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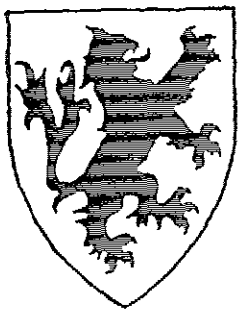
ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC. (YUKON OPERATIONS)



EXECUTIVE BRIEFING
FINAL REPORT

OCTOBER 19, 1992

The Coopers &Lybrand Consulting Group

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ANTON, CAMPION, MACDONALD & PHILLIPS

ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC.: YUKON OPERATIONS

EXECUTIVE BRIEFING

OCTOBER 19, 1992

Submitted By:

Robert Abbott
Jim Taylor
Howard Harowitz
Bill Stanley

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ENVIRONMENTAL MANAGEMENT OF CURRAGH'S YUKON OPERATIONS: AN EXECUTIVE BRIEFING

1.0 INTRODUCTION

The audit of Curragh's Yukon operations was an overview focusing on the systems and procedures in place to manage environmental issues. In view of this scope, the audit cannot ensure that every aspect of a particular environmental issue has been accounted for.

The management of high profile environmental issues including tailings management, decommissioning and acid mine drainage, has been the focus of environmental management efforts in the Yukon over the past three years. The effort that has been made in these areas is significant and Curragh is generally well-positioned when judged against regulatory and industry benchmarks. It would, however, be imprudent to suggest that these primary issues no longer require significant management attention; the potential financial exposure associated with any of these issues is considerable. Moreover, the environmental requirements embodied in the Faro, Vangorda and Sa Dena Hes water licences are sufficiently onerous as to fully utilize existing site environmental resources.

2.0 BACKGROUND ON MINESITE DECOMMISSIONING

2.1 Faro

The environmental audit report for Faro indicated that planning is well established toward a comprehensive closure sequence. An Integrated Decommissioning Plan (IDP) is now being prepared which addresses all aspects of the operations and will be submitted for review and discussion by the regulatory agencies in late 1993.

Financial security to address closure costs is currently being accumulated in a Trusteed Environmental Fund (TEF) at a rate of $0.25 per wet tonne of mineral concentrate. The rate was set in 1986 by the Yukon Territory Water Board (YTWB) in the absence of solid information on cost projections. The YTWB has informed Curragh, by letter dated September 1, 1992, that a Public Hearing would be scheduled shortly to deal with a revision to the per tonne levy as a result of decommissioning costs for the Down Valley Tailings Facility that were discussed in a January 1992 YTWB public hearing.

In the January hearing, Curragh proposed two alternatives for decommissioning of the Down Valley Tailings Facility. The option most favourable to Curragh outlined a plan to remove approximately 67% of the final tailings volume by hydromonitoring and pumping to a modified floatation circuit in the mill. Standard mill techniques would extract a bulk concentrate of sufficient value to pay the cost of relocating the final tailings to the Faro Pit. Tailings remaining in the Down Valley Facility upon completion of this process could then be permanently covered with water behind the existing Intermediate Dam which may prevent any further acid mine drainage from being created. This option was projected to have a capital cost of approximately $7.12 M (plus ongoing monitoring and maintenance costs) and could be financed by an increase in the TEF levy from $0.25 to approximately $0.90.

Curragh is conducting further research on the reprocessing option and results to date have been promising. A mining expert from South Africa was contracted by Curragh to evaluate recovery of tailings at Faro by hydromonitoring/pumping and his opinion is that it is an efficient technique which is currently employed for gold tailings reprocessing. A bulk sample of Faro tailings was taken in 1991 to conduct testing on the feasibility of extracting a bulk lead/zinc concentrate using conventional flotation techniques. The tests showed that while this is technically possible, additional research is needed to demonstrate that the process is economically feasible. A further program is now underway through CANMET which employs bench scale and locked cycle testing to more clearly define the most efficient processing flowsheet and reagent requirements. Curragh hopes to clearly demonstrate that the processing option is reasonable and achievable under current zinc and lead pricing scenarios in time for the IDP public hearings in early 1994.

The YTWB has, to date, been reluctant to accept this option, as it is unable to predict future metal prices and the prospect that the reprocessing will, in fact, cover the costs of relocating the tailings. The YTWB has indicated in its September 1, 1992 correspondence that it will be computing the levy adjustment based on the alternative decommissioning option presented by Curragh as a contingency position in the January hearing. This option involved covering approximately half of the existing tailings by raising the Intermediate Dam and providing permanent inundation. The remaining tailings, which have been deposited at a higher elevation, would be covered by a complex soil layer designed to restrict oxygen access to the underlying tailings, thereby limiting the production of acid mine drainage. Capital costs of this option have been estimated at $25.34 M, requiring a per tonne levy of $1.99. This estimate assumes that the complex soil covers can be established during the remaining life

of the mine; an assumption that requires $10.35 M to be paid from operational cash flow (not from the TEF) between 1994 and 2005.

A further re-evaluation of the TEF levy will be required after submission and discussion of the IDP. This plan will introduce the final element of the Faro decommissioning, the control of waste dump acidic drainage. Sulphide materials and other rock types with the potential to produce acid mine drainage have been randomly spread throughout the waste dumps over the past twenty-three years. The drainage from these dumps will be of poor quality and must be collected and treated in perpetuity. The TEF will have to be substantially enlarged to provide adequate capital, at an appropriate and acceptable real rate of return, to pay the high costs of ongoing water treatment (expected to be in the range of $800,000 per year). The two alternatives appear to be: (i) an increase in the per tonne levy to $4.72 (if water treatment is developed in conjunction with reprocessing); or (ii) an increase in the levy to $5.80 (if water treatment is developed in combination with complex soil covers). In any event, future discussions with respect to the treatment of waste dump drainage at Faro will have a significant impact on the level of contribution to the TEF through the remaining life of the project.

2.2 Vangorda/Grum

A detailed decommissioning plan for the Vangorda/Grum minesite is not required by the YTWB until June 15, 1994. Detailed planning and preparation is scheduled to begin in early 1993.

Waste dumps and pit highwalls will be strong acid drainage producers. Decommissioning will involve flooding the pits, sloping and placing a till cap over dumps and pit walls above the final water line. Although these costs have yet to be firmly established, it would appear that the current funding should be generally adequate to cover the decommissioning liability as it is currently envisioned.

Upon acceptance of the water licence in mid-1990, a security bond in the amount of $943,700 was originated and annually renewed. Cash remittances of $560,000 are deposited in the TEF on December 31 of each year and are accumulating interest as a result of the investment decisions made by the independent trustees. Additionally, the Department of Indian Affairs and Northern Development (DIAND) and the Department of Fisheries and Oceans (DFO), as part of the Environmental Assessment and Review Process (EARP), required an additional

cash security of $4.606 M to be established. This security has been deposited with an investment agency and the interest is returned to Curragh on a monthly basis whereupon it is allocated to general operating revenues. It may be prudent to consider investing the interest generated by this security into an internal Curragh account as a contingency in the event of a future escalation of Vangorda closure funding.

2.3 Sa Dena Hes

A long term acid mine drainage problem at Sa Dena Hes is not anticipated as a result of the calcareous host rocks of the deposit. A final decommissioning plan will be submitted to the YTWB by December 31, 1995. The focus of the plan will be the placement of soil material and seeding of the tailings area to prevent wind and water erosion, the establishment of final watercourses and the removal of buildings and equipment. Decommissioning costs will most likely be very similar to those estimated in the initial application to the YTWB and significant increases in the level of financial security are not anticipated.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

Looking beyond these primary issues, it is clear that Curragh needs to improve its environmental management system (EMS) in a number of areas, both in specific management system elements across the company and in a variety of discrete functional issues. A detailed discussion of these items can be found in the individual audit reports; the following comments are intended to briefly summarize the key environmental issues in need of remediation, and the features of Curragh's EMS most in need of upgrade.

An EMS is a formal, structured mechanism that provides a rigorous framework necessary to achieve a continuing, consistent level of environmental performance. It can be viewed as the defining of environmental objectives, the articulation of policies and procedures, the defining of personal responsibilities, and adequate staffing and training to ensure environmental compliance. The principal elements of an EMS, based on the principles of Quality Management, constitute a powerful framework for organizing and improving an organization's environmental performance. These elements, used as audit control criteria, are listed below.

Policy and Management Leadership

- policies
- corporate objectives and standards
- senior management leadership that demonstrates a commitment to environmental management

Planning and Procedures

- specific procedures that respond to identified environmental concerns

Organization and Training

- an organizational structure that is responsive to environmental requirements
- competent, trained staff

Monitoring and Measuring

- environmental performance continually measured
- performance reports provided regularly to senior management
- corrective action taken (and documented) when deviations are noted

Incident Response and Reporting

- potential incidents facing the corporation are fully understood
- response plans and procedures are in place
- incidents analyzed leading to corrective actions when required

Research

- policies, procedures and processes are continually improved
- legislation and public opinion are tracked

Curragh has made significant progress in the areas of policy, incident response, and research, but a systemic weakness, common to all Yukon operations, is

evident in the planning, organization and training, and monitoring functions. All aspects of the EMS are important, but these three elements are crucial; they are the core of the system. If they are not enhanced, in certain situations Curragh may be in a reactive mode, unable to anticipate and prevent environmental incidents.

With respect to the EMS at Faro and Sa Dean Hes, the following actions are recommended to address these systemic weaknesses:

- Develop job procedures that assign environmental roles and responsibilities.

- Develop an environmental organizational chart that clearly indicates reporting lines.

- Develop operating procedures and/or environmental standards for specific environmental concerns.

- The existing organization of the environmental function is acceptable, but on the medium term, the site environmental group should have direct access to the General Manager. This change would streamline decision-making and give the environmental function a higher profile among site personnel.

- Develop an Environmental Awareness Program to introduce the concept, goals, opportunities and background of environmental management at Curragh to all employees.

  The primary objective of this program will not be to instruct, but rather, to develop an initial level of understanding within the company of how Curragh's activities affect the environment and how the Manager, Environmental Affairs, site environmental personnel, and mine management are working together to ensure the company conducts its activities in an environmentally responsible fashion.

  As this initial level of awareness is being cultivated, more specific environmental training that provides Curragh personnel with practical tools and techniques should be introduced. This training should include the following areas: (i)environmental law and the responsibilities (corporate and personal) that flow from the law; (ii) spill prevention and control; (iii) the Workplace Hazardous Materials Information System (WHMIS); and

(iv) the regulations respecting the handling, offering for transport and transport of dangerous goods (TDG).

- Broaden the concept of monitoring and measuring from water sampling and analysis to include site inspections and reviews. This will allow a broader range of environmental issues, or potential issues, to be detected and remediated than is possible under the present "catch as catch can" approach to monitoring.

At Sa Dena Hes, the human resources assigned to environmental management are under-qualified and stretched very thin by water licence requirements. It is therefore important that consideration be given to creating and staffing a senior environmental position at the mine. This individual would be responsible for coordinating problem identification and resolution as well as developing environmental programs which are peripheral to the water licence. This important work is not being adequately done at present. The Faro mine would also benefit from the addition of a senior environmental resource; however, the need at Faro is not as acute as at Sa Dena Hes.

4.0 IMMEDIATE FUNCTIONAL PRIORITIES

The range of functional issues in need of remediation at the Faro and Sa Dena Hes minesites, and at the transportation facilities that serve the minesites, underscores the importance of these EMS upgrades. These functional deficiencies can be addressed in a reactive fashion, but without the organizing framework of an EMS to track emerging problems, new deficiencies will almost inevitably be detected in a future audit of the Yukon operations.

The Faro audit identified 7 discrete environmental issues in need of remediation. These issues are: (i) petroleum storage; (ii) spill management; (iii) underground storage tanks (USTs); (iv) waste management; (v) airshed management; (vi) housekeeping; and (vii) environmental awareness.

The Sa Dena Hes audit identified 6 discrete environmental issues in need of remediation: (i) site sewage system; (ii) petroleum storage; (iii) airshed management; (iv) spill management; (v) waste management; and (vi) environmental awareness.

Forward action plans to address these specific issues, with risk priorities, estimated costs and target completion dates, are found in the individual audit reports.

At Faro, among the seven issues in need of remediation, three key priorities are petroleum storage, spill management and USTs. These are issues on which the minesite has taken little action to date and the environmental liability for any indiscretions is high. It is estimated that all necessary remediation can be completed by October of 1993 at a cost of $85,000.

At Sa Dena Hes, among the six issues in the need of remediation, three key priorities are the site sewage system, petroleum storage and airshed management. The sewage system is not operational at present; the spill containment for petroleum storage is inadequate in many cases; and Curragh may be contaminating air and soil through inadequate concentrate storage and loadout procedures. It is anticipated that remediation of the septic fields and all required upgrades to petroleum product storage can be completed by October of 1993 at a cost of $65,000-$85,000. The issue of airshed management is more problematic. As a first step, it is expected that monitoring of ambient air quality to assess the magnitude of any problem can be completed by June of 1993 at a cost of $10,000. Contingent on the results of this monitoring, some form of fugitive dust control may be needed. The control options range from installing a wind barrier ($20,000-$50,000) to building indoor storage ($1-2 M). If some form of dust control is needed, a target completion date is October of 1995.

The audit of transportation facilities identified several areas of site environmental management in need of upgrade. At the Gateway facility, these are: (i) waste oil management; (ii) operation of sumps and plumbing system; (iii) concentrate overload station; and (iv) overall site integrity. At the Yukon Alaska Transport Facility, the key environmental issues are: (i) operational parameters for MIBC backhaul; (ii) waste oil management; (iii) concentrate overload station; and (iv) removal of contaminated soil. The Bowhead facility in Skagway, Alaska has undergone significant upgrade in recent years and is impressive from an environmental perspective on several levels; still, there is a need to provide spill containment at 2 short term petroleum storage areas.

It is estimated that all of the functional deficiencies at Gateway can be remediated by October of 1993 at a cost of between $25,000 and $60,000. At Yukon Alaska, it is expected that remediation may take a little longer, contingent on the control measures that are needed at the concentrate storage area. Our

estimate is for all outstanding items at Yukon Alaska Transport to be addressed by September of 1994 at a cost of between $30,000 and $70,000.

5.0 CONCLUSION

In an era of escalating concern for the quality of the environment, Canada has moved aggressively to establish new environmental protection standards and to stiffen the penalties for those who fail to comply with those standards.

