DRAFT II

GOVERNMENT OF CANADA

NORTHERN AFFAIRS PROGRAM

WHITEHORSE, YK

CURRAGH INC.

FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

Report # NAP304

July 1993

GOVERNMENT OF CANADA

NORTHERN AFFAIRS PROGRAM
WHITEHORSE, YK

CURRAGH INC.
FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

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TEMPORARY CLOSURE COST ESTIMATES

SECTION 1.0

INTRODUCTION

DRAFT II

CURRAGH INC.

FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATE

1.0 INTRODUCTION

Robert J. Rodger, P. Eng. was retained by the Department of Indian and Northern Affairs (DIAND) Northern Affairs Program - Whitehorse to prepare cost estimates for temporary closure of the Faro operations. The report covers only those activities required to minimize the impact on the environment and on discharge water quality, in the event of a temporary closure.

For the purposes of this report, temporary closure is defined as a cessation of mining and processing operations for an indefinite period, with the intention of reopening the operations.

The report was based on a review of the documents and the Yukon Territory Water Board (YTWB) licences and schedules (Appendix I) made available by the Northern Affairs Program. It also draws on information contained in previous reports prepared this year for DIAND Northern Affairs - Whitehorse (Appendix I).

1.1 BASIS FOR COST ESTIMATE REVIEW

The cost estimates cover those activities required to minimize the impact on the environment and on discharge water quality. The estimates do not include maintenance of buildings and equipment required to preserve the value of the assets or to facilitate start-up.

In this review, the cost estimates are based on the following assumptions:

The work is to be undertaken by contractors;

the work is as required by Curragh Inc. under the terms of its licences; together with,

additional work necessary to meet water quality standards.

Unit cost estimates were reviewed on the basis of in-house data, and compared to rates contained in the DIAND report entitled "Mine Reclamation in the Northwest Territories and Yukon".

A contingency of 20 % has been applied to those estimates for work of a capital nature as well as the physical maintenance work.

Engineering, procurement and construction management (EPCM) for this type of project would commonly cost 7 to 12 % of the project cost after contingency. These are the percentages used in this review.

The estimates are in constant 1993 dollars.

CURRAGH INC.
FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

SECTION 2.0

FARO TEMPORARY CLOSURE COSTS

2.0 FARO TEMPORARY CLOSURE COSTS

In addition to a brief description of the operations, this section of the report outlines work of a non-recurring nature, which should be undertaken at this time for temporary closure. These estimated costs are presented in Table 2.1.1. The monitoring, maintenance and administration requirements are outlined in Section 3.0.

The Faro mining operation was established by Cyprus Anvil Mining Corp (CAMC) in 1969 and continued until 1982. Curragh Inc. acquired the operation in 1985 and the mine was in production from 1986 until December 1992, when there was a temporary closure. The financial difficulties experienced by Curragh Inc. have resulted in a closure of longer than forecast duration.

2.1 FARO OPEN PIT AND UNDERGROUND MINES

Aside from small remnants of ore remaining in the pit, estimated at 300,000 tonnes, the three zones comprising the Faro open pit and underground are mined out.

2.1.1 Faro Open Pit

With closure of the Faro pit, it is being allowed to fill with water. Tailings were deposited in the Faro pit from mid 1992 until temporary closure in December 1992. Since the temporary inlet from Faro Creek has not been installed, the pit filling will require a number of years.

Sulphide waste rock remains on the walls of the pit, particularly on the northwest (in the area designated as MPA 3 & 4 in the seep surveys) and southern walls (MPA 9).

From the seep surveys conducted during 1987 - 88, the flows from the seeps on the exposed northwest wall are low. Although the zinc concentration is high, Curragh Inc. considers that because of the dilution and neutralization effect of the water in Faro Lake, the metal loading from seeps should not have a negative impact on water quality in the pit.

2.1.2 Waste Rock Dumps

The waste rock from the open pits has been placed on dumps located around the open pit. During mining of the Faro pit by Curragh Inc., waste rock containing sulphide minerals was segregated into sulphide cells in specific areas of the waste dumps. These cells have been covered with a layer of phyllite rock. During the CAMC era, there was no segregation of sulphide waste rock. As a result, the drainage from some of the waste dumps established during that period is acidic.

From the seep surveys conducted during 1987 - 88, the flow from the southwest main dump consistently has high zinc concentrations. While the flow varies seasonally, it averages 3.2 l/s. Zinc concentrations are of the order of 20 - 25 mg/l.

Drainage ditches have been constructed around the toe of the northeast and south dumps as well as the southeast section of the main waste dump to collect water. The water presently flows into the Down Valley Tailings Impoundment.

The waste dump in the Faro Creek channel north of the pit also contains sulphide waste rock. The seepage from this dump flows into Faro pit.

Zone II was mined as a separate open pit located to the south of the main pit, and has since been filled with non acid-generating waste rock from the main open pit. The water flowing from the waste dump located over the Zone II open pit, however, does contain high zinc values. At present, this water is pumped from a well in Zone II to the main pit.

The cost of pumping water from the Zone II pit is included in the section on Ongoing Work for the Faro site (Section 3.1.1).

2.2 FARO MILL COMPLEX AND SURFACE FACILITIES

2.2.1 Fuel and Lube Storage Areas

The fuel and lubricants in the tanks, which are located both above and below ground, should be returned to the fuel supplier.

The estimated cost is $ 2,000.

2.2.2 Chemical Inventory

There is a wide variety of chemicals and reagents on site. In addition, some of the reagent mixing tanks contain reagents. Each chemical should be disposed of in accordance with the guidelines. Most of the chemicals in active use at the time of closure could be returned to the manufacturer. It is expected that at least some of the chemicals are old or obsolete stock.

The estimated cost is $ 50,000.

2.3 DOWN VALLEY TAILINGS IMPOUNDMENT

Tailings from the processing of ores mined from the Faro open pit were placed in the Down Valley Tailings Impoundment from the start of operations until mid 1992. The impoundment is located below the Faro operations in the valley of Rose Creek. The tailings consist of mineral rejects from the processing and contain sulphide minerals which can oxidize to produce an acidic water discharge from the impoundment.

Curragh Inc. proposed to spray lime on the exposed tailings to minimize oxidation of the tailings and acid generation. Testing was to be undertaken to assess the effectiveness of lime addition and to determine optimum quantities. Subsequently, Curragh Inc. indicated that lime addition was not cost effective, since the tailings are similar to hard pan in some areas and the surface is undulating.

When Curragh Inc. stopped disposal of tailings in the Down Valley Tailings Impoundment, there was an increase in the zinc level in the water in the impoundment area. Addition of lime to the water in the impoundment was necessary to increase the pH and decrease zinc concentrations in the water.

The lime was prepared in the lime mixing tank at the mill and transported to the tailings pond by a water truck from the open pit mining operation. Water was recirculated from the Cross Valley pond to the Intermediate Impoundment. It is assumed in this report that a similar approach would be utilized in the future.

The cost of lime addition is included in the section on Ongoing Work for the Faro site (Section 3.1.1).

