Deloitte & Touche

Anvil Range Mining Corporation –

Interim Receivership

Project Description Supplement

September 16, 2002

Project Description Supplement

Submitted by Deloitte & Touche Inc.
in its capacity as Interim Receiver of

Anvil Range Mining Corporation

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Produced with the assistance of:

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1. PURPOSE

Purpose is to respond to request for additional information on the proposed next licence term

In early June 2002, the Interim Receiver of Anvil Range Mining Corporation ("Anvil Range") submitted to DIAND Environment Directorate a document (hereafter referred to as "Project Description") to initiate a CEAA process relating to the renewal of the water licence for the Anvil Range property. The present document is a supplement ("Supplement") to the Project Description, submitted in response to requests for additional information from some members of the Regional Environmental Review Committee to the Project Assessment Manager at DIAND Environment Directorate.

The plan for 2004-2008 is to continue care and maintenance and prepare a Final Closure and Reclamation Plan

The Project Description describes the objective of the Interim Receiver to apply for a single water licence for the site for the period from January 1, 2004 to December 31, 2008 (5 years).

Activities to be carried out during the 2004-2008 timeframe will include:

- as a first priority, to continue to care, maintain and protect the property and the environment
- to consult with stakeholders
- to manage any emergency reclamation work on site
- to continue selected reclamation of mine elements which are not integrated or linked to the rest of the property from the perspective of closure planning
- to carry out required scientific and engineering studies to support the preparation of a Final Closure and Reclamation Plan ("FCRP").

Some questions have been raised regarding the Project Description

The questions that have been raised regarding the Project Description are made in the context of a long history at the site with a lack of closure planning and related activities. Specifically, it is the understanding of the Interim Receiver that additional information is being requested regarding:

- accountability for the development of the closure plan, specifically with regards to continuity and momentum of closure planning efforts
- a clarification of the extent to which existing information and closure studies will be used and a more detailed technical justification regarding the need to revisit closure plans and assumptions.
- Timelines and interlinkages of closure studies.

This document provides additional information on the management structure, a technical analysis of ICAP and timelines for closure planning

This Supplement to the Project Description provides additional information along the themes of the questions described above. Specifically, the Supplement focuses on:

- the management context and a clarification of the role of the proponent
- a technical analysis of the 1996 Integrated Comprehensive Abandonment Plan (the "1996 ICAP") and previous closure documents
- an overview of process flow for closure planning and the interconnections between the studies.

In summary, the questions raised focus on providing an elaboration of the rationale for proposing a five-year term for the next licence period. Additional information regarding the physical activities of care and maintenance and selected stand-alone reclamation work will be provided in the Environmental Assessment Report.

2. ADDITIONAL INFORMATION IN SUPPORT OF THE PROJECT DESCRIPTION

2.1 MANAGEMENT CONTEXT

The Interim Receiver is responsible for preserving and protecting and for applying for licences.

Deloitte & Touche Inc. was appointed Interim Receiver (" Interim Receiver") of Anvil Range pursuant to an order of the Ontario Court (General Division) ("the Court") on April 21, 1998 ("Interim Receivership Order"). This appointment and the Interim Receivership Order itself were recognized and confirmed by the Supreme Court of the Yukon. The Interim Receiver has overseen the management of the property under the terms of the existing water licences since that time.

The rights and responsibilities of the Interim Receiver are set out in the Interim Receivership Order. These include:

- "to receive, preserve, protect and realize upon the Assets"; and
- the authority to "apply for any permits, licences, approvals or permissions on behalf of [Anvil Range] as may be required by any government or regulatory authority"

All accounts are submitted to the Court for its review and approval.

DIAND funds the activities of the Interim Receiver

DIAND is currently advancing required funding on a secured basis to ensure ongoing care and maintenance activities continue at the mine site. As the mine has no economic value and there are no other present sources of funding which will pay for the ongoing protection of the environment, DIAND is at present the exclusive funder of the Interim Receivership.

It is important to note that the ability of the Interim Receiver to carry out the studies and activities proposed in the Project Description are dependent on the availability of funding for this project.

The Interim Receiver is the proponent and is responsible for submitting a Final Closure and Reclamation Plan

In the CEAA process relating to the renewal of the water licence, the Interim Receiver is the proponent of the project, as defined in Section 2 under CEAA.

Through the authority granted by the Interim Receivership Order, the Interim Receiver will be applying for a new water licence for the mine site. Anvil Range (as represented by the Interim Receiver), will be legally bound by the terms of the new licence, as it is currently bound by the terms of the existing licences. The Interim Receiver intends to submit a Final Closure and Reclamation Plan during the next licence term. It is expected that a binding licence requirement will be made under the terms of the renewed water licence.

The proposed project provides continuity of process in a transitional period

The objective of the Project Description and its associated management context is to maximize continuity, momentum and stability for this project, including closure planning, during a period of transition, uncertainty and turnover regarding legal proceedings described below regarding the Plan of Arrangement and regarding the implementation of the agreement regarding devolution between the Government of the Yukon (“YTG”) and the federal government (“DTA”).

With regard to the issue of continuity, the Interim Receiver will ensure that its consulting team has continuity with the engineering and environmental teams that have worked on the site in previous years and maximizes the use of local expertise. In addition, the mine manager has been under contract with the Interim Receiver since 1998. The Interim Receiver has also made efforts to minimize turnover of operational staff. Finally, within Deloitte & Touche Inc., the engagement partner, senior management and environmental staff on the project have been consistent since 1998.

Due to protracted legal proceedings relating to the approval of a Plan of Arrangement which provides for a comprehensive settlement between DIAND, the YTG and secured creditors of the estate, the Interim Receiver currently remains in place to oversee the estate administration. If the Interim Receiver is discharged by the Court before a FCRP is approved, the Anvil Range property will become an Abandoned Site under the DTA. The complex nature of the environmental issues at the site and the current wide range of closure costs, estimated at between $200 to $400 million, drives the need for a rational, step-by-step closure planning process, such as laid out in the Project Description and the present Supplement. As such, the closure planning process laid out in the Project Description is a pragmatic, rational process that needs to be and will be executed regardless of the identity of the proponent.

Finally, it is also important to note that it has been shown that this mine is non-economic. The chances of the property reverting to regular mining operations under the management of a private mining company are nil.

Care and maintenance activities will be carried out in consultation with DIAND and other stakeholders

The care and maintenance activities of the Interim Receiver will be carried out according to the same model that has been followed since its appointment in 1998. Specifically, care and maintenance objectives are driven by the risk based management approach defined in the Project Description. With respect to the short-term risks which need addressing in a given year, the Interim Receiver consults with DIAND as well as with other regulators and advisory groups as required. In addition, whenever possible, the Interim Receiver addresses these matters in court reports before undertaking these activities and obtains Court approval. On occasion, where advanced Court approval has not been obtained, the Interim Receiver ensures that such activities are described in detail in its next court report and it obtains DIAND's approval prior to carrying out the proposed work. The funding for these activities is subject to court approval and is provided by the federal government (specifically through DIAND). The care and maintenance activities are carried out under the supervision of the regulatory agency relevant to each activity.

Under the terms of the current water licenses, the Interim Receiver meets annually with a Technical Advisory Committee ("TAC") to review and discuss the ongoing care and maintenance activities at the mine site. In addition, a semi-annual memo is provided to the TAC members to keep them apprised of such activities.

Consultation structure for closure planning is currently being developed

The second objective of the licence period is to submit and obtain regulatory approval for a Final Closure and Reclamation Plan. As such, an additional parallel consultation structure is being defined to meet these objectives.

At the last meeting of the TAC in July 2002, the Interim Receiver committed to submitting a proposal to existing TAC members regarding updating the structure of the TAC to reflect the current closure planning objectives and the cessation of operations at the mine site.

Senior officials of the federal government and YTG are discussing how the provisions of the DTA relating to the seven Type II sites (located in the Yukon) can best be implemented. The outcome of these discussions as well as consultations with First Nations identified in the DTA will help in identifying mechanisms for First Nations, stakeholders and public involvement in the development and implementation of a FCRP for the Faro mine.

2.2 TECHNICAL ANALYSIS OF THE 1996 ICAP

The following section outlines a technical analysis of previous closure plans, with particular emphasis on the plan most recently submitted, the 1996 ICAP . The purpose is not to provide any direction at the present time regarding closure, but rather to justify the need for re-evaluating closure measures proposed in previous closure plans, while building on the work that went into those previous plans.

Four previous closure plans have been developed.

There have been four closure plan documents for the Faro site:

- Faro Mine Tailings Abandonment Plan, prepared by Klohn Leonoff Consulting Engineers, 1981.
- Abandonment Submission: Summary report, prepared by Curragh Resources, 1988.
- Down Valley Tailings Abandonment Plan, prepared by SRK for Curragh Resources, 1991.
- Integrated Comprehensive Abandonment Plan, prepared by Robertson Geoconsultants Inc., 1996, for Anvil Range.

In addition, closure plans for the Vangorda and Grum sites were provided in the Initial Environmental Evaluation and Water Licence Application documents.

1996 ICAP contained valuable characterization information but knowledge gaps, scientific advances and changed assumptions drive the need to update closure measures.

Summaries of each of the Faro closure plans are provided in Appendix 1 to this report. While some consultation took place during the development of these plans, it is important to highlight that none of these plans have gone through a regulatory review and approval. In addition, these plans have never been through an environmental assessment.

2.2.1 GENERAL WEAKNESSES OF 1996 ICAP

The 1996 ICAP presented an update and/or summary of most of the scientific and technical information contained in the previous closure plans. It also proposed an evaluation of a limited number of closure measures. However, there are many reasons why the Interim Receiver believes that the 1996 ICAP is not a sufficient basis for implementing closure measures. These reasons were touched upon in the Project Description, which makes reference to considerable advances since 1996 in mine closure best practices and in site characterization information, to knowledge gaps and uncertainties in the assessment of the timing and magnitude of the closure problems, and to the fact that the 1996 ICAP was developed by a mining company based on the assumption that mining would continue for many years.

The following paragraphs provide additional information regarding these scientific advances, knowledge gaps, and changed assumptions and indicates that the feasibility and technical merit of some closure measures should be re-evaluated prior to implementation of any closure plan. In addition, the review points to interdependence of the different components of the site in respect to their associated closure measures, which drives the need for an integrated re-evaluation before monies are spent in implementing most of the closure measures.

As an introduction, the general weaknesses of the 1996 ICAP include:

Discussion of possible alternatives are incomplete

- The “closure plan” portions of the 1996 ICAP (Chapters 7-9) generally discuss only two or three alternatives for each major component of the site. A specific example is the Faro Main Zone Pit closure discussed in Section 7.1.1, for which only two alternatives are considered, namely an “isolated pit” alternative and a “flow-through pit” alternative. The latter alternative is rejected on the basis that a flow-through system would always be contaminated. However, that reasoning is not clearly proven. Furthermore, even if the reasoning is correct, there would be many possible “isolated pit” alternatives, not just the specific one proposed in the 1996 ICAP.