To operate successfully under these rules, it is essential for Curragh to continue the cultivation of management practices that allow it to be more proactive in identifying environmental risks, translating those risks into an actionable business context, and managing them. Curragh must take further steps to ensure that adequate resources (human, technical, financial) are made available to honour the goals defined in the MAC Environmental Policy and the company's own Guide for Environmental Practice.

The need for environmental input and resources is especially important in mine planning and design. If environmental protection measures are identified and designed into a mineral project, the need for costly remediation after the fact is often significantly reduced. The need for a strong environmental planning function at the earliest stage of mine development is not unique to Yukon operations; it is something that Curragh must address on a corporate basis.

Senior management attention to these areas in the short term will benefit future corporate environmental performance and enhance employee awareness of the potential environmental impacts of Curragh's operations. Establishment of defined responsibility and modest additional resources at the minesites will expedite the implementation of these actions.

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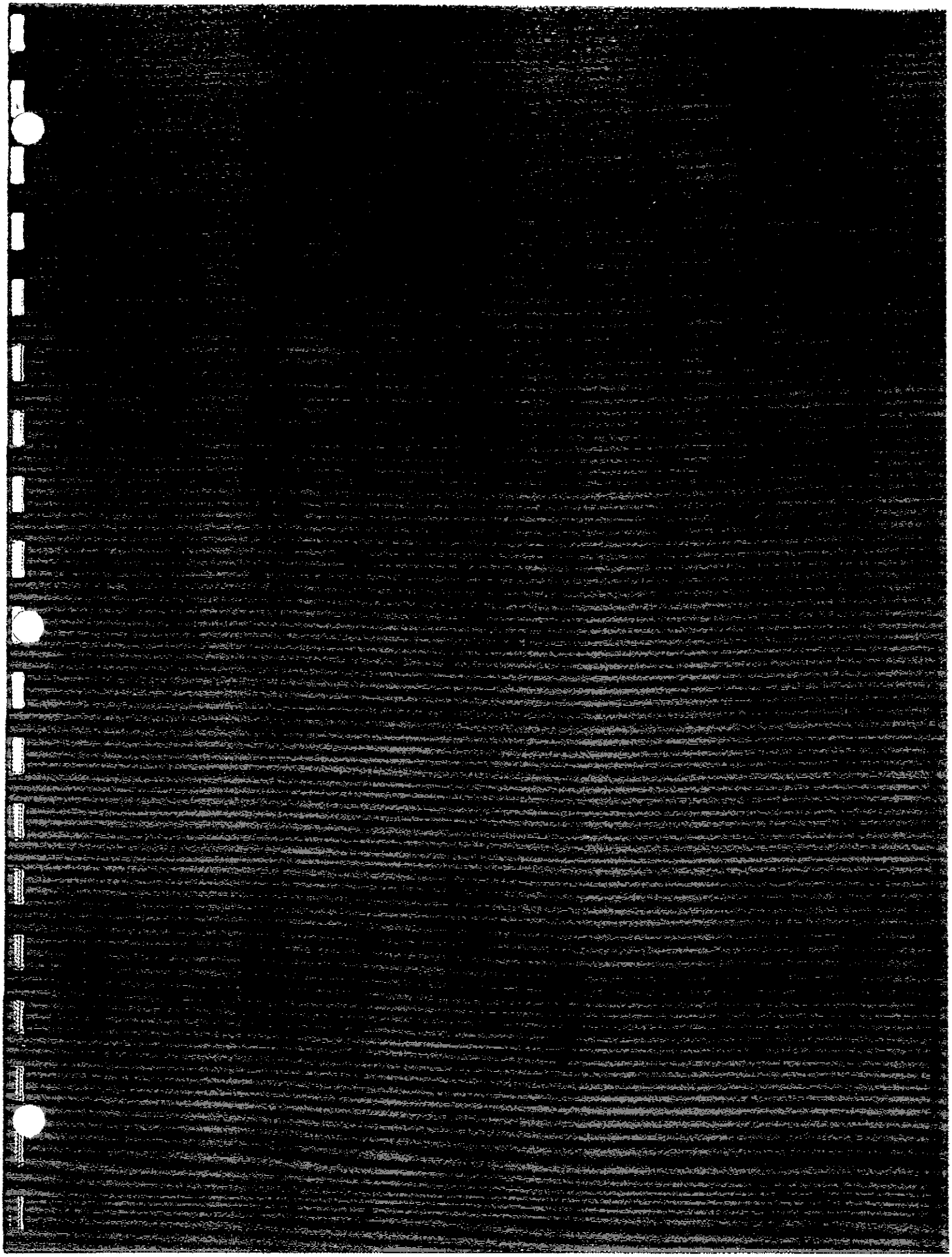

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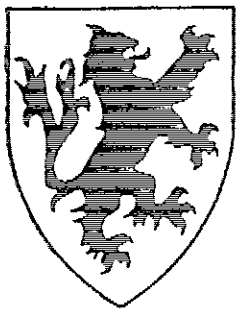

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ACKNOWLEDGEMENTS

The audit was conducted by a team composed of personnel from The Coopers & Lybrand Consulting Group (CLCG) and Curragh Inc. (Curragh). The following people were directly involved:

- Mr. Gerry Acott (Curragh)
- Mr. Robert Abbott (CLCG)
- Mr. Jim Taylor (CLCG)
- Mr. Howard Harowitz (CLCG)
- Mr. Bill Stanley (CLCG)

The audit team wishes to thank the management and staff of Curragh for their cooperation, time and contribution to the conduct of this audit. Their input during audit scoping, fact finding and reporting are valued inputs to this report.

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ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC.: YUKON OPERATIONS

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Executive Summary

The management of high profile environmental issues including tailings management, decommissioning and acid mine drainage, have been the focus of environmental management efforts at Faro. The work that has been done in these areas is significant and the minesite is generally well-positioned when judged against regulatory and industry benchmarks. The potential financial exposure associated with any of these issues, however, underscores the importance of reaffirming the management attention they receive. In particular, the financial security to address closure costs is an issue that will have to be monitored closely. This security is currently being accumulated in a Trusteed Environmental Fund (TEF) at a rate of $0.25 per wet tonne of mineral concentrate. The Yukon Territory Water Board has informed Curragh, be letter dated September 1, 1992, that a Public Hearing to deal with a revision to the per tonne levy will be scheduled shortly. The financial implications of an increase in the levy are considerable and merit close scrutiny by Curragh.

Looking beyond these primary issues, it is clear that the Faro minesite needs to improve its environmental management system in a number of areas, both in specific management system elements across the site and in a variety of discrete functional issues.

From a management systems perspective, there is a pressing need to upgrade the environmental planning function, the level of environmental organization and training and environmental monitoring. The following actions are recommended to address these weaknesses:

- Develop job procedures that assign environmental roles and responsibilities.
- Develop an organizational chart that clearly indicates reporting lines.
- Develop operating procedures and/or environmental standards for specific environmental concerns.
- Develop an Environmental Awareness Program to introduce the concept, goals, opportunities and background of environmental management at Faro to all employees.
- Broaden the concept of monitoring and measuring from a singular focus on water sampling and analysis to include site inspections and reviews.

Discrete functional issues requiring immediate remediate attention are petroleum storage, spill management and management of underground storage tanks. These are issues on which the minesite has taken little action to date and the environmental liability for any indiscretions is high. It is estimated that these issues can be remediated by October of 1993 at a cost of $85,000.

FARO MINESITE

1.0 Introduction

1.1 Objectives and Scope

The purpose of this audit was to evaluate Curragh Inc.'s (Curragh) environmental management practices at its Yukon operations on behalf of their legal counsel, Anton, Campion, Macdonald & Phillips. Specific objectives were to:

(i) Identify areas where environmental management could be strengthened; and

(ii) Identify potential or existing problems which may require remediation.

Due to time constraints, long term contractors employed by Curragh were not included in the audit. These contractors should be the subject of a future audit.

As this was the first environmental audit to be conducted on Curragh operations, it was an overview focusing on the systems and procedures in place to prevent or control potential environmental problems. In view of this scope, the audit cannot ensure that every aspect of a particular environmental issue has been accounted for.

The field investigation for the audit occurred between August 10-19, 1992.

1.2 Audit Control Criteria

Good environmental management is driven by adherence to a sound environmental management system. The elements of such a system are:

(i) Policy and Management Leadership
(ii) Planning and Procedures
(iii) Organization and Training
(iv) Monitoring and Measuring
(v) Incident Response and Reporting
(vi) Program Development and Issue Tracking

These elements must be addressed by Curragh in the context of managing environmental issues. Accordingly, they are used as audit control criteria. Refer to Appendix 1 for a description of these elements.

1.3 Approach

The audit was carried out in three phases: scoping, fact finding and reporting.

During the scoping phase, the audit team established the parameters of the investigation. This process was facilitated by meetings with the Manager, Environmental Affairs for Curragh to ensure that the boundaries imposed on the audit were realistic. As a result of these meetings it was decided to focus on systems and procedures for overall environmental protection rather than specific items such as water quality or waste management.

The fact finding consisted of:

- An examination of environmental documentation including company reports, files and memoranda as well as government inspection reports;
- Interviews and discussions with management and staff; and
- Site tours to identify potential or existing problems that may require remediation.

Major observations noted during the audit were discussed with the site managers in a post-audit debriefing prior to preparing this draft report.

2.0 Primary Functional Issues

The environmental regulatory regime in the Yukon is a complicated one. Land use permits and surface leases are granted under the Territorial Lands Act, however, much of the mining and exploration activities in the Yukon are conducted on "claims" under the Quartz Mining Act. Claims enable the same level of land disturbance as do Land Use Permits or Surface Leases, however, a lease allows exclusive use of the property and ensures long term tenure. Surface Leases have been taken out or have been applied for at most of Curragh's operating mines. These lease agreements outline various requirements including maintenance, environmental protection during operations and reclamation/decommissioning upon closure.

Water use approvals are granted under the Northern Inland Waters Act. The Yukon Territory Water Board reviews water licence applications for the mining industry and writes the licence to be signed by the Minister of Indian Affairs and Northern Development (DIAND). Among the key stakeholders who may become involved in public hearings related to a water licence application are DIAND, the Environmental Protection Service of Environment Canada, The Department of Fisheries and Oceans, the Yukon Territorial Government (YTG), the Yukon Conservation Society, Ross River Dena Council and the Selkirk First Nations. Owing to the fact that most developments in the Yukon take place on Federal Land, a screening under the Environmental Assessment Review Process (EARP) is generally required. This involves the preparation and submission of an Environmental Impact Assessment and an additional review of that document by the above-noted stakeholders.

Faro must cope with both of these regulatory processes. The majority of Faro's legal environmental obligations are defined in their two water licences, Faro licence #IN89-001 and Vangorda licence #IN89-002. The issues associated with this licence are of primary importance to the minesite and overshadow several secondary issues. These primary issues are:

- Tailings Management;
- Acid Mine Drainage; and
- Decommissioning and Reclamation.

2.1 Tailings Management

Mine plans call for placement of the remaining Vangorda tailings, and all Dy and Grum tailings, in the Faro pit. The existing Rose Creek impoundment contains approximately 56 million tonnes of tailings. At the time of the audit, tailings disposal had begun in the Faro pit, which should curtail effluent discharges from the tailings areas.

Compliance with water quality requirements is the focus of the mine's environmental management system. Issues of non-compliance periodically include fish toxicity, copper, zinc, ammonia and cyanide in Rose Creek tailings effluent. The mine has responded to these issues through the introduction of a peroxide treatment system and the changeover to in-pit tailings disposal. These efforts reflect the priority attached to compliance with water quality requirements.

As part of the tailings management system, the mine addresses many other concerns, such as:

- seepage through tailings dam walls;
- seepage through groundwater aquifers; and
- tailings dam stability.

Monitoring systems such as groundwater wells and piezometers have been installed and sampling and inspection procedures are in place to ensure that problems are identified and follow-up initiated promptly. Exposure to undetected large-scale environmental impact in these areas appears to be low.

Tailings planning appears to be similarly rigorous. As part of the site's decommissioning plan, the bulk of tailings from the Rose Creek impoundment will be removed by a hydromonitoring technique and reprocessed to recover residual lead and zinc in the form of a bulk concentrate. Final tailings disposal would be into the Faro pit. Current plans call for revenues from the reprocessing of tailings to pay for the relocation of tailings to the pit. Should reprocessing prove uneconomic, the mine would have to contemplate other options (without metal recovery, removing and pumping the tailings to the Faro pit would cost approximately $40.0 M). These options include building a dam to ensure that Rose Creek tailings can be safely flooded, or covering the tailings with a non-acid generating material. Curragh is currently testing six different cover materials and estimate that if the best option (slimes, till and waste rock) is ultimately used, it would cost in the range of $28.0 M. Obviously, tailings management remains a significant business risk for Curragh.

2.2 Acid Mine Drainage

As at many mining operations, acid mine drainage has become a major issue both in terms of ongoing operations and site decommissioning. Acid mine drainage will be a problem requiring remedial attention at many areas on the minesite including: (i) the Faro exposed pit walls; (ii) Faro Waste Dumps; (iii) the Down

Valley Tailings Facility; (iv) the Vangorda exposed pit walls; (v) the Vangorda cellularized dump; (vi) the Grum exposed pit walls; and (vii) Grum dumps that receive potentially acid generating waste rock.

The mine's response to acid mine drainage has been thorough, and includes: (i) the construction and operation of a large tailings containment facility and water clarification impoundment in the Rose Creek Valley; (ii) the introduction of an innovative sulphate reduction system in the former Faro underground mine; (iii) the construction of a lime water treatment plant for Grum and Vangorda pit and waste dump drainage; and (iv) a significant research effort that examines the impact of potential acid mine drainage levels on local fish habitat. These and other actions underscore the proactive response the mine is taking towards acid mine drainage.

There appears to be some evidence of slippage between the environmental planning process and the implementation of environmental commitments. For instance, the drainage collection ditches immediately west of the Vangorda Creek Diversion were not adequately constructed. Runoff during the Spring of 1992 caused severe erosional problems and deposition of suspended solids into Vangorda Creek. A substantial effort will be required to recontour the area prior to reconstruction of the collection ditches. Such "extra" costs may indicate that tighter control of site design/construction and/or greater environmental involvement in the site planning process is warranted.

The cost of maintaining water treatment and water collection systems in perpetuity, with the corresponding bonding requirements, makes acid mine drainage a potentially costly issue for Curragh. The potential scope of the acid mine drainage problem is also, by nature, difficult to define, so that the company cannot afford to reduce the time and resources already allocated to this issue.