2.4 VANGORDA PLATEAU

The Vangorda Plateau Development, located 14 km southeast of the Faro mill, includes the Vangorda open pit with the associated overburden and waste rock dump, and the Grum open pit and overburden dumps. The Vangorda open pit was developed during 1990 to provide ore for the Faro mill during the period between depletion of ore from the Faro pit and development of the Grum open pit. In order to mine the Vangorda deposit, it was necessary to divert Vangorda Creek around the perimeter of the ultimate pit.

To date, only overburden has been removed from the Grum pit.

The Vangorda and Grum pits are being allowed to fill with water.

The waste rock from the Vangorda open pit has been placed on the dump located to the southwest of the open pit. From tests conducted by Curragh Inc., most of the waste from the Vangorda open pit has the potential to generate acid. To minimize the quantity of acid generation, Curragh Inc. segregated the high sulphide waste and altered phyllite waste into two separate cells. The cells would be surrounded by glacial till berms and then covered with till when mining of the pit was complete.

An increased volume of waste resulted from a change in the original design of the Vangorda open pit. Curragh Inc. modified design of the pit by changing the location of the access/haul ramp to the ore on the lower benches of the pit. This additional waste was removed from the northwest side of the pit.

2.4.1 Instrumentation

The report (# 160649) prepared by Steffen, Robertson and Kirsten (Canada) inc. (SRK) on the modified design for the Vangorda waste dump outlined instrumentation requirements and a program for monitoring of the dump. The instrumentation has not been installed, as yet.

The estimated cost is $ 20,000.

2.4.2 Collection Ditch

Water draining from the Vangorda waste dump flows into a collection ditch constructed around the base of the waste dump. The ditch was supposed to direct the water into a collection pond, but difficulties have been encountered because of the flat slope of the ditch and sloughing of the ditch walls. Curragh Inc. planned to install pipe in the ditch between the rock drains to improve collection. The water is pumped from the collection pond to the water treatment plant.

The estimated cost of the piping is $ 82,000.

2.4.3 Fuel and Lube Storage Areas

The fuel and lubricants stored in the tanks, which are located above ground, should be removed.

The estimated cost is $ 2,000.

CURRAGH INC

FARO OPERATIONS
TEMPORARY CLOSURE

Table 2.1.1 NON-RECURRING WORK
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST	TOTALS
FARO SITE					
CHEMICAL INVENTORY					
Disposal	l.s.			$50	
					$50
FUEL & LUBE					
Removal	l.s.			2	
					2
FRESH WATER RESERVOIR					
Stop Log Removal	l.s.			2	
					2
VANGORDA WASTE DUMP					
COLLECTION DITCH					
Excavation	cu. m.	10,000	3.00	30	
Piping	m.	1,300	40.00	52	
					82
INSTRUMENTATION					
Installation	l.s.			20	
					20
VANGORDA PLATEAU					
FUEL & LUBE					
Removal	l.s.			2	
					2
Subtotal					158
Contingency (20 %)					32
Subtotal					190
EPCM (7 %)					13
TOTAL					$203

CURRAGH INC.
FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

SECTION 3.0

MONITORING, MAINTENANCE AND ADMINISTRATION COSTS

3.0 MONITORING, MAINTENANCE AND ADMINISTRATION COSTS

A monitoring programme is required under the terms of the water licences to ensure that the water quality remains satisfactory. It is assumed that the monitoring is carried out by technical personnel specialized in the particular field. It is also assumed this is carried out by third parties.

During temporary closure, structures such as the dams, diversions and spillways will require maintenance. It is assumed that all the maintenance would be undertaken by local contractors.

Operation of the water treatment plant would form part of the monitoring and maintenance programme.

There would be no monitoring and maintenance requirements for the Faro mill complex and surface facilities.

3.1 FARO SITE

3.1.1 Ongoing Work

In the report prepared by SRK (# 60605) on measures to be taken in the event of temporary closure, there are measures to stabilize the tailings area and diversion channels. SRK recommended that this work be completed prior to temporary closure. It is assumed in this report that these measures have been taken.

As indicated in Section 2.0 of this report, there are a couple of other areas which require ongoing work.

3.1.1.1 Zone II Pumping

The water flowing from the waste dump located over the Zone II open pit contains high zinc values. At present, this water is pumped from a well in Zone II to the main pit.

The estimated annual pumping cost is $ 5,000.

3.1.1.2 Down Valley Tailings Impoundment

There was an increase in the zinc level in the water in the Down Valley tailings impoundment area. Addition of lime to the water in the impoundment was necessary to increase the pH and decrease zinc concentrations, before discharging the water from the Cross Valley pond. It is expected that the high zinc levels will continue in the future. The lime was prepared in the lime mixing tank at the mill and transported to the tailings pond by a water truck from the open pit mining operation. Water was recirculated from the Cross Valley pond to the Intermediate Impoundment. It is assumed in this report that a similar approach would be utilized in the future.

The cost would depend on the water flow into the impoundment.

Curragh Inc.

Table 3.1.1 Faro Site
Ongoing Work Cost Estimate
(1993 constant dollars)

Zone II Pumping		
Pumping	$ 5,000	
Down Valley Tailings Pond		
Lime Addition	100,000	
		105,000
Contingency (20 %)		21,000
TOTAL ANNUAL COST		$ 126,000

3.1.2 Monitoring

Under the terms of its licence, Curragh Inc. is required to conduct water sampling, biological monitoring and physical inspection at specified intervals. Curragh Inc. is also required to submit monthly and annual reports on the inspections and various other aspects of the operations. With the exception of water sampling of fewer stations, the requirements do not change during temporary closure.

Water quality sampling required during temporary closure in outlined in Schedule A, Part II of the YTWB Licences issued

to Curragh Inc.

Biological monitoring requirements are outlined in Schedule B of the YTWB Licences issued to Curragh Inc. Biological monitoring surveys must be conducted every second year.

The visual inspection requirements are outlined in Schedule C of the YTWB Licences issued to Curragh Inc. It involves monitoring the installed instrumentation as well as checking the dams, dykes and dumps for tension cracks, bulges, seeps and erosion, and recording any of these or other occurrences. The visual inspection includes checking the spillways and rock drains for blockage and other problems as well as estimating the flows.

The monitoring at the Faro operations would be coordinated with the monitoring required for the Vangorda Plateau. It is assumed that the biological monitoring and physical inspection in Table 3.1.2 covers both sites.

Curragh Inc.

Table 3.1.2 Faro Site Monitoring Cost Estimate (1993 constant dollars)

Water Quality		
Sample Collection	$ 10,500	
Sample Analysis	14,200	
Travel and Lodging	3,500	
Report Preparation	2,500	
		$ 30,700
Biological Monitoring		
Site Work	17,500	
Sample Enumeration	5,000	
Helicopter	9,000	
Report Preparation	2,500	
	34,000/2	17,000
Physical Inspection		
Site Work	17,500	
Travel and Lodging	4,000	
Report Preparation	2,500	
		24,000
TOTAL ANNUAL COST		**$ 71,700**

3.1.3 Physical Maintenance

Maintenance would be required for the dams, diversion ditches, collection ditches and spillways, all of which could be subject to damage from freeze-thaw cycles, erosion or other problems.

Since the facilities have not been prepared for permanent closure, it is expected that maintenance requirements are higher than for permanent closure. It is probable that the maintenance would require eight days work every year. An estimate of the cost is shown in Table 3.1.3

Curragh Inc.