Assumptions that are no longer appropriate

- The 1996 ICAP considered a site that would be in operation until 2025, an assumption that seriously constrained the selection of closure measures. For example, on page 7-23, it is stated that “relocating all of the (existing) tailings to the Faro Pit would leave no storage for tailings from the proposed Grum underground and Grizzly developments”. Therefore, this option was eliminated from the 1996 ICAP for reasons of operational constraints.

Knowledge gaps exist

- The 1996 ICAP was based on the state of understanding of the mine site at the time. Although there are many very strong sections in the scientific parts of the report (Chapters 1 through 6), there are also gaps. For example, the understanding of the groundwater system below the tailings was repeatedly criticized by many stakeholders, including Environment Canada. This point is also an example of how "since 1996 the scientific understanding at this mine has advanced".

Internal inconsistencies have been identified

- There are key appendices and data missing from the 1996 ICAP (e.g. in the geochemistry sections) that made it impossible for specialist reviewers to verify some of the 1996 ICAP conclusions. There are also discrepancies between closure costs reported in the appendices and those used in the text (e.g., for water treatment).

Anvil Range corporate perspective no longer applies

- Most closure plans developed by mine owners attempt to minimize the net present value of the closure costs. The motivation for such an approach is usually to minimize the value of the security that the mine owner is required to post. However, a minimum net present value plan is not necessarily the most cost effective closure plan, and is seldom the plan preferred by other stakeholders. A specific example from the 1996 ICAP is the (unsupported) assumption that the Grum Pit could be used to store water until 2035 (see page 11-2), before any water treatment would be required on the Vangorda/Grum side. That assumption effectively reduced the net present value of the Vangorda/Grum water treatment to a negligible amount. But the experience since the end of operations shows that the Vangorda and Grum pits are filling much more rapidly than predicted. Water treatment on the Vangorda/Grum side was initiated this year.

2.2.2 SCIENTIFIC AND TECHNOLOGICAL ADVANCES

Since the 1996 ICAP was prepared, the industry has gained further experience in the implementation and monitoring of closure measures. This experience should allow a better assessment of the effectiveness of some alternatives proposed in the 1996 ICAP. Examples of some of the key developments in the industry in general include:

- An assessment of the feasibility of tailings relocation (and reprocessing) was completed shortly after the 1996 ICAP. Experience elsewhere has shown the importance of considering the water treatment costs associated with any relocation or disturbance of tailings materials.
- The performance of soil covers has been an active field of research and rigorous assessments are now available for a number of sites (e.g. Equity Silver (British Columbia), Cluff Lake (Saskatchewan)).
- The performance of sulphide cells has been assessed at other properties, and serious concerns have been noted. (e.g. Samatosum (British Columbia), Mt. Muro (Australia))
- Passive water treatment measures have been shown to be effective for treating low zinc levels in pit lakes (e.g. Island Copper (British Columbia))
- Backfilling of waste rock to pits has been shown to be cost competitive with long-term treatment at other sites, and preferable because it avoids the creation of a contaminated pit lake (e.g. Ronnenburg (Germany), Flambeau (Wisconsin)).

Furthermore, there have been several additional studies and monitoring programs at the site that provide further insight into possible closure measures. Examples regarding the understanding of the Faro and Vangorda/Grum sites in particular include:

- Site monitoring and seep survey data now provide a much better basis for understanding site waste dump water quality. Experience from other sites has led to improved understanding of how such data can be used to predict future trends.
- A detailed investigation of the groundwater regime in the Rose Creek tailings basin was completed last year.

2.2.3 INFORMATION GAPS FOR FINAL CLOSURE PLANNING

Although there are many very strong sections in the scientific parts of the 1996 ICAP (Chapters 1 through 6), which will be integrated into the information used for closure purposes, there are also gaps. The most significant gaps which must be addressed prior to implementation of closure measures include:

- It is uncertain whether some or all of the waste dumps will eventually generate acidic drainage (both at Faro and for the Grum dump). A particular concern is the effectiveness of the sulphide cells.
- There is insufficient knowledge of dump drainage paths and water balances to design a comprehensive collection system.
- The effect of alternative tailings closure measures on the tailings aquifer must be re-evaluated in light of the new information since the 1996 ICAP.
- Geotechnical investigations are required for site selection, design and construction of facilities such as the Faro water treatment plant, the Plug Dam, spillways or re-routing of the major creek diversions.
- Detailed engineering has not yet been done for construction of physical facilities.
- There are concerns as to what level of success can be achieved by implementing some of the proposed closure measures e.g. to control metal loading for flows into the Faro or Vangorda pits.
- The costing is conceptual for some alternatives, or will have changed since 1996, based on more detailed engineering, the availability of actual field data, and data on actual costs for implementing similar measures at other sites.

Specific information gaps in the 1996 ICAP are listed in Tables 2.1 to 2.3 with respect to water flow, water chemistry, and geotechnical/engineering issues. The work plan presented in the Project Description is focused on addressing these information gaps and others not directly related to the 1996 ICAP.

Table 2.1 - Knowledge Gaps with Respect to Hydrology and Hydrogeology

Topic	Description of Knowledge Gap
Water balance	• Including surface and groundwater for final design of the water treatment facilities (plant, ponds, water collection systems). At Faro, it is unclear where the water infiltrating into the dumps eventually discharges as it is not evident from seep surveys and monitoring at the toe. Possibly it reports to shallow groundwater or deeper groundwater systems. The other consideration is that water is being retained physically or chemically within the dump and may, in the longer term, be released and require treatment.
Groundwater	• Flowpaths downstream of the dumps at Faro and Vangorda, in the Rose Creek tailings area. Are there contaminant plumes to be intercepted now or in future?
Seepage	• Water balance and mass balance (in seepage) for Main Pit and Zone II pit to assess storage capacity and seepage potential. • Seepage from Grum pit.
Diversions	• Geotechnical stability and hydrologic capacity for existing and proposed Faro Creek Diversions and Rose Creek Diversion.

Table 2.2 - Knowledge Gaps with Respect to Water Chemistry

Topic	Description of Knowledge Gap
Waste Dump Drainage	• Predictions were made in the 1996 ICAP of "worst case" drainage chemistry from waste dumps. However, the remaining questions are "how soon?" and "how much?". • Grum dumps requirement for long-term collection and treatment. What would be the load to a treatment facility?
Tailings	• Specific requirements for water management and water treatment during relocation of the tailings.
Pit Water	• Length of time required to achieve discharge water quality in both the flooded tailings and in the open pit. This is determined by both the natural changes in drainage chemistry over time plus the effectiveness of the control measures that are implemented. • Measures to achieve dischargeable water quality in the open

Topic	Description of Knowledge Gap
	pit, to allow some version of the flow through option at both Faro and Vangorda, which includes relocation of the waste rock. • For how long will Grum pit require water treatment? • Water treatment options and requirements if waste rock and/or tailings moved to pit.

Table 2.3 - Knowledge Gaps with Respect to Engineering and Field Geotechnical

Topic	Description of Knowledge Gap
Field Investigations	• Investigation of foundation conditions for treatment plant and contaminated water storage reservoir. • Location of spillway in rock for Intermediate Dam. • Investigation of field conditions for routing of Faro Creek diversion around west side of pit.
Stability	• Assessment of stability under dynamic loading of Intermediate Dam for all options, including the proposed design of the toe buttress. Design for long-term stability. • Stability of north pit wall as the pit floods, and requirements to route Faro Creek Diversion and/or inflow away from north wall failure zone.
Design and Materials	• Assessment of foundation conditions and construction material (and source) for the Plug Dam and spillway for Faro Main Pit. • Cover design and borrow sources for cover material.
Engineering	• Detailed engineering has not been done for construction of treatment facilities, re-routing of diversions, stabilization of the Intermediate Dam and construction of the Faro Plug Dam and spillway.
Tailings Relocation	• Feasibility of moving the tailings given that the mine is not operating. Plus, changes (increase) in available storage volume given the early closure.

2.2.4 LINKAGES AMONG CLOSURE COMPONENTS

The Interim Receiver does not believe it would be either technically advisable or administratively possible to implement large portions of the 1996 ICAP, without first preparing a new comprehensive and integrated plan.

The need to assess closure measures in an integrated fashion can be illustrated by making reference to the Faro Pit and tailings alternatives developed in the 1996 ICAP. These alternatives are summarized in Table 2.4 and Table 2.5. The tables show the methods that were considered for each of the major site components, and their relationship to the broader alternatives for each area. The cells marked "x"indicate whether a particular measure is required by, could possibly be added to, or is excluded by each alternative. For example, the first row of Table 2.4 shows that leaving the Faro Creek Valley Dump in its current state is possible under the "isolated pit" alternative but not possible under the "flow-through pit" alternative.

- An example from table 2.5 is the first three rows, which show that either partial or complete relocation of tailings to the Faro Pit would require construction of a plug dam and emergency spillway.

These inter-linkages among the many site components and closure alternatives indicate the difficulties that would be encountered if the Interim Receiver were to request approval to implement major closure measures on selected parts of the site, in the absence of an overall plan. That consideration was behind earlier requirements for an integrated and comprehensive plan, and it is likely to remain important for future closure planning. As stated above, the Interim Receiver has identified all of the closure activities that it believes can reasonably be designed, permitted and implemented in the absence of an overall plan, and they are listed in the Project Description.

2.2.5 INDEPENDENT ACTIVITIES

The Project Description does propose a number of discrete activities that can proceed independently of a comprehensive FCRP (p. 56 and 57). Several closure activities are identified that can reasonably be designed, permitted and implemented independently of an FCRP.