2.3 Decommissioning/Reclamation

Decommissioning and reclamation issues vary substantially between the Faro and Vangorda sites. The following discussion summarizes planning and other activity that has occurred, and the method of providing financial security that has been adopted at each site.

2.3.1 Faro Water Use Licence #IN89-001

Decommissioning plans for the Faro minesite are continuing to evolve, reflecting the changing environmental regulations and technological advances. The most recent YTWB public discussions on the issue were held in January of 1992 and focused on the decommissioning of the Down Valley Tailings Facility in the Rose Creek Valley. The next set of discussions will likely take place in late 1993 and will involve the preparation and submission of an Integrated Decommissioning Plan (IDP). This will be a comprehensive plan that addresses decommissioning of the tailings area, pit and waste dump, final water course design and buildings, grounds and facilities. A brief review of the current decommissioning plans and associated documents indicates that Curragh is responding appropriately to the environmental review process.

With respect to reclamation, it appears that the Yukon Territory has less stringent reclamation requirements than other Canadian jurisdictions. It is likely, however, that these regulations will tighten with time, so that the mine's decision to proceed with limited reseeding of waste dumps, despite the lack of specific regulations in this area, demonstrates admirable anticipation of the course of future regulations.

Subsequent to the YTWB review of the technical issues, a further regulatory review is regularly conducted on the level of security that is held in trust to ensure proper and adequate decommissioning. Security requirements, as negotiated between Curragh and the YTWB, have taken the form of a one time Letter of Guarantee contribution of $500,000 in addition to a production levy of $.25 per wet metric tonne of mineral concentrate. The latter contribution is submitted annually (since 1986) based on concentrate production of that year in the form of a cash payment. Contributions are accumulated in a Trusteed Environmental Fund (TEF) which is directed by five trustees, two chosen by Curragh, one chosen by the Federal Government, one chosen by the Territorial Government and a fifth mutually selected by all parties. As at September 28, 1992 the Faro fund had grown to a market value of $1,473,430. The YTWB has informed Curragh, by letter dated September 1, 1992, that a hearing would be scheduled shortly to deal with a revision to the per tonne levy as a result of the decommissioning costs for the tailings as discussed in the January 1992 YTWB Public Hearing. There is little doubt that the levy assessment will be raised as a result of this upcoming review.

2.3.2 Vangorda Water Licence #IN89-002

The Vangorda Water Use Licence requires the submission of a comprehensive decommissioning plan for the Vangorda/Grum areas by June 15, 1994. Detailed planning and preparation is scheduled to begin in early 1993. Decommissioning will involve the flooding of Vangorda and Grum pits, the resloping and till capping of highwalls above water level, till encapsulation of the Vangorda dump to minimize the rate of acid mine drainage, and collection of the drainage for lime addition at a water treatment plant to be operated in perpetuity.

Securities required by the Vangorda licence include a one time contribution of $943,700 in the form of a security bond as well as a flat annual cash remittance of $560,000 through the 12 year duration of the licence. The latter is managed within a separate account of the TEF. Reviews of the adequacy of the annual cash remittance were scheduled by the licence for "...September 30, 1991 and in 1994 and every four years thereafter...", although no review has been conducted by the YTWB to date.

In addition, the project was screened through the EARP process at the application stage. The EARP review deemed that the security assessment required by the YTWB was inadequate and required an additional cash remittance of $4.606 M. This money is deposited with an investment agency and the interest is returned to Curragh on a monthly basis whereupon it is allocated to general operating revenues.

An in-depth audit of these primary issues requires specialized technical expertise and is beyond the scope of this audit. However, the priority and resources assigned to their management appears appropriate given their large potential impact on the company. At an operating level, the mine appears to be able to hold the line in meeting compliance requirements. The permitting and planning process appears to be well in hand, and in some cases is proactively anticipating future environmental obligations.

The operation has demonstrated that it is generally able to meet the compliance requirements associated with these primary issues with current resources. These resources are, however, stretched very thin. The provision of monthly and annual Water Board reports and the execution of water quality monitoring appears to consume much of the time available to site environmental personnel. As a result, there are a number of secondary issues which are slipping through the cracks.

3.0 Secondary Functional Issues

3.1 Petroleum Product Storage

The minesite uses a large volume of petroleum products on a regular basis (1.8 million litres of diesel fuel and 90,000 litres of gasoline each month) and the storage of these products requires immediate remedial attention. In many instances, the berms around bulk tankage are too small to contain even a portion of the product that could be released during an overflow or rupture event, such as the berms encircling the 1 million litre diesel tanks. This problem is particularly acute during the winter months when the berms fill with snow or meltwater. As well, many of the berms on the site are earthen and have partially collapsed due to frost heaving or other extreme weather events. Finally, the condition of the plastic impermeable liners in many of the berms is poor; several of these liners are in need of immediate replacement. These problems are common to both Curragh and long-term contractors employed on-site by Curragh. A written policy should be established which defines specific criteria for petroleum storage. This policy should, of course, be consistent with the Yukon Territory Gasoline Handling Act.

An internal review of petroleum product storage facilities on the Faro minesite was initiated by the site environmental group earlier this year, but not completed. There is a need to ensure that this review extends to include contractor sites as well as Curragh facilities, and that it is completed as soon as practicable, and in any case before winter.

3.2 Spill Management

Chemical reagents used in the milling process and various petroleum products are the focus of spill contingency efforts on the mine site. This focus derives from both the character of the product and the volume used (i.e. 1.8 million litres of diesel fuel per month).

Curragh's stated management practice is that regardless of whether a spill is reported to the government, it should always be reported internally. With this in mind, environmental spill reporting criteria, and a spill response report, were recently developed. These instruments have not yet been widely adopted and are therefore used on an ad hoc basis. Further effort is needed to ensure that the criteria are known, understood and adhered to, and that the response reports are completed and forwarded to the appropriate persons (including the Manager,

Environmental Affairs in Whitehorse). The importance of this internal reporting is underscored in a memorandum from G. Acott dated 1992 04 01:

"...to keep a record of the event such that we can go back in time and see how many similar incidents we have had and to initiate corrective action... [and to] provide valuable insight on the containment, treatment and clean up methods to employ should a similar situation occur".

These objectives are not being consistently met at present.

There is no formal spill response team on site; an emergency response team, trained in fire fighting and mine rescue, is present, but is used sporadically for spills. Any response that is mounted to contain and clean up a spill is largely dependent on the time and location of the spill and the staff who are immediately available. This informal procedure is not well understood by operators below the first-line supervisory level and, in any case, is dependent on thorough environmental awareness and spill response training to be effective. Such training, which need not be exhaustive and could be conducted at regular safety meetings, has not taken place. Spill response training would also increase the level of environmental awareness generally, and with respect to spills specifically. At present, environmental awareness is very low, as illustrated by the small oil spills (i.e. less than 100 litres) from and adjacent to, the shop area which are regularly allowed to enter a water diversion ditch and flow off-site via Rose Creek.

Anecdotal information derived from interviews suggests that over the past twelve to eighteen months there have been at least three or four fuel spills, one copper sulphate spill and two pipeline ruptures. Spill reports should be filled out for all spills, collected by the environmental department, and used as a basis for root cause analysis. This does not appear to be taking place. As a result, preventive measures such as direct supervision of fuel loading or enhanced pipeline markings are not being implemented. There is a need for the minesite to do more of this kind of analysis or it will inevitably find itself in a reactive rather than a preventive or pro-active mode with respect to spill management.

3.3 Underground Storage Tanks

There is considerable confusion on the minesite with respect to underground storage tanks (USTs); in large part because it appears no inventory of USTs has ever been prepared (if such an inventory exists, no one interviewed by the audit team is aware of it or what it contains). The audit team confirmed the existence

of two USTs for waste oil in the maintenance shop, but a thorough review of this issue, which may include electromagnetic scanning, was outside the scope of the management audit. Curragh should have such a review completed to facilitate preparation of an accurate UST inventory, including the location of all tanks, date installed, type of construction, presence of cathodic protection, piezometers or other leakage prevention/detection features, volume and contents. Removal of USTs is generally the preferred management solution due to the high level of liability associated with them. Viewed in this light, consideration should be given to developing a corporate policy prohibiting USTs at Curragh sites in the Yukon.

3.4 Waste Management

There is no waste management plan for the minesite; the control of solid, liquid or hazardous wastes therefore tends to be ad hoc. Virtually all solid waste is disposed of on site in a variety of loosely controlled dumping areas known as "boneyards". There is a pressing need to exercise tighter control over the materials that are deposited in these sites. Several interview subjects indicated that in addition to empty barrels (including cyanide barrels which are toxic when empty) and other containers, lead acid batteries, scrap metals, waste from process upsets in the mill and, on occasion, waste oils, are deposited in the boneyards. The deposition of waste oils in these sites is especially unfortunate because the mine has adopted a policy of burning waste oil in the concentrate dryer. More generally, the Mining Association of Canada (MAC) Environmental Policy, endorsed by Curragh in 1990, commits the company to sound environmental practices including **"...the adoption of best management practices".** Curragh's Guide for Environmental Practice, developed in support of the MAC policy, underscores the imperative of each employee assisting the company to:

"...limit physical disturbance of the land...encourage recycling of products and waste materials...dispose of non-recyclable wastes in an environmentally sound manner".

The present use of boneyards, and the assertion by several interview subjects that the boneyards are regularly buried and landscaped with a bulldozer or grader makes it difficult, if not impossible, to meet the commitments of the MAC policy and Curragh's own Guide.

Two areas in which the minesite has been proactive in managing wastes are PCBs and radioactive materials. According to the Electrical General Foreman (EGF), there are no PCB-filled transformers, and very few PCB-filled capacitors, in use on site; however, a demonstrated effort has been made to develop documented

plans and procedures to ensure that they are well managed. For example, the record book for PCBs includes the following components:

(i) registry;
(ii) emergency procedures plan;
(iii) list of emergency supplies;
(iv) record of monthly inspections;
(v) record of additions to inventory;
(vi) record of deletions to inventory;
(vii) incident report form; and
(viii) first aid exposure to PCBs

These plans and procedures are centrally coordinated and controlled by the site EGF.

With respect to radioactive materials, a secure storage vessel that exceeds Atomic Energy of Canada requirements has been constructed and located in a very low traffic area of the site and is similarly controlled by the electrical general foreman. The use of tight control, coupled with documented procedures such as inspection reports, minimizes the potential for a PCB or radioactive waste incident. It is recognized that such tight management control over these two materials has been driven by legislation and that it may be difficult to forge the same level of performance in areas where the legislation is either less stringent or even absent; however, a similar approach would be very useful for other waste materials on site.

3.5 Airshed Management

There are no Federal or Territorial regulations respecting outdoor air quality in the Yukon (i.e. particulates, NOx, VOC, SOx), although a set of guidelines have been established by DIAND. Accordingly, airshed management has not been viewed as a priority area by the minesite. The lack of attention to this issue has, however, created a potential problem on at least two levels. Firstly, the site uses a coal-fired concentrate dryer that creates visible stack emissions. A transition to propane fuel has been contemplated for at least two years, but little progress has been achieved and a one-year supply of coal remains on site. It is therefore doubtful that any change will be made while the coal is available. Secondly, the loading of the concentrate trucks and the outdoor stockpiling of concentrate creates an opportunity for concentrate dust to become airborne and spread to the exterior of vehicles, to the soil, and perhaps to the off-site environment. Other related problems include the need for an operating vacuum system at the

concentrate load-out and a means of controlling airborne road dust kicked up by the passage of concentrate trucks. Curragh's endorsement of the MAC policy, and its own Guide for Environmental Practice, coupled with the potential for the promulgation of tighter airshed regulations in the Yukon, suggest that while this remains a lower priority among the secondary functional issues, it merits more attention than recent experience would indicate.

3.6 Housekeeping

Housekeeping is an important component of overall site management because of the first impression it conveys to a visitor. This impression may sufficiently influence a visitor that (s)he becomes favourably or unfavourably disposed towards the balance of the operation. At present there are numerous boneyards, loosely controlled stockpile or storage areas, and swatches of disturbed or dead vegetation that are readily visible when first entering the minesite. Good housekeeping practices are promoted as part of the International Loss Control Institute (ILCI) program; however, although there is tacit commitment to ILCI principles on site, this loss management program has not yet taken hold.

3.7 Environmental Awareness

The environmental awareness of the management group is admirable; when advised of a problem they react well and are diligent in initiating corrective action(s). The awareness and sensitivity of operating personnel are, however, poorly developed. One of the most striking implications of this is that management may not be advised of problems requiring a corrective or pre-emptive response.

Operating personnel need to be made more aware of Curragh's legal obligations from an environmental perspective as well as their own obligations. The measures taken by Curragh to meet these obligations should also be communicated much more effectively than has been the case to date. It appears that operators are treating the environment in much the same way they treat highway speed limits; lip service is periodically offered, particularly after an infraction, but in the main it is ignored. An example of this would be the two recent cases where road maintenance activity on the Vangorda access road spilled suspended solids into Vangorda Creek, resulting in the relocation of a downstream environmental research project co-funded by Curragh and the Federal Government. Unless the overall level of environmental awareness is raised, the numerous spills observed during the audit, to take one common

example, will remain a fixture of the site. The need for enhanced communication was emphasized by one interview subject who did not know that the Faro site had an environmental group and who believed that the occasional water sampling he had observed was being carried out by government inspectors.

4.0 Environmental Management System (EMS) Components

4.1 Policy and Management Leadership (P&ML)

Significant progress on policy has been achieved through official endorsement of the MAC policy and the development of a company-specific Guide for Environmental Practice. Further work is needed, however, with respect to leadership because employee efforts will only reflect the values of senior management if those values are adequately communicated and reinforced, and there is evidence that senior management practices what it preaches. At Faro, the policy is not widely known and, while the general intent of the policy may be understood, environmental staffing is said to be a problem. This problem is easily resolved if management demonstrates leadership, manifest in a willingness to widely disseminate the policy and make the decisions, staff related or other, to deliver the level of performance committed to in the policy. An important first step has been taken with the promulgation of a policy; the crucial step of following through with the resources, human, technical or financial, necessary to deliver the policy and make it mainstream, remain to be taken.