Table 3.1.3 Faro Site
Maintenance Cost Estimate
(1993 constant dollars)

Mobilization and Demobilization		$ 2,000	
Equipment (including operators)			
Loader	80 hr x $ 150/hr	12,000	
Backhoe	80 hr x $ 120/hr	9,600	
Truck	80 hr x $ 100/hr	8,000	
Travel and Subsistence			
4 men x 8 days x $ 100/day		3,200	
Contractor's Supervisor			
8 days x $ 700/day		5,600	
Travel and Subsistence		2,100	
Pick-up		3,200	
Miscellaneous		4,000	
			$ 49,700
Contingency (20 %)			9,900
TOTAL ANNUAL COST			**$ 59,600**

3.2 VANGORDA PLATEAU DEVELOPMENT

3.2.1 Water Treatment Plant

At indicated in Section 2.4, most of the waste on the Vangorda waste dump has the potential to generate acid. The water treatment plant installed at Vangorda treats the acid rock drainage (ARD) from the waste dumps. Based on the estimates of water flow from the dumps, it is assumed that the plant would be operated on an one shift basis for six months of the year.

Curragh Inc.

Table 3.2.1 Vangorda ARD Water Treatment Plant
Operating Cost Estimate
(1993 constant dollars)

Labour		
Operating	$ 55,000	
Supervision	35,000	
Maintenance	28,000	
		$ 118,000
Supplies		
Reagents	18,000	
Operating	12,000	
Maintenance	41,000	
Power	35,000	
		106,000
Sludge Pond Maintenance and Sludge Disposal	25,000	
Sampling and Analysis	10,000	
		35,000
TOTAL ANNUAL COST		$ 259,000

3.2.2 Monitoring

As with the Faro operations, Curragh Inc. is required to conduct water sampling, biological monitoring and physical inspection at specified intervals under the terms of its licence for Vangorda. Curragh Inc. is also required to submit monthly and annual reports on the inspections and various other aspects of the operations. Unlike Faro, the water sampling at the specified stations is required on a quarterly basis. During operation of the water treatment plant, weekly sampling is required at two stations. The other monitoring requirements do not change during temporary closure.

Curragh Inc.

Table 3.2.2 Vangorda Plateau
Monitoring Cost Estimate
(1993 constant dollars)

Water Quality		
Sample Collection	$ 7,000	
Sample Analysis	9,100	
		$ 16,100
TOTAL ANNUAL COST		$ 16,100

3.2.3 Physical Maintenance

Maintenance will be required for the Vangorda Creek diversion ditch as well as the till berms and collection ditches for the Vangorda waste dumps, all of which could be subject to damage from freeze-thaw cycles, erosion or other problems.

It is probable that the maintenance would require five days work every year. An estimate of the cost is shown in Table 3.2.3.

Curragh Inc.

Table 3.2.3 Vangorda Plateau
Maintenance Cost Estimate
(1993 constant dollars)

Mobilization and Demobilization		$ 2,000	
Equipment (including operators)			
Loader	50 hr x $ 150/hr	7,500	
Backhoe	50 hr x $ 120/hr	6,000	
Truck	50 hr x $ 100/hr	5,000	
Travel and Subsistence			
4 men x 5 days x $ 100/day		2,000	
Contractor's Supervisor			
5 days x $ 700/day		3,500	
Travel and Subsistence		1,000	
Pick-up		2,000	
Miscellaneous		2,000	
			$ 31,000
Contingency (20 %)			6,200
TOTAL ANNUAL COST			$ 37,200

3.3 OTHER

3.3.1 Site Security

For the purposes of this report, it assumed that site security is provided on a round-the-clock basis by a firm specialized in the field. There would be two people on duty during the day shift when the water treatment plant is not operating. One person would be based at the guardhouse while the second person would tour the facilities on a regular basis. There would be one person on night shift and when the water treatment plant is operating. The night shift guard would also tour the facilities on a scheduled basis.

Curragh Inc.

Table 3.3.1 Faro Operations
Site Security Cost Estimate
(1993 constant dollars)

Personnel	
30 man-months (m-m) x $ 10,000/m-m	$ 300,000
Pick-up	
12 months x $ 2,000	24,000
TOTAL ANNUAL COST	$ 324,000

3.3.2 Road Maintenance

The road from the town of Faro to the mine site as well as roads on the site would require maintenance. It is expected that the maintenance would cover periodic grading, unblocking culverts and other minor repairs. To the extent possible, this work should be coordinated with other site maintenance requirements.

Snow removal on the access and site roads will also be required during the winter months. It is assumed that the snow removal contract would be an extension of the contract for snow removal for highways in the region.

Curragh Inc.

Table 3.3.2 Faro Operations
Road Maintenance Cost Estimate
(1993 constant dollars)

Equipment (including operators)			
Loader	40 hr x $ 150/hr	$ 2,000	
Backhoe	40 hr x $ 120/hr	4,800	
Truck	40 hr x $ 100/hr	4,000	
Travel and Subsistence			
4 men x 4 days x $ 100/day		1,600	
Contractor's Supervisor			
4 days x $ 700/day		2,800	
Travel and Subsistence		1,100	
Pick-up		1,600	
Miscellaneous		2,000	
			$ 19,900
Contingency (20 %)			4,000
TOTAL - MAINTENANCE			$ 25,600
Snow Removal			68,000
TOTAL ANNUAL COST			$ 73,600

3.3.3 Site Overhead

Site overhead costs for such items as electrical energy, heat, telephone and office supplies will be incurred in support of the activities outlined above. It is assumed that site overhead costs are 10 % of site costs.

Curragh Inc.

Table 3.3.3 Faro Operations
Site Overhead Cost Estimate
(1993 constant dollars)

Faro Site		
Ongoing Work	$ 126,000	
Physical Maintenance	59,600	
		$ 185,600
Vangorda Plateau		
Water Treatment Plant	259,000	
Physical Maintenance	37,200	
		296,200
Other		
Site Security	324,000	
Road Maintenance	73,600	
		397,600
Subtotal		879,400
SITE OVERHEAD (10 %)		$ 88,000

3.3.4 Administration

The requirements for temporary closure are fairly extensive, and there would be a need to manage and co-ordinate these activities. It is assumed that administration costs are 7 % of the costs outlined above.

Curragh Inc.

Table 3.3.4 Faro Operations
Administration Cost Estimate
(1993 constant dollars)

Faro Site		
Ongoing Work	$ 126,000	
Monitoring	71,700	
Physical Maintenance	59,600	
		$ 257,300
Vangorda Plateau		
Water Treatment Plant	259,000	
Monitoring	16,100	
Physical Maintenance	37,200	
		312,300
Other		
Site Security	324,000	
Road Maintenance	73,600	
		297,600
Subtotal		867,200
ADMINISTRATION (7 %)		$ 60,700

CURRAGH INC.
FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

SECTION 4.0

SUMMARY OF TEMPORARY CLOSURE COSTS

4.0 SUMMARY OF TEMPORARY CLOSURE COSTS

The temporary closure cost estimates outlined in this report are summarized in Table 4.1.