Table 2.4 - Relationships among closure methods and Faro Pit options in the 1996 ICAP

Site Components and Possible Closure Methods	"Isolated Pit" Alternative			"Flow-through Pit" Alternative		
	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded
Faro Creek Valley Dump						
1. Leave as is.		x				x
2. Relocate.		x		x		
Faro Creek Diversion						
1. Relocate and upgrade diversion.	x					
2. Remove, redirect creek, build inlet structure for flow to pit.			x	x		
3. Maintain for short term use.				x		
Faro Main, Intermediate, NE and NW waste dumps						
1. Recontour, collect and treat.		x				
2. Recontour and cover.		x				
3. Leave as is.		x				
Near Pit Dumps (Ranch Dumps)						
1. Leave in place, collect and treat.	x	x				x
2. Relocate to Main Pit.				x		
Low Grade Stockpiles						
1. Process through mill.				x		
2. Leave in place, collect and treat.		x				
3. Relocate to Main Pit				x		
Rose Creek Tailings						
1. Partial relocation to Pit, water cover on remaining.		x			x	
2. Complete relocation to Pit.		x			x	
3. Covers		x			x	
Other Measures						
1. Construct plug dam.	x			x		x
2. Construct spillway.	x			x		
3. Pumping for water treatment.	x			x		
4. Construct contaminated water storage facility.	x	x		x		
5. In short term at least, require water treatment.	x			x		
6. Construct water treatment plant.	x			x		
Zone II pit						
1. Maintain pumping system to Main pit.	x	x				
2. Pump to treatment plant.				x		

Table 2.5 - Relationships among closure methods and Rose Creek Tailings alternatives in the 1996 ICAP

Site Components and Possible Closure Methods	Partial Relocation of Tailings to Faro Pit			Complete Relocation of Tailings to Pit			Soil Covers on Tailings			Complete Water Cover on Tailings		
	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded
Faro Pit												
1. Install Plug Dam.	x			x								
2. Install spillway.	x			x								
Tailings												
1. Remove or contour tailings.	x			x			x			x		
2. Water management in short-term for water quality.	x			x			x			x		
3. Install soil or composite covers.			x				x				x	x
4. Flood	x						x			x		
5. Remove or modify embankments.	x			x			x			x		
Intermediate Dam												
1. Construct permanent spillway.	x						x			x		
2. Construct channel & inlet to route Rose Creek through impoundment.	x			x			x			x		
3. Construct toe buttress.	x						x			x		
4. Breach or remove dam.			x	x					x			x
5. Raise dam.						x	x			x		
6. Construct toe buttress.	x					x	x			x		
Rose Creek												
1. Abandon Rose Creek diversion, remove structures.	x			x						x		
2. Route North Fork of Rose Creek diversion to original channel.	x			x								
3. Upgrade Lower Rose Creek Diversion.												
4. Construct channel from spillway to original Rose Creek channel.	x						x			x		
5. Re-route Rose Creek through impoundment.	x			x						x		

Site Components and Possible Closure Methods	Partial Relocation of Tailings to Faro Pit			Complete Relocation of Tailings to Pit			Soil Covers on Tailings			Complete Water Cover on Tailings		
	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded	Method is Required	Method is Possible	Method is Excluded
Pumphouse Pond												
1. Breach dam and remove pond.	x											
2. Lower dam and maintain.												
Freshwater Reservoir												
1. Completely breach dam and remove pond.												
2. Partial breach												
3. Upgrade and maintain.												
North Valley Wall Interceptor Ditch												
1. Breach and abandon.	x			x						x		
2. Redirect flows through impoundment or spillway.	x			x						x		
3. Construct stilling pond.	x	x				x						
Cross Valley Dam	x	x										
1. Maintain in short-term for water treatment	x	x		x			x					
2. Drain pond and remove sludges.	x	x		x			x			x		
3. Breach or remove dam.	x	x		x			x			x		
Other Measures	x	x										
1. Pumping for water treatment.	x	x		x								
2. Construct contaminated water storage facility.	x	x		x								
3. In short term at least, require water treatment.	x			x			x			x		

2.3 TIMING OF THE FINAL CLOSURE AND RECLAMATION PLAN

December 2006 is a proposed licence requirement. The Interim Receiver plans on submitting a plan as soon as possible.

The Project Description proposed that condition 70 of the current Faro water licence be revised so that a final closure and reclamation plan (FCRP) would be required to be submitted by December 31, 2006. As stated on pages 66 and 70 of the Project Description, that date would allow sufficient time for the FCRP to be reviewed and closure activities to be licenced prior to the end of the proposed term of the new water license.

It is important to note that the December 31, 2006 deadline was suggested as a licence requirement, rather than a planning target. The 2006 deadline is appropriate as a licence requirement because it is the latest date at which an FCRP can be submitted if closure activities are to commence in the subsequent water licence term. However, it is the intent of the Interim Receiver to complete the FCRP as soon as is practicable.

The schedule can be affected by factors outside of the control of the Interim Receiver

It is not possible to pinpoint a target planning date for the submission of a FCRP because it must be recognized that there are a number of uncertainties in the FCRP development schedule that are beyond the control of the Interim Receiver. Examples include the possibility that consultation will open up new alternatives or requirements for investigations; unanticipated delays in field work due to adverse weather; possible care and maintenance emergencies taking priority over closure planning; uncertainties associated with annual funding of the closure planning; and the possibility that the role of the Interim Receiver will change during the closure planning period.

The section outlines the timing and inter-linkages of closure studies and the anticipated subsequent regulatory approval phase.

The closure planning process put forward in the Project Description is intended to be the most rapid path to an overall plan that will be defensible to both permitting agencies, First Nations and stakeholders, as well as to the federal government responsible for funding the closure measures. As mentioned in Section 2.1, the complex nature of the environmental issues at the site and the current wide range of closure cost, estimated at between $200 and $400 million, drives the need for a rational, step-by-step closure planning process, such as laid out in the Project Description and the present Supplement. As such, the closure planning process laid out in the Project Description is a pragmatic, rational process that needs to be and will be executed regardless of the identity of the proponent.

The following section outlines inter-linkages between proposed studies and the subsequent regulatory approvals. It is recognized that the exact nature of the proposed studies and the inter-linkages between them could be modified based on stakeholder input during the course of the next licence term. Reviewing the details of these investigations is outside the scope of the current CEAA process.

A process flow chart outlines the length and interlinkages of each proposed characterization and closure alternative study

The process flow chart on the following page illustrates the Interim Receiver's current schedule for the activities described in sections 2.2.2 and 2.2.3 of the Project Description, i.e. the activities leading to completion of the FCRP. Logical dependencies among tasks are indicated by the arrows. The portion of the chart headed "Studies and Engineering Design" shows the sequence of activities listed in section 2.2.2 of the Project Description. Investigations and characterization studies are shown in blue; engineering and closure alternatives studies are shown in green. The bottom of the chart headed "Final Closure and Reclamation Plan (FCRP) Preparation" includes activities described in section 2.2.3.1 of the Project Description.

The logic of the process flow chart is most clear if it is read from the bottom upwards. In this case, the bottom line is the task numbered 41, the preparation of the final FCRP document. In general, all of the tasks above 41 need to be completed before the final FCRP can be prepared. (The exceptions are the tasks shown as number 15, 23 and 32, which are discussed below.) One can follow the linkages upwards through the chart, and see the logical progression among tasks. There are some cases where the start of tasks is delayed to allow coordination with budgeting cycles or seasonal requirements. In most cases, however, tasks are targeted to begin as soon as their logical predecessors are complete, i.e. as soon as is practicable.

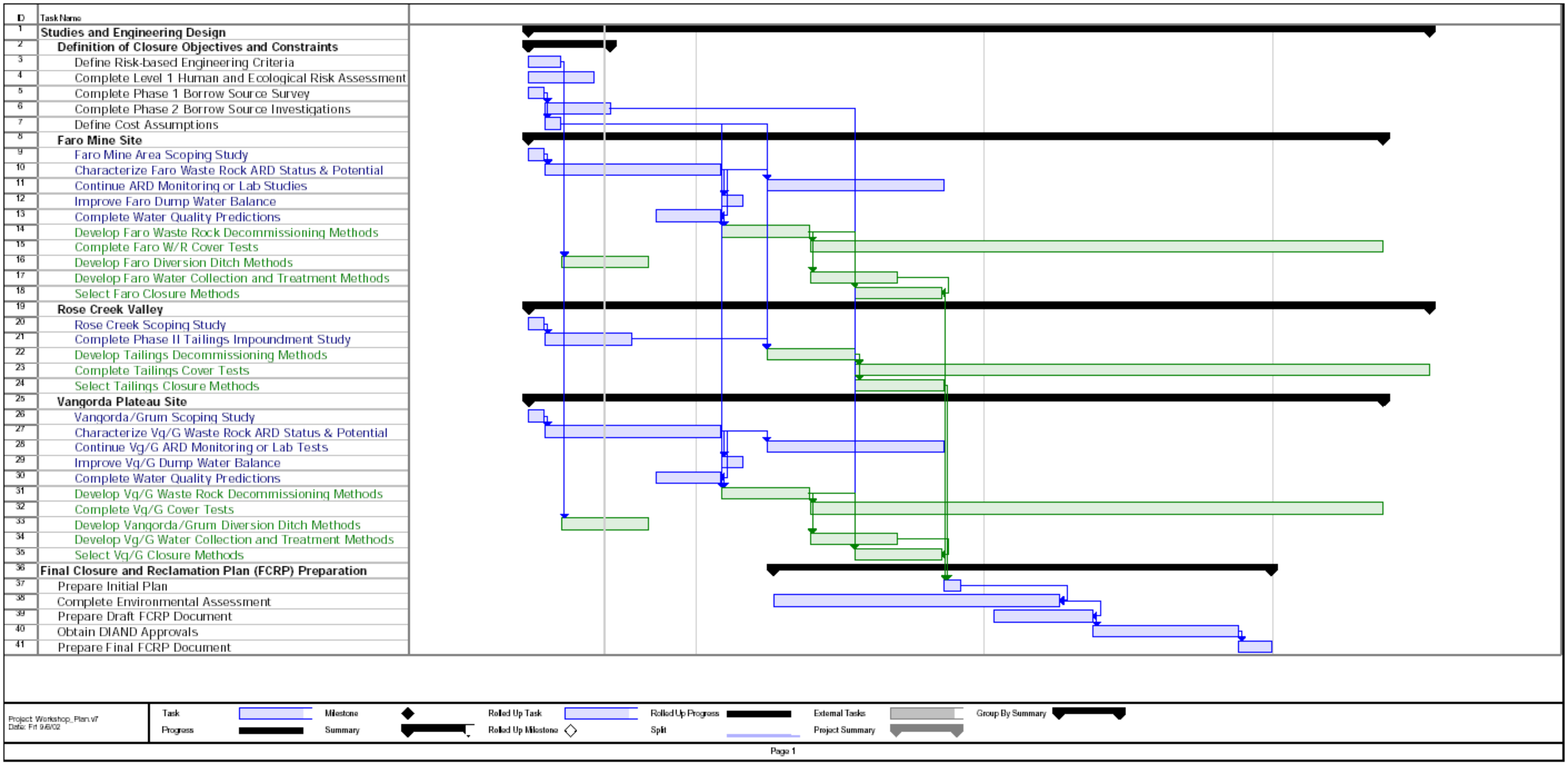
Some tasks are "fast tracked" where reasonably and technically possible.

Further inspection of the process flow chart reveals several cases where the Interim Receiver is planning to "fast track" logically related tasks. In other words, some tasks are being initiated even before their logical predecessors are completed. A good example is the tasks numbered 37 and 38, for which the target schedule has preparation of the Environmental Assessment being started several months before the initial plan is available. It would be easier to wait for the initial plan and related consultation to be complete before initiating the environmental assessment. However, the Interim Receiver believes it will be possible to complete portions of the environmental assessment work without having the details of the plan in place. The "fast tracking" of these two activities will allow completion of the final plan to be moved forward.