4.2 Planning and Procedures (P&P)

The corporate culture within Curragh resists the application of structural instruments such as job descriptions, organizational charts and operating manuals. While there may be legitimate benefits in such a culture from a business perspective, the resistance to structure can be problematic from an environmental management perspective where consistent levels of performance are needed to comply with increasingly stringent regulations. For example, when plans and procedures are not documented, whether for water sampling, spill response or waste disposal, continuity problems are possible when staff turnover, an acute problem in Faro, occurs. More urgently, if the only procedural direction a new hire receives is that offered by the incumbent, bad habits may be transferred and/or the new hire may not be advised of changes in legislation that mandate a higher performance standard. The materials manual for the warehousemen at Faro is a good example of the kind of formal direction that should be available for all staff, but it is just that, an example; no other departmental policies or procedures have been formalized and documented. Roles and responsibilities respecting the environment are generally thought to be well understood by site personnel, but no written procedures formally assign responsibility or provide

assistance to someone who may be unfamiliar with a specific activity or process. Fundamentally, there is no way of ensuring that assigned responsibilities are known, understood and carried out.

4.3 Organization and Training (O&T)

Environmental policies can only be translated into effective action when a mining company develops a management structure that is responsive to environmental requirements. Individuals with the necessary skills must be placed in the organizational structure and given training in key aspects of environmental policies, plans and procedures.

The environmental group at Faro consists of two people, an engineer and a technician, who report through the Chief Engineer to the Manager of Mining and, ultimately, the Vice-President and General Manager (VP-GM). An informal reporting line links the group to the Manager, Environmental Affairs in Whitehorse. This organizational structure is generally good; there is a clear need for the environmental group to formally report to the senior individual on site. The structure could be improved, however, if the group had a higher profile in the organizational hierarchy. Ultimately, this might include the establishment of a joint Safety/Environment department reporting directly to the VP-GM. Faro is probably not ready for such a department, but there is a need to make the environmental function more visible and to involve it in more site planning and design. On the short to medium term, the existing organizational structure could be improved by making the Environmental Engineer a peer of the Chief Engineer, both reporting to the Manager of Mining. The environmental office must also be physically moved closer to the mining engineering department to facilitate the involvement of the Environmental Engineer in planning. As a minimum requirement, the Environmental Engineer at Faro should attend regular engineering planning meetings, track upcoming activities at the minesite and be asked for input on all engineering plans. There must, of course, also be an understanding that the Environmental Engineer has a direct line of communication with the VP-GM where this is necessary.

Quite apart from organizational structure, the resources that are devoted to environmental management at Faro are in need of review. The engineer and technician are fully utilized meeting water licence requirements; other environmental issues are addressed on a "catch-as-catch-can" basis. As a result, many secondary issues, including environmental awareness, slip through the cracks.

Training is indelibly linked to awareness; a recurrent theme in the audit interviews was the lack of environmental training available or provided to Curragh personnel, including members of the environmental group. The prevailing philosophy appears to be one of "react and learn". Some WHMIS and TDG training has been introduced on site, but the roster of those who have been trained is by and large limited to warehouse and materials handlers. In an era of escalating environmental regulation, the best insurance against an incident is frequently a thoughtful training and awareness program. No such program exists at Faro.

4.4 Monitoring and Measurement (M&M)

Compliance monitoring, to internal standards as well as regulatory standards, must be undertaken on a consistent, regular basis. Mine management must receive accurate, ongoing information on environmental performance to ensure that the operation is meeting its objectives and that corrective action is taken as soon as any deviations are noted. At Faro, this kind of monitoring and measurement is conducted for water quality under the terms of a water licence. Monthly reports, and an annual report, summarizing the results of all water quality tests are sent to the Yukon Territory Water Board (YTWB), the administrator of the licence. Any exceedances of the licence are immediately communicated to the YTWB through the DIAND Water Resources Group. Internally, these same water quality tests are summarized on a monthly basis in a mine report and, less formally, discussed every two weeks at mine manager meetings. The Manager, Environmental Affairs, receives copies of all water quality results. Zinc, copper, cyanide and ammonia have been recurring problems in the effluent from the Faro tailings and zinc and ammonia have intermittently exceeded licence levels for discharge from the water treatment plant at Vangorda over the past 6 months. No charges have been laid as a result of these exceedances. The effort that has been made to monitor water quality is admirable and understandable; effluent from the Faro site is a significant environmental risk and deserves the attention it receives. In view of the rather thin resources devoted to environmental management at Faro, however, this effort has come at the expense of other issues that are not presently being monitored. The containment facilities for above-ground bulk tankage, the integrity of underground tankage, soil quality at various locations on site, waste disposal practices and airborne emissions of concentrate which may adhere to vehicles leaving the site are all important areas that should be monitored as part of an environmental program. At Faro, scarce environmental resources have been allocated to the highest profile issues; there is a need to allocate additional resources to ensure that other issues are not ignored.

4.5 Incident Response and Reporting (IR&R)

In order to develop an effective incident response and reporting system, a mining company must have a complete understanding of the full range of potential incidents it faces. Specific response plans must then be developed, not only for high probability events, but also for low probability/high impact events.

The Faro minesite has made a good start on developing such a system with documented spill reporting criteria and spill response forms, as well as internal and external reporting of water licence violations. The minesite's demonstrated commitment to respond to water licence issues is admirable and could be used as a template to assist response planning for other issues or incidents (i.e. fuel spills). The efforts at Faro are, however, still embryonic when the site is viewed as a whole. The definition of the full range of incidents is one area that needs greater attention. Acute spill incidents and effluent discharges that exceed licence requirements are obviously important, but other potential incidents such as low-level chronic discharges from leaking underground storage tanks or sumps, the failure of vacuum equipment at the concentrate load-out facility to contain airborne emissions, or the arrival of a material shipment with leaking containers of reagent also require thoughtful contingency planning. This has not occurred at Faro.

4.6 Research

Research in the environmental management context is the improvement of procedures, processes or product designs that enhance a mining company's environmental performance. A company must, for example, have the ability to rethink its processes to reduce or eliminate the use of hazardous materials and other avoidable environmental impacts.

A proactive mining company must also track trends in environmental legislation, both locally and abroad, if it is to effectively position its environmental program to meet emerging challenges. It appears that this is occurring at the Faro minesite. The Manager, Environmental Affairs and the Vice-President, Exploration, track regulatory developments that may impinge on environmental management practices at the mine and communicate these to the site directly, or through the site environmental group.

5.0 Forward Action Plan

The primary issues, tailings management; acid mine drainage; and decommissioning/reclamation have rightly been the focus of environmental efforts to date. They should remain the highest priority items at the minesite in view of the scrutiny they are subjected to by regulatory and other groups, and the large environmental and business impact(s) they potentially create.

Among the secondary issues, waste management, underground storage tanks and petroleum product storage are marginally more important than spill and airshed management. The rationale here is that while the site needs to do more with respect to spill response, it has made some progress and a greater marginal gain could be realized by expending effort elsewhere. With respect to airshed management, the absence of regulations makes this an issue to monitor closely for emerging regulations and, work on when other, more pressing, concerns have been addressed. Housekeeping and environmental awareness are longer term programs that can be kick-started by visible successes in other areas that build momentum (i.e. a site waste management plan and a program to upgrade petroleum product storage will send a powerful signal to employees that the environment is important to Curragh and this will foster awareness).

Specific actions to address these secondary issues are discussed below and summarized in Table 1:

Step 1 **Upgrade Petroleum Product Storage Facilities**

- Develop clear, consistent design specifications for construction of all storage facilities, including detailed requirements for spill containment and ensure that on-site contractors are provided with a copy and are required to follow them.
- Ensure that adequate containment is provided at all storage facilities, and that the containment (berms, liners, drainage, etc.) is in good repair.
- Document the location and condition of all pipelines paying particular attention to the potential for a vehicle accident involving a pipeline; and the presence of operating procedures for work near pipelines.

Step 2 **Enhance Spill Prevention and Control Effort**

- Conduct orientation programs (spill response procedures, spill reporting criteria, etc.) with first line supervisors and operators (potential response teams).

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TABLE 1
CURRAGH INC. (YUKON OPERATIONS)
ENVIRONMENTAL FORWARD ACTION PLAN

FARO

Functional Issue	Environmental Risk Priority	Estimated Cost	Target Completion Date	Action Priority	Assigned Responsibility	Assigned Completion Date
Petroleum Storage	1					
1. develop design specifications		$5K	Dec. '92	8		
2. upgrade spill containment		$50K	Oct. '93	16		
3. inventory location of pipelines		$10K	Aug. '93	14		
Spill Management	2					
1. orientation to intent of program		internal	Apr. '93	10		
2. criteria (identifying a spill)		internal	Apr. '93	9		
3. reports (filed with the site and WH office)		internal	Nov. '92	1		
4. follow-up for all spills (causal analysis)		internal	Nov. '92	2		
5. provide spill containment in shop area		$5000	June '93	13		
USTs	3					
1. corporate policy on underground storage tanks		internal	Nov. '92	3		
2. survey and remediation (if req'd.)		$20K	Oct. '93	15		
Waste Management	4					
1. develop management plan		internal	Apr. '93	12		
2. launch a recycling program		$10K	Nov. '92	4		
3. remediate all boneyards		$100K	Sept. '94	18		
Airshed Management Program	5					
1. evaluate alternatives to control fugitive dust						
- wind barrier		$50K	Oct. '93	17		
- covered/indoor storage		$2.5M	Oct. '95	19		
Housekeeping	6					
1. remove dead vegetation and contour slopes		$5K	Nov. '92	5		
2. small reclamation efforts		$30K	ongoing	11		
3. hire students for site clean-up		$10K				
4. establish green cmtee		internal	Nov. '92	7		
Awareness	7	internal	ongoing (intensive in first 6 months)	6		
1. begin program of environmental presentations						

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TABLE 1
CURRAGH INC. (YUKON OPERATIONS)
ENVIRONMENTAL FORWARD ACTION PLAN (CONT'D)

FARO

EMS Issues	Environmental Risk Priority	Estimated Cost	Target Completion Date	Action Priority	Assigned Responsibility	Assigned Completion Date
P&ML - follow-up on environmental policy implementation - increase resources devoted to environmental management	3	internal $35K/$45K/yr.	Dec. '93 Dec. '93	7 8		
P&P - introduce formal management systems for environmental issues	1	internal	Dec. '93	3		
O&T - training of emergency response team - training in environmental law - on medium term, review reporting line of site environmental group	2	$5K/session internal	ongoing Dec. '93 Dec. '94	5 9		ongoing
M&M - broaden from focus on water quality and dam stability to include other env. issues	4	internal	Dec. '93	6		
IR&R - formal spill reporting procedures are needed - causal analysis of all spills needed - the need for a formal spill response team should be investigated	5	internal internal internal	Nov. '92 Nov. '92 Dec. '93	1 2 4		
Research - reaffirm effort presently given in this area	6	internal	N/A	N/A		ongoing

P&P	♦	formal management systems must be introduced for environmental issues (i.e. job procedures which assign environmental roles and responsibilities, an organizational chart, and specific plans for environmental improvement).
O&T	♦	Existing organization is acceptable for the short-term; on the medium-term, the site environmental group should have direct access to the General Manager.
	♦	Further training is needed in environmental law and the responsibilities (corporate and personal) that flow from the law: spill response; WHMIS; and TDG.
M&M	♦	Efforts in this area must broaden from a singular focus on water quality and dam stability (i.e. spill containment, waste disposal sites, etc. are important areas to monitor as well).
IR&R	♦	Formal spill reporting procedures are needed.
	♦	There is a pressing need for causal analysis of all spills.
	♦	The need for a formal spill response team (with procedures and equipment) should be investigated.
Research	♦	Environmental staff on-site and in Whitehorse are managing this component of the system well.

The upgrades to any environmental management system (EMS) tend to constitute cultural changes that are not as quickly executed as the remediation of a specific functional issue. It should be recognized, however, that improvements to the EMS are much more important than merely rectifying some of the functional problems which have been identified; the EMS is the prevention system that will keep these functional problems from recurring. Curragh should pursue these EMS upgrades concurrently with the functional issues, but recognize that more time and constant re-enforcement will be needed to demonstrate progress.

To facilitate this action plan, the Manager, Environmental Affairs should allocate time at Faro to get specific initiatives organized and underway. This is especially important from the perspective of giving meaningful hands-on support to site personnel in terms of training and liaising with site management to underline the corporate importance of these environmental improvements.

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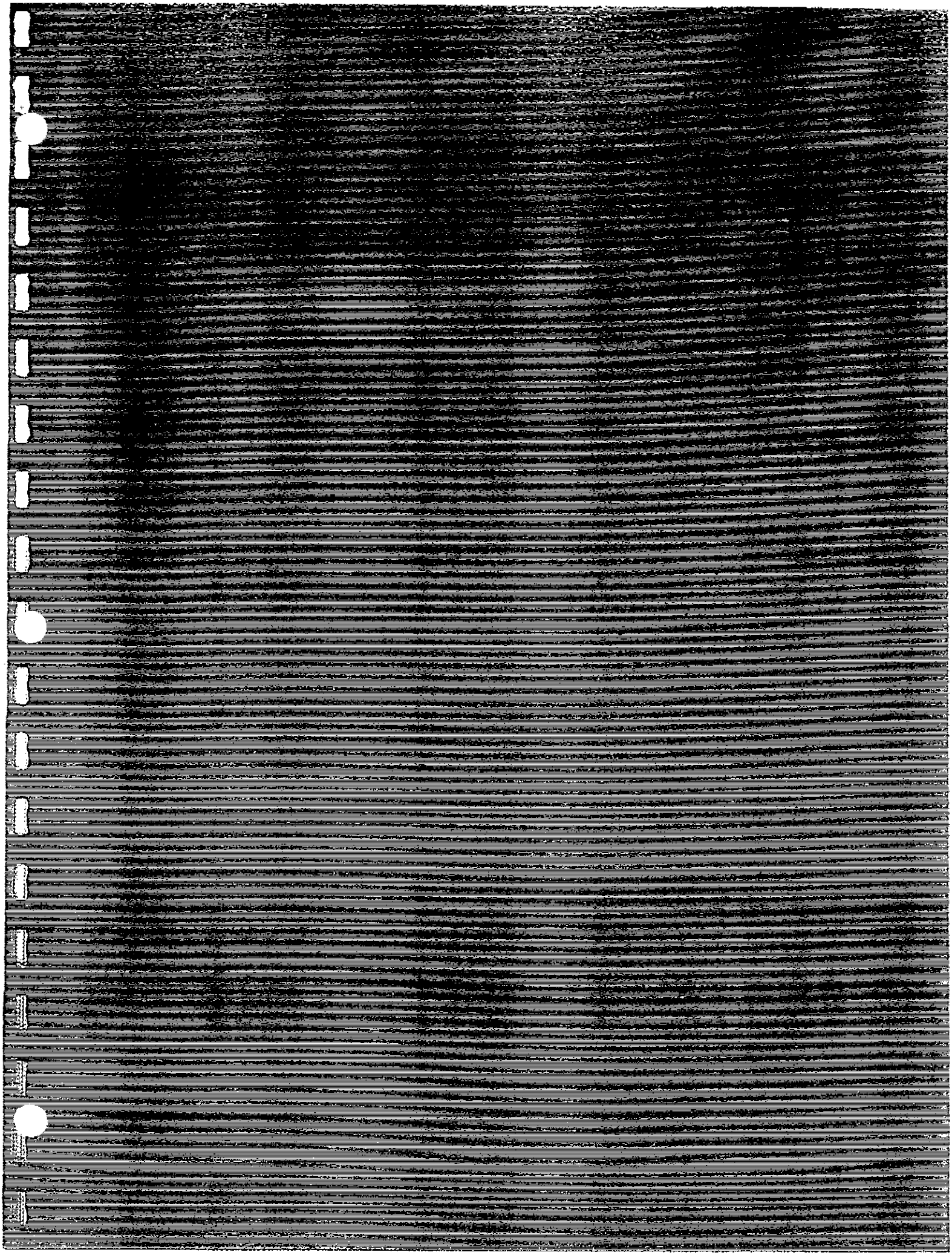

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APPENDIX 1.