CURRAGH INC

FARO OPERATIONS
TEMPORARY CLOSURE

Table 4.1 SUMMARY OF ESTIMATED COST
(Thousand 1993 dollars)

DESCRIPTION	COST
CAPITAL WORK	
FARO SITE	54
VANGORDA PLATEAU	104
Subtotal	158
Contingency (20 %)	32
Subtotal	190
EPCM (7 %)	13
TOTAL	$203

MONITORING & MAINTENANCE		
FARO SITE		
Ongoing Expense	126	
Monitoring	72	
Maintenance	60	
		257
VANGORDA PLATEAU		
Water Treatment	259	
Monitoring	16	
Maintenance	37	
		312
OTHER		
Site Security	324	
Road Maintenance	74	
Site Overhead	88	
Administration	61	
		546
TOTAL ANNUAL EXPENSES MONITORING, MAINTENANCE AND ADMINISTRATION		1,116

CURRAGH INC.
FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

APPENDIX I

REFERENCES

CURRAGH INC.

FARO OPERATIONS

TEMPORARY CLOSURE COST ESTIMATES

APPENDIX I

REFERENCES

1. FARO OPEN PIT

1.1 Curragh Resources Inc.
Faro Mine Abandonment Plan
April 1988

1.2 Curragh Resources Inc.
Faro Temporary Abandonment Plan
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60605

1.3 Curragh Resources Inc.
Development of the Zone 2 Waste Dump
December 1987

1.4 Curragh Resources Inc.
Faro Pits and Waste Rock Dumps
1987 and 1988 Seep Surveys
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60612
June 1989

2. DOWN VALLEY TAILINGS

2.1 Curragh Resources Inc.
Groundwater Contingency Plans
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60603
March 1987

2.2 Curragh Resources Inc.
Conceptual Plans for Stabilization of Rose Creek Tailings Facilities, Rose Creek Diversion and North Wall Interceptor in the Event of Temporary Closure.
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60604
April 1988

2.3 Curragh Resources Inc.
Down Valley Tailings Impoundment Decommissioning Plan.
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60635
Volumes I to IV
April 1991

2.4 Curragh Resources Inc.
Faro Decommissioning - Overview of the Environmental Plans
Volumes I and II
December 1991

2.5 Curragh Resources Inc.
Yukon Territory Water Board IN89-001-PH91
Exhibit V and VIII

2.6 Curragh Resources Inc.
Amendment # 1 to IN89-001
Faro Mine Water Recycle and Tailings Deposition Plan.
Volumes I and II
Kilborn Inc. Report # 3509 28

2.7 Northern Affairs Program
Down Valley Tailings Impoundment Decommissioning Plan.
Evaluation Report and Addendum
PBK Engineering Ltd. Project # 91116
November 1991

2.8 Environmental Protection Environment Canada
Critical Evaluation of Curragh, Down Valley Tailings Acid Mine Drainage Modelling, 1986 - 1991
Ronald V. Nicholson and Jeno M. Scharer
Draft Final Report
February 24, 1993

2.9 Northern Affairs Program
Curragh Resources - Faro Mine
Report on 1992 Inspection.
GEO-ENGINEERING (M.S.T.) LTD. Report # G052-4
September 1992

3. VANGORDA PLATEAU DEVELOPMENT

3.1 Curragh Inc.
Vangorda Plateau Development
Expansion of the Vangorda Mine Rock Containment Facility.
Steffen, Robertson, Kirsten (Canada) Inc. Letter Report # 160649
December 1992

3.2 Curragh Resources Inc.
Vangorda Plateau Development
Review of Alternative Abandonment Plans and Water Quality Prediction Methods.
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60609
February 1990

3.3 Curragh Resources Inc.
"Stage Two" Initial Environment Evaluation
Volumes I, II and III
July 1989

3.4 Curragh Resources Inc.
"Stage Two" Initial Environment Evaluation
Addendum
May 1990

3.5 Curragh Resources Inc.
Vangorda Plateau Development
Projected Mitigation and Treatment Costs for Closure.
CRI Report # WH003.
Steffen, Robertson, Kirsten (B.C.) Inc. Report # 60609
June 1990

3.6 Northern Affairs Program
Vangorda Plateau Development
Mine Abandonment Plan Evaluation Report
PBK Engineering Ltd. Project # 90086
June 1990

4. FARO SURFACE FACILITIES

4.1 Curragh Resources Inc.
Other Facilities Abandonment Plan

5. YUKON TERRITORY WATER BOARD

5.1 Water Licence # IN89-001

Licence issued to Curragh Resources Inc. for Rose Creek., with,

Amendment # 1, and

Amendment # 2.

5.2 Water Licence # IN89-002

Licence issued to Curragh Resources Inc. for Vangorda Creek.

Joseph Lazarovich
Director, Mining and Infrastructure

Fred Privett
Chairman of Regional Curragh Issues Core Group

September 15, 1993

Immediate, Temporary and Permanent Closure of Curragh's Faro and Vangorda Operations

Please find attached a summary of immediate, temporary and permanent closure activities and costs prepared by Water Resources in respect to Curragh's Faro operations.

Please note, that while some consultation with DOE and DFO has taken place, they have not reviewed these specific recommendations Based on previous discussions with them they may have different views on some of the elements of closure.

The permanent closure costs do not include all of the elements of closure considered necessary to satisfy surface land reclamation requirements. We are in possession of a draft costing report on surface reclamation recently prepared by Bob Rodger based on information provided by Land Resources. I will forward this to you once we have had time to evaluate it.

Fred Privett

Fred Privett
CC Joe Ganske

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

To / À: Fred Privett, Co-ordinator
Curragh Issues Regional Core Group
Yukon Region

From / De: Dave Sherstone
Regional Manager, Water Resources
Yukon Region

Security Classification – Classification de sécurité
Our File – Notre référence
Your File – Votre référence
Date: September 15, 1993

Subject / Objet

WATER RESOURCES RECOMMENDATIONS AND PRELIMINARY COSTINGS FOR IMMEDIATE, TEMPORARY AND PERMANENT CLOSURE OF CURRAGH'S FARO AND VANGORDA OPERATIONS.

Outlined below are three sets of recommendations for the Faro and Vangorda sites. These are based on Water Resources best estimation of the work needed to maintain water quality at these sites for the "immediate" future, for a "temporary" closure and for a "permanent" abandonment.

Water Resources defines these periods as follows;

Immediate. The immediate future covers the period from the abandonment of responsibility by Curragh until the time that a receiver or trustee is appointed to manage the assets of Curragh. This period is expected to be no greater than six months and should terminate no later than the beginning of the Spring freshet of 1994.

Temporary. A temporary closure would be a mothballing of the Faro and Vangorda sites for a period no longer than three years. This period would place the sites in a condition that production could be resumed without significant additional retroactive work on environmental structures and processes. The mines and capital assets could be sold during this period without the environmental liabilities having been increased.

Permanent. This would represent either the final abandonment of the site or an enhanced temporary shut-down where operation was not expected to resume for at least three years.

FARO SITE: WATER LICENCE IN89-001, AMENDMENT #3.

