite 800, 1066 West Hastings Street
Vancouver, B.C. V6E 3X2
Tel: 604.681.4196
Fax: 604.687.5532
E-mail: vancouver@srk.com
Web site: www.srk.com

Compiled by:

_____
Daryl Hockley, P.Eng.

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Attachment 1 Liability Estimate Spreadsheet

1 Introduction

SRK Consulting Inc. was retained by Viceroy Minerals Corporation to provide an independent engineer's review of the outstanding closure liabilities at the Brewery Creek Mine near Dawson, Yukon. This report presents the results of SRK's work.

This review is the first of several that might be required under the terms of a proposed agreement between Viceroy Minerals Corporation and the Government of the Yukon. Therefore, an effort has been made to develop a methodology that can be used consistently by future reviewers. Section 2 below explains the methods in some detail.

Sections 3 and 4 present the resulting estimates of outstanding liabilities. Expected costs are covered in Section 3 and costs for possible mitigation measures are covered in Section 4. All of the calculations leading to the Section 3 and 4 estimates are presented in tables appended to this report. Section 5 presents a summary opinion of the outstanding closure liabilities at the Brewery Creek Mine, as of September 2003.

2 Methods

2.1 Site Visit

The undersigned, a professional engineer with expertise in mine closure, visited the Brewery Creek Mine on September 19, 2003. All of the liability estimates presented herein are based on the state of the site as of that date.

The site visit began with discussions with Mr. Brad Thrall, who was formerly the mine manager and who continues to direct the decommissioning and reclamation work. The undersigned and Mr. Thrall then inspected the areas of the site that had been used for mining and ore leaching. Access to all areas was good, and conditions were adequate for most of the observations. A light covering of snow was present in some places, but did not prevent examination of the reclamation work.

Mr. John Chapman, an SRK engineer with expertise in geochemistry and water treatment, was present for the discussions with Mr. Thrall and for the inspection of the heap and land application areas. Mr. Chapman subsequently provided his opinions as to the chemical processes occurring in the heap and these were taken into account in developing estimates of possible mitigation costs.

2.2 Available Documents

Several documents were provided and were referred to in the course of the review. The most relevant documents included:

- "Brewery Creek Mine Effluent Treatment and Land Application Water License Submission", (Viceroy Minerals Corporation, March 2001), which reviews options for dealing with the cyanide solutions in the heap, and proposes and presents test results to support the use of land application as a final water treatment measure.

- "2001 Decommissioning and Reclamation Plan, Volumes I, II, and III", (Viceroy Minerals Corporation, 2001), which describe the conditions at the site and present an overall closure plan.

- "2001 Decommissioning and Reclamation Plan, Volume IV", (Viceroy Minerals Corporation, November 2002), which provides further detail on specific decommissioning and closure measures, and revised cost estimates.

- "Comprehensive Study Report on the Decommissioning and Reclamation of the Brewery Creek Mine", (Environmental Assessment Unit, Executive Council Office, Government of Yukon, July 2003), which presents the results of the federal and Yukon governments' review of the above documents.

- "Draft Brewery Creek Mine Reclamation Cost Estimate", (Brodie Consulting Ltd., June 2003), which provides draft results of a review carried out for the Yukon Water Resources Branch.

- "Draft Terrestrial Reclamation Standards for the Brewery Creek Mine", (EMR Mineral Management, October 2003) which provides a concise summary of requirements for reclamation of the site.

This review was not SRK's first involvement with the Brewery Creek Mine. In the early 1990's, SRK assisted Loki Gold Corporation in developing the initial plans and permit requests for the project. In 1999, SRK assisted Viceroy Minerals Corporation with an early draft of the closure plan. In July 2003, Mr. Stephen Day, a geochemist with SRK, prepared a review of the Blue Dump geochemistry for Viceroy Minerals Corporation. The files from these projects were available to the undersigned and were reviewed for background information.

2.3 Development of Liability Estimate

Broadly speaking, the outstanding closure liability for the site can be separated into two components:

- Cost for activities needed to complete the expected decommissioning and reclamation measures.
- Costs for mitigation measures that might be required at some time in the future.

The methods and assumptions used in developing estimates for these two components are explained in the following paragraphs, and the results presented in Section 3 and 4 below.

Cost Estimate Spreadsheet

The cost estimates for both the currently planned decommissioning and reclamation measures and the mitigation measures were developed in a spreadsheet. For ease of comparison to earlier (and future) estimates, the spreadsheet was based on one presented in the "2001 Decommissioning and Reclamation Plan, Volume IV".

The spreadsheet, like the "Volume IV" version, assigns direct costs to eight "cost centers", namely Mine Area Reclamation, Site Facilities Removal and Reclamation, Leach Pad Detoxification, Manpower, General and Administration, Process Water Treatment, Leach Pad Reclamation, and Post-Closure Monitoring. This structure is common in closure cost estimates produced by industry, and is readily convertible to other structures such as the RECLAIM spreadsheet used by DIAND.

A printout of the cost estimate spreadsheet is attached to this report. Electronic copies are available upon request.

Current Status and Standards for Completion

The "Volume IV" estimates for most of the cost centers were modified to take into account the current extent of completion and any deficiencies observed during the site visit. More details are provided in Section 3 below.

In assessing what activities would be needed to complete the expected decommissioning and reclamation measures, two sets of standards were taken into consideration. The first was the commitments made in the "2001 Decommissioning and Reclamation Plan" (including Volume IV). The second was the general standard of good mine closure practice elsewhere in Canada, as it is known to the undersigned. The "Draft Terrestrial Reclamation Standards for the Brewery Creek Mine" were also reviewed, and found to be generally consistent with both the plans set out in the "2001 Decommissioning and Reclamation Plan" and the standards of good practice elsewhere in Canada.

Viceroy Costs vs. Contractor Costs

The "Volume IV" estimates were based on productivities and unit costs achieved by Viceroy Minerals Corporation. However, the independent estimate of closure liabilities is to consider the case where Viceroy is no longer on the site, and the Government of the Yukon needs to bring a local contractor in to complete the work. The productivities and unit costs assumed in the "Volume IV" estimates were therefore reviewed and adjusted to values that are more typical of Yukon contractors. For most tasks, it was assumed that the equipment used by local contractors would be one to two classes smaller than that used by Viceroy.

Unit costs for equipment were obtained from the 2003-2004 edition of "The Blue Book", an equipment rate rental guide produced by the B.C. Road Builders and Heavy Construction Association. All-found rates, which include all costs, expenses and profit were used. When the guide indicated a difference between rates for new and older equipment, an average rate was used. All of the unit rates were increased by 10% as a northern allowance. Costs for mobilizing the equipment to the site were also added to the estimates as a separate line item.

Contingencies

The "Volume IV" estimates applied contingencies of between 10% and 20% to the estimated total costs from each cost center. It is important to understand what is meant by "contingencies". In common usage, contingencies are provisions for something that might never come to pass. However, the contingencies in these estimates are likely to be required. They are included to account for a number of costs and uncertainties that cannot be more explicitly detailed in this level of estimate.

The contingency percentages suggested in "Volume IV" are generally consistent with good practice elsewhere, particularly given the fact that there is now direct experience carrying out most of the required activities at this site. Some thought was given to increasing the contingency for Site Facilities Removal and Reclamation, on the grounds that there is as yet no site experience with this type of work and because costs of demolition projects elsewhere have proven difficult to estimate accurately. However, it was also noted that the current estimate takes no account of value that might be recovered from re-use or salvage of the site buildings. If that value were taken into account, it would act to offset cost overruns. The "Volume IV" contingency percentages were therefore accepted for all of the cost centers.

Net Present Value Calculations

In preparing cost estimates for activities that can take place many years in future, it is important to take into account the effects of interest and inflation. The conventional way to do that is to use a Net Present Value or "NPV" calculation. In simple terms, the NPV calculation shows how much money one would need to set aside today in order to have enough money to carry out the future activities.

To complete the NPV calculations, all of estimated costs were set out on a timeline extending from 2003 to 2018. Costs were generally put in the earliest year when an activity might be required. That approach has the effect of resulting in a cautiously high estimate of the NPV.

The timeline of costs was then used to calculate the NPV of the estimates for each cost center and each mitigation measure, *i.e.* how much money would need to be set aside under each cost category. The interest rate used in such calculations is a question of policy, rather than engineering. Most corporate investors would use a relatively high rate, which would result in a lower NPV. In SRK's experience, Canadian governments commonly use a much lower interest rate, roughly equivalent to the rate of return on long-term Government of Canada Savings Bonds.

The "Volume IV" estimates included an escalator for inflation. The escalator was applied to each year's cost estimates. However, a simpler method is to recognize that inflation acts counter to interest, *i.e.* it requires one to put aside more money now to allow for the increased future costs. Inflation can then be accounted for within the NPV calculations. For example, an apparent interest rate of x % and an annual inflation of y % can be accounted for by simply assuming an "effective interest rate" of x-y % in the NPV calculation.

That approach was used for the independent engineer's estimate of the outstanding liability. An apparent interest rate of 5% was selected from tables of long term bond rates, and adjusted downward by an assumed inflation rate of 2%, resulting in the effective interest rate of 3% that was used in the NPV calculations.

Mitigation Measures and Likelihood

Most of the closure activities at the Brewery Creek site are low risk. However, in the opinion of the undersigned, there are three areas where the uncertainties are greater. The three areas are the heap, the Lucky Haul road, and the Blue Dump. For each of those areas, mitigation measures that conceivably might be required at some time in the future were assessed and cost estimates were developed. Further details are provided in Section 4 below.

The likelihood that each of the mitigation measures will be required was then described using the terms "possible", "unlikely" and "very unlikely". The definitions of these terms were taken from SRK experience with qualitative risk assessments on similar projects:

- "Possible" implies that the event has happened elsewhere, perhaps several times, and could happen here;
- "Unlikely" implies that the event may have happened elsewhere, but only under conditions that are less favourable than here; and,
- "Very unlikely" implies that the event is theoretically possible, or at least cannot be ruled out given currently available information, but would require a remote combination of circumstances.

Provision for Mitigation Measures in Outstanding Closure Liability

It could be argued that the estimate of outstanding liability should include provision for all of the above mitigation measures, regardless of their likelihood. The problem with such reasoning is that it is always possible to imagine a lower probability outcome requiring a more costly mitigation measure. Ultimately a policy decision is required to determine whether a probability is low enough that the risk can be accepted without a provision in the liability estimate. There is no single answer as to where the line should be drawn. It is clear that governments are less willing to accept risk than investors, and the line is drawn more cautiously when government is to be left holding the risk.

To come up with a basis for determining which mitigation costs should be included in the independent engineer's estimate of the outstanding liability, reference was made to SRK's experience with precedents involving government accepting mine closure-related risks. The precedents are three cases in British Columbia where the provincial government has participated in negotiations of final securities for closed mines.

- In the case of Equity Silver Mine, the negotiated security provides for perpetual collection and treatment of contaminated water, which is certainly "possible", but does not provide for "unlikely" or "very unlikely" increases in contaminant concentrations.
- In the case of Britannia Mine, the provincial government negotiated with former owners of the property to pay for construction and operation of a water treatment plant. Again the plant was sized to handle "possible" current flows and chemistry, but not "unlikely" increases in either.
- In the third case, which is confidential, the owner was transferring the property to a third party and wanted an "exit ticket" from the provincial government. The negotiated security included provision for "possible" activities such as groundwater cleanup and collection of acidic pit water, but did not require provision for "unlikely" increases in acid generation.

On the basis of these precedents, only "possible" mitigation measures were included in the independent engineer's estimate of outstanding liability for the Brewery Creek Mine.

3 Estimated Costs for Expected Activities

Table 1 presents a summary of the estimated costs for the expected decommissioning and reclamation activities in each of the cost centers. The table shows both the undiscounted (no interest, no inflation) estimates and the NPV estimates.

Cost items under the Mine Area Reclamation estimate include:

- Mobilization of equipment for the 2004 field work;
- Repairs to erosion damage, estimated as 5% of the reclaimed area of the Upper Fosters, Canadian, Blue, South Golden, Lower Fosters, Pacific and Moosehead reclaimed areas, and 15% of the Kokanee and, North Golden and Lucky reclaimed areas;
- Re-seeding and fertilization, covering an estimated 25% of the Canadian, Blue, South Golden, Upper Fosters, Lower Fosters, Lucky, Pacific and Moosehead reclaimed areas and 40% of the Kokanee and North Golden reclaimed areas;
- Construction of sediment control works at Kokanee and South Golden pits;
- Cutting back of the waste rock benches to the southeast of North Golden pit;

- Removal of 12,000 m^3 of waste rock to stabilize the Lucky Haul Road;
- Scarification, covering, seeding and fertilizing of the Moosehead haul road;
- Scarification and re-contouring of the perimeter roads;
- Removal of berms and re-contouring of sideslopes on haul roads (partially completed); and,
- Removal of six culverts on the Main Haul Road.

Cost items under the Leach Pad Reclamation estimate include:

- Construction of a breach and ditches to allow free drainage from the heap (once water quality is acceptable for direct release);
- Seeding and fertilizing of the covered heap (partially completed);
- Re-contouring, seeding and fertilization of the Cell 8-10 areas;
- Repair of erosion over an estimated 10% of the reclaimed area;
- Re-seeding and fertilization of an estimated 25% of the reclaimed area.

The Manpower estimate was revised to include only management and maintenance labour costs for 2003 and 2004. Other labour costs were shifted to activities. The General and Administration estimate was extended to allow for an additional year (2004) of site presence. The Process and Water Treatment estimate was also extended to allow for an additional year of monitoring the heap drainage and sending effluent to the land application area.

Work in one of the cost centers, Leach Pad Detoxification, is complete. The category was kept in the estimate for consistency, but the outstanding liability was set to zero. Work has not started in two of the cost centers, Site Facilities Removal and Reclamation and Post-Closure Monitoring. The "Volume IV" estimates for those categories were reviewed and accepted with only minor modification.

As discussed above, contingencies were calculated using the factors from "Volume IV".

Table 1. Cost Estimates for Expected Decommissioning and Reclamation Activities

Cost Center	Undiscounted Costs	Net Present Value Costs
Mine Area Reclamation	$ 529,000	$ 489,000
Site Facilities Removal and Reclamation	$ 577,000	$ 534,000
Leach Pad Detoxification	-	-
Manpower	$ 261,000	$ 243,000
General and Admin	$ 445,000	$ 415,000
Process Water Treatment	$ 58,000	$ 54,000
Leach Pad Reclamation	$ 120,000	$ 116,000
Post-Closure Monitoring	$ 585,000	$ 442,000
Subtotal Direct Costs	$ 2,575,000	$ 2,293,000
Contingency	$ 316,000	$ 284,000
Total	$ 2,891,000	$ 2,577,000

4 Estimated Costs for Mitigation Measures

Table 2 presents a summary of the estimated costs for possible mitigation measures in heap, Lucky Haul Road, and Blue Dump areas.