ENVIRONMENTAL MANAGEMENT SYSTEM FRAMEWORK

The six key elements of an environmental management system are described briefly below.

Policy and Management Leadership. Sound environmental management requires that senior management develop and widely disseminate policies which state how the corporation intends to address environmental protection issues to ensure that statutory and environmental risks are reduced to an acceptable level. Based on these policies, senior management has a responsibility for setting departmental objectives as they affect the environment. Employee efforts will reflect the values of senior management if these values are adequately communicated and reinforced, and if there is evidence that senior management practices what it preaches.

To achieve effective management of environmental performance, responsibility for the implementation of environmental policy must be clearly defined. Responsibility and authority for environmental management must also be clearly established and articulated within the environmental policy. There should be evidence that the environmental policies are based on a sound assessment and awareness of the potential and actual direct and indirect impact of the department's activities and/or products on the environment, as well as measures to mitigate any negative effects.

Planning and Procedures. The planning process can be used to prevent or reduce the impact of a department's activities or products on the environment. An effective planning strategy includes an integrated management approach toward environmental protection on an department-wide basis. Diverse management functions such as purchasing, legal, engineering, operations, etc. must be coupled to environmental principles to provide appropriate business solutions to complex operational issues of an environmental nature. Specific procedures must be established and communicated to all parts of the department. These can range from sourcing and purchasing guidelines to instructions for the secure storage, handling, transport and disposal of dangerous goods.

Organization and Training. Environmental policies can only be translated into action when the department develops a management structure that is responsive to environmental management requirements. Appropriate individuals with the necessary skills must be placed in the organizational structure and given training in key aspects of environmental policies, plans and procedures. Delegation of appropriate authority and specific reporting relationships depends on a number of factors, including the geographic spread of departmental operations, speed of response time required,

degree of risk exposure, similarity or dissimilarity of different departmental operations, as well as the department's overall corporate culture and ways of doing business.

An environmental training program should be established such that staff receive timely, current training with respect to environmental protection issues, relevant to the employee's level of authority and responsibility within a company. Key personnel must be familiar with overall department environmental policies, objectives and action plans, and all personnel should be familiar with the environmental action plan for their area, and the relevant objectives and applicable departmental procedures.

Monitoring and Measuring. Compliance monitoring and/or ambient environmental monitoring must be undertaken to allow monitoring data and notices of non-compliance to be submitted to the relevant government agency in accordance with the terms and conditions of permits or other relevant agreement.

Monitoring and reporting information should also be used for internal purposes, specifically to ensure that corrective action is taken as soon as deviations from requirements are noted.

Incident Response and Reporting. In order to develop an effective incident response and reporting system, a department and its individual facilities must undertake a complete and thorough analysis of all possible incidents, and must have well-developed reporting procedures and response action plans for each type of incident. These plans must include not only high probability events but also low probability/high impact potential events.

Procedures must be developed which detail appropriate response plans for each type of incident. These response plans must be practised regularly so that employees are fully aware and trained. Incident reports should be prepared and distributed in accordance with the above analysis. Remedial actions and follow-ups must be initiated in a timely fashion and government agencies should be notified according to the requirements of applicable laws and regulations. A record of these contacts should be maintained to avoid any later dispute regarding a department's attention to proper procedures.

Research. Program development is the improvement of procedures, processes or product designs that enhance a department's or a facility's environmental performance. A facility must, for example, have the capacity to rethink its industrial processes to reduce or eliminate the use of hazardous materials and other avoidable environmental impacts.

A facility must also track trends in environmental legislation, both locally and abroad, if it is to effectively position its environmental program to meet emerging challenges. Participation in industry-government, to take one example, are essential if a facility or government department is to stay abreast of new developments.

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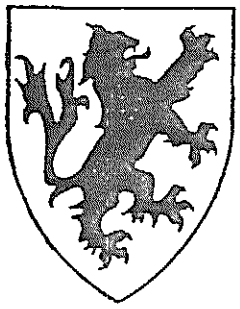
ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC. (YUKON OPERATIONS)



TRANSPORTATION AND PORT FACILITIES FINAL REPORT

OCTOBER 19, 1992

The Coopers & Lybrand Consulting Group

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ANTON, CAMPION, MACDONALD & PHILLIPS

ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC.: YUKON OPERATIONS

TRANSPORTATION AND PORT FACILITIES

OCTOBER 19, 1992

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Bill Stanley

ACKNOWLEDGEMENTS

The audit was conducted by a team composed of personnel from The Coopers & Lybrand Consulting Group (CLCG) and Curragh Inc. (Curragh). The following people were directly involved:

- Mr. Gerry Acott (Curragh)

- Mr. Robert Abbott (CLCG)
- Mr. Jim Taylor (CLCG)
- Mr. Howard Harowitz (CLCG)
- Mr. Bill Stanley (CLCG)

The audit team wishes to thank the management and staff of Curragh for their cooperation, time and contribution to the conduct of this audit. Their input during audit scoping, fact finding and reporting are valued inputs to this report.

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ANTON, CAMPION, MACDONALD & PHILLIPS

ENVIRONMENTAL MANAGEMENT AUDIT OF CURRAGH INC.: YUKON OPERATIONS

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TRANSPORTATION AND PORT FACILITIES

Executive Summary

The two transportation companies that move ore concentrate for Curragh, Gateway Transport Ltd. (Gateway) and Yukon Alaska Transport Ltd. (YAT), have developed management systems that are generally effective in managing environmental risks during transport. There are, however, several functional issues in need of upgrade at their respective yard facilities.

At Gateway, the issues in need of upgrade are: (i) waste oil management; (ii) operation of sumps and plumbing system in the wash bays; (iii) management of the concentrate overload storage station; and (iv) overall site integrity. It is estimated that these functional deficiencies can be remediated by October of 1993 at a cost of between $25,000 and $60,000.

At YAT, the key environmental issues are: (i) operational parameters for MIBC backhaul; (ii) waste oil management; (iii) management of the concentrate overload station; and (iv) removal of contaminated soil, particularly from the North Boundary of the property. The timing for remediation of these issues will be contingent on the control measures that are needed at the concentrate storage area, but we would estimate that remediation can be carried out by September of 1994 at a cost of between $30,000 and $70,000.

The Bowhead facility in Skagway, Alaska has undergone significant upgrade in recent years and is impressive from an environmental perspective on several levels. One area that is in need of upgrade is the provision of spill containment at 2 short term petroleum storage areas.

TRANSPORTATION AND PORT FACILITIES

1.0 Introduction

1.1 Objectives and Scope

The purpose of this audit was to evaluate Curragh Inc.'s (Curragh) environmental management practices at its Yukon operations on behalf of their legal counsel, Anton, Campion, Macdonald & Phillips. As part of the audit, the environmental integrity of the transportation companies that move ore concentrate for Curragh, and the port facility at Skagway, Alaska, where the ore is stored prior to overseas shipment, were also investigated. Specific objectives of this phase of the audit were to:

(i) Identify areas where environmental management could be strengthened; and

(ii) Identify potential or existing problems which may require remediation.

Due to time constraints, long term contractors employed by Curragh were not included in the audit. These contractors should be the subject of a future audit.

As this was the first environmental audit to be conducted on Curragh operations, it was an overview focusing on the systems and procedures in place to prevent or control potential environmental problems. In view of this scope, the audit cannot ensure that every aspect of a particular environmental issue has been accounted for.

The field investigation for the audit occurred between August 10-19, 1992.

1.2 Audit Control Criteria

Good environmental management is driven by adherence to a sound environmental management system. The elements of such a system are:

(i) Policy and Management Leadership
(ii) Planning and Procedures
(iii) Organization and Training
(iv) Monitoring and Measuring
(v) Incident Response and Reporting
(vi) Program Development and Issue Tracking

These elements must be addressed by Curragh in the context of managing environmental issues. Accordingly, they are used as audit control criteria. Refer to Appendix 1 for a description of these elements.

1.3 Approach

The audit was carried out in three phases: scoping, fact finding and reporting.

During the scoping phase, the audit team established the parameters of the investigation. This process was facilitated by meetings with the Manager, Environmental Affairs for Curragh to ensure that the boundaries imposed on the audit were realistic. As a result of these meetings it was decided to focus on systems and procedures for overall environmental protection rather than specific items such as water quality or waste management.

The fact finding consisted of:

- An examination of environmental documentation including company reports, files and memoranda as well as government inspection reports;
- Interviews and discussions with management and staff; and
- Site tours to identify potential or existing problems that may require remediation.

Major observations noted during the audit were discussed with the site managers in a post-audit debriefing prior to preparing this draft report.

2.0 Gateway Transport Ltd.

Gateway Transport Ltd. (Gateway) has been contracted to haul ore concentrates from the Sa Dena Hes mine to tidewater in Skagway, Alaska. The company has a complement of 27 line drivers who drive from Watson Lake to Skagway, and 6 "shuttle drivers" who drive exclusively from the mine to Watson Lake. Production from the mine is planned to be at a rate of 120 to 150 thousand tonnes of concentrate annually. Based upon the highest annual tonnage of ore concentrates, a truck (B-train) should leave the minesite or return from Skagway every two and a half hours. Each line driver makes one trip to Skagway (approximately eleven hours), takes eight hours off, and returns to Watson Lake. This cycle is repeated three times and then the driver takes a seventy-two hour break. This arrangement ensures compliance with the National Safety Code.

The parameters within which Gateway operates are contained in a bulk ore agreement with Curragh. These parameters include stringent minimum experience credentials for drivers (100,000 miles of "B" train experience, 5 years driving experience with clean safety record, etc.). In addition, each driver receives safety and hazardous materials training and is certified in accordance with the Federal Transport of Dangerous Goods Regulations.

Under the terms of the bulk ore agreement, each driver must stop and inspect the security of his vehicle every two hours. This practice significantly reduces the potential for an accident or spill; however, in the event of an accident, the response is generally understood to be as follows:

(i) dispatch in Watson Lake notified by driver;
(ii) dispatch notifies Lloyd Bjork, Manager of Gateway;
(iii) dispatch notifies Environment Canada and other government agencies as required;
(iv) Lloyd Bjork ensures that a Gateway representative is sent to the accident scene to secure the area; and
(v) the on-scene Gateway representative ensures that the appropriate clean-up equipment is mobilized (grader, backhoe, etc.).

Gateway employs a safety supervisor who is on twenty-four hour call and who travels to Skagway one or two times per week to monitor the movement of concentrates. In the event of an accident, the safety supervisor would facilitate accident scene activities. Gateway has experienced two major accidents in the last twelve months; both were roll-overs in which concentrate was spilled. In both cases, the spilled concentrate was cleaned up and returned to the mine. Environment Canada conducted post-clean-up inspections of the accident sites and was satisfied with the quality of the clean-up.

In summary, then, Gateway appears to have established a management system that is effective in reducing the risk associated with the transport of lead and zinc concentrates.

The transport of concentrates, while the most important and conspicuous activity undertaken by Gateway, does not capture all of the risks associated with the movement of concentrates; the operation of Gateway's yard facility in Watson Lake must also be considered.

There are several functional issues associated with the operation of Gateway's yard facility that require remedial attention. These include:

2.1 Waste Oil

The site has installed a waste oil burning furnace; however, the manufacturer of the furnace went into receivership before the installed unit was approved by government representatives and it is Gateway's understanding that the unit cannot be approved if the manufacturer is in receivership. As a result, waste oil is being stored in several drums on site and alternative disposal will have to be sought. If the furnace cannot be approved, it will be important to secure a reliable alternative disposal because extended drum storage is not secure; many of the drums presently in use are in poor condition and at least one was observed to be leaking. There is, as well, considerable soil staining on the site.

2.2 Operation of Sumps in Wash Bay and Garage

The site is equipped with two sumps; one in the wash bay, and one in the service garage. Neither is working properly. Apparently, a four inch pipe was used to link these sumps with two settling ponds, a small cement enclosure intended for primary settlement of coarse material (which facilitates easy dredging) and a larger earthen pond intended for final clarification of effluent and evaporation/exfiltration. Unfortunately, these ponds are not being used in the manner for which they were intended. The concrete pond is being by-passed and all sediment/oily waste is going directly to the earthen pond where dredging will be more difficult. The four inch diameter pipe routinely clogs with oily sand and gravel, inhibiting the flow of material and negating the performance of an oil/water separator. As a result, dirty water regularly backs up into the used oil sump. A pump truck removes the blockage and discharges dirty water, oily gravel etc. into the earthen pond. This practice has fostered erosion of the bank area immediately above the large settling pond. There is no visible oil sheen on this

pond, however, in view of the material that is discharged on site when the sumps are cleaned, the sediments may be oily. The extent of this potential problem should be defined by Curragh. More importantly, the extent to which the sump network can be retrofitted to perform in the manner for which it was intended should be determined. Otherwise, the operation of these sumps will be a persistent problem.

2.3 Concentrate Storage

Excess concentrate is stored in two pots (one lead; one zinc) until full, and then returned to the mine. The need for excess concentrate storage derives from two sources; overloads at the government scales, and spills of concentrate at the mine (i.e. when a "plug" of concentrate breaks the lid of one or more pots on a "shuttle" truck, the broken lid(s) remains on the truck until it reports to the yard in Watson Lake). Gateway has provided two cement berms within which the storage pots are kept, but each of these berms has a drainage hole which facilitates the movement of spilled or windblown concentrate downslope into the large settling pond. This situation requires immediate remedial attention.