Immediate Measures

1. Maintain tailings pond water above pH 9.5 by operating liming plant and related water works,

2. Monitor structural integrity of all dams, spillways and other water control and treatment structures,

3. Maintain a program of water quality analyses to ensure licence limits are met,

4. Continue pumping Zone II waters to main Faro pit,

5. Maintain the Faro Creek diversion,

6. Remove all chemicals and fuels stocks from site that are not immediately required for operations of 1, 4, and 5, above,

7. Provide adequate site and operations security.

Temporary Measures

1. Remove all stop logs from the fresh water reservoir, prior to the Spring 1994 freshet,

2. Upgrade the spill way dike at the intermediate dam, during the Winter of 93-93 or early Spring 1994,

3. Maintain tailings pond water above pH 9.5 by operating liming plant and related water works,

4. Monitor structural integrity of all dams, spillways and other water control and treatment structures,

5. Maintain a program of water quality analyses to ensure licence limits are met,

6. Continue pumping Zone II waters to main Faro pit,

7. Maintain the Faro Creek diversion,

8. Remove all chemicals and fuels stocks from site that are not immediately required for operations of 1, 4, and 5, above,

9. Provide adequate site and operations security.

Permanent Closure

1. Breach the fresh water reservoir,

2. Breach the North Fork Rose Creek Causeway,

3. Remove all tailings to Faro open pit. Breach all stream control structures and restore Rose Creek to valley bottom,

4. Establish "Faro Lake" and route discharge via the original Faro Creek channel,

5. Maintain water treatment for discharges from Zone II,

6. Cap all sulphide dumps and/or treat discharges (in perpetuity) that exceed current licence parameters,

7. Breach the haul road at the Reservoir, Rose and North Fork Vangorda Creeks crossings,

8. Remove mill and all unnecessary infrastructure,

9. Provide adequate site and operations security,

10. Maintain water quality and required maintenance programs.

VANGORDA - GRUM SITE: WATER LICENCE # IN89-002.

Immediate Measures

1. Mothball the water treatment plant to prevent freeze damage,
2. Monitor structural integrity of all dams, spillways and other water control and treatment structures,
3. Remove all chemicals and fuels stocks from site that are not immediately required for operations,
4. Provide adequate site and operations security.

Temporary Measures

1. Collect and treat all discharges from dumps or pits that exceed licence limits,
2. Maintain all necessary infrastructure,
3. Maintain the Vangorda Creek diversion,
4. Remove all unnecessary fuels and lubricants from the site,
5. Maintain a site monitoring and inspection program as per the water licence,
6. Provide adequate site and operations security.

Permanent Closure

1. Collect and treat all discharges from dumps or pits that exceed licence limits,
2. Maintain all necessary infrastructure,
3. Maintain the Vangorda Creek diversion,
4. Remove all unnecessary fuels and lubricants from the site,
5. Maintain a site monitoring and inspection program as per the water licence,

6. Provide adequate site and operations security,

7. Cap the Vangorda Dump and maintain a collection system for Acid Rock Drainage (ARD),

8. Cover sulphide rock in Vangorda pit,

9. Create "Vangorda Lake" in Vangorda open pit by constructing appropriate outlet dams and drainage channels,

10. Breach Vangorda Creek haul road crossing and diversion dams,

11. Cover exposed sulphide rock in the Grum dumps and pit wall and provide the necessary outlets for water discharge,

12. Provide adequate site and operations security.

COST ESTIMATES FOR IMMEDIATE, TEMPORARY AND PERMANENT CLOSURE OF CURRAGH'S FARO AND VANGORDA OPERATIONS.

These estimates are based on information provided by Robert J. Rodgers, consulting engineer, under a contract with Economic Development Directorate, DIAND, Yukon Region.

FARO SITE: WATER LICENCE IN89-001, AMENDMENT #3.

Immediate measures.

Monitoring & Maintenance (6 months)	$ 336,500

Temporary Measures.

One time costs	$ 54,000
Annual Monitoring & Maintenance	$ 674,000

Permanent Closure.

One time costs	$70,200,000
Annual Monitoring & Maintenance	$ 585,000

VANGORDA SITE: WATER LICENCE 1N89-002.

Immediate measures.

Monitoring & Maintenance (6 months)	$ 156,000

Temporary Measures.

One time costs	$ 104,000
Annual Monitoring & Maintenance	$ 585,000

Permanent Closure

One time costs	$13,824,000
Annual Monitoring & Maintenance	$ 156,000

SUMMARY OF TOTAL COSTS; FARO AND VANGORDA.

Immediate Measures.

Faro & Vangorda	$ 492,500

Temporary Measures.

One time costs	$ 158,000
Annual Monitoring & Maintenance ...	$ 1,259,000

Permanent Closure.

One time costs	$84,024,000
Annual Monitoring & Maintenance ...	$ 741,000

ROBERT J. RODGER, P.Eng.

8465 146th St., Surrey, B.C. CANADA

Tel. (604) 599 - 1670

No. of Pages: 7

July 12, 1993

FAX (403) 668 - 3599

Northern Affairs Program
200 Range Road
Whitehorse, YK
Y1A 3V1

Att: Mr. F. Privett
Economic Development

Re: CURRAGH INC.
Faro Operations
Progressive Restoration

Per our conversation, preliminary draft of report on schedule for progressive restoration.

Regards,

Bob Rodger

PRELIMINARY DRAFT

July 12, 1993

Northern Affairs Program
Economic Development
200 Range Road,
Whitehorse, YK

Re: Curragh Inc. Faro Operations
Progressive Restoration.
Report # NAP306

1.0 INTRODUCTION

This report outlines a schedule for progressive restoration, up to and including permanent closure, of the site and facilities at the Faro operations. The Faro operations include the Faro open pit, the Vangorda Plateau development, the Down Valley Tailings Impoundment and the mill/surface facilities on the Faro site.

This report draws on information contained in previous reports prepared this year for DIAND Northern Affairs-Whitehorse, as well as information from the Yukon Territory Water Board (YTWB) licences and schedules made available by the Northern Affairs Program (Appendix I).

1.1 BASIS FOR COST ESTIMATES

The cost estimates in this report are based on the estimates contained in previous reports prepared this year for DIAND Northern Affairs - Whitehorse.

The cost estimates are based on the following assumption:

The work is to be undertaken by contractors;

The work is as specified by Curragh Inc in its submissions, with any noted exceptions.

A contingency of 20 % has been applied to the cost estimates.

An engineering, procurement and construction management

(EPCM) fee of 10 % of the project cost after contingency has been used in this report.

The estimates are in constant 1993 dollars.

2.0 ASSUMPTIONS

Based on the assumption that the present closure is temporary, there are few restoration measures which can be taken in the immediate future.

At current levels, prices for zinc and lead are unlikely to justify an immediate start-up of the operations. The schedule assumes that the operations are re-opened over the course of the next year.

Other assumptions in this report include:

Faro Open Pit

The ore remnants remaining in the walls of the pit are mined after a return to production and Faro Creek is then diverted into the pit.

Vangorda Open Pit

Ore remaining in the Vangorda pit is mined within six months of a return to production, so that restoration could commence one year (designated as Year 2 in this report) after start-up.

Grum Open Pit

The mining reserves within the presently defined pit limits are sufficient for over six years production. Additional reserves in the Champ zone and other extensions could provide a longer life.

Swim - Dy Deposits

The Swim and Dy deposits would be mined after the Vangorda Plateau Development. Although the schedule for restoration considers the period covered by mining of the Swim and Dy deposits, the decommissioning costs for these operations are not included in the cost estimates presented in this report.