In the heap area, the primary uncertainty is the future chemistry of drainage from the heap. The currently available effluent water quality data show continuing changes in several major parameters. There are no particularly troubling trends, *i.e.* no increases in contaminant levels. But the continuing changes show that the system has not yet reached a steady state or equilibrium condition. Therefore, the possibility that contaminant concentrations might change in future cannot be ruled out. Various mitigation measures were considered and cost estimates were developed for an additional two years of land application, construction and operation for five years of a small biological treatment cell, and construction and five-year operation of a large biological treatment cell.

A portion of the Lucky Haul Road is showing clear signs of slope failure. Removing material from the crest of the slope is one way to improve stability. The cost of removing 12,000 m^3 of material was included in the estimate of expected reclamation costs. However, it is uncertain whether more material will have to be removed at some time in the future. The mitigation measure considered in this case was to remove an additional 24,000 m^3 of material from the slope crest.

The Blue Dump contains the only dominantly acid-generating waste rock on the site. There are concerns as to whether water seeping through the Blue Dump will eventually carry contaminants to Laura Creek, and thereby to the South Klondike river. Those concerns have recently been assessed in some detail by Mr. Stephen Day of SRK. The results of his work suggest that a significant increase of contaminants in Laura Creek would only result under a combination of worst case assumptions, and that even under those assumptions the increase in contaminant concentrations in the South Klondike River would be so low as to be very hard to measure. However, there are weaknesses in the currently available data. Under Mr. Day's advice, Viceroy has initiated a series of tests to further reduce the uncertainty about future water quality. Those tests are a mitigation measure for the uncertainty. To cover the possibility that physical mitigation will also be needed, a cost estimate was developed for improving the cover on the dump. It was assumed that the vegetation would be stripped from the existing cover, which would then be re-compacted, and an additional 2 m of cover material would then be placed and vegetated.

Table 2: Cost and Likelihood Estimates for Possible Mitigation Measures

Mitigation Measure	Undiscounted Costs	Net Present Value (NPV) Costs	Likelihood that Measure will be Needed
Operate heap effluent land application for additional two years	$ 431,000	$ 406,000	Possible
Construct and operate heap effluent BTC in Stage 2 Pond for five years	$ 1,233,000	$ 1,106,000	Possible
Construct and operate heap effluent BTC in Pregnant Solution Pond for five years	$ 1,363,000	$ 1,230,000	Possible
Remove additional material from crest of Lucky Haul Road	$ 83,000	$ 80,000	Unlikely
Construct improved cover on Blue Dump waste rock	$ 1,074,000	$ 1,033,000	Very Unlikely

The likelihood that each mitigation measure will be needed was then assessed using the terminology defined in Section 2.3. The results are also shown in Table 2:

- The use of an additional two years of land application to mitigate water quality of the heap drainage was judged to be "possible", on the grounds that heaps elsewhere have shown a slower than expected improvement in drainage water quality. The use of biological treatment cells, for the same purpose but for five years, was also judged to be "possible".
- As mentioned, stabilization of the Lucky Haul Road was included in the reclamation estimate. The material removal provided for in the reclamation estimate is substantial, and therefore further mitigation was judged to be "unlikely".
- Uncertainty about the Blue Dump water quality will be mitigated by the ongoing tests. Further physical mitigation at the Blue Dump was judged to be "very unlikely", on the basis of the low levels of risk suggested by the currently available information.

5 Estimate of Outstanding Liability

Table 3 summarizes the undersigned independent engineer's opinion as to the outstanding closure liabilities at the Brewery Creek Mine, as of September 2003. The estimate includes the full cost of the expected decommissioning and reclamation activates.

The estimate also includes provision for the "possible" mitigation measures, *i.e.* those associated with heap water quality. Only one of the three possible heap area mitigation measures would be implemented. The most costly of the three was included in the estimate, until time and/or further investigation shows that one of the less costly measures would lead to acceptable results.

The "unlikely" additional stabilization of the Lucky Haul Road, and the "very unlikely" construction of a much deeper cover on the Blue Dump were not included in the estimate of the outstanding closure liability, for the reasons discussed in Section 4. It bears repeating that the decision to include or exclude low probability mitigation measures is a policy choice, not a technical matter. To allow Viceroy and the Government of the Yukon to understand the implications of a different choice, the cost estimates for the "unlikely" and "very unlikely" activities have been presented above.

Table 3: Independent Engineer's Estimate of Outstanding Closure Liability at Brewery Creek Mine as of September 2003

Category	Outstanding Undiscounted Liability	Outstanding Net Present Value Liability
Expected Decommissioning and Reclamation Activities	$ 2,891,000	$ 2,577,000
Heap Area Mitigation Measures	$ 1,363,000	$ 1,230,000
Total Outstanding Closure Liability	**$ 4,254,000**	**$ 3,807,000**

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Approval Signature:

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Attachment 1
Liability Estimate Spreadsheet

Table 1
Undiscounted Summary of All Items

Cost Center	Estimates from Sept 2003 Review	Contingency Factors	Notes and references
Mine Area Reclamation	$ 528,894	20%	See Tables 5 and 6.
Site Facilities Removal and Reclamation	$ 576,929	10%	Not changed. See Table 7.
Leach Pad Detox	$ -	20%	Complete.
Manpower	$ 260,550	10%	See Table 9.
General and Admin	$ 444,915	10%	Assumes one more year of G&A cost. See Table 10.
Process Water Treatment	$ 58,500	20%	Assumes one more year of Land Application. See Table 12.
Leach Pad Reclamation	$ 120,485	10%	See Table 8.
Post-Closure Monitoring	$ 584,600	10%	Not changed except for removed nutrient cost. See Table 13.
Direct Costs	$ 2,574,873		
Contingency	$ 316,227		
Inflation Allowance			Now covered in NPV calculation
Total	$ 2,891,100		
NPV			

Mitigation Measures			
Operate land application for additional two years	$ 431,024		See Table 3
Construct and operate BTC in Stage 2 Pond for five years	$ 1,233,372		See Table 3
Construct and operate BTC in Pregnant Solution Pond for five years	$ 1,362,560		See Table 3
Lucky Haul Road - Additional stabilization	$ 83,064		See Table 3
Blue Dump cover improvement	$ 1,074,239		See Table 3

Cases			
Base case	$ 2,891,100		Likely
Base case with additional land application	$ 3,322,124		Possible
Base case with BTC in Stage 2 Pond	$ 4,124,472		Possible
Base case with BTC in Preg Pond	$ 4,253,659		Possible
Base case with BTC and haul road removal	$ 4,336,723		Unlikely
Base case with BTC, haul road and Blue Dump	$ 5,410,962		Very unlikely

Table 2
NPV Discounted Summary

4%

Cost Center	NPV	2003	2004	2005	2006	2007	2008	2009-2013	2014	2015-2017	2018
Mine Area Reclamation	$ 488,992	$ -	$ 528,894	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Site Facilities Removal and Reclamation	$ 533,403	$ -	$ 576,929	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Leach Pad Detox	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Manpower	$ 243,265	$ 64,125	$ 196,425	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
General and Admin	$ 415,317	$ 107,297	$ 337,618	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Process Water Treatment	$ 54,087	$ -	$ 58,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Leach Pad Reclamation	$ 115,851	$ 120,485	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Post-Closure Monitoring	$ 442,133	$ -	$ 63,940	$ 63,940	$ 62,440	$ 62,440	$ 62,440	$ 24,240	$ 33,240	$ 24,240	$ 33,240
Direct Costs	$ 2,293,048	$ 291,907	$ 1,762,306	$ 63,940	$ 62,440	$ 62,440	$ 62,440	$ 24,240	$ 33,240	$ 24,240	$ 33,240
Contingency	$ 283,613	$ 29,191	$ 234,970	$ 6,394	$ 6,244	$ 6,244	$ 6,244	$ 2,424	$ 3,324	$ 2,424	$ 3,324
Inflation Allowance	$ -										
Total NPV	$ 2,576,660	$ 321,098	$ 1,997,276	$ 70,334	$ 68,684	$ 68,684	$ 68,684	$ 26,664	$ 36,564	$ 26,664	$ 36,564

Mitigation Measures	NPV	2003	2004	2005	2006	2007	2008	2009
Operate land application for additional two years	$ 406,476			$ 215,512	$ 215,512			
Construct and operate BTC in Stage 2 Pond for five years	$ 1,105,682			$ 331,324	$ 225,512	$ 225,512	$ 225,512	$ 225,512
Construct and operate BTC in Pregnant Solution Pond for five years	$ 1,229,901			$ 460,512	$ 225,512	$ 225,512	$ 225,512	$ 225,512
Lucky Haul Road - Additional stabilization	$ 79,869			$ 83,064				
Blue Dump cover improvement	$ 1,032,922			$ 1,074,239				

Cases		
Base case	$ 2,576,660	Likely
Base case with additional land application	$ 2,983,136	Possible
Base case with BTC in Stage 2 Pond	$ 3,682,342	Possible
Base case with BTC in Preg Pond	$ 3,806,561	Possible
Base case with BTC and haul road removal	$ 3,886,430	Unlikely
Base case with BTC, haul road and Blue Dump	$ 4,919,352	Very unlikely

Table 3
Mitigation Measures

Heap Area

Operate land application for additional two years

Operating cost	$	58,500	See Table 12
G&A cost	$	157,012	See Table 11
Annual total	$	215,512	
Additional years	$	2	
Total	$	431,024	

Construct and operate BTC in Stage 2 Pond for five years

Construct BTC	$	105,813	See Table 14a
Operate BTC	$	68,500	See Table 12. Add $10,000 p.a. for nutrients and maintenance.
G&A cost	$	157,012	See Table 11
Annual total	$	225,512	
Additional years	$	5	
Total	$	1,233,372	

Construct and operate BTC in Pregnant Solution Pond for five years

Construct BTC	$	235,000	See Table 14b
Operate BTC	$	68,500	See Table 12. Add $10,000 p.a. for nutrients and maintenance.
G&A cost	$	157,012	See Table 11
Annual total	$	225,512	
Additional years	$	5	
Total	$	1,362,560	

Mine Area

Lucky Haul Road - Additional stabilization

Remove 100m x 20m x 12m		24,000	m^3
Unit Cost	$	2.21	From Table 5
Removal cost	$	53,064	
Engineering & Supervision	$	20,000	
Mob/Demob	$	10,000	
Total	$	83,064	

Blue Dump cover improvement

Strip and compact curent cover. Add 2 m new material. Revegetate. Assume borrow source available!

Improve cover over total area	m^2	106,000					
Strip vegetation	m^2	106,000	2000	53	$ 359	$	19,003
Compact	m^2	106,000	1000	106	$ 441	$	46,754
2m new cover over total area	m^2	106,000					
Load growth media with front end loader (s	m^3	212,000	389	545	$ 322	$	175,570
Haul growth media with haultrucks	m^3	212,000	100	2120	$ 292	$	618,913
Spread growth media with dozer	m^3	212,000	1000	212	$ 359	$	76,012
Broadcast seed and fertilizer	hectare	10.60			$ 400	$	4,240
Regrade borrow area	m^2	50,000	1000	50	$ 135	$	6,749
Re-seed and fertilize borrow area	hectare	5.00			$ 400	$	2,000
Engineering & Supervision						$	75,000
Mob/Demob						$	50,000
Total						$	1,074,239

Table 4
Unit Cost Table

Contractor Equipment Rates as Revised in Sept 2003

Revised Equipment Rates Unit of Equipment	Cost per Op Hour
Smaller fleet	
D9 Bulldozer	$ 283
D8 Bulldozer	$ 216
12H Grader	$ 124
769 Haul truck (35 tonne)	$ 194
990 Front end loader	$ 275
365 Backhoe	$ 301
Large fleet	
D10N Bulldozer	$ 359
14G Grader	$ 135
777 Haul truck (70 tonne)	$ 292
992 FEL	$ 322
375 Backhoe	$ 317
Compactor	$ 83

Basis	All-Found Rates New	10-Year Old	Source	Average	With 10% Northern Increase
Smaller fleet					
D9 Bulldozer	$ 269	$ 245	(B.C.)	$ 257	$ 283
D8 Bulldozer	$ 205	$ 187	(B.C.)	$ 196	$ 216
12H Grader	$ 117	$ 109	(B.C.)	$ 113	$ 124
769 Haul truck	$ 177	$ 177	(B.C.)	$ 177	$ 194
990 Front end loader	$ 250	$ 250		$ 250	$ 275
365 Backhoe	$ 286	$ 261	(B.C.)	$ 273	$ 301
Viceroy fleet					
D10N Bulldozer	$ 341	$ 311	(B.C.)	$ 326	$ 359
14G Grader	$ 127	$ 118	(B.C.)	$ 123	$ 135
777 Haul truck	$ 265	$ 265	(B.C.)	$ 265	$ 292
992 FEL	$ 293	$ 293	(Sask.)	$ 293	$ 322
365/385 Backhoe	$ 301	$ 275	(B.C.)	$ 288	$ 317
Compactor	$ 76	$ 74	(B.C.)	$ 75	$ 83

Viceroy Minerals Corporation Owned and Operated Equipment Rates

Unit of Equipment	Cost per Op Hour
D10N Bulldozer	$ 88
16G Grader	$ 50
Haul truck (100 ton)	$ 92
992 Front end loader	$ 118
375 Backhoe	$ 88
Labour	$ 25

Operating costs include operator, fuel, maintenance, room and board

Volume IV Equipment Rates Unit of Equipment	Cost per Op Hour
D10N Bulldozer	$ 164
14G Grader	$ 77
Haul truck (100 ton)	$ 189
992 FEL	$ 235
375 Backhoe	$ 194
Compactor	$ 44

Operating costs for Dozer, Grader, Compactor based on quoted 1999 Leach Pad Construction inflated by 3% annually through 2002. Costs include operator, fuel and maintenance. Other equipment is 50% above Viceroy Minerals Costs for owning/operating for a conservative value for estimating Contractor Rates.

Table 4
Unit Cost Table

Actual Brewery Creek Mine Production Figures

Task Description	Unit of Measure	Production per Hour	Actual BCM $/m3	Plan Costs $/m3
Stockpile to Dump Location (500 m)				
FEL/Backhoe (164,000 m^3 @ 422 hrs)	m^3	389	$ 0.30	$ 0.83
Blue WRSA in April/May 2001				
D10N dozer (62,100 m^3 @ 202 hours)	m^3	307	$ 0.29	$ 1.17
Blue In-pit Backfill				
D10N dozer (19,200 m^3 @ 65 hours)	m^3	295	$ 0.30	
North Golden WRSA Recontour May 2002 D10N & 375 Backhoe (74,885 m3 @150 Dozer hours, 15 Backhoe hours)	m3	453	$ 0.23	$ 0.38

Broadcast (includes seed and fertilizer)	hectare	$	400	Open Pits
Hydroseed (includes mulch/seed/etc.)	hectare	$	5,000	Open Pits
Broadcast (includes seed and fertilizer)	hectare	$	750	Leach Pad

All production rates are actual machine hours that included idle running time.

Broadcast seed and feritlizer rates from August 2002 quotation - Pickseed Edmonton, AB

Hydroseed rates are quoted rates from Adorna Flowers and Landscaping Ltd.

Note: This table corresponds to Table 7-4 in "Volume IV".