Another example is provided by the tasks labelled 15, 23, and 32. These tasks are all field tests of cover systems. Although cover tests may continue for several years before a definitive cover design is prepared, the Interim Receiver's engineering advisors have indicated that the FCRP could be prepared after a shorter period of cover testing.

These examples and the other "fast tracking" are evidence that the Interim Receiver is indeed committed to preparing an FCRP as rapidly as is practicable. The Interim Receiver is prepared to exert the required management effort associated with this approach in the interest of meeting the needs of other stakeholders, particularly the local communities that would like to see closure measures underway as soon as reasonably possible.

Figure 2.1 Process flow chart of planned closure studies for the Anvil Range site.



3. CONCLUSION

The proposed plan is aimed at fast tracking closure planning as much as possible while maintaining management stability at the site

The information provided in this Supplement to the Project Description aims at providing additional context regarding the management structure of the project during the next licence term and the need for a five-year licence term to plan closure.

- The application for a new licence by the Interim Receiver aims to maximize continuity, and momentum for closure planning and to provide stability at the site during a period of uncertainty regarding the legal proceedings regarding the Plan of Arrangement and regarding regulatory transition relating to the DTA.
- It is important to recognize that the chances of the mine re-opening under the management of a private mining company are non-existent.
- Gaps in previous closure plans, recent advances in closure best practices and in available site characterization information, and changed assumptions drive the need to re-evaluate previous closure plans in an integrated fashion.
- In recognition of the desire of stakeholders and of the physical realities at the site, the proposed tasks have been fast-tracked as much as possible. However, there are a number of scheduling factors that are outside the control of the Interim Receiver.
- It is recognized that the exact nature of the proposed studies and the inter-linkages between them could be modified based on stakeholder input during the course of the next five years. Reviewing the details of these investigations is outside the scope of the current CEAA process.
- The proposed licence requirement that a final closure and reclamation plan be submitted no later than December 2006 is intended to provide sufficient time for regulatory and funding processes to be completed by the end of 2008

APPENDIX – SUMMARY TABLE OF PREVIOUS CLOSURE PLANS

Table A1 – 1996 ICAP (Faro Mine – Mine Workings)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Main Zone Pit	Pit water chemistry, specifically decant from pit, to achieve compliance objectives for closure.	Option 1: Isolated pit option.	Maintain the pit as a secure long-term contaminated water storage facility, keeping it isolated from Faro Creek	Pit water discharge would be controlled therefore water quality standards would probably be a requirement to meet receiving water in Rose Creek	Faro pit is primary contaminated water storage facility. Therefore, consider storage requirements for high precipitation and inflow periods. Uses an existing facility, rather than construction of a new facility for contaminated water storage.	This option was selected over the Option 2 because of the difficulties anticipated in achieving water quality objectives in pit either in short or long term. Anticipated that water treatment would be required prior to discharge.	Remaining uncertainties as of ICAP; rates of consolidation of tailings and waste rock in pit, migration of water through pit rock and tailings, drainage chemistry from in-pit rock and Faro valley dumps and particularly migration of contaminated water from pit.	ICAP, 1996
			Construction of a dam (called both the Plug dam and the Faro dam) to raise flooded elevation to 3850 ft and an emergency spillway.	Dam to increase storage capacity from 44 Mm3 to 55 Mm3. A concern is potential for contaminated water seepage, especially from Zone 2 pit	Upgrade and maximize diversions.	Plug dam had been proposed in 1991 as part of the in-pit tailings disposal evaluation. Technically feasible, concern is cost and construction.		ICAP, 1996
			Upgrade of Faro Creek Diversion and other diversions to minimize clean water flow into pit.	To minimize clean water flow into pit to ensure sufficient volume.	Faro Creek diversion would require significant upgrading and probably relocation to pass appropriate design even for long term and to ensure physical stability given the progressive degradation of the (north) pit wall.	Technically feasible, concern is cost.	Seepage from pit, flows from Zone II pit. Potential flows for treatment from Vangorda, tailings facility depending on those closure alternatives.	ICAP, 1996
			Provisions for pumping/discharge to water treatment facility.	If water treatment is required prior to discharge, this option can allow the pit to effectively be used for interception and storage of drainage from the Faro Valley	New water treatment plant and associated pumping/piping/ponds must be constructed.			ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
				Dump, Faro Creek diversion and Faro waste dumps draining to pit. Additionally, contaminated water from other areas e.g. Zone II pit can be pumped to pit for secure storage.				
			Construction of new water treatment plant.	Construction of water treatment plant for pit overflow, dump drainage and seepage. Consideration for plant sizing is whether to treat seasonally or year round.	Construction of contaminated water storage reservoir in Lower Faro Creek Valley and sludge settling ponds.	Required method.	Geotechnical investigations for design of facilities.	ICAP, 1996
		Option 2: pit integrated into Faro Creek flow system. "Clean Pit" option.	Faro Creek would be allowed to flow through the Main zone pit, and become part of the Faro Creek system.	Limits would probably be somewhere between 0.03 and 0.5 mg/L Zn (CCREM, IN89001 licenced discharge).	Ability to apply closure measures to all of the sources of water and therefore contaminant loading into the pit, to meet something close to receiving water standards within the pit. Requires removal of Faro Valley dumps.	This was the original plan before the pit became a tailings impoundment. However it was rejected during the ICAP because of the uncertainty of achieving instream water standards. Specific technical uncertainties - rate of tailings consolidation, migration of water through pit rock, acidic drainage inputs to pit from dumps, groundwater.		ICAP, 1996
			Relocation of acid generating dumps draining into Main pit - both external and internal dumps that would be above water level.	Move Faro Valley waste rock dump to the Northwest Dump, collect/pump/treat seepage in the Lower Faro Creek valley until cleaned up.	Still uncertainty about release of load from in-pit waste rock - rate and extent of release, effect of disturbing rock.		Might not need to relocate dumps already in pit, covered now by tailings or water? Also question of how to physically move the rock - access.	ICAP, 1996

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Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
			Relocate Faro Creek Diversion to west bank of Faro Valley and into Main pit.		Can only be done after pit water is of acceptable quality to be part of the Faro Creek system.			ICAP, 1996
			Construct inlet structure for Faro Creek to pit.	Stability of pit wall on north side where flow would enter pit.		Remaining concerns with handling of PMF, dissipation of energy of flow into pit over north wall.		
			Construct Faro Dam and spillway.	To achieve high flooded water level and minimize oxidation of sulphides in pit walls.	Dam similar to Option 1 but spillway must be much larger as not maintaining water level by pumping.			ICAP, 1996
			Maintain current Faro diversion and water treatment until instream water quality objectives are met.	Requires installation of pumping to take pit water to water treatment plant, until acceptable pit water quality is achieved.	Could take a LONG time to achieve "acceptable" pit water quality given the stored load in waste rock in pit plus all sources of drainage to pit. Comment in ICAP that it would be "extremely difficult to demonstrate that the water quality in Faro Pit will achieve discharge water quality within several decades."	Very difficult to ensure pit water will be clean - ever.	Field data for geochemical since 1996 survey to evaluate loading to pit, geochemical controls.	ICAP, 1996
			Construct contaminated water storage reservoir at mill site.	This is a very large volume of water to store, same as in option 1, because of the anticipated lag time till acceptable water quality is achieved in pit.	New water treatment plant and associated pumping/piping/sludge ponds must be constructed.		Geotechnical investigations for design of facilities.	ICAP, 1996
			Construction of new water treatment plant.	Construction of water treatment plant for pit overflow, dump drainage and seepage.	Construction of contaminated water storage reservoir in Lower Faro Creek Valley and sludge	Required method.	Geotechnical investigations for design.	ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
				Consideration for plant sizing is whether to treat seasonally or year round.	settling ponds. Reservoir in this case is larger than required for Option 1.			
Zone II Pit and In-pit Rock Dumps	Contaminant loading from waste rock in-pit, pit walls, Main Zone pit seepage and subsequent seepage from the Zone II pit.	Continue pumping to maintain water level at 3642.	Utilize existing system, possibly requires additional pumping capacity.	Additional monitoring for water level was recommended. Concerns remain about long-term sources of metals and acidity in the in-pit dumps, seepage from Main Pit.	Requires on-going maintenance of existing pumps plus provision for increased capacity if pit flooding results in increased flow from the Main Pit to the Zone II pit.	Good, however for clean pit option might require water treatment.	Change in pumping capacity as a result of possible increase in seepage from Main Pit after flooding.	ICAP, 1996
Faro Underground Workings	Only use of these workings for water treatment sludge disposal	None proposed		Possibly use for water treatment sludge storage.				ICAP, 1996