Down Valley Tailings Impoundment

Alternative 5, as presented by Curragh Inc., is the alternative utilized in this report for decommissioning of the Down Valley Tailings Impoundment.

3.0 SCHEDULE

The schedule in this report is based on the schedule contained the Steffen, Robertson and Kirsten (B.C.) Ltd. report on the Down Valley Tailings Impoundment Decommissioning Plan (Report # 60635, Volume I Table 12.1)

If all the known reserves in the area of the Faro operations are mined, permanent closure would occur some fifteen years after a return to production.

The schedule for restoration is presented in five year tranches in Table 3.1.

3.1 YEARS 2 - 5

Faro Open Pit

The Faro open pit is being allowed to fill with water. After resumption of production, the flow from Faro Creek would be directed into the pit. The pit has been utilized for tailings disposal. Towards the end of the first five year period, these activities would result in the water level approaching the pit rim. Installation of the plug dam between the main pit and Zone II would be undertaken before the main pit is filled with water.

The diversion ditches to minimize flow through the waste dumps as well as the collection ditches and sumps for seepage from the waste dumps could be constructed during this period.

Vangorda Open Pit

Decommissioning of the Vangorda open pit and waste dump could commence in the year (designated as Year 2 in this report) following a return to production.

3.2 YEARS 6 - 10

Faro Open Pit

Although Curragh Inc. proposed to construct the outlet spillway at the end of all activities at Faro, it is felt that it should be constructed when the Faro pit is filled with water. Since one of the collection sumps is located in the original Faro Creek channel, the outlet spillway would be directed to Next Creek.

Grum

Reserves in the Grum deposit will probably be depleted during this period. The decommissioning plan for the Grum open pit and waste dumps would be implemented.

Vangorda Plateau

With completion of mining activities on the Vangorda Plateau, decommissioning of the other facilities at Vangorda would be undertaken.

3.3 YEARS 11 - 15

With depletion of all the known reserves in the area of the Faro operations and processing of the low grade and other stockpiles, the Faro mill would be modified for tailings reprocessing.

Swim - Dy Deposits

Although the decommissioning costs for these operations are not included in the cost estimates presented in this report, costs would be incurred for decommissioning during this period.

3.4 YEARS 16 - 20

Down Valley Tailings Impoundment

Under the assumption that Alternative 5 is selected for decommissioning of the Down Valley Tailings Impoundment, reprocessing of the tailings would be initiated during this period.

Vangorda Plateau

The Vangorda haul road would be reclaimed, with the major cost being the breaching of the road at the North Fork of Rose Creek.

3.5 YEARS 21 - 25

Down Valley Tailings Impoundment

Reprocessing of the tailings would be completed during this period.

Faro mill/Surface Facilities

On completion of reprocessing of the tailings, decommissioning of these facilities would be undertaken.

Faro Open Pit

Seepage flowing from the waste dumps through the collection ditches and sumps, which has been pumped directly or indirectly in the Faro pit, would have to be treated. Fro the purposes of this report, it is assumed that a water treatment is installed at Faro.

CURRAGH INC

FARO OPERATIONS
PROGRESSIVE RESTORATION

Table 3.1 SCHEDULE OF DISBURSEMENTS
(Thousand 1993 dollars)

DESCRIPTION	YEARS 2 - 5	YEARS 6 - 10	YEARS 11 - 15	YEARS 16 - 20	YEARS 21 - 25	TOTALS
FARO OPEN PIT						
Faro Ck Waste Dump	$1,500					$1,500
Diversion Ditches	418					418
Collection Ditches & Sump	486					486
Plug Dam	465					465
Water Treatment					3,100	3,100
VANGORDA PLATEAU DEV						
Vangorda Open Pit	1,748					1,748
Vangorda Waste Dump	6,567					6,567
Grum Open Pit		148				148
Grum Waste Dump		884				884
Other			289	1,900		2,189
DOWN VALLEY TAILINGS (Alternative 5)						
Hyd. Mining (Capital)				5,620		5,620
Reprocessing (Capital)				487		487
Hyd. Mining *				9,024	8,601	17,625
Reprocessing (Revenue) *				(38,784)	(36,966)	(75,750)
Reprocessing (Operating) *				36,480	34,770	71,250
Decommissioning					4,709	4,709
Faro Pit Prep	188	100				288
Faro Pit Decom	33	1,150			68	1,251
Other		100			146	246
FARO MILL/SURFACE FACILITIES					3,641	3,641
Subtotal	11,405	2,382	289	14,727	18,068	46,872
Contingency (20 %)	2,281	476	58	1,601	2,333	6,749
Subtotal	13,686	2,858	347	16,328	20,402	53,621
EPCM (10 %)	1,368	286	35	981	1,400	4,050
TOTAL	$15,055	$3,144	$381	$17,289	$21,801	$57,671

* Contingency & EPCM are not applied to Revenues or Operating Costs

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TO: NAP ECO DEV

FAX: 14036683599

FROM: ROBERT RODGER P ENG

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TEL: 6045991670

01 PAGE[S] TO FOLLOW

COMMENT: ATT F PRIUETT

ROBERT J. RODGER, P.Eng.

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No. of Pages: 17

Sept 10, 1993

FAX (403) 668 - 3399

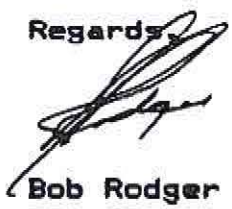
Northern Affairs Program
200 Range Road
Whitehorse, YK
Y1A 3V1

Att: Mr. F. Privett
Economic Development

Re: CURRAGH INC. FARO OPERATIONS
Land Resources Division
Minimum Requirements for Permanent Closure

Enclosed is a preliminary draft of this report.

Regards,



Bob Rodger

PRELIMINARY DRAFT

September 10, 1993

Northern Affairs Program
Economic development
200 Range Road,
Whitehorse, YK

Re: Curragh Inc. Faro Operations
Land Resources Division
Minimum Requirements for Permanent Closure
Report # NAP307

1.0 INTRODUCTION

This report covers cost estimates for site reclamation outlined by the Land Resources Division as the minimum requirements in the event of permanent closure of the Faro Operations.

The report is based on information contained in previous reports prepared this year for DIAND Northern Affairs-Whitehorse (Appendix I) as well as information gathered during visit of the Faro mine on May 21 and 22, 1993.

1.1 BASIS FOR COST ESTIMATE REVIEW

In this review, the cost estimates are based on the following assumptions:

The work is to be undertaken by contractors;

Permanent closure occurs after mining of the Grum pit.

The estimates are in constant 1993 dollars.

2.0 SITE RECLAMATION

The minimum requirements outlined by the Land Resources Division in the event of permanent closure of the Faro operations are:

1) construction of berms around the open pits;

2) reclamation of the waste dumps to ensure long term stability;

3) construction of berms around the tailings impoundment;

4) reclamation of the haul and unused access roads by scarifying to promote regrowth of vegetation;

5) removal of all unnecessary structures;

6) stabilization of drainage areas with riprap, where required;

7) breaching the Fresh Water Reservoir dam;

8) decontamination of fuel soaked soils by treatment with nitrogen;

9) disposal of chemicals remaining on site at closure;

10) reclamation of all disturbed lands in and around the Faro site; and,

11) construction of chain link gates to secure access to the property.