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
Mobilization/Demobilization	Season	1			$ 80,000	$ 80,000		100%	$ -	
2004 Mobilization		1			$ 80,000	$ 80,000		0%	$ 80,000	
Subtotal							$ 160,000			$ -
Upper Fosters Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	2,400	307	complete	$ 359	complete				
Backhoe work to pull back slopes	m^3	2,900	300	complete	$ 317	complete				
Dozer recontouring areas	m^2	3,800	600	complete	$ 359	complete				
Total area to be reseeded	m^2	36,700								
Load growth media with front end loader	m^3	-	389	0	$ 322	$ -		100%	$ -	
Haul growth media with haultrucks	m^3	-	195	0	$ 292	$ -		100%	$ -	
Spread growth media with dozer	m^3	-	389	0	$ 359	$ -		100%	$ -	
Broadcast seed and fertilizer	hectare	3.67			$ 400	$ 1,468		100%	$ -	
2004 Erosion Repairs (5%)	m^2	1,835								
Erosion repairs with dozer	m^3	918	150	6	$ 283	$ 1,695		0%	$ 1,695	
2004 Re-Seeding (25%)	m^2	9,175								
Broadcast seed and fertilizer	hectare	0.92			$ 400	$ 367		0%	$ 367	
Subtotal							$ 3,530			$ 2,062
The Canadian Open Pit - Reclamation 90% Complete										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	63,200	295	214	$ 359	$ 76,729		100%	$ -	
Dozer work to construct diversion ditches	lot				$ 359	$ -		100%	$ -	
Construct cap for waste landfill area	lot					$ 5,000		100%	$ -	
Total area to be reseeded	m^2	91,500								
Load growth media with front end loader	m^3	31,050	389	80	$ 322	$ 25,772		100%	$ -	
Haul growth media with haultrucks	m^3	31,050	195	159	$ 292	$ 46,418		100%	$ -	
Spread growth media with dozer	m^3	87,627	389	225	$ 359	$ 80,673		100%	$ -	
Broadcast seed and fertilizer	hectare	9.15			$ 400	$ 3,660		100%	$ -	
2004 Erosion Repairs (5%)	m^2	4,575								
Erosion repairs with dozer	m^3	2,288	150	15	$ 283	$ 4,238		0%	$ 4,238	
2004 Re-Seeding (25%)	m^2	22,875								
Broadcast seed and fertilizer	hectare	2.29			$ 400	$ 915		0%	$ 915	
Subtotal							$ 243,404			$ 5,153

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
The Blue Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	19,200	295	complete	$ 359	complete				
Dozer recontouring areas	lot			30	$ 359	$ 10,756		100%	$ -	
Dozer/Backhoe work to construct diversion ditches	lot			complete	$ 359	complete				
Construction of overflow sediment control works	lot					$ 4,700		100%	$ -	
Total area requiring seds/silt cap	m^2	4,000						100%	$ -	
Load seds/silt with front end loader	m^3		389	0	$ 322	$ -		100%	$ -	
Haul seds/silt with haultrucks	m^3	-	195	0	$ 292	$ -		100%	$ -	
Spread seds/silt with dozer	m^3	-	389	0	$ 359	$ -		100%	$ -	
Compact seds/silt with roller	m^2			0	$ 83	$ -		100%	$ -	
Total area to be reseeded	m^2	49,300								
Load growth media with front end loader	m^3	-	389	0	$ 322	$ -		100%	$ -	
Haul growth media with haultrucks	m^3	-	195	0	$ 292	$ -		100%	$ -	
Spread growth media with dozer	m^3	-	389	0	$ 359	$ -		100%	$ -	
Broadcast seed and fertilizer	hectare	4.93			$ 400	$ 1,972		100%	$ -	
2004 Erosion Repairs (5%)	m^2	2,465								
Erosion repairs with dozer	m^3	1,233	150	8	$ 283	$ 2,260		0%	$ 2,260	
2004 Re-Seeding (25%)	m^2	12,325								
Broadcast seed and fertilizer	hectare	1.23			$ 400	$ 493		0%	$ 493	
Subtotal							$ 20,182			$ 2,753

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
The Blue Waste Rock Storage Area										
Equipment work to recontour Waste Rock Storage Area										
Dozer cut to fill slopes	m^3	62,100	307	complete	$ 359	complete				
Dozer recontouring areas	m^2			complete		complete				
Dozer work to construct diversion ditches	lot			complete	$ 359	complete				
Backhoe work to re-construct collection ditch	lot			complete	$ 317	complete				
Total area requiring seds/silt cap	m^2									
Load seds/silt with front end loader	m^3		389	0	$ 322	$ -		100%	$ -	
Haul seds/silt with haultrucks	m^3		195	0	$ 292	$ -		100%	$ -	
Spread seds/silt with dozer	m^3		389	0	$ 359	$ -		100%	$ -	
Compact seds/silt with roller	m^2				$ 83	$ -		100%	$ -	
Construct monitor locations downstream of WRSA	lot			20	$ 317	complete				
Supplies and labour to set up monitor sites	lot					complete				
Complete Blue WRSA Field Program										
Recontour Canadian Creek Control Structure	lot					$ 25,000		100%	$ -	
Backhoe	lot			30	$ 317	$ 9,504		100%	$ -	
Dozer	lot			30	$ 359	$ 10,756		100%	$ -	
Revegetation	lot					$ 1,000		100%	$ -	
Total area to be reseeded	m^2	106,000								
Load growth media with front end loader (soil cover)	m^3	53,000	389	136	$ 322	$ 43,812		100%	$ -	
Haul growth media with haultrucks	m^3	53,000	195	272	$ 292	$ 79,408		100%	$ -	
Spread growth media with dozer	m^3	53,000	389	136	$ 359	$ 48,762		100%	$ -	
Broadcast seed and fertilizer	hectare	10.60			$ 400	$ 4,240		0%	$ 4,240	
2004 Erosion Repairs (5%)	m^2	5,300								
Erosion repairs with dozer	m^3	2,650	150	18	$ 283	$ 5,086		0%	$ 5,086	
2004 Re-Seeding (25%)	m^2	26,500								
Broadcast seed and fertilizer	hectare	2.65			$ 400	$ 1,060		0%	$ 1,060	
Blue Dump ARD studies	lump					$ 10,000		0%	$ 10,000	
Blue Dump cover monitoring	lump							0%	$ -	
Subtotal							$ 238,628			$ 20,386
The Kokanee Open Pits										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	39,800	295	complete	$ 359	complete				
Dozer recontouring areas	m^2	70,400	600	complete	$ 359	complete				
Dozer work to construct diversion ditches	lot				$ 359	$ -		100%	$ -	
Construction of overflow sediment control works	lot					$ 4,700		0%	$ 4,700	
Total area to be reseeded	m^2	168,500								
Load growth media with front end loader	m^3	14,079	389	36	$ 322	complete				
Haul growth media with haultrucks	m^3	2,079	195	11	$ 292	complete				
Spread growth media with dozer	m^3	19,679	389	51	$ 359	complete				
Broadcast seed and fertilizer	hectare	16.85			$ 400	complete				
2004 Erosion Repairs (15%)	m^2	25,275								
Erosion repairs with dozer	m^3	12,638	400	32	$ 283	$ 9,041		0%	$ 9,041	
2004 Re-Seeding (40%)	m^2	67,400								
Broadcast seed and fertilizer	hectare	6.74			$ 400	$ 2,696		0%	$ 2,696	
Subtotal							$ 16,437			$ 16,437

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
The North Golden Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	23,200	295	79	$ 359	complete				
Dozer recontouring areas	m^3	15,000	600	25	$ 359	complete				
Dozer work to construct diversion ditches	lot				$ 359	$ -				
Total area to be reseeded	m^2	112,200								
Load growth media with front end loader	m^3	9,985	389	26	$ 235	complete				
Haul growth media with haultrucks	m^3	6,615	195	34	$ 189	complete				
Spread growth media with dozer	m^3	7,441	389	19	$ 359	complete				
Broadcast seed and fertilizer	hectare	11.22			$ 400	complete				
Bench dump to southeast of Pit	m^3	15,000								
Small Backhoe	m^3	15,000	200	75	$ 301	$ 22,558		0%	$ 22,558	
2004 Erosion Repairs (15%)	m^2	16,830								
Erosion repairs with dozer	m^3	8,415	400	21	$ 283	$ 5,933		0%	$ 5,933	
2004 Re-Seeding (40%)	m^2	44,880								
Broadcast seed and fertilizer	hectare	4.49			$ 400	$ 1,795		0%	$ 1,795	
Subtotal							$ 30,286			$ 30,286
The South Golden Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	5,600	295	19	$ 359	complete				
Backhoe cut to fill slopes	m^3	9,100	300	30	$ 317	complete				
Dozer recontouring areas	m^2			60	$ 359	complete				
Dozer work to construct highwall/road access berms	lm			10	$ 359	complete				
Dozer work to construct diversion ditches	lm				$ 359	$ -				
Construction of overflow sediment control works	lot					$ 4,700		100%	$ -	
Total area to be reseeded	m^2	13,800								
Load growth media with front end loader	m^3	9,985	389	26	$ 235	complete				
Haul growth media with haultrucks	m^3	9,985	195	51	$ 189	complete				
Spread growth media with dozer	m^3	11,459	389	29	$ 359	complete				
Broadcast seed and fertilizer	hectare	1.38			$ 400	complete				
2004 Erosion Repairs (5%)	m^2	690								
Erosion repairs with dozer	m^3	345	150	2	$ 322	$ 644		0%	$ 644	
2004 Re-Seeding (25%)	m^2	3,450								
Broadcast seed and fertilizer	hectare	0.35			$ 400	$ 138		0%	$ 138	
Subtotal							$ 5,482			$ 782

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
The Lucky Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	1,000	295	complete	$ 359	complete				
Dozer recontouring areas	m^2	40,800	600	68	$ 359	complete				
Backhoe work to recontour stream channel	m3	1,900	300	complete	$ 317	complete				
Construction of overflow sediment control works	lot			complete		complete				
Total area to be reseeded	m^2	42,500								
Load growth media with front end loader	m^3	5,500	389	14	$ 235	complete				
Haul growth media with haultrucks	m^3	5,500	195	28	$ 189	complete				
Spread growth media with dozer	m^3	5,900	389	15	$ 359	complete				
Broadcast seed and fertilizer	hectare	4.25			$ 400	complete				
2004 Erosion Repairs (15%)	m^2	6,375								
Erosion repairs with dozer	m^3	3,188	400	8	$ 283	$ 2,260		0%	$ 2,260	
2004 Re-Seeding (25%)	m^2	10,625								
Broadcast seed and fertilizer	hectare	1.06			$ 400	$ 425		0%	$ 425	
Stabilization of Haul Road										
Remove 100 m x 20 m x 6 m	m^3	12,000								
Load with backhoe	m^3	12,000	300	40	$ 275	$ 11,000		0%	$ 11,000	
Haul with haultrucks	m^3	12,000	150	80	$ 194	$ 15,532		0%	$ 15,532	
Subtotal							$ 29,217			$ 29,217
The Lower Fosters Open Pit										
Equipment work to recontour partially backfilled open pit										
Dozer recontouring areas	m^2	44,300	1000	complete	$ 359	complete				
Dozer work to construct highwall/road access berms	lot			complete	$ 359	complete				
Dozer work to construct diversion ditches	lot			complete	$ 359	complete				
Total area to be reseeded	m^2	44,300								
Broadcast seed and fertilizer	hectare	4.43			$ 400	$ 1,772		0%	$ 1,772	
2004 Erosion Repairs (5%)	m^2	2,215								
Erosion repairs with dozer	m^3	1,108	150	7	$ 283	$ 1,978		0%	$ 1,978	
2004 Re-Seeding (25%)	m^2	11,075								
Broadcast seed and fertilizer	hectare	1.11			$ 400	$ 443		0%	$ 443	
Subtotal							$ 4,193			$ 4,193

Table 5
Open Pit Mining and Waste Rock Storage Areas
Note: This table corresponds to Table 7-5 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
The Pacific Open Pit & Silt Borrow Area										
Equipment work to recontour partially backfilled open pit										
Dozer cut to fill slopes	m^3	12,545	307	41	$ 359	$ 14,700		100%	$ -	
Dozer recontouring areas	m^2	24,800	600	41	$ 359	$ 14,700		100%	$ -	
Backhoe work to pull back veg/gm from trees in borrow area	lot			complete	$ 317	complete				
Dozer work to construct diversion ditches	lot				$ 359	$ -				
Construction of overflow sediment control works	lot					$ 4,700		0%	$ 4,700	
Total area to be reseeded	m^2	116,500								
Load growth media with front end loader	m^3	4,800	389	12	$ 235	complete				
Haul growth media with haultrucks	m^3	4,800	195	25	$ 189	complete				
Spread growth media with dozer	m^3	7,100	389	18	$ 359	complete				
Broadcast seed and fertilizer	hectare	11.65			$ 400	complete				
2004 Erosion Repairs (5%)	m^2	5,825								
Erosion repairs with dozer	m^3	2,913	150	19	$ 322	$ 6,121		0%	$ 6,121	
2004 Re-Seeding (25%)	m^2	29,125								
Broadcast seed and fertilizer	hectare	2.91			$ 400	$ 1,165		0%	$ 1,165	
Subtotal							$ 41,386			$ 11,986
The Moosehead Open Pit										
Equipment work to recontour partially backfilled open pit				complete	$ 359	complete				
Dozer work to construct highwall/road access berms	lot			complete	$ 359	complete				
Dozer work to construct diversion ditches	lot				$ 359	$ -				
Construct cap for waste landfill area	lot					$ 5,000		0%	$ 5,000	
Construction of overflow sediment control works	lot					$ 4,700		0%	$ 4,700	
Total area to be reseeded	m^2	29,600								
Load growth media with front end loader	m^3		350	0	$ 235	$ -				
Haul growth media with haultrucks	m^3		175	0	$ 189	$ -				
Spread growth media with dozer	m^3	1,435	350	4	$ 359	$ 1,434		0%	$ 1,434	
Broadcast seed and fertilizer	hectare	2.96			$ 400	$ 1,184		0%	$ 1,184	
2004 Erosion Repairs (5%)	m^2	1,480								
Erosion repairs with dozer	m^3	740	150	5	$ 283	$ 1,413		0%	$ 1,413	
Haul road	m^2	22,500								
Scarify with dozer	m^2	22,500	1200	19	$ 283	$ 5,368		0%	$ 5,368	
Load growth media with front end loader	m^3	4,500	300	15	$ 275	$ 4,125		0%	$ 4,125	
Haul growth media with haultrucks	m^3	4,500	150	30	$ 194	$ 5,825		0%	$ 5,825	
Spread growth media with dozer	m^3	4,500	200	23	$ 283	$ 6,498		0%	$ 6,498	
2004 Re-Seeding (25%)	m^2	29,900								
Broadcast seed and fertilizer	hectare	2.99			$ 400	$ 1,196		0%	$ 1,196	
Subtotal							$ 36,743			$ 36,743
Total Estimated Cost in Reclaiming Open Pits and WSRA's							**$ 829,489**			**$ 159,998**