Table A2 – 1996 ICAP (Faro Mine – Tailings)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Rose Creek Tailings Facility	Acid generation, metal leaching, physical stability and potential for erosion of dams and tailings by Rose Creek.	Option 1: Partial relocation of tailings to Faro pit, establishment of water cover.	Remove sufficient tailings from all three impoundments to allow a 2 m water cover over the remaining tailings without raising the Intermediate Dam.	Reprocessing of tailings required to mitigate contained contaminant load in tailings slurry to pit. Water management and some form of water treatment would be required in tailings pond during and after physical removal of the tailings to mitigate resultant water chemistry as water cover is being established.	Requires construction of a permanent spillway in the Intermediate Dam, abandonment of the Rose Creek Diversion and the North Valley Wall Interceptor Ditch followed by redirection of flows through the tailings facility (possibly requiring a stilling pond), removal and cleanup of the polishing pond behind the Cross Valley Dam, breaching of the Cross Valley dam, construction of toe buttress for Intermediate Dam. Also (possibly) requires construction of Plug dam and Spillway in pit to increase final flooded elevation.	Selected option.		ICAP, 1996
		Removal of tailings progressively from Original and Second Impoundment then Intermediate Dam by dredging or hydraulic monitoring. Process tailings and deposit final		Need to check exposed ground for contamination and reclaim as appropriate.	Portion of Second Tailings Dam (constructed of tailings) would also be removed. Assumes acceptable process metallurgy.		Assumption was made that seepage water quality through contaminated material would be controlled by attenuation capacity of underlying soils.	ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		tailings in Faro pit.						
		Construction of a permanent spillway in the Intermediate Dam.	Sized for the PMF for entire upstream catchment of the dam.	Recommended construction in south abutment.				ICAP, 1996
		Maintain existing diversions around Rose Creek tailings complex during mining of the tailings.		Water management and water treatment during tailings recovery.				ICAP, 1996
		Once mining completed and discharge water quality achieved, abandonment of the Rose Creek Diversion followed by redirection of flows through the tailings facility.	Might require a stilling pond for high flows into facility.				Time until acceptable water quality for water cover, seepage to aquifer.	ICAP, 1996
		Abandonment of the North Valley Wall Interceptor Ditch followed by redirection of flows to Guardhouse Creek channel and into impoundment .						ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		Removal and cleanup of the polishing pond behind the Cross Valley Dam, breaching of the Cross Valley dam.		Place sludges underwater in Intermediate Pond.	This pond would be maintained during mining and initial flooding, and used as part of water treatment system until discharge water quality achieved.			ICAP, 1996
		Construction of toe buttress for Intermediate Dam.					Existing geotechnical information was considered inadequate to assess stability.	ICAP, 1996
		Option 2: Complete relocation of tailings to Faro Pit.	All tailings would be dredged or hydromonitored from the Rose Creek facility to the open pit, and the Rose Creek Channel re-established.	Storage volume available in pit.	As above. Also must excavate embankments and dispose of construction materials, probably in pit.	Fatally flawed at the time as insufficient storage volume available for storage of all tailings plus the future developments.	However, need to check struck level curves to see if there is room without Grum u/g and Grizzly.	ICAP, 1996
		Option 3: Covers on existing tailings.	Composite soil cover on Original and Second Impoundments, Water Cover on Intermediate Impoundments.	Closure objectives: long-term stability of Original and Second tailings embankments for MCE, erosion protection of Rose Creek diversion for PMF, CCREM water quality standards in Rose Creek.	Intermediate Dam raised and stabilized for MCE, plus construction of a permanent spillway designed for PMF. Cross Valley Dam breached, polishing pond cleaned and removed, and channel excavated to direct spillway discharge into Rose Creek channel. Upper Rose Creek diversion upgraded for PMF.	This alternative was also considered in the 1991 closure plan for the tailings facility. Not selected as the closure objectives could not be achieved at a sustainable cost. Key concerns are not achieving control of acid generation and contaminant migration, and with stability of dams.	Time until acceptable water quality for water cover, seepage to aquifer.	ICAP, 1996
			Intermediate Dam raised and stabilized, plus construction of a permanent spillway.	Structures stable for MCE, spillway sized for PMF.				ICAP, 1996
			Cross Valley Dam breached, polishing					ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
			pond cleaned and removed, and channel excavated to direct spillway discharge into Rose Creek channel.					
			Upper Rose Creek diversion upgraded for PMF.					ICAP, 1996
		Option 4: re-contour tailings and establish 2 m water cover.	Redistribute tailings from the Original and Second Impoundments to lower elevation and flood all tailings.		Requires raising of Intermediate Dam, construction of spillway, re-routing of Rose Creek, water management and water treatment during and after handling of tailings.	This option was originally proposed in the 1981 Abandonment plan. Concerns at the time remain; stability of high dam required in Rose Creek and high spillway to handle MCE and PMF, control of water quality, and cost.	Time until acceptable water quality for water cover, change in seepage to aquifer.	ICAP, 1996

Table A3 – 1996 ICAP (Faro Mine – Waste Dumps)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Faro Creek Valley Dump	Two issues: contaminant loading to Main Pit and that Faro Creek diversion leaks through the dump plus has the potential to erode the dump in event of ditch failure.	Option 1: leave dump as is.	Dump remains in place and disturbance is minimized.	All contaminated drainage will report to the Main pit.	Eliminates Faro Pit Option 1 of "clean pit" i.e. pit incorporated into Faro Creek.	Selected option.		ICAP, 1996
		Option 2: relocate	Remove all Faro Valley waste rock including reactive rock from diversion ditch construction and place on the upper surface of the Northwest Faro Dumps. Also requires treatment and reclamation of original ground.	Could be significant contamination of underlying ground, also alluvium.	Still requires collection and treatment of this load, that would now report to X23. Ongoing collection and treatment as contaminants are flushed from underlying alluvium. Possible upgrading of diversion required while works in progress.	Required for Option 2 (clean pit) for Faro Pit, to minimize contaminated seepage to the pit.	Amount of rock to be moved, extent of contamination of underlying alluvium.	ICAP, 1996
Faro Main, Intermediate, NE, and NW waste Dumps	Contaminant migration to surface and groundwater.	Three approaches were considered. 1.Collection	Interception and collection of contaminated surface and groundwater flows.	Drainage controlled by topography - requires both surface ditches and groundwater interception.	Extensive, complex.	Considered to be only feasible option.	Long-term predictions of water chemistry and, more significantly, water flow from the dumps. Also, uncertainty as to flowpath of water that (should be) draining from dump as less reports to surface water courses that expected.	ICAP, 1996
		2. Minimize infiltration		Covers and surface treatments evaluated.	Infiltration can be minimized, but will not	Not sufficient.		ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
					eliminate requirement for collection and treatment.			
		3. Remove source.	Oxidized sulphides.	Large existing loads of oxidation products, combined with ongoing reactions.	No existing technically feasible methods to removed existing loads or prevent further oxidation.	No.		ICAP, 1996
		Option 1. Recontour surface, install collection.	Areas of free dumped piles will be recontoured to avoid ponding and minimize infiltration and erosion. Surface water directed by ditching to storage ponds for pumping to contaminated reservoir. Deep dewatering wells required for groundwater flow below ditches.	Slurry walls may be required for cutoff of deep groundwater flows.	Significant construction required of surface and groundwater interception systems. Also intermediate storage ponds for contaminated groundwater flows.	Selected method, however there is insufficient understanding of the groundwater flow regime and extent of contaminant plume development.	Considerable uncertainty about groundwater flow regime, extent of plumes and insufficient info for installation of a groundwater capture system at this time.	ICAP, 1996
		Option 2. Recontour dumps and cover.	Recontour all slopes to 3:1 or flatter, install low permeability cover.	Low permeability materials not locally available. Geomembrane would required replacement every 125 years.	Not economically achievable.	Rejected as not certain could attain sufficiently low permeability cover. Some water treatment would still be required.		ICAP, 1996
Near Pit Dumps (Ranch Dumps)	High source of loading as all rock is sulphide.	Relocate dumps to pit if the Option 2: Faro Clean pit, is selected.						ICAP, 1996
		Option 1: Leave dumps in place.	Leave dumps in place, combined with collect and treat run-off and seepage.	Option appropriate with the contaminated pit option for the Faro pit.				ICAP, 1996
		Option 2: Relocate.	Relocate to below water in the Faro Main pit.	Will increase contaminant load to Main pit during and after placement.	Must be done if Faro Pit Option 2 is selected. Rock must be placed below water, probably with some alkali addition.			ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Low Grade Stockpiles	Contaminant migration to surface and groundwater.	Option 1: Process through mill.	During operations screen and process coarse fraction.	Might have been economically processed but only in conjunction with processing of new ores.	Fine fraction of ore cannot be processed and would have to be deposited in pit, below water level.	Selected option.		ICAP, 1996
		Option 2: Leave in place.	Leave in place, combined with collection and treatment of runoff.			Selected option if not feasible to process ore in mill.		ICAP, 1996
		Option 3: Relocate.	Relocate to below water in the Faro Main pit.	This would apply to portions of the stockpile draining to the Main pit, if the Clean Pit option is selected.				ICAP, 1996

Table A4 – 1996 ICAP (Faro Mine – Water Management)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Water Treatment Plant		Construct and operate water treatment plant.	HDS water treatment plant is recommended option.	LDS or HDS plant, year round versus seasonal operation, treating just Faro water or also Vangorda/Grum (option not selected).	Construction of surface and groundwater collection, contaminated water storage reservoir, sludge ponds, pumping/piping for plant.	Required.	Water chemistry, water flows for design. Geotechnical investigations for design.	ICAP, 1996
Faro Creek Diversion	Stability during extreme flood events, erosion of valley alluvium or tailings, seepage from diversion increasing leaching from tailings, stability of Faro north pit wall.	Faro Pit Option 1: Isolated pit.	For this option, the diversion is redesigned to accommodate a 1 in 500 year flood event with reserve storage in pit for all events in excess of the 500 year.	Diversion is also relocated to avoid the north wall failure. Objective of diversion is to minimize clean water inflow, and maximize storage for contaminated water.	Selected option.			ICAP, 1996
		Faro Pit Option 2:	Relocate diversion to a new channel on west side of valley and into pit.	Concern is how to dissipate the flow energy in the event of the PMF, avoiding the north wall of the pit.		Concern is erosion of the pit wall and of the tailings, and consequent increase in TSS and metals in pit water.		ICAP, 1996
Rose Creek Diversion	Capacity of spillway to pass PMF, ability to locate spillway in rock.	Removal of Cross Valley dam and polishing pond, re-routing of lower portion of diversion through tailings pond or						ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		Intermediate Pond, construction of spillway, possible raise and buttress of Intermediate Dam depending on selected tailings option.						
North Fork of Rose Creek Diversions		North Fork of Rose Creek diverted back into original channel.	North Fork of Rose Creek upstream of the Pumphouse will be diverted back into original channel, small dams downstream will be removed. Dam forming Pumphouse pond will be breached.					ICAP, 1996
North Fork Rock Drain	Plugging of the rock drain in the long term, back up water in the Zone II pit.	Option 1: breach rock drain.	The rock drain will be breached to a level just above the then current pond elevation. A discharge channel will be construction. Road surface will be scarified to encourage vegetation.	Significant rock excavation required.		Selected option.		ICAP, 1996
		Option 2: maintain rock drain.	Rock drain would be left in place with no modifications.	Plugging of rock drain over time.		Not selected as long term performance of the rock drain is uncertain. Concern is water backing up into Zone II pit.		ICAP, 1996
North Valley Wall Interceptor Ditch	No material issues.	Flow will be redirected into Intermediate Impoundment.	Upper flows redirected to Guardhouse Creek and then into the Intermediate Impoundment. Lower portion of ditch will be breached to allow this					ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
			flow also into the Intermediate Impoundment.					
Intermediate Dam	Stability of Intermediate Dam under MCE.	Option 1:Stabilize Dam.	For selected tailings option (partial removal and flooding), Intermediate Dam will be buttressed and a spillway constructed.	Required to address concerns with stability under MCE and PMF conditions.	Requires partial removal of tailings to achieve flooded water cover. Possible alternative routing of Rose Creek water to maintain water cover.		Dynamic stability of proposed design under MCE.	ICAP, 1996
		Option 2: Raise Dam		Raise dam to provide additional storage capacity for tailings from Original and Second Impoundments, and for water cover.	Flood routing, spillway construction.	Concerns with physical stability.	Dynamic stability of proposed design under MCE.	ICAP, 1996
		Option 3: Remove Dam.			Only feasible if tailings are completely relocated to pit.	Concerns with physical stability.		ICAP, 1996
Cross Valley Dam	Cross Valley Dam must be stable until in-situ water treatment no longer needed.	No action until water cover established and water quality acceptable.						ICAP, 1996
	Closure	Dam and pond will be removed.	Pond will be drained, basin hydraulically monitored to remove sludges which will be placed in the Faro pit underwater. Dam will be breached.					ICAP, 1996
Pumphouse Pond		Drain pond and breach.						ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations or Required Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Freshwater Reservoir	Has become fish habitat and some portion of dam would need to be maintained to retain this overwintering habitat.	Option 1: Complete breaching of dam.	Dam would be breached in two stages to allow settling and removal of suspended solids and revegetation of the reservoir basin.	Fish habitat, release of sediments to downstream water course when dam is breached.				ICAP, 1996
		Option 2: Partial breach of maximum height of 4 m.	Dam would be lowered to maximum height of 4 m to achieve stability and overwintering habitat.	Would also require construction of a spillway and modification of the low level outlet if this facility to be maintained.	However, owner (Anvil Range) was requiring transfer of responsibility for facility to a custodian for closure.	Possible if custodian could be found.		ICAP, 1996
		Option 3: Upgrade dam to pass PMF and MCE.				Rejected based on cost.		ICAP, 1996