3.0 Yukon Alaska Transport Ltd.

Yukon Alaska Transport Ltd. (YAT) has been contracted to haul ore concentrates from the Faro mine to tidewater in Skagway, Alaska. The company has a complement of 125 drivers who operate between Faro and Whitehorse, and Whitehorse and Skagway. Each driver is given an opportunity to work any (or all) of the following schedules:

(i) 5 days on, 3 days off (Whitehorse/Faro)
(ii) 6 days on, 2 days off (Whitehorse/Skagway)
(iii) 3 days Faro; 2 days Skagway, 3 days off
(iv) 5 days Faro (3 off), 5 days Skagway (2 off)

The parameters within which YAT operates are contained in a bulk ore agreement with Curragh. These parameters include stringent minimum experience credentials for drivers (100,000 miles of "B" train experience, 5 years driving experience with clean safety/impaired record, etc.). In addition, each driver receives safety and hazardous materials training and is certified in accordance with the Federal Transport of Dangerous Goods Regulations.

Under the terms of the bulk ore agreement, each driver must stop and inspect the security of his vehicle every two hours or one hundred miles. This practice significantly reduces the potential for an accident or spill; however, in the event of an accident, the response is generally understood to be as follows:

(i) dispatch in Whitehorse notified by driver;
(ii) dispatch notifies Vic Broadhead, Manager of YAT or Dave Avoledo, Safety Manager for YAT;
(iii) dispatch notifies Environment Canada and other government agencies as required;
(iv) Vic or Dave ensures that a YAT representative is sent to the accident scene to secure the area; and
(v) the on-scene YAT representative ensures that the appropriate clean-up equipment is mobilized (grader, backhoe, etc.).

Dave Avoledo and two safety inspectors who work with him, are on twenty-four hour call and they travel to Faro and Skagway on a regular basis to monitor the movement of concentrates. In the event of an accident, they facilitate the appropriate response. Environment Canada conducts post-clean-up inspections of any accident sites and to date has been satisfied with the quality of the clean-up undertaken by YAT.

In summary, YAT appears to have established a management system that is effective in reducing the risk associated with the transport of lead and zinc concentrates.
The transport of concentrates, while the most important and conspicuous activity undertaken by YAT, does not capture all of the risks associated with the movement of concentrates; the operation of YAT's yard facility in Whitehorse must also be considered. There are several functional issues associated with the operation of YAT's yard facility that require remedial attention. These include:

3.1 Backhauling of MIBC From Skagway

YAT trucks frequently backhaul supplies to the Faro mine from Skagway. In the main, these are non-hazardous materials used in mine and mill operation. A significant exception is MIBC, a toxic mill reagent. This material is apparently backhauled from Skagway without TDG placards and supporting documentation. Such a practice is in contravention of the Canadian Federal TDG regulations and must be suspended until the appropriate documentation is in place.

3.2 Integrity of Underground Storage Tanks (Diesel Fuel, Waste Oil)

The YAT yard has three underground storage tanks; two for diesel fuel, the other for waste oil. Control over the diesel tanks appears to be generally quite good; they are dip checked every other day and cannot be accessed unless the dispatcher activates a switch inside the main YAT building. As well, records are kept of all additions to/deletions from the tanks. Greater care is needed, however, in the dispensing of fuel by drivers; the ground where the trucks refuel shows considerable staining from overflows. The control over the smaller tank is not as good. There is no dip checking and mass balance records are not kept. As a result, it is difficult to identify a leak or unaccounted loss in inventory. As well, the control over the deposition of waste oil in this tank needs to be strengthened; the ground near the spout of the tank shows considerable staining from oil spillage.

The YAT yard is equipped with two settling ponds (final clarification pond "A" and primary clarification pond "B") that are intended to filter dirty wash water. In view of the loose control over concentrates, these ponds are inspected annually and, contingent on the results of that inspection, dredged to remove concentrate sediment. These sediments are returned to the minesite. A persistent problem that has complicated the operation of these ponds is the presence of oil. Both the site manager and the safety manager have investigated this issue and it

appears that, despite verbal instructions and warnings to the contrary, mechanics are periodically dumping waste oil into the ponds.

3.3 Concentrate Storage

When an overload is detected at the government weigh scale in Whitehorse, the truck returns to the yard and excess concentrate is removed by backhoe and/or shovel and stored in a lead or zinc pot. The removal of excess concentrate is loosely controlled and neither storage pot is equipped with a lid. As a result, concentrate readily becomes airborne and is scattered about the yard. The absence of secure storage also allows concentrate to be carried to other areas of the site, or offsite, by tracking or rainwater runoff. The operational parameters associated with the removal and storage of excess concentrate require immediate remedial attention. The importance of this issue is underscored by the fact that it has been previously identified by G. Acott, most recently during a site visit in April, 1992:

"The overload transfer station continues to be a problematic site. During our site visit of April 30, 1992, small spills of concentrate were observed on the ground adjacent to the overload pots. Although the SWEP analysis results of 16.3 mg/l were only a third of the spring analysis (51.0), this still exceeds the limits by a factor of 3 and would be considered a hazardous waste in B.C."

A related, but separate, issue is the initial loading of the trucks at the Faro mine. A vacuum system was installed about two years ago to control dust during loading, but the system is no longer working and the inside of the pot lids "always" have concentrate dust on them. When lids are removed to facilitate overload concentrate, the dust drops onto the ground.

The lack of control over truck loading is the direct cause of a chronic problem at the government weigh scales. The manager of YAT indicates that there are at least three overloads each day (over one thousand a year) at an average cost of at least $100.00. The inability to properly and accurately load YAT trucks is costing Curragh on the order of $100,000 a year in overload fines.

Glycol is used to prevent concentrate dust from freezing to the interior of pots, but the control over its application is poor and glycol residue is frequently found on the exterior of pots and/or trucks. The glycol attracts road dust which may be perceived by the public to be concentrate dust on the exterior of pots or trucks. This is a significant business risk because Canadian or United States regulatory officials could stop the movement of concentrates if a swab test of a pot lid

revealed the presence of lead or zinc. This is an issue that requires immediate remedial attention. More thorough truck washing at Whitehorse is required to ensure the pots are free of glycol before departing the terminal.

3.4 Contaminated Soil - North Boundary of Property

Historically, the overload transfer station area has been "cleaned" by scooping up surface soils and depositing them along the north boundary of the YAT property. This practice has created a contamination problem that was identified in site investigations conducted by G. Acott (May, 1991; October, 1991; April, 1992) and summarized in a memorandum to Vic Broadhead dated 1992 06 01:

"The North Boundary sampling...consists of four separate samples. These samples show levels of lead to be elevated to the point where these soils would be considered hazardous by B.C. standards. Only one of the four samples, at 3.75 mg/l, was below the 5.0 mg/l limit. The other three values, at 5.8, 11.9 and 10.3, all exceed standards. These soils should be excavated and returned to the mine for disposal."

A site investigation during the audit indicated that these soils had not yet been excavated and returned to the mine for disposal.

G. Acott reports that during his April, 1992 investigation of the YAT yard, it was apparent that:

"...small spills of concentrate were observed on the ground adjacent to the overload pots...although the practice of dumping over the edge appears to have stopped, grading it on the surface of the pad has not. Visual inspection of the working area at the overload station revealed concentrate that had been graded into the working surface.Furthermore, recent grading from the overload area towards the back of the pad was evident, and there were two small piles of mixed gravel and concentrate near the back of the pad. These piles should be collected and disposed of at the Faro minesite."

It was evident from the audit investigation at YAT that the practice of grading has continued and that the clean up of spilled concentrate near the overload station, and graded soil near the North Boundary, had not taken place.

3.5 General Site Integrity

In general, the YAT site was reasonably clean; this reflects a recent effort to improve housekeeping practices. Continued diligence in this area is important because poor housekeeping can foster a poor public image that taints local perceptions of YAT and Curragh. The importance of good housekeeping was emphasized by G. Acott in his report on the YAT facility, cited above:

"The toe of the pad in the overload area, and of the surrounding bush for at least 100 yards from the edge of the active site is very heavily littered with old tires, scrap metal, head lights, oil containers, coffee cups and other miscellaneous garbage. Better housekeeping practices should be implemented and a policy regarding collection and proper disposal of garbage should be prepared and enforced...In a community clean-up of the highway adjacent to the site in May of 1992, Curragh received complaints of excessive amounts of garbage in the ditch consisting of styrofoam cups, paper towels and truck time cards most of which came from the YAT operations."

4.0 Bowhead Ltd.

Bowhead Ltd. unloads and stores concentrates in Skagway. As well, its warehouse/loadout system loads concentrate onto bulk cargo vessels for ocean shipment to smelters in Europe, Korea and Japan. At present approximately two cargo vessels are scheduled at the port each month. The facility operates three eight-hour shifts (two twelve-hour shifts during boat loading), split between a core staff of nine people.

Each employee is given a pre-hire drug test as well as a blood lead level test and a complete physical examination before working with the concentrates. Thereafter, the blood lead level is monitored twice yearly. Formal safety meetings are held every two months and, less formally, every two weeks. From a training perspective, each new employee is instructed in the following: (i) the correct use of a respirator; (ii) the effect of lead in the blood and the regulations respecting lead exposure; (iii) the correct operation of forklifts and other key machinery (three shifts with the lead operator); (iv) general mechanical and operational issues in the warehouse (one week with a veteran operator); and (v) Department of Transport regulations respecting dangerous and hazardous material management. Bowhead also invites an industrial hygienist to speak to employees and their wives on a regular basis. This latter initiative has proven to be a valuable forum for the exchange of health care tips, and an effective public relations exercise as well - the workers and their families have confidence in, and are proud of, the efforts made by Bowhead to protect them and this information is communicated to the community at large. Finally, the company has instituted a profit-sharing plan for its employees (eight per cent of Bowhead's profit per quarter shared among the employees) contingent on the absence of accidents or injuries. In the second quarter of 1992 this plan added over two dollars per hour to each employee's pay cheque - it therefore acts as a powerful incentive to operate safely.

Quite apart from human health sampling, Bowhead conducts ongoing environmental quality monitoring as well. The drain sediments at all four corners of First Avenue in Skagway (the truck route) are monitored on a monthly basis and the air quality at the end of the loading dock nearest Skagway is monitored continuously over a 24 hour period once every 3 days for airborne emissions. The drain results have never indicated lead or zinc, and the air quality results have been sufficiently good that state EPA officials have recently authorized a reduction in sampling to periods when ships are being loaded.

These positive developments reflect a considerable effort that has been made over the past four years to upgrade the entire Bowhead facility. In 1987-88 considerable local concern was expressed over the operation of the facility and the extent to which blood lead levels in the local population were elevated. In the face of this concern, local families were tested for blood lead, the Bowhead site was examined and contaminated

soil removed, and, as a safeguard against a recurrence of similar problems, the facility was upgraded. Of particular interest in the upgrading was the complete enclosure of all cargo loading procedures. Previously, the conveyors that loaded concentrate onto the ships were open-air designs that allowed concentrate dust to become airborne. The upgraded facility greatly reduced the potential for this problem. Gordon Meachem, the General Manager of Bowhead, reports that the results of blood lead testing on the local population were relatively benign; the concern that had been expressed in 1987-88 was largely confined to former employees who had been involved in a strike at the facility in 1987. Today, Meachem reports that there are no local concerns respecting blood lead levels or the conditions at the site generally. Anecdotal information discussed during the audit visit suggests that state environmental and health authorities regard Bowhead's Skagway facility as the cleanest ore terminal in Alaska.

Visually, the Bowhead facility is impressive on a number of levels. The site is clean and there appears to be a genuine commitment on the part of all employees to keep it clean. Operating procedures designed to minimize the escape of concentrates to the outside environment have been established and are well understood by the small staff. All working areas where there is the possibility for concentrate dust to accumulate are regularly washed and the wash water captured in a central sump. The sediment is then recycled back to the concentrate storage area. The staff have a high regard for Meachem and the general rapport among management and staff suggests that Bowhead have established a mutually supportive and high performing team. For this, Bowhead is to be congratulated.

Perhaps the only areas where Bowhead's operation could be improved are in the containment of waste oils and small volume fuels. Neither of these areas has secondary containment at present. Bowhead has expended considerable effort in establishing a secure bulk fuel storage area and these two smaller storage areas are less conspicuous and of less risk to the environment. Still, in the interests of overall environmental protection, both should be equipped with containment suitable to prevent spilled material from having an adverse effect on the environment. Bowhead management indicated to the audit team that this deficiency was short-term; both storage vessels are to be decommissioned in the near future.

The importance of providing adequate spill containment is underscored by the legacy of an oil spill on the site approximately two years ago that has been the subject of ongoing biological remediation. Tests on soil and water quality indicate that the biological exercise has been successful thus far and should eliminate the problem within a year, but the cost of this remediation is expensive. A better approach is to spend money on the infrastructure that reduces or eliminates the need for post facto clean-up.

5.0 Forward Action Plan

Specific actions that will address the functional deficiencies identified at the transportation and port facilities are discussed below and summarized in Tables 1-3:

Gateway Transport Ltd.

Step 1. Upgrade Waste Oil Storage and Handling

- Transfer oil from temporary storage area to permanent, secure storage.
- Investigate existing waste oil storage area to determine if any soil contamination is present and clean-up as appropriate.
- Clarify availability of waste oil furnace and implement, or make alternative arrangements with PetroCanada for removal of oil.

Step 2. Investigate Operation of Sumps (plumbing system) and Upgrade as Required

- Investigate water and sediment quality in settling ponds to ensure that poor performance of sumps, and encroachment of concentrate dust from storage area, have not adversely affected environmental quality.
- Clean-up settling ponds as required; return contaminated soil to minesite.

Step 3. Upgrade Concentrate Storage Area

Yukon Alaska Transport Ltd.

Step 1. Suspend Backhauls of MIBC from Skagway

- Obtain legislative approval and supporting documentation (placards, labels, etc.) to engage in backhauls.
- Ensure that all persons handling, offering for transport or transporting MIBC are trained and certified as required under dangerous goods legislation (US and Canada).