Table 6

Haul Road and Perimeter Access Road Reclamation

Note: This table corresponds to Table 7-6 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
Scarify & Recontour Perimeter Roads (11,000 meters)										
Grader	m	11,000	100	110	$ 124	$ 13,634		0%	$ 13,634	
Dozer (25% of total)	m	2,750	50	55	$ 301	$ 16,542		0%	$ 16,542	
Backhoe (25% of total)	m	2,750	50	55	$ 283	$ 15,539		0%	$ 15,539	
Front end loader (25% of total)	m	2,750	50	55	$ 275	$ 15,125		0%	$ 15,125	
Subtotal							$ 60,840			$ 60,840
Removal of Main Haul Road Side Berms (8,000 meters)										
Length	m	8,000								
Height	m	3.0								
Base	m	4.2								
Total Volume	m^3	50,400								
Adjusted Volume (10% of berms remain to prevent highwall ac	m^3	45,360								
FEL (10% of adjusted volume)	m^3	4,536	300	15	$ 275	$ 4,125		100%	$ -	
Backhoe (80% of adjusted volume)	m^3	36,288	200	181	$ 283	$ 51,139		90%	$ 5,114	
Dozer (30% of adjusted volume)	m^3	13,608	100	136	$ 301	$ 40,904		75%	$ 10,226	
Haul (25% of adjusted volume)	m^3	11,340	150	76	$ 194	$ 14,755		100%	$ -	
Subtotal							$ 110,924			$ 15,340
General Recontour of Haulroad Slopes (90% of existing haulroads)										
(10% of existing slopes remain same above pit walls)										
length	m	7,200								
depth (6 m @ 2H : 1V)	m^2	11								
Volume	m^3	79,200								
Consists of sloping top 6 meters back to haul road at 2H:1V										
Backhoe (100% of total length)	m^3	79,200	200	396	$ 283	$ 111,884		75%	$ 27,971	
Haul (25% of total material)	m^3	19,800	150	132	$ 194	$ 25,628		100%	$ -	
Dozer (75% of total)	m^3	59,400	307	193	$ 301	$ 58,048		100%	$ -	
Broadcast Seed and Fertilizer (4000 ft @ 13.4 meters of slope)	hectares	5.40			$ 1,000	$ 5,400		0%	$ 5,400	
Hydroseed (4000 ft @ 13.4 meters of slope)	hectares	5.40			$ 5,000	$ 27,000		0%	$ 27,000	
Subtotal							$ 227,960			$ 60,371

Table 6

Haul Road and Perimeter Access Road Reclamation

Note: This table corresponds to Table 7-6 in "Volume IV".

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
Upper Lucky Creek Crossing										
Volume of material overlaying riprap	m^3									
Volume of material to bring both slopes to 2H:1V with channel	m^3									
Material volume subtotal	m^3	10,864								
Total riprap in channel	m^3	1,420								
100% of riprap currently in place	m^3									
Material overlaying riprap and side slopes										
Backhoe (100% of adjsuted volume)	m^3	10,864	300	36	$ 283	$ 10,171		100%	$ -	
Haultrucks (50% of adjusted volume)	m^3	5,432	150	36	$ 194	$ 6,989		100%	$ -	
Dozer Assist (100% of adjusted volume)	m^3	10,864	300	36	$ 301	$ 10,828		100%	$ -	
Place riprap										
Backhoe	m^3	-	100	0	$ 317	$ -				
Subtotal							$ 27,988			$ -
Six Culverts on Main Haul Road										
Excavation to remove culverts and establish drainage channel (6 culverts)	m^3	59,450								
Backhoe (100% of adjusted volume)	m^3	59,450	200	297	$ 283	$ 83,913		0%	$ 83,913	
Haul trucks (50% of adjusted volume)	m^3	29,725	100	297	$ 194	$ 57,663		0%	$ 57,663	
Dozer (100% of adjusted volume)	m^3	59,450	300	198	$ 301	$ 59,552		0%	$ 59,552	
Load, Haul & Place riprap	m^3	3,200								
Make riprap	m^3	3,200	17.5	183	$ 100	$ 18,300		40%	$ 10,980	
FEL	m^3	3,200	200	16	$ 275	$ 4,400		0%	$ 4,400	
Haul trucks	m^3	3,200	100	32	$ 194	$ 6,213		0%	$ 6,213	
Backhoe	m^3	3,200	100	32	$ 301	$ 9,625		0%	$ 9,625	
Subtotal							$ 239,665			$ 232,345
Total Estimated Cost of Reclaiming Haul and Perimeter Roads							**$ 667,377**			**$ 368,896**

Table 7
Site Facilities Removal and Reclamation
Note: This table corresponds to Table 7-7 in "Volume IV".

Area and Task Description	Estimated Hours	Unit Rate	Estimated Cost		Percent Complete	Subtotal Liability	Total Liability
Building Dismantling and Salvaging							
Accommodation Camp - Prefabricated Modular Trailer Units							
These units have been sold "as is where is" and are being prepared by buyer							
General cleanup of site	0	$ 30	$ -	complete	0%	$ -	
Subtotal				$ -			$ -
Administration Office Complex							
These units have been sold "as is where is" and are being prepared by buyer							
General cleanup of site	0	$ 30	$ -	complete	0%	$ -	
Subtotal				$ -			$ -
Engineering Office Complex							
These units have been sold "as is where is" and are being prepared by buyer							
General cleanup of site	0	$ 30	$ -	complete	0%	$ -	
Subtotal				$ -			$ -
Environmental Trailer							
This unit has been sold "as is where is" and has left the property							
General cleanup of site	0	$ 30	$ -	complete	0%	$ -	
Subtotal				$ -			$ -
Warehouse & Maintenance Shop Building (Steel Frame Building on Concrete Slab)							
Remove hazardous materials	96	$ 30	$ 2,880		0%	$ 2,880	
Remove salvageable materials and fittings	240	$ 30	$ 7,200		0%	$ 7,200	
Remove and dispose of steel roof & wall panelling & insulation	480	$ 38	$ 18,240		0%	$ 18,240	
Disassemble steel frame of building	480	$ 38	$ 18,240		0%	$ 18,240	
Disassemble interior steel framing	240	$ 38	$ 9,120		0%	$ 9,120	
Disconnect service piping and electrical cabling	120	$ 38	$ 4,560		0%	$ 4,560	
Remove scrap to landfill	192	$ 38	$ 7,296		0%	$ 7,296	
Prepare salvaged steel for shipment	72	$ 38	$ 2,736		0%	$ 2,736	
Freight to ship building	lot		$ 15,000		0%	$ 15,000	
Crane support	144	$ 100	$ 14,400		0%	$ 14,400	
General cleanup of site	24	$ 30	$ 720		0%	$ 720	
Haul and place soil cover over slab (m^3)	1100	$ 2.25	$ 2,475		0%	$ 2,475	
Subtotal				$ 102,867			$ 102,867
Surface Shop - Atco Fold Away - 12.2 m long x 9.1 m wide on concrete slab							
Remove hazardous materials	12	$ 30	$ 360		0%	$ 360	
Remove salvageable materials and fittings	48	$ 30	$ 1,440		0%	$ 1,440	
Disassemble steel frame of building	192	$ 38	$ 7,296		0%	$ 7,296	
Disconnect service piping and electrical cabling	48	$ 38	$ 1,824		0%	$ 1,824	
Remove scrap to landfill	24	$ 30	$ 720		0%	$ 720	
Freight to ship building	lot		$ 5,000		0%	$ 5,000	
Crane support	48	$ 100	$ 4,800		0%	$ 4,800	
General cleanup of site	12	$ 30	$ 360		0%	$ 360	
Haul and place soil cover over slab (m^3)	150	$ 2.25	$ 338		0%	$ 338	
Subtotal				$ 22,138			$ 22,138
Camp Potable Water Tank - 455 m3 steel tank							
Drain tank & disconnect piping	24	$ 30	$ 720		0%	$ 720	
Disconnect steel tank	192	$ 38	$ 7,296		0%	$ 7,296	
Haul scrap steel to landfill	24	$ 30	$ 720		0%	$ 720	
Haul and place soil over foundation (m3)	100	$ 2.25	$ 225		0%	$ 225	
Subtotal				$ 8,961			$ 8,961

Table 7
Site Facilities Removal and Reclamation
Note: This table corresponds to Table 7-7 in "Volume IV".

Area and Task Description	Estimated Hours	Unit Rate	Estimated Cost		Percent Complete	Subtotal Liability	Total Liability
Exploration Office & Core Logging Facility - Wood Frame & Truss Building - 9.8m wide x 12.5 m long							
Remove hazardous materials	6	$ 30	$ 180		0%	$ 180	
Remove salvageable materials and fittings	48	$ 30	$ 1,440		0%	$ 1,440	
Disassemble wood frame of building	192	$ 30	$ 5,760		0%	$ 5,760	
Disconnect service piping and electrical cabling	24	$ 38	$ 912		0%	$ 912	
Remove scrap to landfill	24	$ 30	$ 720		0%	$ 720	
General cleanup of site	12	$ 30	$ 360		0%	$ 360	
Subtotal				$ 9,372			$ 9,372
Exploration Office Shipping Containers - Two 6.1 m shipping containers with wood roof cover							
Remove salvageable materials and fittings	0	$ 30	$ -	complete	0%	$ -	
Disassemble wood frame of roof cover	0	$ 30	$ -	complete	0%	$ -	
Load and ship two containers off site	0	$ 38	$ -	complete	0%	$ -	
Freight cost to ship containers off site	0			complete	100%	$ -	
General cleanup of site	12	$ 30	$ 360		0%	$ 360	
Subtotal				$ 360			$ 360
ADR Plant Building - Engineered Steel Frame Building - 70 m long x 21 m wide							
Remove hazardous materials & clean plant interior	96	$ 30	$ 2,880		0%	$ 2,880	
Remove salvageable materials, equipment & fittings	480	$ 30	$ 14,400		0%	$ 14,400	
Remove and dispose of steel roof & wall panelling & insulation	480	$ 38	$ 18,240		0%	$ 18,240	
Disassemble steel frame of building	384	$ 38	$ 14,592		0%	$ 14,592	
Disassemble interior steel framing	240	$ 38	$ 9,120		0%	$ 9,120	
Disconnect service piping and electrical cabling	240	$ 38	$ 9,120		0%	$ 9,120	
Remove scrap to landfill	192	$ 30	$ 5,760		0%	$ 5,760	
Prepare salvaged steel for shipment	72	$ 30	$ 2,160		0%	$ 2,160	
Freight to ship building	lot		$ 20,000		0%	$ 20,000	
Crane support	192	$ 100	$ 19,200		0%	$ 19,200	
General cleanup of site	24	$ 30	$ 720		0%	$ 720	
Haul and place soil cover over slab (m^3)	1875	$ 2.25	$ 4,219		0%	$ 4,219	
Revegetation - 75m x 25m	1875	$ 0.50	$ 938		0%	$ 938	
Subtotal				$ 121,348			$ 121,348
Assay Lab Building - Engineered Steel Frame Building - 29.3 m long x 8.5 m wide							
Remove hazardous materials & clean lab interior	48	$ 30	$ 1,440		0%	$ 1,440	
Remove salvageable materials, equipment & fittings	240	$ 30	$ 7,200		0%	$ 7,200	
Remove and dispose of steel roof & wall panelling & insulation	144	$ 38	$ 5,472		0%	$ 5,472	
Disassemble steel frame of building	144	$ 38	$ 5,472		0%	$ 5,472	
Disconnect service piping and electrical cabling	48	$ 38	$ 1,824		0%	$ 1,824	
Remove scrap to landfill	96	$ 30	$ 2,880		0%	$ 2,880	
Prepare salvaged steel for shipment	24	$ 38	$ 912		0%	$ 912	
Freight to ship building	lot		$ 10,000		0%	$ 10,000	
Crane support	48	$ 100	$ 4,800		0%	$ 4,800	
General cleanup of site	24	$ 30	$ 720		0%	$ 720	
Haul and place soil cover over slab (m^3)	300	$ 2.25	$ 675		0%	$ 675	
Revegetation - 30m x 10m	300	$ 0.50	$ 150		0%	$ 150	
Subtotal				$ 41,545			$ 41,545

Table 7

Site Facilities Removal and Reclamation

Note: This table corresponds to Table 7-7 in "Volume IV".

Area and Task Description	Estimated Hours	Unit Rate	Estimated Cost		Percent Complete	Subtotal Liability	Total Liability
Heap Leach Valve Houses - 7 Modular Steel Frame Buildings each 3.4 m x 3.7 m							
Remove salvageable materials, equipment & fittings	96	$ 30	$ 2,880		0%	$ 2,880	
Remove and dispose of steel roof & wall panelling & insulation	120	$ 30	$ 3,600		0%	$ 3,600	
Disassemble steel frame of building	120	$ 38	$ 4,560		0%	$ 4,560	
Disconnect service piping and electrical cabling	96	$ 38	$ 3,648		0%	$ 3,648	
Remove scrap to landfill	96	$ 30	$ 2,880		0%	$ 2,880	
Crane support	48	$ 100	$ 4,800		0%	$ 4,800	
General cleanup of site	24	$ 30	$ 720		0%	$ 720	
Subtotal				$ 23,088			$ 23,088
Lime Silo - Bolted Steel Tank - 36 m high x 10 m diameter							
Remove salvageable materials, equipment & fittings	96	$ 30	$ 2,880		0%	$ 2,880	
Disassemble bolted steel silo	192	$ 38	$ 7,296		0%	$ 7,296	
Disconnect and remove service piping and electrical cabling	48	$ 38	$ 1,824		0%	$ 1,824	
Remove scrap to landfill	24	$ 30	$ 720		0%	$ 720	
Crane support	48	$ 100	$ 4,800		0%	$ 4,800	
General cleanup of site	12	$ 30	$ 360		0%	$ 360	
Haul and place soil cover over slab (m^3)	200	$ 2.25	$ 450		0%	$ 450	
Revegetation (m^2)	200	$ 0.50	$ 100		0%	$ 100	
Subtotal				$ 18,430			$ 18,430
ADR Plant Fresh Water Tank - Steel Welded Tank - 637 m3 Capacity							
Drain tank and disconnect piping	24	$ 38	$ 912		0%	$ 912	
Disassemble steel tank	192	$ 38	$ 7,296		0%	$ 7,296	
Haul scrap steel to land fill	24	$ 30	$ 720		0%	$ 720	
Haul and place soil cover over slab (m3)	50	$ 2.25	$ 113		0%	$ 113	
Revegetation (m2)	50	$ 0.50	$ 25		0%	$ 25	
Subtotal				$ 9,066			$ 9,066
Laura Creek Pumphouse - Steel Frame Building							
Remove salvageable materials, equipment & fittings	96	$ 30	$ 2,880		0%	$ 2,880	
Remove and dispose of steel roof & wall panelling & insulation	96	$ 38	$ 3,648		0%	$ 3,648	
Disassemble steel frame of building	48	$ 38	$ 1,824		0%	$ 1,824	
Disconnect and remove service piping and electrical cabling	48	$ 38	$ 1,824		0%	$ 1,824	
Remove scrap to landfill	48	$ 30	$ 1,440		0%	$ 1,440	
Crane support	24	$ 100	$ 2,400		0%	$ 2,400	
General cleanup of site	24	$ 30	$ 720		0%	$ 720	
Haul and place soil cover over slab (m3)	50	$ 2.25	$ 113		0%	$ 113	
Revegetation (m2)	50	$ 0.50	$ 25		0%	$ 25	
Subtotal				$ 14,874			$ 14,874
Electrical Distribution System							
Remove above ground electrical distribution cabling	240	$ 38	$ 9,120		0%	$ 9,120	
Remove electrical transformers and switch gear	240	$ 38	$ 9,120		0%	$ 9,120	
Subtotal				$ 18,240			$ 18,240

Table 7
Site Facilities Removal and Reclamation
Note: This table corresponds to Table 7-7 in "Volume IV".