Table A5 – 1996 ICAP (Faro Mine – Mine and Mill Facilities)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Buildings	Public safety, environmental impact.	Dismantle for salvage or scrap. Concrete removed, or broken up and buried.		Can use facilities such as mill basement or crusher basement for waste disposal (building materials or scrap components).		Standard approach.		ICAP, 1996.
Mine Shop and Equipment		Salvage or scrap on site.				Standard approach.		ICAP, 1996.
Waste Disposal Areas						Standard approach.		ICAP, 1996.
Special areas	Process or stockpile.	Cleanup, stabilize and revegetate.	Concentrate loadout, ore stockpiles, coal plant, explosives plant extraction pit, PCB storage facility			Standard approach.		ICAP, 1996.
Chemical Inventory Disposal		Return to supplier, process through mill to tailings, or treat.				Standard approach.		ICAP, 1996.
Other Infrastructure		Block roads, scarify for revegetation, maintain those required for ongoing operation.				Standard approach.		ICAP, 1996.

Table B1 – 1996 ICAP (Vangorda/Grum Mines – Mine Workings)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Vangorda Pit	Acid generation and metal leaching from in-pit dumps/stockpiles and pit walls.	Option 1 Pit as Contaminated Water Storage Reservoir	Vangorda pit would be used as a reservoir for contaminated drainage	Contaminated water storage facility for both the Vangorda and Grum mining areas. Using existing facility as a contaminated water reservoir upstream of treatment plant, rather construction of new facility.	Maintain Vangorda Creek Diversion and all other diversions to minimize clean water flow into pit. Maintain and operate treatment plant. On-going care and maintenance for diversions. Also requires water management facilities to route all contaminated water to pit, and then to treatment plant. Control access to pit.	Selected as anticipated that will not be possible to achieve discharge water quality in Vangorda pit. Pit provides reservoir upstream of treatment plant. Insufficient information to predict long-term water quality.	Seepage flowpaths out of pit. Variations in chemistry of feed to treatment plant due to leaching from pit walls resulting from fluctuating water levels in pit (to provide sufficient storage). Spillway not mentioned but assume would be needed.	ICAP, 1996
		Option 2 Partially backfill pit and use as contaminated water reservoir.	Pit serves as contaminated water reservoir, pit partially backfilled and a channel constructed on the fill to route Vangorda Creek through the pit. Pumping installed in pit.	Pit water level to be maintained below 1120 m.	Till covers required on upper pit walls, above flooded elevation. Maintain and operate water treatment plant. Must control access to pit.	Option rejected due to potential instability of Vangorda creek channel, inability to reduce contaminant load to pit sufficient to eliminate need to treatment plant, insufficient storage capacity in pit because of backfilling.	Effectiveness of till covers on pit walls, extent of stored oxidation products, channel design and sizing for Vangorda Creek. Assume spillway needed from pit.	ICAP, 1996
		Option 3 Backfill pit.	Entire pit is backfilled to original contours, pump water using in-pit well, Vangorda Creek routed over fill.	Loss in water storage capacity as a result of backfilling.	Maintain and operate water treatment plant. Must control access to pit.	Option rejected for same reasons as Option 2 plus high cost for somewhat uncertain benefits.	Effectiveness, ability to store sufficient water. Assume spillway needed from pit.	ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		Option 4 Clean Pit.	Cleaning and covering of reactive rock, lime addition during flooding and routing Vangorda Creek through pit.	Requires on-going water treatment and maintenance of Vangorda diversion until discharge water quality achieved.	Construction of inlet and outlet channels for Vangorda Creek. Construction of new reservoir for contaminated water storage (Little Creek Dam not sufficient). Relocation of in-pit dumps and stockpiles. Must control access to pit. Maintain and operate treatment plant until water quality in pit acceptable.	Rejected - uncertainties of achieving discharge water quality, construction costs and requirements for new contaminated water storage pond.	Time and extent of water treatment required to achieve discharge water quality from pit. Does not consider water management for other components of site - may still need water treatment plant anyway.	ICAP, 1996
Grum Pit	Possible concern with respect to metal leaching, physical stability of pit walls unless pit flooded.	Option 1 Flood pit and use as contaminated water reservoir.	Treat only water that is discharged.	Extent and effect of seepage from pit.	Once pit is flooded, pumping from Vangorda pit would stop. Maintenance of northeast diversion around Grum pit.	Lowest cost option, selected option.		ICAP, 1996
		Option 2 Flood pit and treat to achieve clean water.	Start treatment once sulphides are flooded, pumping water to Vangorda treatment plant.		Treated water containing excess lime then pumped back to Grum pit for disposal. If this does not result in clean pit water, water would be pumped to treatment plant and then discharged to environment.	High cost for questionable success.		ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		Option 3 Slow flooding of pit	Northeast Diversion ditch is maintained to route clean water around the pit.	Sulphides are exposed in pit walls up to 1210 m elevation, pit can be flooded to 1230 m. Estimated time to fill is 105 years.	Once pit is filled, water will need to be treated prior to discharge to Vangorda Creek. With slower filling, more contaminant load is expected and therefore more extensive (and possibly longer) water treatment is required.		Seepage to aquifer at the East end of the Grum pit - insufficient information to quantify seepage flowpath and quantity. Was any Grum underground developed?	ICAP, 1996
		Option 4 Rapid flooding of pit.	Northeast Diversion ditch is maintained. Contaminated water is pumped from the Vangorda pit.	Estimated time to fill is 25 years.	Requires that there is a water storage reservoir in Vangorda pit, and pumping capacity to Grum pit.		Seepage to aquifer at the East end of the Grum pit - insufficient information to quantify seepage flowpath and quantity. To what extent was Grum underground developed.	ICAP, 1996

Table B2 – 1996 ICAP (Vangorda/Grum Mines – Waste Dumps)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Vangorda Waste Dumps	No long term dump stability issues but concerns with cover stability and geochemical.	Reslope, cover entire dump, collect and treat.	Cover would be 1 m thick compacted till cover. Water collected in existing ditch system and pumped to pit, prior to treatment.	To be successful, requires relocation of other waste rock piles to main dump e.g. in-pit piles (for clean pit option), oxide fines.	Requires contaminated water storage reservoir (assumes pit in this case), pumping and water treatment plant. Also, long-term care and maintenance of water management systems and treatment plant.	Measures based on those proposed in 1989 Water Licence Application. Requires long-term seepage collection and water treatment.	Is all contaminated drainage from the dumps being collected in ditch system? Long-term integrity and effectiveness of till cover and replacement/maintenance requirements.	ICAP, 1996
Vangorda in-pit rock dumps (two).	Acid generation and metal leaching.	Remain in pit or remove to waste dump.		Depends on pit option chosen - would probably need to be moved for clean pit option.				ICAP, 1996
Vangorda in-pit low grade stockpile.	Acid generation and metal leaching.	To be removed for processing.		Depends on pit option chosen - would need to be moved for clean pit option.				ICAP, 1996
Oxide fines on Vangorda waste dump.		Move to sulphide cell and cover.		Very high stored soluble load of metals and acidity.				ICAP, 1996
								ICAP, 1996
Grum Dumps		Combination of covers on reactive areas plus surface and groundwater collection and treatment.		To what extent is acid generation and metal leaching observed, expected in future.	Long-term care and maintenance for covers, ditches and water management (pumping for treatment).	Measures based on 1989 Water Licence Application and subsequent Anvil Range dump design modification (1996).	Evaluation of field data to determine if there is a water quality issue.	ICAP, 1996
Grum till dump	Erosion, TSS	Reslope and vegetate.			Proposed revegetation trials.		No vegetation plan developed at the time.	ICAP, 1996
Grum Southwest Dump	Acid generation and metal leaching.	Stockpile to be removed and processed before closure.		Stockpile may not have been processed due to early closure. However drainage reports to sump from the sulphide cell.			Was it removed? Actions depend on whether is it anticipated that the Grum dump drainage needs collection and treatment.	ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Main Dump		Reslope sulphide cell and place 1 m till covers over sulphide areas.		The originally proposed intermediate till layers are not being installed (1996 design modification).				ICAP, 1996
		Establish vegetation on covers.		To control erosion. But may effect integrity of cover.			Effectiveness and integrity of cover.	ICAP, 1996
		Construction of sumps to intercept seepage.						ICAP, 1996
		Construction of monitoring wells to evaluate groundwater quality and determine if additional deeper groundwater interception is required.					Groundwater regime not well understood - not sufficient to evaluate potential flowpaths nor to design interception system.	ICAP, 1996

Table B3 – 1996 ICAP (Vangorda/Grum Mines – Water Management)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Vangorda Creek Diversion	Physical stability of diversion, water management with respect to pit.	Option 1: Upgrade and maintain diversion system.	Construct new channel to replace culvert and associated earthwork, breach haul road and construct new plunge pool at confluence with Vangorda Creek.		Long-term care and maintenance.	Selected option.		ICAP, 1996
		Option 2: Construct channel to flow over pit.		Must be done in conjunction with selected pit option i.e. requires some backfilling of pit.	Physical stability, sufficient storage for contaminated water either in-pit or in new ponds.			ICAP, 1996
		Option 3: Allow to flow into pit.		Water management decisions for open pit.	Requires either clean pit option, or sufficient in-pit storage prior to treatment.			ICAP, 1996
Little Creek Dam		Upgrade, construct spillway and maintain dam.	Dam will be used for storage of waste dump drainage prior to treatment.	Does not allow for storage of an other contaminated water prior to treatment.	If other flows have to be treated, e.g. Grum or Vangorda pit waters, reservoir capacity probably not sufficient.	Good.	Seepage losses.	ICAP, 1996
Water Treatment Plant		Option 1: Continue treatment plant operation as planned for closure.	Existing lime sludge neutralization plant as per IEE and Water Licence Application.	Depends on whether treatment is required of Grum pit water; possibly plant should be refurbished or moved.	Final sludge disposal location. Grizzly and Grum underground workings were proposed, also Little Creek dam if plant is moved. However, initial sludge settling ponds must be constructed.	Selected option. However, as a result of ICAP there are a number of additional sources of water that may require treatment over a longer time period than anticipated in design.	For all options, limitation is ability to predict long-term water chemistry and water flows for treatment.	ICAP, 1996
		Option 2: Relocate treatment plant to Little Creek Pond, near Vangorda pit.	Vangorda pit would be the contaminated water storage reservoir upstream of plant.	LDS or HDS plant. HDS would considerably reduce sludge volumes and lime consumption.	Construction of new sludge settling ponds required prior to final disposal of sludge in underground or Grum pit at depth.			ICAP, 1996