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TABLE 1
CURRAGH INC. (YUKON OPERATIONS)
ENVIRONMENTAL FORWARD ACTION PLAN

GATEWAY TRANSPORT

Functional Issue	Environmental Risk Priority	Estimated Cost	Target Completion Date	Action Priority	Assigned Responsibility	Assigned Completion Date
Waste Oil	1					
1. transfer oil from temporary storage drains to permanent, secure storage		internal	Dec. '92	2		
2. clean up temporary storage area		$5K	Aug. '93	4		
3. clarify availability of waste oil furnace		internal	Nov. 92	1		
Upgrade Plumbing System	2	$10K-$50K	Nov. '93	6		
Upgrade Concentrate overload station	3	$5K	Oct. '93	5		
Enhance Site Integrity	4	$5K (annually)	ongoing	3		

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TABLE 2
CURRAGH INC. (YUKON OPERATIONS)
ENVIRONMENTAL FORWARD ACTION PLAN

YUKON ALASKA TRANSPORT

Functional Issue	Environmental Risk Priority	Estimated Cost	Target Completion Date	Action Priority	Assigned Responsibility	Assigned Completion Date
MIBC Backhaul	1	internal	Nov. '92	1		
Waste oil operational procedure	2	internal	Nov. '92	2		
Concentrate overload station	3					
1. concrete pad		$20K	Aug. '93	4		
2. dust containment		$10K-$50K	Sept. '94	6		
Removal of contaminated soil	4					
1. Pond A and B		variable based on volume	ongoing	3		
2. North Boundary			Sept. '93	5		

Step 2. **Upgrade Waste Oil Storage and Handling**

- Develop an operational procedure for waste oil storage, handling and disposal and review with all site personnel, especially mechanics.
- Investigate integrity of both clarification ponds and remove all contaminated soil to Faro for disposal.

Step 3. **Upgrade Concentrate Storage Area**

- Install concrete pad to minimize movement of dust (via air, water or tracking) to other areas of the site or off-site.

Step 4. **Remove Contaminated Soil From Site**

- Remove known pockets of contaminated soil from site (North Boundary).
- Investigate balance of site to determine if additional soil contamination is present. If so, remove to prevent environmental degradation.

Bowhead Ltd.

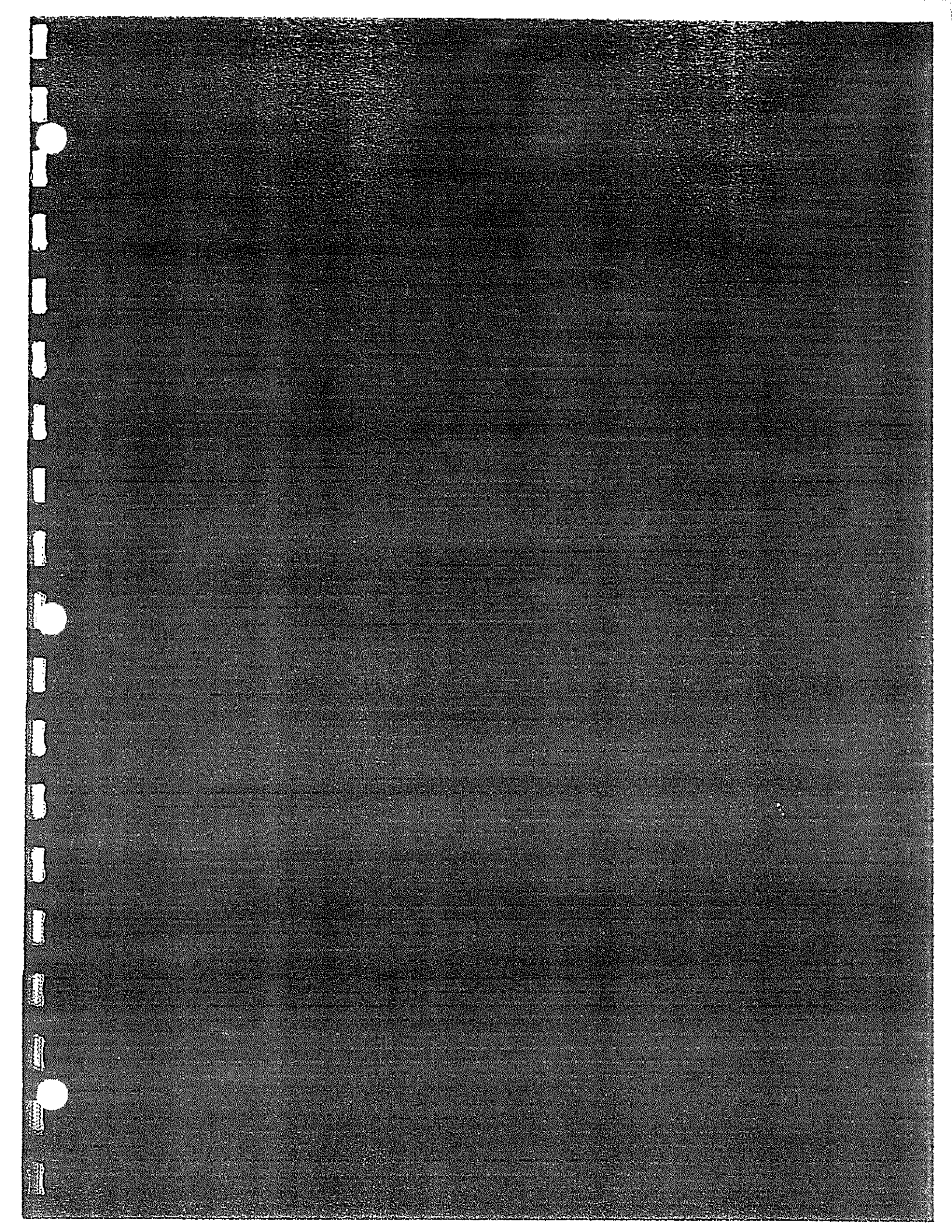
Step 1. **Provide Secure Spill Containment at all Fuel Storage Sites**

- Provide containment for waste oil and small volume fuel storage to prevent uncontrolled spills.

THE COOPERS & LYBRAND CONSULTING GROUP

W.E. (Bill) Stanley
Director
National/International Mining Services

Robert M. Abbott
Manager



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APPENDIX 1.

ENVIRONMENTAL MANAGEMENT SYSTEM FRAMEWORK

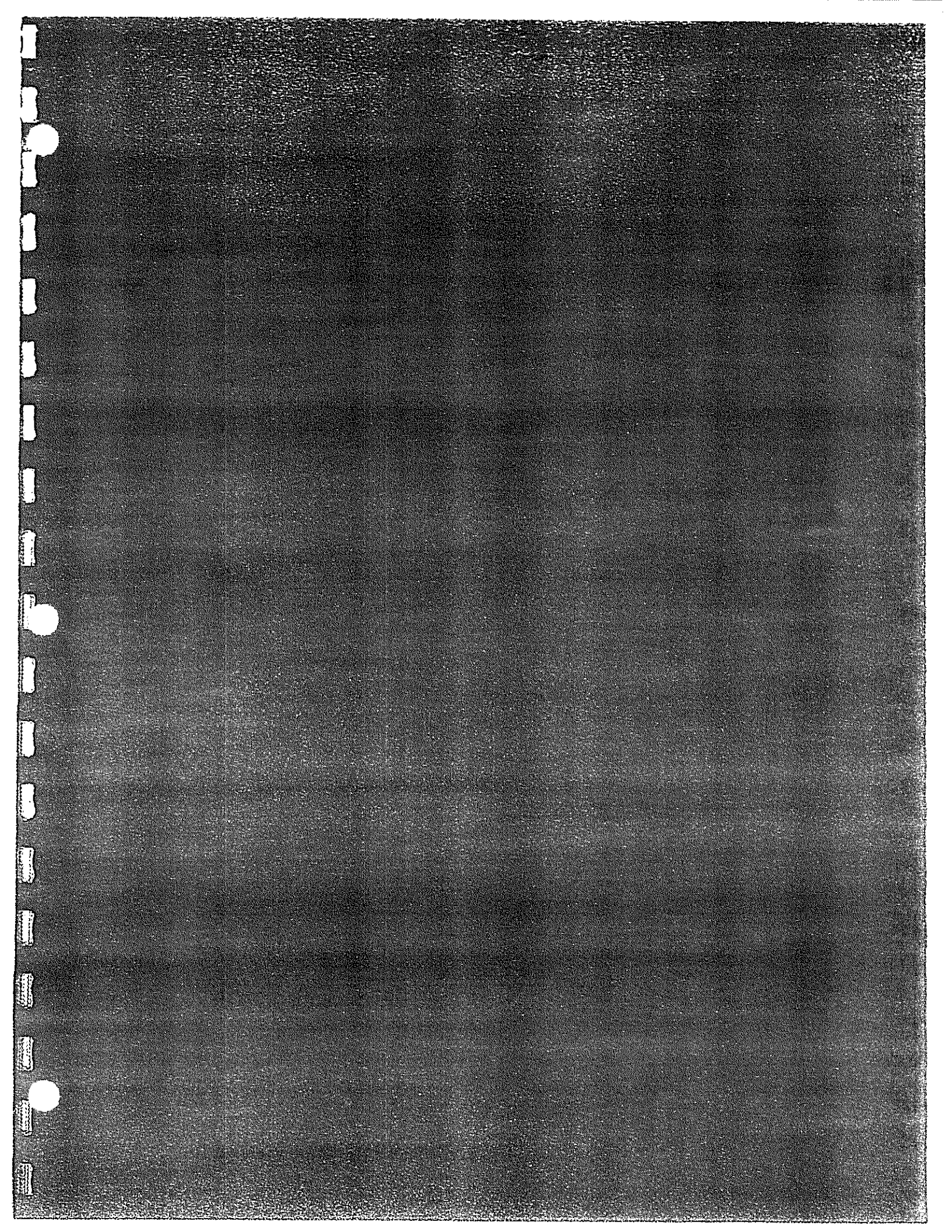
The six key elements of an environmental management system are described briefly below.

Policy and Management Leadership. Sound environmental management requires that senior management develop and widely disseminate policies which state how the corporation intends to address environmental protection issues to ensure that statutory and environmental risks are reduced to an acceptable level. Based on these policies, senior management has a responsibility for setting departmental objectives as they affect the environment. Employee efforts will reflect the values of senior management if these values are adequately communicated and reinforced, and if there is evidence that senior management practices what it preaches.

To achieve effective management of environmental performance, responsibility for the implementation of environmental policy must be clearly defined. Responsibility and authority for environmental management must also be clearly established and articulated within the environmental policy. There should be evidence that the environmental policies are based on a sound assessment and awareness of the potential and actual direct and indirect impact of the department's activities and/or products on the environment, as well as measures to mitigate any negative effects.

Planning and Procedures. The planning process can be used to prevent or reduce the impact of a department's activities or products on the environment. An effective planning strategy includes an integrated management approach toward environmental protection on an department-wide basis. Diverse management functions such as purchasing, legal, engineering, operations, etc. must be coupled to environmental principles to provide appropriate business solutions to complex operational issues of an environmental nature. Specific procedures must be established and communicated to all parts of the department. These can range from sourcing and purchasing guidelines to instructions for the secure storage, handling, transport and disposal of dangerous goods.

Organization and Training. Environmental policies can only be translated into action when the department develops a management structure that is responsive to environmental management requirements. Appropriate individuals with the necessary skills must be placed in the organizational structure and given training in key aspects of environmental policies, plans and procedures. Delegation of appropriate authority and specific reporting relationships depends on a number of factors, including the geographic spread of departmental operations, speed of response time required,



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Inter-Office Memorandum

TO: George Whyte
Vice Chairman and Secretary
Toronto Office

FROM: Colin Benner
President, Operations
Toronto Office

RE: Memo from G. Acott dated January 8/93

DATE: 02 16 1993

As you are aware, Cassels, Brock & Blackwell were asked to conduct a status of liability for Curragh's Yukon operations as of December 31, 1992 in conjunction with or for J. Bailley of Tory, Tory, DesLauriers & Binnington. Gerry was asked to contribute to that exercise by estimating the outstanding decommissioning costs in the event that the mines were to close as at that date (Dec 31/92) and I reviewed the numbers with Gerry to ensure they were in the ballpark.

Nonetheless, it is Gerry's and my opinion that the information contained in the memo is somewhat speculative and based on a best-guess scenario of many decommissioning elements of a plan which has yet to be discussed with regulatory authorities. Technical methodology, although generally acceptable in practice, has not been firmly defined nor have the associated costs. It is also important to note that the approach to decommissioning and associated costs will not be discussed with the Yukon Territory Water Board until December of 1994 and actual implementation of the plan will not commence until the year 2008. A great many changes and technological improvements can and will occur between now and then.

For these reasons, we must caution people in the use of the information as it is meant to represent the worst case scenario assuming cessation of any further mining activity. On the more reasonable and positive assumption that we will continue to operate, many of these costs can be incorporated with normal operations at a much reduced cost.

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Received
Jeb 1/1993
A

Inter-Office Memorandum

TO: Colin Benner
President, Operations
Toronto Office

FROM: Gerry Acott
Manager, Environmental Affairs
Whitehorse Office

Gerry

Via Cassette

CC: Gregg Jilson
Vice President, Exploration
Whitehorse Office

C. Brian Campion
Anton, Campion, Macdonald & Phillips

RE: ESTIMATED OUTSTANDING DECOMMISSIONING COSTS FOR CURRAGH'S YUKON OPERATIONS as at December 31, 1992

DATE: 01 08 1993

Decommissioning costs may be divided into two categories; temporary and permanent closure. **PERMANENT CLOSURE** will involve those actions required to totally remove all buildings, equipment, physical structures not required for decommissioning and the restoration of the landscape to a useful level of productivity. The Yukon has no regulations requiring that pits be refilled or that dump slopes be recontoured, however Curragh has committed to a till cover over the Vangorda dump, Vangorda pit walls and portions of the Grum dump (to inhibit acid mine drainage) as well as the Sa Dena Hes tailings pond (to stabilize the sands from aeolian actions); some level of resloping may be required to accomplish this. Curragh has further committed to a reduced level of revegetation on disturbed areas.