Area and Task Description	Estimated Hours	Unit Rate	Estimated Cost		Percent Complete	Subtotal Liability	Total Liability
Surface Piping							
Flush surface piping	96	$ 30	$ 2,880		0%	$ 2,880	
Disassemble and remove surface piping	480	$ 30	$ 14,400		0%	$ 14,400	
Dozer/FEL support	60	$ 150	$ 9,000		0%	$ 9,000	
Subtotal				$ 26,280			$ 26,280
Removal of Site Fencing Around Heap Leach Facilities							
Removal and disposal of fencing	336	$ 30	$ 10,080		0%	$ 10,080	
Subtotal				$ 10,080			$ 10,080
Removal of Land Application Piping System							
Removal and disposal of land application piping	160	$ 30	$ 4,800		0%	$ 4,800	
Subtotal				$ 4,800			$ 4,800
General Site Regrading/ Growth Media Placement/Runoff and Erosion Control							
Regrading of general site with grader	52	$ 123	$ 6,396		0%	$ 6,396	
Haul and place soil cover over surface (0.15 meter)	7800	$ 2.25	$ 17,550		0%	$ 17,550	
Revegetation (hectares)	5.18	$ 1,000	$ 5,180		0%	$ 5,180	
Removal of culverts and resloping of culvert crossings	lot	$ 2,500	$ 17,500		0%	$ 17,500	
Runoff ditch maintenance and rock armouring	lot	$ 50	$ 12,500		0%	$ 12,500	
Removal of wash bay sediment control pond	lot	$ 500	$ 500		0%	$ 500	
Subtotal				$ 59,626			$ 59,626
Fuel and Reagent Storage Facilities							
Bulk Diesel Fuel Storage Tanks at Maintenance Shop Facility							
Drain and remove remaining fuel inventory to ADR facility	lot	$ 750	$ 750		0%	$ 750	
Disassemble storage tanks	192	$ 38	$ 7,296		0%	$ 7,296	
Remove fueling equipment and steel platforms	96	$ 38	$ 3,648		0%	$ 3,648	
Crane support	72	$ 100	$ 7,200		0%	$ 7,200	
Clean out concrete containment berm	24	$ 30	$ 720		0%	$ 720	
Dispose of oil residue	lot	$ 1,000	$ 1,000		0%	$ 1,000	
Remove concrete containment berm to landfill	12	$ 110	$ 1,320		0%	$ 1,320	
Haul and place soil over foundation (m^3)	50	$ 2.25	$ 113		0%	$ 113	
Revegetation (m^2)	50	$ 0.50	$ 25		0%	$ 25	
Subtotal				$ 22,072			$ 22,072

Table 7
Site Facilities Removal and Reclamation
Note: This table corresponds to Table 7-7 in "Volume IV".

Area and Task Description	Estimated Hours	Unit Rate	Estimated Cost		Percent Complete	Subtotal Liability	Total Liability
Bulk Diesel Fuel Storage Tanks at ADR Plant Facility							
Drain and remove remaining fuel inventory	lot	$ 1,000	$ 1,000		0%	$ 1,000	
Disassemble storage tanks	192	$ 38	$ 7,296		0%	$ 7,296	
Remove fueling equipment and steel platforms	48	$ 38	$ 1,824		0%	$ 1,824	
Crane support	72	$ 100	$ 7,200		0%	$ 7,200	
Clean out concrete containment berm	24	$ 30	$ 720		0%	$ 720	
Dispose of oil residue	lot	$ 1,000	$ 1,000		0%	$ 1,000	
Remove concrete containment berm to landfill	12	$ 110	$ 1,320		0%	$ 1,320	
Haul and place soil over foundation (m^3)	50	$ 2.25	$ 113		0%	$ 113	
Revegetation (m^2)	50	$ 0.30	$ 15		0%	$ 15	
Subtotal				$ 20,488			$ 20,488
Shipment of Remaining Inventory of Other Hydrocarbon Products	lot	$ 3,500	$ 7,000		0%	$ 7,000	
Subtotal				$ 7,000			$ 7,000
Shipment of Remaining Inventory of Reagents, Chemicals and Wastes	lot	$ 3,500	$ 10,500		0%	$ 10,500	
Subtotal				$ 10,500			$ 10,500
Land Farming of Hydrocarbon Contaminated Soils							
Grader to turn over soils	52	$ 85	$ 4,420		0%	$ 4,420	
Analysis	lot	$ 100	$ 2,600		0%	$ 2,600	
Ammonium Nitrate or other fertilizer	lot	$ 50	$ 100		0%	$ 100	
Subtotal				$ 7,120			$ 7,120
Close Out of Site Sewage Septic Systems - 3 Systems							
Pump out sludge holding tanks and transport to sludge trench	lot	$ 250	$ 750		0%	$ 750	
Excavate and remove three septic tanks to landfill	lot	$ 500	$ 1,500		0%	$ 1,500	
Bury sewage sludge trench	lot	$ 1,000	$ 1,000		0%	$ 1,000	
Subtotal				$ 3,250			$ 3,250
Cleanup Site Boneyard							
Decontaminate scrapped equipment in boneyard	lot	$ 500	$ 500		0%	$ 500	
Remove non-salvageable scrap to landfill	lot	$ 2,500	$ 2,500		0%	$ 2,500	
Subtotal				$ 3,000			$ 3,000
Close Out Site Landfill Area							
Clean up landfill with dozer	10	$ 327	$ 3,270		0%	$ 3,270	
Load silt into trucks with FEL	4	$ 293	$ 1,172		0%	$ 1,172	
Haul in silt for cover	8	$ 345	$ 2,760		0%	$ 2,760	
Spread silt with dozer	4	$ 327	$ 1,308		0%	$ 1,308	
Compact silt	4	$ 77	$ 308		0%	$ 308	
Growth Media Placement (FEL @4 hrs., Haul Trucks @ 8 hrs., Dozer @ 4 hrs.)	lot		$ 3,108		0%	$ 3,108	
Revegetate cover	1000	$ 0.50	$ 500			$ 500	
Subtotal				$ 12,426			$ 12,426
Total Estimated Cost of Reclaiming Ancillary and Support Facilities				**$ 576,929**			**$ 576,929**

Table 8
Heap Leach Pad Reclamation

Area and Task Description	Unit of Reclamation Measure	Estimated # of Units	Production Rate	Estimated Hours	Unit Cost	Estimated Task Cost		Percentage Complete Sept. 2003	Estimated Remaining Cost	Estimated Remaining Subtotals
Leach Pad Resloping and Drainage Ditches										
Dozer cut to fill slopes	m^3	20,000	307	65	$ 359	$ 23,305		100%	$ -	
General recontour prior to cap placement	lot			50	$ 359	$ 17,927		100%	$ -	
Dozer work to construct drainage ditches	lot				$ 359	$ -				
Backhoe work to construct ditches	lot			20	$ 317	$ 6,336		0%	$ 6,336	
Place riprap/gravel in channels/ditches	m^3									
Load material	m^3		200	0	$ 322	$ -				
Haul material	m^3		100	0	$ 292	$ -				
Spread material	m^3		200	0	$ 317	$ -				
Breach leach pad dike material	m3	3,250	50	65	$ 194	$ 12,610		0%	$ 12,610	
Place riprap/gravel in dike breach	m3	500			$ 5	$ 2,500		0%	$ 2,500	
Subtotal							$ 62,679			$ 21,446
Leach Pad Soil Cover Construction										
Total area requiring seds/silt cap	m^2	-								
Load seds/silt with front end loader	m^3		389	0	$ 322	$ -				
Haul seds/silt with haultrucks	m^3	-	195	0	$ 292	$ -				
Spread seds/silt with dozer	m^3		389	0	$ 359	$ -				
Compact seds/silt with roller	m^2				$ 83	$ -				
Subtotal							$ -			$ -
Leach Pad Revegetation										
Total area to be reseeded (sloped surface area)	m^2	323,000								
Load growth media with FEL (100% of area, 0.25 m)	m^3	80,750	389	208	$ 322	$ 67,006		100%	$ -	
Haul growth media	m^3	80,750	130	621	$ 292	$ 181,295		100%	$ -	
Spread growth media	m^3	80,750	389	208	$ 359	$ 74,577		100%	$ -	
Broadcast seed and fertilizer	hectares	32.3			$ 750	$ 24,225		75%	$ 6,056	
Subtotal							$ 347,103			$ 6,056
Previously Projected Cells 8 -10 (Northeast of Leach Pad)										
Dozer work to recontour surface area	m^2	30,000	600	50	$ 359	$ 17,927		0%	$ 17,927	
Total area to be reseeded	m^2	172,800								
Load growth media with front end loader	m^3	-	389	0	$ 322	$ -		0%	$ -	
Haul growth media with haultrucks	m^3	-	130	0	$ 292	$ -		0%	$ -	
Spread growth media with dozer	m^3	25,800	200	129	$ 283	$ 36,447		0%	$ 36,447	
Broadcast seed and fertilizer	hectares	17.3			$ 400	$ 6,912		0%	$ 6,912	
Subtotal							$ 92,982			$ 61,286
2004 Reclamation Repairs										
2004 Erosion Repairs (10%)	m^2	49,580								
Erosion repairs with dozer	m^3	24,790	300	83	$ 322	$ 26,738		0%	$ 26,738	
2004 Re-Seeding (25%)	m^2	123,950								
Broadcast seed and fertilizer	hectare	12.40			$ 400	$ 4,958		0%	$ 4,958	
							$ 31,696			$ 31,696
Total Leach Pad Earthworks							**$ 534,461**			**$ 120,485**

Note: This table corresponds to Table 7-8 in "Volume IV".

Table 9
Manpower

	$/Annum	2003	2004	2005	2006	
Staff						
Site Manager	$ 125,000	$ 31,250				
Administrative Manager	$ 75,000	$ -	$ -			
Process Manager/Engineer	$ 65,000	$ 16,250	$ 65,000			
Accounts Payable	$ 35,000					
Environmental Manager	$ 75,000					
Reclamation Supervision	$ 50,000		$ 25,000			
Mine Technician	$ 40,000		$ 20,000			
Lab Technician	$ 40,000		$ -			
Surface Operator	$ 45,000		$ -			
Process Operators	$ 50,000		$ 25,000			
Mechanic	$ 50,000		$ 5,000			
Electrician	$ 55,000		$ 5,500			
Equipment Operator	$ 45,000		$ -			
Laborer	$ 35,000		$ -			
Salary Load	35%	$ 16,625	$ 50,925	$ -	$ -	
Total Manpower		$ 64,125	$ 196,425	$ -	$ -	$ 260,550

Note: This table corresponds to Table 7-10 in "Volume IV".

Table 10

General Services & Administration

Category	Area Total	Sep-03 18	Oct-03 19	Nov-03 20	Dec-03 21	Jan-04 22	Feb-04 23	Mar-04 24	Apr-04 25	May-04 26	Jun-04 27	Jul-04 28	Aug-04 29
General Services & Administration													
Miscellaneous Operating Supplies	$ 4,000		$ 500			$ 250	$ 250	$ 250	$ 250	$ 500	$ 500	$ 500	$ 500
Insurance	$ 85,000		$ 5,000	$ 5,000	$ 5,000	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 5,000	$ 5,000
Freight	$ 16,000		$ 2,000	$ 1,000	$ 1,000					$ 2,000	$ 2,000	$ 2,000	$ 2,000
Propane	$ 30,000		$ 5,000							$ 5,000	$ 5,000	$ 5,000	$ 5,000
Water Supply	$ 9,600		$ 1,600							$ 1,600	$ 1,600	$ 1,600	$ 1,600
Access Road Maintenance	$ 16,554		$ 1,415	$ 1,415	$ 1,415	$ 600	$ 600	$ 600	$ 600	$ 1,415	$ 1,415	$ 1,415	$ 1,415
General Site Grounds	$ 25,426		$ 2,119	$ 2,119	$ 2,119	$ 1,059	$ 1,059	$ 1,059	$ 1,059	$ 2,119	$ 2,119	$ 2,119	$ 2,119
Waste Disposal	$ 4,800		$ 800							$ 800	$ 800	$ 800	$ 800
Light Vehicle Costs	$ 11,963		$ 896	$ 896	$ 896	$ 750	$ 750	$ 750	$ 750	$ 896	$ 896	$ 896	$ 896
Travel & Lodging	$ 18,000		$ 1,500	$ 1,500	$ 1,500	$ 750	$ 750	$ 750	$ 750	$ 1,500	$ 1,500	$ 1,500	$ 1,500
Tele,Fax,Internet,Radio,Satellite	$ 42,000		$ 5,000	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 5,000	$ 5,000	$ 5,000	$ 5,000
Office Equipment/Lease Rent	$ 12,000		$ 1,000	$ 1,000	$ 1,000	$ 500	$ 500	$ 500	$ 500	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Building Maintenance	$ 6,000		$ 500	$ 500	$ 500	$ 250	$ 250	$ 250	$ 250	$ 500	$ 500	$ 500	$ 500
Safety Supplies	$ 4,000		$ 500			$ 250	$ 250	$ 250	$ 250	$ 500	$ 500	$ 500	$ 500
Office Supplies	$ 6,800		$ 850			$ 425	$ 425	$ 425	$ 425	$ 850	$ 850	$ 850	$ 850
Crew Rotations & Transportation	$ 6,000		$ 1,000							$ 1,000	$ 1,000	$ 1,000	$ 1,000
Staff Housing	$ 25,200		$ 4,200							$ 4,200	$ 4,200	$ 4,200	$ 4,200
Crew Mobilization	$ 15,000								$ 15,000				
Camp Operations	$ 15,000		$ 2,500							$ 2,500	$ 2,500	$ 2,500	$ 2,500
CS - Technical Consultants	$ 18,000		$ 1,500	$ 1,500	$ 1,500	$ 750	$ 750	$ 750	$ 750	$ 1,500	$ 1,500	$ 1,500	$ 1,500
CS - Legal	$ 12,000		$ 1,000	$ 1,000	$ 1,000	$ 500	$ 500	$ 500	$ 500	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Environmental Monitoring	$ 10,500		$ 3,500	$ 3,500	$ 3,500								
Geotechnical Inspections	$ 876		$ 292	$ 292	$ 292								
Electrical Power	$ 50,196		$ 17,510	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335
Total G & A	$ 444,915	$ -	$ 60,183	$ 23,557	$ 23,557	$ 17,419	$ 17,419	$ 17,419	$ 32,419	$ 43,715	$ 43,715	$ 41,215	$ 41,215
Annual totals	$ 444,915		107297			337618							

Note: This table corresponds to Table 7-11 in "Volume IV".