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
		Option 3: Upgrade existing treatment plant to HDS.	Currently plant operates as a straight lime neutralization circuit, low density sludge.					ICAP, 1996
		Option 4. Pump all water to Faro for treatment.	Sludge disposal in Faro underground workings.	Consider seasonal or year round water treatment, affects sizing of plant and contaminated water storage reservoir.	Construction of pipeline between Vangorda/Grum to Faro.	Separate water treatment plant would be built at Faro, but only to treat Faro drainage.		ICAP, 1996
		Option 5: Evaluate alternative treatment technologies.	Considered ion exchange, wetlands, limestone trenches, alkali addition to tailings, in-pit treatment.	To replace requirement for active water treatment.	Passive treatment alone was not considered to be sufficient, and an active water treatment plant would still be required.	Passive methods not sufficient for water quality compliance.	Consider advances since then in passive treatment.	ICAP, 1996
Pelly Pond		Embankment breached and vegetation established.						ICAP, 1996
Sheep Pad Pond		Ditch between treatment plant and pond will remain as permanent discharge channel from treatment plant. Ponds will remain for sediment control structures.		If water quality acceptable for discharge, flow will be ditched to Vangorda Creek system.				ICAP, 1996
Groucho Ponds		Pond drained, berms removed and area revegetated.	Located between Grum pit and the treatment plant.					ICAP, 1996

Table B4 – 1996 ICAP (Vangorda/Grum Mines – Infrastructure)

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Roads	Access, reclamation.	Maintain those required for closure. Berm off, remove culverts and abutments, revegetation for others.				Standard measures.		ICAP, 1996
Borrow Areas	Erosion, stability.	Minor resloping, revegetation.						ICAP, 1996
Pipelines, power lines.		Maintain those required for closure. Salvage or bury others.						ICAP, 1996
Buildings		Buildings not required for on-going care and maintenance will be dismantled, salvaged, or burned/buried.						ICAP, 1996
Mine Equipment		Salvaged or scrapped.						ICAP, 1996
Fuel and Oil Storage		Remaining supplies consumed or burned. Tanks salvaged or scrapped.						ICAP, 1996

Table C1 – Faro Down Valley Tailings Facility – CRI, SRK, 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
Rose Creek Tailings	Control acid generation and metal leaching.	Alternative 1 No Covers (Base Case)	Tailings surfaces left bare, no contouring or covers.			Not acceptable to objectives of decommissioning plan. High metal loadings and therefore high predicted receiving water zinc concentrations. Poor evaluation with respect to long-term stability because of risks associated with Rose Creek.		CRI, SRK 1991
			Intermediate Dam left at final elevation (estimated at 1049.3 masl). Spillway upgraded. Channel constructed across surface of impoundment to carry Rose Creek.	Spillway upgraded to carry half PMF with 1 m of freeboard or full PMF with no freeboard. Channel sized for full PMF with no freeboard.			This was estimate of final dam height, based on predictions at the time (1990).	CRI, SRK 1991
			Polishing pond behind Cross Valley dam drained and fines/contaminated soils removed to the Intermediate Dam. Cross Valley dam breached and channel constructed to redirect spillway discharge into original Rose Creek channel.					CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Upper reach of Rose Creek diversion widened and riprapped to carry half PMF. Lower Rose Creek diversion (along Intermediate Dam Impoundment) would be abandoned and armoured channel sized for PMF constructed across Intermediate Impoundment to carry Rose Creek.					CRI, SRK 1991
			Construct diversion channel around north side of Second and Intermediate Dam to carry flows from pit and waste dumps.	Channel would discharge into Intermediate Dam spillway.				CRI, SRK 1991
			North Wall Interceptor ditch would be abandoned and Next Creek returned to original channel (Guardhouse Creek) and then discharge into new diversion channel.					CRI, SRK 1991
			North Fork Rose Creek would be returned to original channel.	This would join the South Fork immediately upstream of the Pumphouse Reservoir.	The North Fork diversion would be abandoned and the four sediment control dams in the original channel removed. Dam forming Pumphouse Reservoir would be removed.			CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
		Alternative 2 Soil Cover	Three types of covers are considered within this option; composite soil cover (2a), simple soil cover (2b), or synthetic membrane cover (2c). The cover would be placed on all three impoundments.	All measures from Alternative 1 would be implemented, plus placement of covers on all three tailings impoundments.		Acceptable predicted receiving water chemistry however these predictions depend on cover performance and metal mobility. Poor evaluation with respect to long-term stability because of risks associated with Rose Creek		CRI, SRK 1991
			Intermediate Dam left at current elevation. Spillway upgraded. Channel constructed across surface of impoundment to carry Rose Creek.	Spillway upgraded to carry half PMF with 1 m of freeboard or full PMF with no freeboard. Channel sized for full PMF with no freeboard.				CRI, SRK 1991
			Polishing pond behind Cross Valley dam drained and fines/contaminated soils removed to the Intermediate Dam. Cross Valley dam breached and channel constructed to redirect spillway discharge into original Rose Creek channel.					CRI, SRK 1991
			Upper reach of Rose Creek diversion widened and riprapped to carry half PMF. Lower Rose Creek diversion (along Intermediate Dam Impoundment) would be abandoned and channel constructed across Intermediate Impoundmetn to carry Rose Creek flow.	Channel would be sized for PMF and armoured.				CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Construct diversion channel around north side of Second and Intermediate Dam to carry (storm) flows from pit and waste dumps.	Channel would discharge into Intermediate Dam spillway or a point downstream.	Must be control on water quality of pit and dump drainage, and mill site runoff.		Chemistry of pit and dump drainage and effect on receiving water.	CRI, SRK 1991
			North Wall Interceptor ditch would be abandoned and Next Creek returned to original channel (Guardhouse Creek) and then discharge into new diversion channel.					CRI, SRK 1991
			North Fork Rose Creek would be returned to original channel.	This would join the South Fork immediately upstream of the Pumphouse Reservoir.	The North Fork diversion would be abandoned and the four sediment control dams in the original channel removed. Dam forming Pumphouse Reservoir would be removed.			CRI, SRK 1991
		Alternative 3 Water Cover	Establish minimum 2 m water cover over all tailings by moving tailings and raising Intermediate Dam.	Two variations were considered; minimal tailings rehandle and 29.3 m raise of Intermediate Dam (Alternative 3a), or significant tailings rehandle to lower maximum tailings surface elevation and a 24.3 m raise of Intermediate Dam (Alternative 3b).	For alternative 3a conventional shovel and truck equipment would be used. For alternative b3, hydraulic monitoring would be used and therefore there is a significant water management and water treatment requirement during mining and until a "clean" water	Considered best technology to prevent further oxidation, however still produces a significant metal load to seepage, at least in the short term. Considered reasonable with respect to long-term stability (best after alternative 5).	Amount of tailings rehandle, and required elevation of Intermediate Dam depends on final tailings surface elevation.	CRI, SRK 1991
			Rose Creek Diversion abandoned and flow of Rose Creek routed through the flooded impoundment area.					CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Spillway required for Intermediate Dam.	Sized to carry PMF.				CRI, SRK 1991
			North Wall Interceptor ditch would be abandoned and Next Creek returned to original channel (Guardhouse Creek), discharging into flooded impoundment.					CRI, SRK 1991
			Pit overflow and drainage would flow into flooded impoundment area.	No armoured channel required in this alternative.	Control of water chemistry of pit and dump drainage flowing into flooded impoundment.			CRI, SRK 1991
			North Fork diversion would be abandoned and North Fork Rose Creek would flow into directly into flooded impoundment.	No need to breach sediment dams in original channel or breach dam forming Pumphouse Reservoir.	North Fork Diversion would be abandoned.		North Fork Diversion would be abandoned. Disagree, these probably need to be removed for physical stability at closure.	CRI, SRK 1991
		Alternative 4 Water/Composite Soil Cover	This alternative combines a water cover over the tailings in the Intermediate dam, combined with a composite soil cover over the tailings in the Original and Second Impoundments and a synthetic membrane liner on embankment faces.			Similar predictions to Alternatives 2 and 3. However considered a moderate risk with respect to long-term stability due to control structures required.	Required elevation of Intermediate Dam depends on final tailings surface elevation.	CRI, SRK 1991
			Intermediate Dam raise required.	To establish a 2 m water cover over the Intermediate Dam, it was estimated that a 10 m raise would be required.				CRI, SRK 1991
			Spillway required for Intermediate Dam.	Sized to carry PMF or half PMF with 1 m freeboard.				CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Polishing pond behind Cross Valley dam drained and fines/contaminated soils removed to the Intermediate Dam. Cross Valley dam breached and channel constructed to redirect spillway discharge into original Rose Creek channel.					CRI, SRK 1991
			Section of Rose Creek diversion beside Intermediate Impoundment would be abandoned, diversion dam breached and Rose Creek allowed to flow through flooded Intermediate Dam. Rose Creek diversion south of Second Tailings Impoundment would upgraded.	Diversion would be expanded and armoured to carry half PMF.				CRI, SRK 1991
			North Wall Interceptor ditch would be abandoned and Next Creek returned to original channel (Guardhouse Creek), discharging into flooded impoundment.					CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Construct diversion channel around north side of Second and Intermediate Dam to carry flows from pit and waste dumps.	Channel would discharge into Intermediate Dam Impoundment or spillway.	A control structure may be included to periodically route water to Original and Second Impoundments to maintain saturated layer in composite cover. Also, requires control of chemistry of drainage flowing into flooded impoundment.		Chemistry of pit and dump drainage and effect on receiving water.	CRI, SRK 1991
			North Fork Rose Creek would be returned to original channel.	This would join the South Fork immediately upstream of the Pumphouse Reservoir.	The North Fork diversion would be abandoned and the four sediment control dams in the original channel removed. Dam forming Pumphouse Reservoir would be removed.			CRI, SRK 1991
			Cover constructed.	selection of material for saturated (slimes) layer of cover.				CRI, SRK 1991
			Recontouring of tailings to form a series of level terraces, followed by construction of low dykes to form "paddies" on the tailings surface that would maintain saturation in covers.	Effect of tailings handling on surface water chemistry.	Water management and water treatment until "clean" water established (not addressed in plan?).			CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
		Alternative 5 Water Cover with Reprocessing	Tailings would be recovered from Down Valley Facility and pumped to mill for reprocessing. Water cover would be established at 1046.3 m elevation.	Water cover would be established using the existing Intermediate Dam (not raised).	Concentrator would need to be modified. Tailings would be pumped to pit.	Selected: Results in lowest predicted contaminant load, however success is contingent on removal of a significant volume of tailings. Considered to have the lowest long-term stability risk, again contingent on extent of tailings removal.	Metallurgical feasibility?	CRI, SRK 1991
			Spillway would be constructed on north abutment.	Sized to pass 1 in 500 year event with 1 m freeboard..	Considered that no additional stabilization of Dam is required.		Amount of tailings that would be left in Intermediate Impoundment. Consequences of failure of Intermediate Dam.	CRI, SRK 1991
			Tailings recovered how? How much tailings?	Spillway elevation is below original ground surface elevation in some areas of impoundment. Therefore after tailings are removed, some contaminated soils will also have to be removed and placed underwater.				CRI, SRK 1991
			Rose Creek Diversion abandoned and flow of Rose Creek routed through the flooded impoundment area.					CRI, SRK 1991
			North Wall Interceptor ditch would be abandoned and Next Creek returned to original channel (Guardhouse Creek), discharging into flooded impoundment.					CRI, SRK 1991