Some of these requirements have been covered under previous reviews. For these requirements, the estimated cost is taken from these reviews.

Stabilization of drainage areas with riprap, where required, has been covered under previous reviews, and is not shown as a separate item in this review.

3.0 FARO SITE

3.1 FARO OPEN PIT

The minimum requirements outlined by the Land Resources Division, which affects the Faro open pit are:

construction of berms around the open pits.

reclamation of the waste dumps to ensure long term stability.

With closure of the Faro pit, it is being allowed to fill with water. Tailings were deposited in the Faro pit from mid 1992 until December 1992. In the event, the pit will become a lake. There will be an inlet from Faro Creek on the northern side of the lake and an outlet spillway on the western side of the pit.

3.1.1 Pit Berm

As specified in the Land Resources requirements, a berm would be constructed around the perimeter of the open pit, except at the inlet and outlet. The berm would have a minimum height of 5.0 m and the width on the top would be 5.0 m. In order to reduce access to the pit lake, slopes would be a minimum of 45°. The berm would be constructed with non-sulphide waste rock.

The estimated cost is presented in Table 3.1.

3.1.2 Faro Waste Dumps

The waste rock from the open pits has been placed on dumps located around the open pit. During mining of the Faro pit by Curragh Inc., waste rock containing sulphide minerals was segregated into sulphide cells in specific areas of the waste dumps. These cells have been covered with a layer of phyllite rock. During the CAMC era, there was no segregation of sulphide waste rock.

Zone II was mined as a separate open pit located to the south of the main pit, and has since been filled with non acid-generating waste rock from the main open pit. The waste dumps in this area have been built to the edge of the slope above the North Fork of Rose Creek.

A number of studies have reportedly been conducted on stability of the waste dump slopes. With one exception, the dumps are considered to be stable. Movement has been detected on the slope of the dump located adjacent to the Vangorda Haul Road and immediately above the North Fork of Rose Creek. Monitors have been installed on the crest to measure the movement.

Should the slope prove to be unstable, given the location of the toe of this dump, it would be necessary to remove waste off the top of the dump in order to flatten the slope. For the purposes of this report, it is assumed that a slope of 3H/1V is required to assure long term stability.

The estimated cost is presented in Table 3.1.

3.2 MILL COMPLEX AND SURFACE FACILITIES

The minimum requirements outlined by the Land Resources Division, which affect the mill and surface facilities are:

removal of all unnecessary structures;

disposal of chemicals remaining on site at closure;

breaching the Fresh Water Reservoir dam;

decontamination of fuel soaked soils by treatment with nitrogen;

reclamation of the unused access roads by scarifying to promote regrowth of vegetation;

reclamation of all disturbed lands in and around the Faro site; and,

construction of chain link gates to secure access to the property.

The first two items were covered under the Mine Closure Costs evaluation report (NAP # 303).

In the Mine Closure Costs report, which outlined work as specified by Curragh Inc., the Freshwater Reservoir was maintained as a fish habitat. The estimated cost of breaching the reservoir dam is lower than the cost maintaining the reservoir.

In the case of decontamination of fuel soaked soils in the Mine Closure Costs report, the soils were excavated and transported for treatment elsewhere. On-site treatment with nitrogen would be significantly lower in cost.

Costs have been estimated for the last three items, which have not been covered elsewhere.

The estimated costs are presented in Table 2.2.

4.0 VANGORDA PLATEAU

4.1 VANGORDA OPEN PIT

The minimum requirements outlined by the Land Resources Division, which affects the Vangorda open pit are:

construction of berms around the open pits.

reclamation of the waste dumps to ensure long term stability.

On completion of mining in the Vangorda pit, it will be allowed to fill with water. There will be an inlet from Vangorda Creek on the northeastern side of the lake and an outlet spillway on the northwestern side of the pit.

4.1.1 Pit Berm

As specified in the Land Resources requirements, a berm would be constructed around the perimeter of the open pit, except at the inlet and outlet. The berm would have a minimum height of 5.0 m and the width on the top would be 5.0 m. In order to reduce access to the pit lake, slopes would be a minimum of 45º. The berm would be constructed with non-sulphide waste rock.

The estimated cost is presented in Table 4.1.

4.1.2 Vangorda Waste Dump

The waste rock from the open pit has been placed on a dump located to the southwest of the open pit. During mining of the Vangorda pit, sulphide waste rock was segregated into a sulphide cell in the waste dump. This cell is to be covered with a layer of glacial till. However, the phyllite waste

rock from the Vangorda open pit also contains sulphide minerals.

The Vangorda waste dump has not been constructed as designed. The cost of reworking the dump to construct till berms and a till cover was covered under the Mine Closure Costs report.

The estimated cost of reworking the dump is presented in Table 4.1.

4.2 GRUM OPEN PIT

The minimum requirements outlined by the Land Resources Division, which affects the Grum open pit are:

construction of berms around the open pits.

reclamation of the waste dumps to ensure long term stability.

On completion of mining in the Grum open pit, it will be allowed to fill with water. There will be an inlet from Grum Creek on the northeastern side of the lake and an outlet spillway on the western side of the pit.

4.2.1 Pit Berm

As specified in the Land Resources requirements, a berm would be constructed around the perimeter of the open pit, except at the inlet and outlet. The berm would have a minimum height of 5.0 m and the width on the top would be 5.0 m. In order to reduce access to the pit lake, slopes would be a minimum of 45°. The berm would be constructed with non-sulphide waste rock.

The estimated cost is presented in Table 4.1.

4.2.2 Grum Waste Dumps

Till overburden has been placed on dumps located to the southeast of the Grum open pit. The waste rock from the Grum open pit will be placed on dumps located to the south and the southwest of the open pit. During mining of the Grum pit, sulphide waste rock will be segregated into a sulphide cell in the main (south) waste dump. This cell is to be placed over calcareous phyllite rock and covered with layers of glacial till.

Most of the phyllite waste rock from the Grum open pit is expected to contain only minor amounts of sulphide minerals. This waste is expected to be acid consuming and till covers are not expected to be necessary.

For the most part, only till has been removed from the Grum pit at present. If the dumps are constructed as designed, the final configuration would be stable on completion of mining in the Grum pit.

With the dump as presently constructed, some resloping of the till would be required to assure long term stability.

The estimated cost is presented in Table 4.1.

4.3 OTHER FACILITIES

The minimum requirements outlined by the Land Resources Division, which affect the other facilities at the Vangorda Plateau are:

removal of all unnecessary structures;

decontamination of fuel soaked soils by treatment with nitrogen;

reclamation of the unused access roads by scarifying to promote regrowth of vegetation;

reclamation of all disturbed lands in and around the site; and,

construction of chain link gates to secure access to the property.

The first item was covered under the Mine Closure Costs evaluation report.

As outlined in Section 3.2, the fuel soaked soils were excavated and transported for treatment elsewhere. On-site treatment with nitrogen would be significantly lower in cost.

Costs have been estimated for the last three items, which have not been covered elsewhere.

The estimated costs are presented in Table 4.2.

5.0 DOWN VALLEY TAILINGS IMPOUNDMENT

The minimum requirement outlined by the Land Resources Division, which affects the Down Valley Tailings Impoundment is:

construction of berms around the tailings impoundment.