Table 10

General Services & Administratio

Category	Sep-04 30	Oct-04 31	Nov-04 32	Dec-04 33
General Services & Administration				
Miscellaneous Operating Supplies	$ 500			
Insurance	$ 5,000	$ 5,000	$ 5,000	
Freight	$ 2,000	$ 1,000	$ 1,000	
Propane	$ 5,000			
Water Supply	$ 1,600			
Access Road Maintenance	$ 1,415	$ 1,415	$ 1,415	
General Site Grounds	$ 2,119	$ 2,119	$ 2,119	
Waste Disposal	$ 800			
Light Vehicle Costs	$ 896	$ 896	$ 896	
Travel & Lodging	$ 1,500	$ 1,500	$ 1,500	
Tele,Fax,Internet,Radio,Satellite	$ 5,000	$ 1,500	$ 1,500	
Office Equipment/Lease Rent	$ 1,000	$ 1,000	$ 1,000	
Building Maintenance	$ 500	$ 500	$ 500	
Safety Supplies	$ 500			
Office Supplies	$ 850			
Crew Rotations & Transportation	$ 1,000			
Staff Housing	$ 4,200			
Crew Mobilization				
Camp Operations	$ 2,500			
CS - Technical Consultants	$ 1,500	$ 1,500	$ 1,500	
CS - Legal	$ 1,000	$ 1,000	$ 1,000	
Environmental Monitoring				
Geotechnical Inspections				
Electrical Power	$ 2,335	$ 2,335	$ 2,335	$ 2,335
Total G & A	$ 41,215	$ 19,765	$ 19,765	$ 2,335

Annual totals

Note: This table corresponds to Table 7-11 in

Table 11

General Services & Administration for Contingency Cases where Land Application or BTC is operating

Category	Area Total	Apr-02 1	Dec-04 33	Jan-05 34	Feb-05 35	Mar-05 36	Apr-05 37	May-05 38	Jun-05 39	Jul-05 40	Aug-05 41	Sep-05 42	Oct-05 43	Nov-05 44	Dec-05 45
General Services & Administration															
Miscellaneous Operating Supplies	$ -														
Insurance	$ 11,000			$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	
Freight	$ 5,000							$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000			
Propane	$ -														
Water Supply	$ 8,000							$ 1,600	$ 1,600	$ 1,600	$ 1,600	$ 1,600			
Access Road Maintenance	$ 9,093						$ 600	$ 1,415	$ 1,415	$ 1,415	$ 1,415	$ 1,415	$ 1,415		
General Site Grounds	$ -														
Waste Disposal	$ 800											$ 800			
Light Vehicle Costs	$ 8,250			$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	
Travel & Lodging	$ -														
Tele,Fax,Internet,Radio,Satellite	$ -														
Office Equipment/Lease Rent	$ -														
Building Maintenance	$ -														
Safety Supplies	$ 2,750						$ 250	$ 500	$ 500	$ 500	$ 500	$ 500			
Office Supplies	$ -														
Crew Rotations & Transportation	$ -														
Staff Housing	$ 10,000							$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000			
Crew Mobilization	$ 2,500						$ 2,500								
Camp Operations	$ -														
CS - Technical Consultants	$ -														
CS - Legal	$ -														
Environmental Monitoring	$ -														
Geotechnical Inspections	$ -														
Electrical Power	$ 25,682	$ -		$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	$ 2,335	
Labour															
Shipper/Receiver/Accountant	$ 35,438						$ 5,063	$ 5,063	$ 5,063	$ 5,063	$ 5,063	$ 5,063	$ 5,063		
Process Operator/Technician	$ 31,500						$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500	$ 4,500		
Contract Maintenance	$ 7,000						$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000		
	$ 157,012														
Total G & A	$ 157,012	$ -	$ -	$ 4,085	$ 4,085	$ 4,085	$ 17,997	$ 21,163	$ 21,163	$ 21,163	$ 21,163	$ 21,963	$ 16,063	$ 4,085	$ -

Note: This table corresponds to Table 7-11B in "Volume IV".

Table 12

Process Water Treatment

Category	Area Total	Jan-04 22	Feb-04 23	Mar-04 24	Apr-04 25	May-04 26	Jun-04 27	Jul-04 28	Aug-04 29	Sep-04 30	Oct-04 31	Nov-04 32	Dec-04 33
Incremental Process & Water Treatment Costs													
Outside Assays	$ 15,000				$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500			
Pipe/Hose/Fittings	$ 12,500					$ 2,500	$ 2,500	$ 2,500	$ 2,500	$ 2,500			
Hydrogen Peroxide - Water Treatment	$ -				$ -	$ -	$ -	$ -	$ -	$ -			
Small Tools	$ 1,500				$ 250	$ 250	$ 250	$ 250	$ 250	$ 250			
Reagents/Chemicals	$ 600				$ 100	$ 100	$ 100	$ 100	$ 100	$ 100			
Antiscalant	$ -												
Caustic Soda	$ -												
Activated Carbon	$ -												
Hydrochloric Acid	$ -												
Misc. Maintenance Supplies	$ 7,200				$ 1,200	$ 1,200	$ 1,200	$ 1,200	$ 1,200	$ 1,200			
Misc. Operating Supplies	$ 9,000				$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500			
Fuels/Lubes	$ 4,500				$ 750	$ 750	$ 750	$ 750	$ 750	$ 750			
Propane	$ -												
Pumps	$ 3,000				$ 500	$ 500	$ 500	$ 500	$ 500	$ 500			
Maintenance of ditch and roadway Assume FEL 990: 16 hours * $325 / hour	$ 5,200							$ 5,200					
Total Process & Water Treatment	$ 58,500	$ -	$ -	$ -	$ 6,800	$ 9,300	$ 9,300	$ 14,500	$ 9,300	$ 9,300	$ -	$ -	$ -

Note: This table corresponds to Table 7-12 in "Volume IV".

Table 13

Post Closure Monitoring & Maintenance Ending Month 142

Category	Area Total	Jan-04 22	Feb-04 23	Mar-04 24	Apr-04 25	May-04 26	Jun-04 27	Jul-04 28	Aug-04 29	Sep-04 30	Oct-04 31	Nov-04 32	Dec-04 33
Post Closure Monitoring & Maintenance													
Revegetation Inspections	$ 33,000	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458
Reclamation Maintenance	$ 20,000	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Annual Geotechnical Inspections	$ 21,000	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292
Environmental Studies	$ 3,000	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125
Long Term Nutrients BTC/IG	$ -	$ -	$ -										
Contract Services Labor	$ 67,875	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Lab Analysis	$ 272,439	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037
Support Equipment (Helicopter)	$ 30,106	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Total Monitoring & Maintenance	$ 584,600	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328

Annual totals 63940

Note: This table corresponds to Table 7-14 in "Volume IV".

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-05 34	Feb-05 35	Mar-05 36	Apr-05 37	May-05 38	Jun-05 39	Jul-05 40	Aug-05 41	Sep-05 42	Oct-05 43	Nov-05 44	Dec-05 45
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458
Reclamation Maintenance	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Annual Geotechnical Inspections	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292
Environmental Studies	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125	$ 125
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Lab Analysis	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037
Support Equipment (Helicopter)	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Total Monitoring & Maintenance	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328	$ 5,328

Annual totals 63940

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-06 46	Feb-06 47	Mar-06 48	Apr-06 49	May-06 50	Jun-06 51	Jul-06 52	Aug-06 53	Sep-06 54	Oct-06 55	Nov-06 56	Dec-06 57
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458
Reclamation Maintenance	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Annual Geotechnical Inspections	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Lab Analysis	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037
Support Equipment (Helicopter)	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Total Monitoring & Maintenance	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203

Annual totals 62440

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-07 58	Feb-07 59	Mar-07 60	Apr-07 61	May-07 62	Jun-07 63	Jul-07 64	Aug-07 65	Sep-07 66	Oct-07 67	Nov-07 68	Dec-07 69
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458
Reclamation Maintenance	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Annual Geotechnical Inspections	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Lab Analysis	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037
Support Equipment (Helicopter)	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Total Monitoring & Maintenance	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203

Annual totals 62440

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-08 70	Feb-08 71	Mar-08 72	Apr-08 73	May-08 74	Jun-08 75	Jul-08 76	Aug-08 77	Sep-08 78	Oct-08 79	Nov-08 80	Dec-08 81
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458	$ 458
Reclamation Maintenance	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Annual Geotechnical Inspections	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292	$ 292
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750	$ 750
Lab Analysis	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037	$ 3,037
Support Equipment (Helicopter)	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333	$ 333
Total Monitoring & Maintenance	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203	$ 5,203

Annual totals 62440

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-09 82	Feb-09 83	Mar-09 84	Apr-09 85	May-09 86	Jun-09 87	Jul-09 88	Aug-09 89	Sep-09 90	Oct-09 91	Nov-09 92	Dec-09 93
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-10 94	Feb-10 95	Mar-10 96	Apr-10 97	May-10 98	Jun-10 99	Jul-10 100	Aug-10 101	Sep-10 102	Oct-10 103	Nov-10 104	Dec-10 105
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-11 106	Feb-11 107	Mar-11 108	Apr-11 109	May-11 110	Jun-11 111	Jul-11 112	Aug-11 113	Sep-11 114	Oct-11 115	Nov-11 116	Dec-11 117
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,500	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,500	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 11,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 33240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-12 118	Feb-12 119	Mar-12 120	Apr-12 121	May-12 122	Jun-12 123	Jul-12 124	Aug-12 125	Sep-12 126	Oct-12 127	Nov-12 128	Dec-12 129
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-13 130	Feb-13 131	Mar-13 132	Apr-13 133	May-13 134	Jun-13 135	Jul-13 136	Aug-13 137	Sep-13 138	Oct-13 139	Nov-13 140	Dec-13 141
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-14 142	Jan-14 143	Mar-14 144	Apr-14 145	May-14 146	Jun-14 147	Jul-14 148	Aug-14 149	Sep-14 150	Oct-14 151	Nov-14 152	Dec-14 153
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,500	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,500	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 11,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 33240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-15 154	Feb-15 155	Mar-15 156	Apr-15 157	May-15 158	Jun-15 159	Jul-15 160	Aug-15 161	Sep-15 162	Oct-15 163	Nov-15 164	Dec-15 165
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-16 166	Feb-16 167	Mar-16 168	Apr-16 169	May-16 170	Jun-16 171	Jul-16 172	Aug-16 173	Sep-16 174	Oct-16 175	Nov-16 176	Dec-16 177
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-17 178	Feb-17 179	Mar-17 180	Apr-17 181	May-17 182	Jun-17 183	Jul-17 184	Aug-17 185	Sep-17 186	Oct-17 187	Nov-17 188	Dec-17 189
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 24240

Note: This table corresponds to Table 7-14 in "Volum

Table 13

Post Closure Monitoring & Maintenanc

Category	Jan-18 190	Feb-18 191	Mar-18 192	Apr-18 193	May-18 194	Jun-18 195	Jul-18 196	Aug-18 197	Sep-18 198	Oct-18 199	Nov-18 200	Dec-18 201
Post Closure Monitoring & Maintenance												
Revegetation Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,500	$ -	$ -	$ -	$ -
Reclamation Maintenance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Geotechnical Inspections	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,500	$ -	$ -	$ -	$ -
Environmental Studies	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Long Term Nutrients BTC/IG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contract Services Labor	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375	$ 375
Lab Analysis	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479	$ 1,479
Support Equipment (Helicopter)	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166	$ 166
Total Monitoring & Maintenance	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020	$ 11,020	$ 2,020	$ 2,020	$ 2,020	$ 2,020

Annual totals 33240

Note: This table corresponds to Table 7-14 in "Volum

Table 14a
Facilities Construction Capital Cost Estimate - Small Pond

Biological Treatment Cell in Stage 2 Pond

Item	Unit	Amount	$/Unit	Total
Engineering/Design	lot			$ 20,000
QA/QC	lot			$ 12,500
Excavate/Construct Cell	m^3		$ 7.50	$ -
Install Liner System	m^2		$ 12.00	$ -
Piping	lot			$ 12,500
Haul/Place Rock Substrate	m^3	1,800	$ 8.00	$ 14,400
Silt/Organics Cap	m^3	2,500	$ 3.50	$ 8,750
Nutrient Addition System	lot			$ 7,500
Manpower	hrs	360	$ 25.00	$ 9,000
Subtotal				$ 84,650
Contingency	25%			$ 21,163
Total				**$ 105,813**

Table 14b
Biological Treatment Cell in Pregnant Solution Pond

Item	Unit	Amount	$/Unit	Total
Engineering/Design	lot			$ 20,000
QA/QC	lot			$ 12,500
Excavate/Construct Cell	m^3		$ 7.50	$ -
Install Liner System	m^2		$ 12.00	$ -
Piping	lot			$ 25,000
Haul/Place Rock Substrate	m^3	10,000	$ 8.00	$ 80,000
Silt/Organics Cap	m^3	5,000	$ 3.50	$ 17,500
Nutrient Addition System	lot			$ 15,000
Manpower	hrs	720	$ 25.00	$ 18,000
Subtotal				$ 188,000
Contingency	25%			$ 47,000
Total				**$ 235,000**

Note: This table corresponds to Table 7-15 in "Volume IV".

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX F

CLOSURE PERFORMANCE STANDARDS AND OBJECTIVES

1.0 CLOSURE PERFORMANCE STANDARDS AND OBJECTIVES

1.1 *General*

For each mine component, engineering design plans or criteria for the particular component are referenced from the DRP. Specific performance standards and or objectives are then outlined. The performance standards and objectives are presented in three categories: water/chemical stability; physical stability; and revegetation. Monitoring and potential follow-up programs are also outlined where required.

For this DRP, the following definitions have been used.

Criteria – generic numerical limits or narrative statements intended as general guidance for engineering designs or the protection, maintenance and improvement of specified uses of soil and water.

Objectives – numerical limits or narrative statements established to protect and maintain specified uses of soil and water at a particular site by taking into account site-specific conditions.

Standard – numerical limits or narrative statements adopted from criteria or objectives in a legally enforceable form, such as in a regulation, statute, contract or other legally binding document.

> *Note: Definitions found in Environment Canada – Review and Recommendations for Canadian Interim Environmental Quality Criteria for Contaminated Sites, 1991.*

The following sections discuss closure performance standards and objectives for each mine component.

1.2 *Open Pits*

1.2.1 Pit Design Parameters

As built drawings for the reclaimed open pits shall be provided. These drawings are contained in Appendix A, Figures 1 to 8.

1.2.2 Performance Standards or Objectives

1.2.2.1 Water/Chemical Stability

1. The Licensee shall ensure that all effluent, which is discharged from the project directly to Laura, Lucky, and Pacific Creeks, both during operation and at final decommissioning, shall meet the following effluent quality standards:

PARAMETER	CONCENTRATION MG/L
PH	6.0 – 9.5 pH Units
WAD CN	0.25
Total CN	2.0
Ammonia as N	5.0
Copper	0.5
Arsenic	0.5
Antimony	1.0
Mercury	0.005
Zinc	0.5
Selenium	0.05
Lead	0.2
Aluminum	1.0
Bismuth	0.5
Cadmium	0.1
Chromium	0.5
Iron	1.0
Manganese	2.0
Molybdenum	0.5
Nickel	0.5
Silver	0.1

2. Any effluent, which is discharged from the project, must meet the non-toxicity requirement defined by a 96 hour LC_{50} bioassay of 100%, using rainbow trout.