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Long-term Success at the time	Additional Information Needed/Available	Document Reference
			Pit overflow and drainage from waste dumps would flow into flooded impoundment area via original Faro Creek channel.				Chemistry of pit and dump drainage and effect on receiving water.	CRI, SRK 1991
			North Fork Rose Creek would be returned to original channel.	This would join the South Fork immediately upstream of the Pumphouse Reservoir.	The North Fork diversion would be abandoned and the four sediment control dams in the original channel removed. Dam forming Pumphouse Reservoir would be removed.			CRI, SRK 1991

Table D1 – Faro Mine, Curragh Resources 1988 – All Facilities

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Open Pits		Flooding of both the Main pit and the Zone II pit.	After completion of mining, Faro Creek would be diverted into Main Pit to fill. Two dykes to be constructed at low points to raise flooded elevation (west and south sides of pit).	Groundwater will be monitored by sampling wells south of Zone II and surface water monitoring.	Overflow would be pumped and treated until suitable for discharge to North Fork Rose Creek.	Selected measure.		Curragh, 1988.
			Construction of overflow spillway and exit channel.			Selected measure.		Curragh, 1988.
			Zone II pit will be allowed to fill.	Overflow exits through a constructed rock drain to a sump.	Water will be pumped from sump to treatment facility until suitable for discharge.	Selected measure.	Sources of contaminants and variations in loading with seasons and over time.	Curragh, 1988.
		Backfill of Zone II pit will be completed.	Plan was to be backfilling with non-acid generating rock.	Plan was that long-term treatment from this pit would not be necessary.	Construction of interceptor ditches for surface water and shallow groundwater away from pit to limit inflow through pit walls.	Selected measure.		Curragh, 1988.
Tailings	ARD, physical stability					Selected measure.		Curragh, 1988.
Waste Dumps - Under construction at the time.	ARD	Separate sulphide dump, then backfill all reactive rock into Main Pit.	Plan was to haul all non acid generating rock to Zone II, east and intermediate dumps.		Construction of separate cellular sulphide dump with base of calc silicates and a compacted phyllite cover.	Selected measure.		Curragh, 1988.
Waste Dumps - Existing Dumps	ARD	Assessment of problem.	Take water samples to assess concerns. Map and sample rocks on dumps.	Assume dumps will not generate acid but are concerned about elevated zinc levels.		Selected measure.	Didn't know composition of dumps, no ARD testing.	Curragh, 1988.

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/ Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Waste Dumps	Slope stability	No action required.	Based on observation, 2:1 dump slopes are considered stable.		Planned to do an assessment of dump slope stability with ongoing monitoring until closure.	Selected measure.		Curragh, 1988.
North Fork Rock Drain	Stability under high flows.	Rock drain causeway will be breached and emergency spillway constructed.	Spillway will be constructed and downstream slope prepared to minimize erosion.	Commented on water sampling but no concerns with respect to water quality at that time.	Concern about fisheries habitat loss as a result of construction.	Selected measure.		Curragh, 1988.
Pumphouse Dam	Physical stability.	Dam will be breached and concrete broken up, removed or buried.				Selected measure.		Curragh, 1988.
Freshwater resrevoir.		Reservoir dam will be upgraded, spillway lowered by 2 m and dam left in place.		To maintain overwintering habitat and as a flood reservoir for protection downstream.		Selected measure.		Curragh, 1988.
Faro Creek Diversion		Construct temporary channel to divert Faro Creek into pit to flood faster.	Diversion will be maintained until water quality in pit suitable for discharge, at which time a permanent channel to put Faro Creek into pit will be constructed.	If permanent water treatment required, channel will be upgraded to maintain diversion.	Construction of permanent diversion channel complicated by presence of Faro Valley dumps. Must construct around dumps to minimize flow through acid generating waste rock in these dumps. Possibly must remove part of dumps.	Selected measure.	Extent of acid generation from dumps. Potential for clean pit option.	Curragh, 1988.
North Valley Wall Interceptor Ditch		Upgrade and leave in place.	Increase capacity by 50%, armour and stabilize slopes.			Selected measure.		Curragh, 1988.
North Fork Rose Creek		Return to original channel.	At confluence with Rose Creek, upstream of the pumphouse.			Selected measure.		Curragh, 1988.

Table E1 – Faro Rose Creek Tailings Facility – Klohn Leonoff 1981 – Rose Creek Tailings

Specific Component (source)	Specific Issue	Description of Methods	Description	Considerations	Limitations/Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Rose Creek Tailings	Physical stability, metal leaching and ARD	Alternative 1 Retain tailings in unsaturated state and cover.	Route all water around tailings facility and treat tailings surface.	This might minimize infiltration of water and "maximize inherent strength of the tailings and tailings dams."	Continued oxidation of tailings. Difficulties in design and construction of Rose Creek diversion structure.	Concerns remain with water quality.		Klohn Leonoff, 1981
			Surface runoff from Rose Creek and tributary drainages would be diverted around tailings using Rose Creek and North Valley Wall Interceptor structures.	Scheme was previously proposed by Golder 1977.	Construction of either upgraded channel or tunnel for Rose Creek diversion. Recommended channelling Faro Creek flow and Zone II pit outflow into North Fork Rose Creek. Construction of low permeability, low sulphide cover.	Advantages - channel water away from tailings and minimize infilration and metal leaching, economically attractive as uses existing structures, maintains fish passage. However there are concerns with log-term stability of diversion structures, design of channels to carry PMF, measures to prevent channel from blocking and design to prevent failure of channel and flow across unsaturated tailings.	Engineering required for long-term stability and effectiveness of water management structures.	Klohn Leonoff, 1981
			Construct cover.					Klohn Leonoff, 1981
		Alternative 2 Submerge tailings.	Construct dam downstream of tailings to flood area.	Some levelling of tailings might be required. Reservoir could also act as a settlign basin, and provide attenuation of peak flood events.	Construct spillway.	Concerns are quality of rock in abutments, permafrost, blockage of spillway.	Spillway design and construction materials.	Klohn Leonoff, 1981
			Raise one of the dam crests to flood impoundment.		Faro Creek will flow through the Main Pit and spill into the flooded tailings reservoir.			Klohn Leonoff, 1981

Specific Component (source)	Specific Issue	Description of Methods	Description	Considerations	Limitations/Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
			Construct spillway to carry Rose Creek flow downstream of the dam and into the original Rose Creek Valley.	Location of the dam - proposed either moving the Cross Valley Dam downstream (selected) or using the Intermediate Dam.	Runoff from upstream of flooded impoundment must be routed through impoundment. Also must route overflow from Main Pit through flooded impoundment. Anticipated some tailings would have to be moved from higher elevation in impoundment to below flooded level.	Has advantages of control of oxidation, wind erosion, sedimentation basin however the concerns are the physical stability and expense of the spillway and increased infiltration through the tailings.	Design of spillway, location of the dam. Needed to consider water quality concerns for both the tailings pond water and the pit water.	Klohn Leonoff, 1981
		Alternative 3 Remove tailings from Rose Creek Valley.	Remove all or a portion of tailings to Main Pit.	Consider that all tailings would need to be removed otherwise containment facility would still be needed.	Cleanup of exposed ground required after tailings removed, remove Cross Valley and Intermediate Dams.	Very high cost.		Klohn Leonoff, 1981

Table E2 – Faro Rose Creek Tailings Facility – Klohn Leonoff 1981 – Other Facilities – Independent of Closure of Rose Creek Tailings

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Freshwater Supply Dam		Remove dam and restore stream bed.		Removal of dam restores fish passage up Rose Creek.		Selected.	Suggested that at closure this dam might be used for power generation.	Klohn Leonoff, 1981
Pumphouse and Related Facilities		Pumphouse will be removed, pond drained and dam removed.		This dam is not necessary with the implementation of Alternative 2, as recommended by the consultant.	Concern about release of sediments when dam is removed.	Selected.		Klohn Leonoff, 1981
North Fork Rose Creek Diversion		Diversion structure removed and original channel improved to return creek to pre-mine condition.				Selected.		Klohn Leonoff, 1981
Faro Creek Diversion		Diversion structure will be removed and Faro Creek allowed to flow into pit.			Did not consider closure requirements for open pit in this plan.	Selected.		Klohn Leonoff, 1981
Waste Rock Dumps	Physical stability	No concerns based on observation and design.		Abandonment concern could be slides into North Fork Rose Creek but not anticipated with current design and foundation conditions.		Selected.		Klohn Leonoff, 1981
Waste Rock - Sulphides	Geochemical	Isolate to minimize oxidation and leaching.	No measures recommended.			Selected.		Klohn Leonoff, 1981

Specific Component (source)	Specific Issue	Measure	Description of Methods	Considerations	Limitations/Concurrent Activities	Evaluation of Success at the time	Additional Information Needed/Available	Document Reference
Open Pits		Backfill Zone II pit, allow Main pit to flood.	For Alternative 3, tailings would also be placed in Main Pit.	Exposed sulphides above flooded level not considered a concern.	Outflow from pit will flow through waste dump therefore a overflow channel is required, and a small berm at point of outflow from waste dumps.	Selected.		Klohn Leonoff, 1981