The requirement for berms depends on the Alternative selected for decommissioning of the Down Valley Tailings Impoundment. For the purposes of this report, it is assumed that Alternative 5 is the selected option.

The estimated cost is presented in Table 5.1.

6.0 SUMMARY OF ESTIMATED COST

The cost estimates for site reclamation on permanent closure, based on Land Resources minimum requirements, are summarized in Table 6.1.

The changes in the previous cost estimates for permanent closure presented in the Mine Closure Costs evaluation report, resulting from Land Resources minimum requirements, are presented in Table 6.2.

CURRAGH INC

PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 3.1 FARO OPEN PIT
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
OPEN PIT				
Berm Construction	cu. m.	217,500	4.00	870
WASTE DUMP				
Re-slope	cu. m.	2,400,000	2.50	6,000
Subtotal				6,870
Contingency (20 %)				1,374
Subtotal				8,244
EPCM (10 %)				824
TOTAL				$9,068

CURRAGH INC

PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 3.2 FARO MILL COMPLEX/SURFACE FACILITIES
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST	
MILL BUILDING					
Demolition	sq. m.	14,300	55.00	787	
Cover Site	cu. m.	7,500	3.00	23	
					809
OTHER BUILDINGS					
Demolition	sq. m.	9,000	35.00	315	
Cover Site	cu. m.	5,000	3.00	15	
					330
MINE & SHOP EQUIPMENT					
Disposal	l.s.			0	
					0
MILL EQUIPMENT					
Clean-up	l.s.			250	
Disposal	l.s.			0	
					250
SULPHIDE ORE AREAS					
Excavation	cu. m.	37,000	4.00	148	
Treatment	cu. m.	37,000	4.00	148	
					296
FUEL & LUBE STORAGE AREAS					
Excavation	cu. m.	900	4.00	4	
Treatment	cu. m.	1,600	60.00	96	
Tanks, Pumps & Piping	l.s.			250	
					350
BULK EXPLOSIVES PLANT					
Disposal	l.s.			0	
					0
CHEMICAL INVENTORY					
Disposal	l.s.			200	
					200
WASTE MATERIAL DISPOSAL					
Scrap metal	l.s.			0	
Refuse (Garbage)	l.s.			25	
Sewage	l.s.			25	
					50
PIPELINES					
Water Line Removal	m.	2,000	20.00	40	
					40

Table 3.2 (Cont'd)

FRESHWATER RESERVOIR					
Breach Dam	cu. m.	60,000	3.00	180	
Channel Excavation	cu. m.	30,000	3.00	90	
Clean-up	l.s.			50	
					320
SITE RECLAMATION					
Power Lines	l.s.			100	
Site Roads	l.s.			50	
Borrow Pits	l.s.			50	
Revegetation	ha.	54	1600.00	86	
Fence Gate	l.s.			10	
					296
OTHER					
MetaFina plant	l.s.			50	
					50
Subtotal					2,991
Contingency (20 %)					598
Subtotal					3,589
EPCM (10 %)					359
TOTAL					$3,948

CURRAGH INC

PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 4.1 VANGORDA PLATEAU
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
VANGORDA OPEN PIT				
Berm Construction	cu. m.	117,500	4.00	470
VANGORDA WASTE DUMP				
Till Berms				
Dump Rework	l.s.			450
Till Placement	cu. m.	1,620,000	$3.00	4,860
Till Cover				
Lower Layer	cu. m.	105,000	4.00	420
Upper Layer	cu. m.	210,000	3.50	735
Collection Ditches				
Excavation	cu. m.	10,000	3.00	30
Piping	m.	1,300	40.00	52
Other				
Instrumentation	l.s.			20
GRUM OPEN PIT				
Berm Construction	cu. m.	120,000	4.00	480
GRUM WASTE DUMP				
Re-slope	cu. m.	1,200,000	2.00	2,400
Subtotal				9,917
Contingency (20 %)				1,983
Subtotal				11,900
EPCM (10 %)				1,190
TOTAL				$13,090

CURRAGH INC

PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 4.2 VANGORDA PLATEAU
OTHER FACILITIES
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST	
DRY/OFFICE BUILDING					
Demolition	sq. m.	500	35.00	18	
Cover Site	cu. m.	250	3.00	1	
					18
FUEL & LUBE STORAGE AREAS					
Excavation	cu. m.	50	4.00	0	
Treatment	cu. m.	500	60.00	30	
Tanks, Pumps & Piping	l.s.			50	
					80
HAUL ROAD					
North Fork Rose Creek	cu. m.	600,000	3.00	1,800	
Stream Crossings	l.s.			100	
Reclamation	km.	16.5			1,900
RECLAMATION					
Site	l.s.			50	
Site Roads	l.s.			50	
Power Lines	l.s.			30	
Revegetation	ha.	60	1600.00	96	
Fence Gate	l.s.			10	
					236
Subtotal					2,234
Contingency (20 %)					447
Subtotal					2,681
EPCM (10 %)					268
TOTAL					$2,949

CURRAGH INC

PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 5.1 DOWN VALLEY TAILINGS IMPOUNDMENT
COST ESTIMATE
(Thousand 1993 dollars)

DESCRIPTION	UNIT	QUANTITY	UNIT COST	COST
TAILINGS POND				
Berm Construction	cu. m.	330,000	4.50	1,485
Subtotal				1,485
Contingency (20 %)				297
Subtotal				1,782
EPCM (10 %)				178
TOTAL				$1,960

CURRAGH INC

PERMANENT CLOSURE
with
LAND RESOURCES REQUIREMENTS

Table 6.2 SUMMARY OF ESTIMATED COST
based on ALTERNATIVE 5
(Thousand 1993 dollars)

DESCRIPTION	COST	TOTALS
FARO OPEN PIT	$5,504	
Berm Construction	870	
Waste Dumps	6,000	
		12,374
FARO MILL/SURFACE FACILITIES	3,641	
Fuel/Lube	(450)	
Freshwater Reservoir	(210)	
Fence Gate	10	
		2,991
VANGORDA PLATEAU DEV		
Vangorda	8,315	
Berm Construction	870	
Waste Dumps	0	
Grum	1,032	
Berm Construction	480	
Waste Dumps	2,400	
Other	2,189	
Fuel/Lube	(95)	
Reclamation	140	
		15,331
DOWN VALLEY TAILINGS (Alternative 5)	26,191	
Berm Construction	1,485	
		27,676
Subtotal		58,372
Contingency (20 %)		9,049
Subtotal		67,421
EPCM (10 %)		5,430
TOTAL		$72,851

* Contingency & EPCM are not applied to Revenues or Operating Costs

CURRAGH INC

FARO OPERATIONS
PERMANENT CLOSURE
per
LAND RESOURCES REQUIREMENTS

Table 6.1 SUMMARY OF ESTIMATED COST
(Thousand 1993 dollars)

DESCRIPTION	COST
FARO OPEN PIT	$6,870
FARO MILL/SURFACE FACILITIES	2,991
VANGORDA PLATEAU	
OPEN PITS/WASTE DUMPS	9,917
OTHER FACILITIES	2,234
DOWN VALLEY TAILINGS IMPOUNDMENT	1,485
Subtotal	23,497
Contingency (20 %)	4,699
Subtotal	28,196
EPCM (10 %)	2,820
TOTAL	$31,016