3. The Licensee shall decommission the operation in such a manner that the long-term water quality of the South Klondike River shall meet the objective of the Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life. Prepared by the Canadian Council of Minister of the Environment, 1999, updated June 2001.

1.2.2.2 Physical Stability

Open pit physical stability shall be measured by the following terrain stability and erosion control performance.

A. Terrain Stability

The objective of open pit terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose (pit walls) must demonstrated to be stable
4. Access to pit walls is restricted where they pose a threat to safety

B. Erosion Control

The objective of open pit erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes

4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Pit ponds are in place where water could collect
7. Pit pond decants are in place

Revegetation

Where appropriate, revegetation of open pits shall be measured by the following revegetation performance.

The objective of open pit revegetation is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

1.2.2.3 Monitoring

Open pits will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted. Maintenance of open pit reclamation measures will be undertaken based on an assessment of monitoring performance.

1.3 *WRSAs*

1.3.1 WRSA Designs

1.3.1.1 The general design criteria for the WRSA slopes shall be 2.5H:1V. As–built drawings for the WRSAs shall be provided. These drawings are contained in the DRP, Appendix A, Figures 1 to 8. Exceptions to the general design slope criteria on the property are presented in the DRP, Volume IV, Attachment 1, Figures 1 to 10.

1.3.1.2 Blue WRSA

The Blue WRSA cover design shall be constructed in accordance with the criteria presented in BGC's Report, Appendix C. Design infiltration rate criteria shall be 19%. The Blue WRSA lysimeter design shall be constructed in accordance with the criteria presented in BGC's Report, Appendix D. As-built drawings and construction records report will be provided.

1.3.2 Performance Standards or Objectives

1.3.2.1 Water/Chemical Stability

1. The Licensee shall ensure that all effluent, which is discharged from the project directly to Laura, Lucky, and Pacific Creeks, both during operation and at final decommissioning, shall meet the following effluent quality standards:

PARAMETER	CONCENTRATION MG/L
pH	6.0 – 9.5 pH Units
WAD CN	0.25
Total CN	2.0
Ammonia as N	5.0
Copper	0.5
Arsenic	0.5
Antimony	1.0
Mercury	0.005
Zinc	0.5
Selenium	0.05
Lead	0.2
Aluminum	1.0
Bismuth	0.5

PARAMETER	CONCENTRATION MG/L
Cadmium	0.1
Chromium	0.5
Iron	1.0
Manganese	2.0
Molybdenum	0.5
Nickel	0.5
Silver	0.1

2. Any effluent, which is discharged from the project, must meet the non-toxicity requirement defined by a 96 hour LC_{50} bioassay of 100%, using rainbow trout.

3. The Licensee shall decommission the operation in such a manner that the long-term water quality of the South Klondike River shall meet the objective of the Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life. Prepared by the Canadian Council of Minister of the Environment, 1999, updated June 2001.

4. The Licensee shall decommission the operation in such a manner that the long-term groundwater quality down gradient of the WRSAs shall meet the objective of the Yukon Environment Act, *Contaminated Sites Regulations*, Aquatic Life criteria.

1.3.2.2 Physical Stability

WRSA physical stability shall be measured by the following terrain stability and erosion control performance.

A. Terrain Stability

The objective of WRSAs terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose must be demonstrated to be stable

B. Erosion Control

The objective of WRSA erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes
4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Water management ponds and ditches are in place where water could collect and be decanted

1.3.2.3 Revegetation

Where appropriate, revegetation of WRSAs shall be measured by the following revegetation performance.

The objective of WRSA revegetation is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals

6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

The revegetation seed and fertilizer mix criteria for the WRSAs shall be as outlined in DRP, Volume IV, Attachment 11. Seed application rate = 25 kg/ha and 300 kg/ha of fertilizer. The seed mix used shall be consistent with:

- 36% Violet Wheat grass
- 14% Sheep Fescue
- 14% Northern Fescue
- 11% Fowl Bluegrass
- 11% Glaucous Bluegrass
- 7% Tickle Grass
- 7% Legumes

1.3.2.4 Monitoring

WRSA will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted. Maintenance of WRSA reclamation measures would be undertaken based on an assessment of monitoring performance.

Additional geochemical studies and lysimeter monitoring for the Blue WRSA shall be undertaken as outlined in Appendix B and D, respectively. Results from these monitoring programs shall be compiled and reported. Exceedances of water/chemical and physical stability performance standards for the Blue WRSA shall trigger the development and submission of an Adaptive Management Plan for the Blue WRSA.

1.4 *Stream Crossings & Diversions*

1.4.1 Design Criteria

Stream crossing and diversions shall be constructed in accordance with the design criteria as presented in the DRP, Volume IV, Attachment 1, Clearwater Consultants Ltd. Design Memorandum CCL-BCM4. Specific criteria shall include;

- 200-year peak instantaneous design event (44 mm in 30 minutes);
- Maintaining light vehicle and small equipment access through the crossing;
- Rock armor and rip/rap to stabilize crossing and prevent erosion;
- A minimum of 5 meters of width at the bottom of the crossing; and
- 2H:1V side slope contours on the inside of the stream crossing.

1.4.2 Performance Standards or Objectives

1.4.2.1 Water/Chemical Stability

1. The Licensee shall ensure that all effluent, which is discharged from the project directly to Laura, Lucky, and Pacific Creeks, both during operation and at final decommissioning, shall meet the following effluent quality standards:

PARAMETER	CONCENTRATION MG/L
pH	6.0 – 9.5 pH Units
WAD CN	0.25
Total CN	2.0
Ammonia as N	5.0
Copper	0.5
Arsenic	0.5
Antimony	1.0
Mercury	0.005
Zinc	0.5
Selenium	0.05
Lead	0.2
Aluminum	1.0
Bismuth	0.5
Cadmium	0.1
Chromium	0.5
Iron	1.0
Manganese	2.0
Molybdenum	0.5
Nickel	0.5
Silver	0.1

2. Any effluent, which is discharged from the project, must meet the non-toxicity requirement defined by a 96 hour LC_{50} bioassay of 100%, using rainbow trout.

3. The Licensee shall decommission the operation in such a manner that the long-term water quality of the South Klondike River shall meet the objective of the Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life. Prepared by the Canadian Council of Minister of the Environment, 1999, updated June 2001.

1.4.2.2 Physical Stability

Stream crossings and diversions physical stability shall be measured by the following terrain stability and erosion control performance.

A. Terrain Stability

The objective of stream crossings and diversions terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose must demonstrated to be stable

B. Erosion Control

The objective of stream crossings and diversions erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes

4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Water management structures and decants are in place where water could decant

1.4.2.3 Revegetation

Where appropriate, revegetation near stream crossings shall be measured by the following revegetation performance.

The objective of revegetation near stream crossings is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

Stream crossing and diversions revegetation seed and fertilizer mix criteria shall be as outlined in DRP, Volume IV, Attachment 11. Seed application rate = 25 kg/ha and 300 kg/ha of fertilizer. The seed mix used for revegetated slopes shall be consistent with:

- 36% Violet Wheat grass
- 14% Sheep Fescue
- 14% Northern Fescue

- 11% Fowl Bluegrass
- 11% Glaucous Bluegrass
- 7% Tickle Grass
- 7% Legumes

1.4.2.4 Monitoring

Stream crossing and diversions will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted. Maintenance of stream crossing and diversions reclamation measures will be undertaken based on an assessment of monitoring performance.

1.5 *Heap Leach Pad*

1.5.1 Designs

The leach pad cover shall be constructed in accordance with the engineering designs as prepared by BGC in the DRP, Volume IV, Attachment 13. The design infiltration rate criteria shall be 24% based on average conditions. The heap containment dyke breach and Cell 7 GCL liner resloping shall be constructed in accordance with engineering criteria as prepared by Sitka Engineering in the DRP, Volume IV, Attachment 5. The engineering design criteria shall be a factor of safety of 1.3. Final as-built drawings will be provided.

1.5.2 Performance Standards or Objectives

Water/Chemical Stability

1. The Licensee shall ensure that all effluent, which is discharged from the project directly to Laura both during operation and at final decommissioning, shall meet the following effluent quality standards:

PARAMETER	CONCENTRATION MG/L
PH	6.0 – 9.5 pH Units
WAD CN	0.25
Total CN	2.0
Ammonia as N	5.0

PARAMETER	CONCENTRATION MG/L
Copper	0.5
Arsenic	0.5
Antimony	1.0
Mercury	0.005
Zinc	0.5
Selenium	0.25
Lead	0.2
Aluminum	1.0
Bismuth	0.5
Cadmium	0.1
Chromium	0.5
Iron	1.0
Manganese	2.0
Molybdenum	0.5
Nickel	0.5
Silver	0.1

2. Any effluent, which is discharged from the project directly to Laura Creek, must meet the non-toxicity requirement defined by a 96 hour LC_{50} bioassay of 100%, using rainbow trout.

3. All effluent that is discharged from the project to the land application area, both during operation and at final decommissioning, shall meet the following effluent quality standards:

   a) Effluent discharged from the water treatment plant, at monitoring station BC-28:
   b) Groundwater, at monitoring stations BC-65 and BC-66 and any lysimeter at a depth of 5.0 metres or greater, that has passed through the land application area, both during operation and at final decommissioning:

PARAMETER	CRITERIA 1 (END OF PIPE – BC-28)	CRITERIA 2 (5 METER LYSIMETERS, BC-68,69)
WAD CN	0.25	0.125
Total CN	2.0	1.00
Ammonia as N	15.0	7.5
Copper	0.5	0.1
Arsenic	0.5	0.25
Antimony	1.0	0.5

PARAMETER	CRITERIA 1 (END OF PIPE – BC-28)	CRITERIA 2 (5 METER LYSIMETERS, BC-68,69)
Mercury	0.005	0.0025
Zinc	0.5	0.25
Selenium	0.75	0.30
Lead	0.2	0.1
Aluminum	1.0	3.0
Bismuth	0.5	0.25
Cadmium	0.1	0.05
Chromium	0.5	0.25
Iron	1.0	5.0
Manganese	2.0	6.0
Molybdenum	0.5	0.25
Nickel	0.8	0.25
Silver	0.1	0.05

4. Upon detoxification of the heap leach pad the Licensee shall:

   a) Undertake a leach pad drilling and core program to obtain representative samples of the heap solids at various depth intervals. At a minimum, 30 depth integrated samples shall be collected and composited and analyzed for free CN.
   b) Detoxify the leach pad solids to ensure that free CN concentrations in heap solids do not exceed 2.0 mg/kg.
   c) Detoxify the leach pad to ensure that total metals concentrations within the heap are geochemically stable as determined by effluents concentrations discharging from the leach pad.

5. Should the leach pad effluent discharge and leach pad solids not meet the above performance standards, then the licensee shall implement the heap detoxification Adaptive Management Plan as contained in Appendix G.

6. Prior to implementing the heap detoxification Adaptive Management Plan; the licensee shall submit detailed engineering designs and plans for construction, operation and monitoring to the YWB for the selected treatment contingency measures.

7. The Licensee shall decommission the operation in such a manner that the long term water quality of the South Klondike River shall meet the objective of the Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life and in particular the in-stream selenium criterion of 3.8 ug/L at lower Laura Creek as measured at monitoring station BC-39. Prepared by the Canadian Council of Minister of the Environment, 1999, updated June 2001.

8. If the in-stream selenium criterion of 3.8 ug/L is exceeded in lower Laura Creek, as measured at monitoring station BC-39, then the licensee shall implement the Selenium Adaptive Management Plan for Laura Creek. (Note: Based on the QZ03-060 water licence amendment application hearing, it is assumed that the Selenium Adaptive Management Plan for Laura Creek will be submitted before May 2004).

1.5.2.1 Physical Stability

Leach pad physical stability shall be measured by the following terrain stability and erosion control performance.

A. Terrain Stability

The objective of leach pad terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose must demonstrated to be stable

B. Erosion Control

The objective of leach pad erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes
4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Water management ditches, ponds and decants are in place where water could collect and be decanted

1.5.2.2 Revegetation

Where appropriate, revegetation of the leach pad shall be measured by the following revegetation performance.

The objective of the leach pad cover revegetation is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

The leach pad revegetation seed and fertilizer mix criteria shall be as outlined in DRP, Volume IV, Attachment 11. Seed application rate = 75 kg/ha and 300 kg/ha of fertilizer. The seed mix for the leach pad shall be consistent with:

- 50% Violet Wheat grass
- 20% Kentucky Bluegrass
- 20% Red Fescue
- 10% Alfalfa

1.5.2.3 Monitoring

The leach pad will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted.

The licensee shall implement the leach pad Adaptive Management Plan as contained in Appendix G if monitoring and assessment indicates that leach pad detoxification is not meeting the chemical and physical performance standards.

Lower Laura Creek at monitoring station BC-39 will be monitored specifically as part of the selenium monitoring program. The licensee shall implement the Lower Laura Creek Selenium Adaptive Management Plan if the site-specific Se criterion of 3.8 ug/l is exceeded in lower Laura Creek at station BC-39. (Note: Based on the QZ03-060 water licence amendment application hearing, it is assumed that the lower Laura Creek will be the location for meeting the site specific Se criterion).

1.6 *Infrastructure and Buildings*

1.6.1 Designs

Infrastructure and buildings shall be removed in accordance with the following physical stability standards or objectives.

1.6.2 Performance Standards or Objectives

1.6.2.1 Water/Chemical Stability

Not applicable.

1.6.2.2 Physical Stability

Infrastructure and buildings area physical stability shall be measured by the following general standards and terrain stability and erosion control performance. The objective is the removal of all structures and re-establishment of vegetation mat. All hazardous material will be removed.

A. General Standards:

1. Structures removed
2. Waste from dismantling is removed from the site and reused or stored in an authorized waste disposal site
3. All buried support infrastructures (tanks, pipes, underground services, etc.) should be removed or decommissioned in a safe, acceptable manner. All buried infrastructure remaining will be identified on site closure maps.
4. All non-toxic waste may be disposed of in an approved waste disposal site. The location and contents of disposal sites will be identified and recorded
5. All hazardous materials are removed from the site.
6. In all areas where fuel and chemicals were stored and handled at the site, the soil has been tested for contaminants, and treated if required
7. Mining equipment, ore processing equipment, and heavy machinery has been removed from the site
8. After being emptied, decommissioned septic tanks are either removed or completely filled with gravel, sand, earth or inert material
9. Foundations covered with self sustaining vegetation
10. Contaminated soils dealt with in accordance with *Contaminated Sites Regulations*
11. The rehabilitation of all petroleum products sites used for storage of fuels and lubrication shall comply with Handling of Fuel Products
12. No hazardous materials remaining on site

B. Terrain Stability

The objective of infrastructure and building terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose must demonstrated to be stable

C. Erosion Control

The objective of infrastructure and building erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes
4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Water management ponds and ditches are in place where water could collect and be decanted

1.6.2.3 Revegetation

Where appropriate, revegetation of infrastructure and building areas shall be measured by the following revegetation performance.

The objective of infrastructure and building area revegetation is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.
3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

Infrastructure and building areas revegetation seed and fertilizer mix criteria shall be as outlined in DRP, Volume IV, Attachment 11. Seed application rate = 25 kg/ha and 300 kg/ha of fertilizer. The seed mix used for revegetated slopes shall be consistent with:

- 36% Violet Wheat grass
- 14% Sheep Fescue
- 14% Northern Fescue
- 11% Fowl Bluegrass
- 11% Glaucous Bluegrass
- 7% Tickle Grass
- 7% Legumes

1.6.2.4 Monitoring

The infrastructure and building areas will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted. Maintenance of infrastructure and building areas reclamation measures would be undertaken based on an assessment of monitoring performance.

1.7 *Haul Roads and Trails*

1.7.1 Design Criteria

Haul roads and trails will be reclaimed as per the design parameters outlined in the DRP, Volume I, Section 4.3.5.3. These include:

- Re-establish stream crossings;
- Recountour road embankments, with side slopes at embankment top 2H:1V;
- Removal of roadside safety berms; and
- Scarifying roadway to promote natural revegetation.

1.7.2 Performance Standards or Objectives

1.7.2.1 Water/Chemical Stability

See Stream Crossings

1.7.2.2 Physical Stability

Haul roads and trails physical stability shall be measured by the following terrain stability and erosion control performance.

A. Terrain Stability

The objective of haul roads and trails terrain stability is the protection of health and safety through prevention of terrain hazards.

General Standards:

1. Slope stability is demonstrated through the absence of landform features such as slides, cave-ins, slumping, gullies, potholes, overhangs etc.
2. Reclaimed slopes angles are less than angle of repose
3. Any slopes exceeding angle of repose must demonstrated to be stable

B. Erosion Control

The objective of haul roads and trails erosion control is to support terrain stability and to protect wildlife habitat through the stabilization of growth media and through the absence of sediment load into the watershed.

General Standards:

1. Slopes are stabilized by contouring and leveling to provide land forms which conform to the surrounding terrain and provide suitable seedbeds
2. Lack of erosion features on re-sloped surfaces such as gullies and rills
3. Run-off is diverted away from steep slopes
4. Vegetative mat is sufficient to control erosion
5. Adequate growth media (fines) is present to sustain re-vegetation
6. Water management ponds and ditches are in place where water could collect and be decanted

1.7.2.3 Revegetation

Where appropriate, revegetation of haul roads and trails shall be measured by the following revegetation performance.

The objective of haul roads and trails revegetation is to protect wildlife habitat through the re-establishment of a vegetation mat (food source) and self-sustaining native vegetation.

General Standards:

1. Vegetation is self sustaining and comprises native seed mixes
2. The vegetative cover is capable of self-regeneration without continued dependence on fertilizer or re-seeding.

3. The establishment of a vegetative cover with sufficient density and species diversity to stabilize the surface against the effects of long term erosion
4. The successive vegetation must be similar to naturally occurring habitats in the surrounding area
5. Plant material does not show deleterious uptake of metals
6. Points of Compliance
    - fertilizing/seeding completed
    - vegetation established
    - vegetation accepted

Hauls roads and trails revegetation seed and fertilizer mix criteria shall be as outlined in DRP, Volume IV, Attachment 11. Seed application rate = 25 kg/ha and 300 kg/ha of fertilizer. The seed mix used for revegetated haul roads and trails shall be consistent with:

- 36% Violet Wheat grass
- 14% Sheep Fescue
- 14% Northern Fescue
- 11% Fowl Bluegrass
- 11% Glaucous Bluegrass
- 7% Tickle Grass
- 7% Legumes

1.7.2.4 Monitoring

The haul roads and trails will be monitored in accordance with the monitoring schedule presented in Table 7-1. Routine physical and revegetation inspections and a geotechnical assessment will be conducted. Maintenance of haul roads and trails reclamation measures would be undertaken based on an assessment of monitoring performance.

1.8 *Main Access Road*

1.8.1 Designs

Long-term reclamation access shall be decided through a commitment to community consultative process. This commitment in outlined in the DRP, Volume I, Section 4.3.5.2.

1.8.2 Performance Standards or Objectives

1.8.2.1 Water/Chemical Stability

To be determined through a community consultative process.

1.8.2.2 Physical Stability

To be determined through a community consultative process.

1.8.2.3 Revegetation

To be determined through a community consultative process.

1.8.2.4 Monitoring

To be determined through a community consultative process.

1.8.2.5 Main Access Road Consultative Process

The licensee will facilitate a community consultation process including Tr'ondek Hwech'in, the registered trap line concession holder and the Community of Dawson City to decide on the long-term decommissioning of the main access road from the Klondike Ditch to the mine site. Site access will remain for long-term monitoring and the licensee will implement the decision arising from the consultation process.

1.9 *General Mine Components*

1.9.1 Final Plans

Once reclamation has been completed, the Licensee shall submit to the Yukon Water Board and the Minister of Energy Mines and Resources, plans showing the extent of all reclamation measures. These plans shall include: all open pits, WRSA, leach pad, and buried piping or structures.

1.9.2 Reporting

As part of the Yukon Water Board Annual Report, results from all reclamation activity, studies and inspections shall be assessed and reported to the YWB. This report will also be submitted to YG Energy Mines and Resources.

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX G

HEAP DETOXIFICATION ADAPTIVE MANAGEMENT PLAN

1.0 HEAP DETOXIFICATION ADAPTIVE MANAGEMENT PLAN

A number of contingency measures are provided in the closure plan (see Section 5.4.3) in the event the overall heap effluent chemistry does not remain stable in the long-term. A performance based response or Adaptive Management Plan (AMP) has been prepared that outlines the contingency measures and responses that will be implemented if the effluent water quality or receiving waters is not achieving the performance standards and objectives. The overall performance plan is summarized in Table 1.

1.1 *Basis of Response Plan*

The adaptive management plan is predicated around the water quality of the heap effluent as well as the water quality in the receiving waters. The specific contingencies and response measures are triggered around significant changes or excursions in either the heap effluent or receiving waters. Table 1 summarizes the various responses associated with the AMP. Earlier submittals of responses to heap upset conditions were based on a timeline from the point of detoxification. This AMP is based on water quality standards and objectives and can be implemented at any time in the future, regardless of the time that has passed after heap detoxification.

The performance based contingency response measures provided in the AMP include the following:

1. Heap Cell Monitoring Program
2. Heap Cell Solution Segregation
3. Lined Process Pond Storage
4. Effluent Treatment and Land Application
5. Biological Treatment Cell
6. Pumpback Solution to the Heap
7. Intensive Evaporation

A discussion of each of these contingency and response measures is provided in the following sections.

1.2 *Heap Cell Monitoring Program*

A heap cell monitoring program is proposed as a response measure to identify the area of the heap that is exceeding the performance criteria. For example, if direct water discharge standards are not being met in the heap effluent, a single parameter (i.e. As, Se) from a single cell within the heap may be the only barrier from the overall effluent meeting the criteria. This information will be important in determining the appropriate response measures and contingencies to be taken. The heap is segregated into 7 cells, each with its own solution collection system. Once solution distribution to the heap has ended and the heap is in a drained down condition, the cells become discrete measuring points for segregated areas within the heap. The heap cell monitoring program will consist of the following measures:

- Increased sampling frequency of all 7 cells and analysis of the parameters that exceed the performance criteria.
- Both total and dissolved metals will be analyzed for the parameters not meeting the criteria.
- If a certain cell is meeting the performance criteria, that cell would no longer be sampled during the bi-weekly program. Likewise, if only one parameter was exceeding the criteria in a certain cell, only that parameter would be analyzed rather than the entire suite of parameters.

This information will be used to determine the specific area of the heap and parameters that are creating the condition of not meeting the performance criteria. This information will enable segregation of a particular cell without having to treat the entire heap effluent through a contingency treatment measure.

1.3 *Heap Cell Solution Segregation*

The current heap piping network allows segregation of each of the 7 cells and the drainage from one cell can be redirected and isolated from the drainage of the remaining cells. This current flexibility in the system is significant since the entire volume of heap drainage does not have to be handled and treated if only a portion of the heap is creating the out of compliance condition. This contingency measure greatly reduces the amount of solution that could potentially require management and provides additional contingency through reduced solution volumes requiring secondary treatment.

1.4 *Lined Process Pond Storage*

The lined process ponds are valuable resources that will remain intact until the long-term heap detoxification performance standard is achieved.

The pregnant pond (30,000 m^3) will serve as the buffer and receiving pond for heap effluent. Any suspended solids in the heap effluent will be settled in the pregnant pond. The pregnant pond will also serve as a buffering pond for the biological treatment cell (BTC). The BTC may be constructed in either the barren pond or one of the Stage 2 ponds within the effluent treatment plant. With direct surface water discharge quality emanating from the heap, the pregnant pond solution can be directly released. The pregnant pond configuration allows for the ability to pump solution directly to the effluent treatment plant, land application area or to the BTC. The overflow pond (90,000 m^3) will remain as additional long-term storage and contingency capacity. By using the pregnant pond as a buffer pond, high flows from the heap can be retained and discharged on a more uniform and consistent basis and discharge rates can be linked with receiving water flows. The three ponds also provide significant storage capacity in a worse case scenario where no solution can be released for a time period. Using the long-term infiltration design parameter of 30%, approximately 30,000 m^3 of solution will report through the heap on an average annual basis. Assuming the conservative case that the barren pond is used for construction of the BTC and the remaining ponds are 20% full (24,000 m^3), approximately 96,000 m^3 of storage capacity is available if a worse case condition arises where no solution can be released for some unforeseen reason.

1.5 *Effluent Treatment and Land Application*

The effluent treatment and land application system is a contingency measure that can be implemented if either the land application criteria or the direct surface water standard is not being met in the heap effluent. If Criteria 1 is not being met, the effluent treatment portion of the system can be used to meet Criteria 1, followed by land application. If Criteria 1 is met but direct surface water discharge is not, the land application portion of the system can continue to be used. The land application system has a finite volume of 400,000 m^3 that can be land applied. Approximately 120,000 m^3 of compliant solution has been land applied during the 2002-2003 seasons. The land application system will remain in place until long-term heap stability has been demonstrated.

1.6 *Biological Treatment Cell*

The BTC has been offered as a contingency treatment system that can be implemented if effluent solution is not meeting direct release criteria. Preliminary designs of the BTC have been provided in the DRP, Volume IV Attachment 9. If the BTC is constructed and operated, direct surface water quality solution will be made and released into the Laura Creek drainage. This effectively adds to the life of the land application system by not using any of the remaining 400,000 m^3 of volume. This adds further contingency to the closure plan by not using all of the available land application capacity. A final design (including location) will be submitted to YWB prior to construction of the BTC.

1.7 *Pumpback Heap Effluent to Heap*

A contingency measure previously proposed is the ability to pumpback effluent from the ponds to the heap. The heap effluent can be pumped back to the heap for retention of the solution in dry spent ore. Since the heap has already been drained down, a significant quantity of water can be stored in the heap temporarily. Based on the total amount of spent ore on the heap at 9,500,000 tonnes and a draindown moisture percent of 2.1%, approximately 200,000 m^3 of solution can be temporarily pumped back and stored in the heap as residual moisture. This large volume would obviously not be allowed or capable of building up prior to pumpback, but it demonstrates the ability to retain significant volumes of heap effluent that has not met any release criteria. It is recognized that this contingency measure does not release solution or necessarily improve its water quality but rather it provides temporary "storage" capacity and volume in much the same fashion as additional process pond capacity.

1.8 *Intensive Evaporation*

The use of intensive evaporation was previously proposed and continues to be provided as a contingency measure. Although it is recognized that evaporation does not improve water quality conditions from the heap, it does eliminate water that might require secondary treatment and release. The process facility has the capability of evaporating 100% of the expected annual heap drainage volume (based on 30% infiltration) after the heap has been revegetated. The intensive evaporation units consist of spray nozzles fed by electric motors that atomize the solution and promote high evaporation rates. The 2 units together operate at 40 m^3/hr and have a demonstrated

evaporation rate of 30%. These units were relocated to the top of the heap in 2001. On a monthly basis, the units can evaporate nominally 8,600 m^3. Over a 5-month season (May - August), approximately 43,000 m^3 of solution can be evaporated from these 2 units. Using the design parameter of 30% infiltration through the heap, in an average year (329 mm), approximately 30,000 m^3 of solution will infiltrate through the heap. In the case of a 100-year snowmelt, approximately 63,000 m^3 of solution would report from the heap. The intensive evaporation units are a proven contingency measure for eliminating the heap effluent volume in the event the solution cannot be released either through land application or direct surface water. As part of this contingency measure, the evaporative units will remain installed for immediate operation.

Table 1

Brewery Creek Mine
Heap Detoxification Adaptive Management Plan Summary

Performance Standard	Point of Sampling	Meet Objective?	Actions Taken in Order of Priority
Criteria 1 Land Application	BC-28 (Heap Effluent)	No	Heap Cell Monitoring Program Begin Operation Effluent Treatment Plant
		Yes	No Action - Continue Monitoring as per Closure Schedule
Criteria 2 Land Application	Lysimeters, Piezometers (BC-68,69)	No	See Conditions QZ01-050
		Yes	No Action - Continue Monitoring as per Closure Schedule
Direct Discharge	BC-28 (Heap Effluent)	No	Cease discharge Verify Sampling results Heap Cell Monitoring Program Heap Cell Solution Segregation Lined Process Pond Solution Segregation/Storage Land Application Effluent Treatment Land Application Effluent Treatment Direct Discharge Submit detailed for construction design BTC Construct/operate BTC Pump back solution to heap Intensive evaporation Investigate/test/permit infiltration gallery
		Yes	No Action - Continue Monitoring as per Closure Schedule
Receiving Water Objectives			
Site specific selenium criteria 3.8 ug/l	Laura Creek at BC-39	No	Verify sampling results Increase sampling frequency Implement Laura Creek Selenium AMP Collect fish tissue samples Lower Laura/South Klondike Review and implement heap contingency plans
		Yes	No Action - Continue Monitoring as per Closure Schedule
Site specific selenium criteria 3.8 ug/l including all CCME parameters	BC-6 South Klondike River	No	Verify sampling results Increase sampling frequency Collect fish tissue samples Lower Laura/South Klondike Implement Laura Creek AMP
		Yes	No Action - Continue Monitoring as per Closure Schedule

VICEROY MINERALS CORPORATION
BREWERY CREEK MINE DECOMMISSIONING AND RECLAMATION PLAN

EXECUTIVE SUMMARY

APPENDIX H

FINAL MINE AREA RECLAMATION PLANS – AS-BUILTS OCTOBER 2003

RECLAMATION PHOTOGRAPHS



North Golden 2002



North Golden 2003

Kokanee (August 2003) Recontoured and Growth Media placed 2002, Seeded October 2002



Heap Cover Construction (August 2003)



Blue Pit WRSA (September 2003) 0.5 m GM cover completed