The major decommissioning cost, however, stems from the requirement that we construct and operate systems, in perpetuity, to ensure that toxic effluents of acid mine drainage are either inhibited or collected and treated prior to release to

natural watercourses. This will involve the outlay of significant capital dollars to construct these systems as well as the investment of significant capital dollars to provide ongoing revenue for their operation. All of these costs are included in the following estimates:

FARO

1. Decommissioning - per my memo of December 30, 1992 to Gregg Jilson:
   - Option 5 $18,189,800
   OR
   - Option 4 $31,056,800

   Includes final abandonment - collection of waste dump drainage, cover or submerge tailings, decommission buildings and physical structures, post closure monitoring - less current status of TEF
   1,100 - 625 = 775

   ADD capital required to support long term operation of Sulphate Reduction Water Treatment estimate $500,000 annually @ 3% real rate of return $16,700,000

TOTAL FARO OPTION 5 $34,889,800
OR
OPTION 4 $47,756,800

VANGORDA

Reclamation of Vangorda Dump & Pit per my memo dated December 16, 1992 to Colin Benner $5,268,000

Per IHE
(Grum Dump $2,773,364
(Water Treatment Plan & Sludge Pond Relocation $600,000
(Grum Pit $70,000
(Removal of Dry, Fuel/Lube Station, Powerlines $50,000

SUBTOTAL $8,761,364

ADD long term operation of Lime Treatment Plant Estimate $200,000 annually @ 3% real rate of return $6,700,000

ADD post closure monitoring

Estimate $20,000 annually @ 3%	$670,000
SUBTOTAL	$7,370,000
SUBTOTAL VANGORDA/GRUM	$16,131,364
LESS current status of TEF as at January 5/93 (does not include 1992 payment of $560,000 - will not be paid until Feb 26/93)	$625,000
LESS cash deposit with DIAND	$4,406,000
TOTAL VANGORDA/GRUM	$11,100,364
SĀ DENA HES	
Total decommissioning costs per Volume VI	$1,326,000
LESS costs for sealing Attila portal (included in above total but not yet constructed)	$150,000
TOTAL SĀ DENA HES	$1,176,000
TOTAL PERMANENT CLOSURE COSTS	
FARO/VANGORDA/GRUM/SĀ DENA HES - Option 5	$47,166,164
FARO/VANGORDA/GRUM/SĀ DENA HES - Option 4	$60,033,164

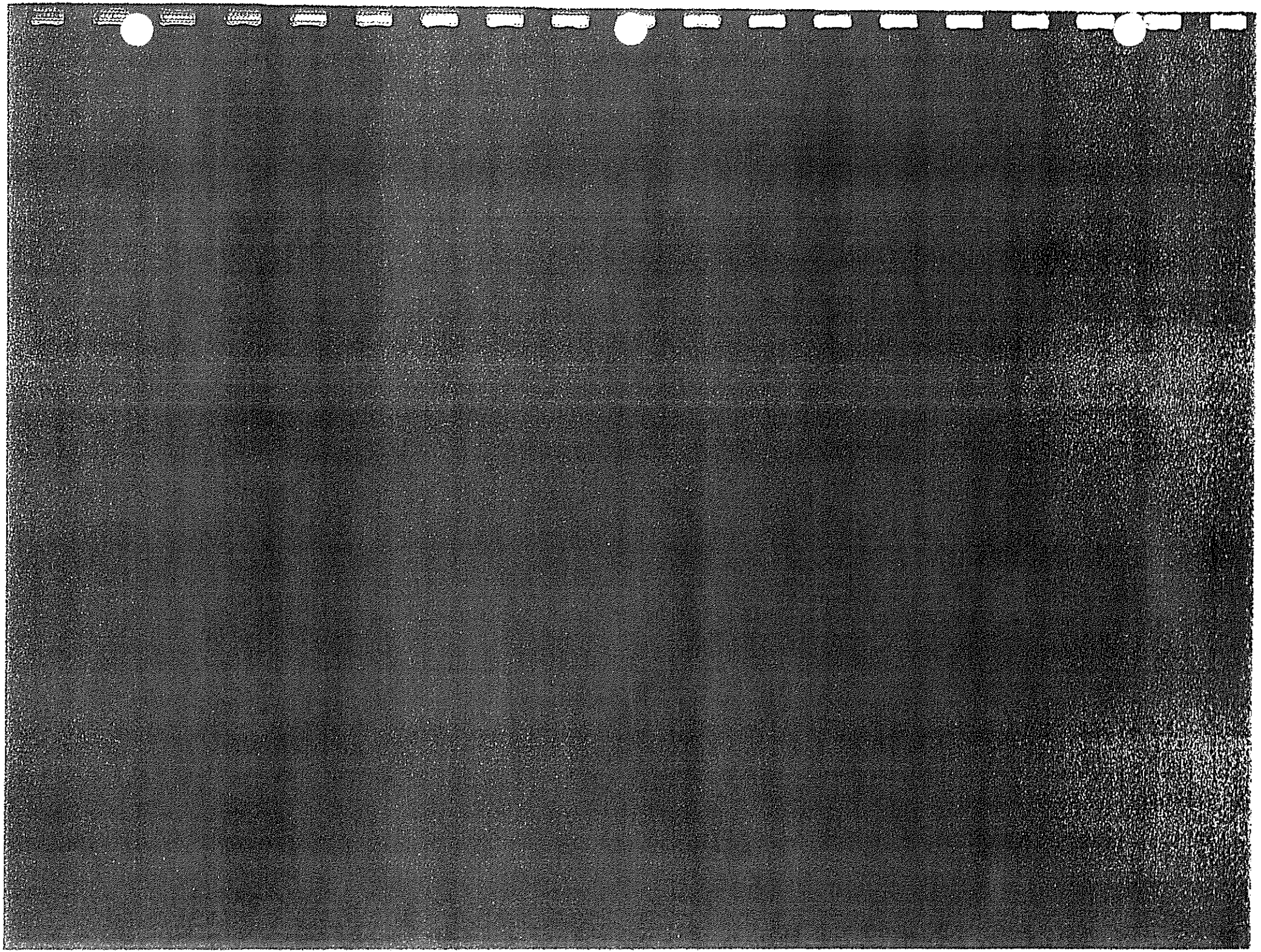
The second category of decommissioning costs are the costs associated with **TEMPORARY CLOSURE** of the mines. The definition of temporary closure varies from one water licence to the next but, generally, can last for up to four or five years until permanent closure requirements will be mandated by the YTWB. It is most likely that this decision would be made in a public hearing at which time Curragh would have opportunity to present their arguments as to why a temporary closure scenario should be maintained. Permanent closure involves the removal of buildings, processing equipment, removal or decommissioning of physical structures (dams and ditches) and final contouring of pits and dumps; all these activities would cause a continuation of operations by Curragh or any other mining company which purchased their interests to become much more expensive

and possibly make the future operation of these mines uneconomic.

The attached table reveals the activities and associated costs of temporary closure of our current Yukon Operations. "One Time Expenditures" would only be required upon announcement of a temporary closure which would extend beyond six months and covers the cost of preparing and securing the sites for a long period of inoperation similar to the situation at Venus or Elsa Mines.

ESTIMATED ENVIRONMENTAL COSTS
DURING TEMPORARY SHUTDOWN AT CURRAGH YUKON OPERATIONS

Description		Faro	Vangorda	Grum	Total
ANNUAL EXPENDITURES					
Water sampling	per water licence schedule plus 10%	$22,500	$15,450	$15,900	$53,850
Biological sampling	once every 2 years – annual cost	$4,400	$4,400	$8,000	$16,800
Physical monitoring	site inspections – prof. engineer	$12,000	$8,000	$8,000	$28,000
	contractor repair & maintenance	$36,000	$20,000	$20,000	$76,000
Ongoing pH adjustment	Faro tailings area & Vangorda WT plant	$100,000	$200,000	$0	$300,000
Personnel	2 persons full time – Faro & Vangorda	$50,000	$50,000	$39,600	$139,600
Camp costs	groceries etc.	$0	$0	$36,000	$36,000
Communication charges	telephone and radio	$1,800	$1,800	$4,500	$8,100
Power	genset costs and fuel or line power	$20,000	$20,000	$3,600	$43,600
Snowmobile or ATV	fuel, repairs and maintenance	$1,200	$1,200	$1,200	$3,600
Road maintenance	grading and snowplowing in winter	$15,000	$10,000	$5,000	$30,000
Truck	cost split Vangorda – 50%, Faro – 50%	$7,200	$7,200	$5,000	$19,400
Fuel, lube, maintenance	on truck only	$1,500	$1,500	$1,000	$4,000
Tradesmen	electrical and plumbing repairs	$5,000	$8,000	$5,000	$18,000
Lab supplies and equipment		$6,000	$3,000	$3,000	$12,000
Total		$282,600	$350,550	$155,800	$788,950
ONE TIME EXPENDITURES					
Per SRK Report 60605	Cross Valley toe berm – completed	$0	$0	$0	$0
	Rose Creek Diversion – not required	$0	$0	$0	$0
	Cross Valley Dam Spillway upgrade	$83,500	$0	$0	$83,500
Winterizing equipment/machinery	included with operating costs	$0	$0	$0	$0
Posting of security signs		$3,000	$2,000	$2,000	$7,000
Genset pruchase		$0	$0	$12,000	$12,000
Bulkheads at underground entries	to prevent public access	$0	$0	$20,000	$20,000
Removal of milling reagents	sodium cyanide and copper sulphate	$10,000	$0	$5,000	$15,000
Removal of excess petroleum products		$0	$0	$0	$0
Concentrate clean–up	around loadout area	$15,000	$0	$10,000	$25,000
Bury waste disposal sites	barrel and garbage disposal areas only	$10,000	$0	$5,000	$15,000
Total		$121,500	$2,000	$54,000	$177,500



CURRAGH INC.

Discussion Paper re

CONTINGENCY PLAN

for

ENVIRONMENTAL PROTECTION
and
ASSETS PRESERVATION

for the period of

Sept. 11 through Oct. 7, 1993

for the

FARO MINE SITE
Sä DENA HES MINE SITE
STRONSAY PROJECT SITE

September 10, 1993

CONTINGENCY PLAN - September 10,1993

PURPOSE

The purpose of this document is to set out Curragh Inc.'s understanding of the steps which should be taken during the next four week period in order that environmental obligations/requirements at the Faro Mine Site, Sä Dena Hes Mine Site, and the Stronsay Project Site continue to be maintained and the assets be preserved during the same period. This Discussion Paper is meant to highlight the major considerations at each of the mine sites discussed and is not an exhaustive consideration of all steps which should be taken.

SUMMARY

Faro Mine Site:

The two water licenses at the Faro Mine Site, along with governments Acts and guidelines, essentially set the environmental standards for the Site. Although there are other environmental concerns that have to be monitored, the major concerns at the Faro Mine Site are those related to continuing to meet the regulatory discharge standards of effluent being discharged into the natural environment (Priority 1). The levels of dissolved metals contained in, and the acidity of, the effluent especially require special and diligent attention. The Major Assets of the Faro Mine Site comprise of land and mineral rights holdings, and plant and equipment required for a large northern self-sustaining and self-sufficient mining and minerals concentrating operation. To prevent unnecessary deterioration of some of those assets, remedial and/or continual maintenance work is required (Priority 2 and Priority 3).

Week	S11-S17	S18-S24	S25-S30	O1-O7
Estimated Costs of Priority 1:				
With Labour	$120,885	$153,025	$ 76,107	$116,509
Without Labour	$ 80,445	$120,396	$ 48,435	
Estimated Costs of Priority 2 and Priority 3:				
With Labour	$ 10,082	$ 18,722	$ 41,696	$ 14,997
Without Labour	$ 2,585	$ 11,225	$ 34,541	

Sä Dena Hes

The Sä Dena Hes Mine Site has one water license (IN90-002). This license, along with governments Acts and guidelines, essentially set the environmental standards for the Site. Most

Sä Dena Hes (Cont'd)

of environmental-related matters involve monitoring and collecting samples from the environmental collection structures and ensuring that discharge standards are met. The Major Assets of the Sä Dena Hes Mine Site comprise of land and mineral rights holdings, and plant and equipment required for a northern self-sustaining and self-sufficient underground mining and minerals concentrating operation.

Tasks over the next four weeks related to environmental protection and assets preservation will require two people and cost:

Week	S11-S17	S18-S24	S25-S30	O1-O7
Estimated Costs:				
With Labour	$ 35,077	$ 3,412	$ 13,316	$ 20,000
Without Labour	$ 32,315	$ 650	$ 10,949	

Stronsay

The Stronsay Site operates under an exploration license. This license, along with governments Acts and guidelines, essentially set the environmental standards for the Site. Most of environmental-related matters involve monitoring and collecting samples from the environmental collection structures and ensuring that discharge standards are met. The Major Assets of the Stronsay Project Site comprise of land and mineral rights holdings, and some plant and equipment required for a northern self-sustaining and self-sufficient underground exploration/development project.

Tasks over the next four weeks related to environmental protection and assets preservation will require two people and cost:

Week	S11-S17	S18-S24	S25-S30	O1-O7
Estimated Costs:				
With Labour	$ 10,788	$ 10,788	$ 10,788	$ 10,788

FARO MINE SITE

Introduction

In the event that Curragh Inc. is no longer able to continue in business, it will be necessary that environmental requirements at the facilities continue to be satisfied. Environmental requirements should be treated on a priority 1 basis. Also, to prevent deterioration of the assets and equipment due to the harsh environment other protective measures are required. For the purposes of this document these protective measures are referred to as Priority 2 and Priority 3.

This document provides a description and cost of providing environmental requirements each week for a period of four weeks, commencing September 11, 1993, and of other tasks required to protect the assets against unnecessary deterioration during the same period.

Overview of Environmental Matters at the Faro Mine Site

The Faro Mine Site is located approximately 360 road-km northeast of the City of Whitehorse in the Yukon Territory. The climate in the area is categorized as sub-arctic, and the Fall/Winter season, characterized by sub-zero temperatures, extends from late September through April.

A simplified plan indicating the major Faro Mine Site infrastructure is shown on Figure 1.

There are three open pit mining locations at the site, these are Faro Pit, Grum Deposit, and Vangorda Pit. At each open pit location there are the mining area (pit), waste rock dumps, access roads, electrical services, buildings and storage areas. Most of the Site buildings and facilities including the Concentrator, the main maintenance shops, the warehouse, the main fuel facility and storage, and the administration buildings are located near the Faro Pit. An office building, a temporary field maintenance and fuel storage/vehicle service facility are located in the area of the Grum Deposit.

The Faro Mine Site has two water licenses (IN89-001 Amendment #3, and IN89-002). These licenses, along with governments Acts and guidelines, essentially set the environmental standards for the Site.

Although there are other environmental concerns that have to be monitored, the major concerns at the Faro Mine Site are those related to continuing to meet the regulatory discharge standards of effluent being discharged into the natural environment. The levels of dissolved metals contained in, and the acidity of, the effluent especially require special and diligent attention. Therefore all water drainage at each location is collected and directed by dams and ditches to

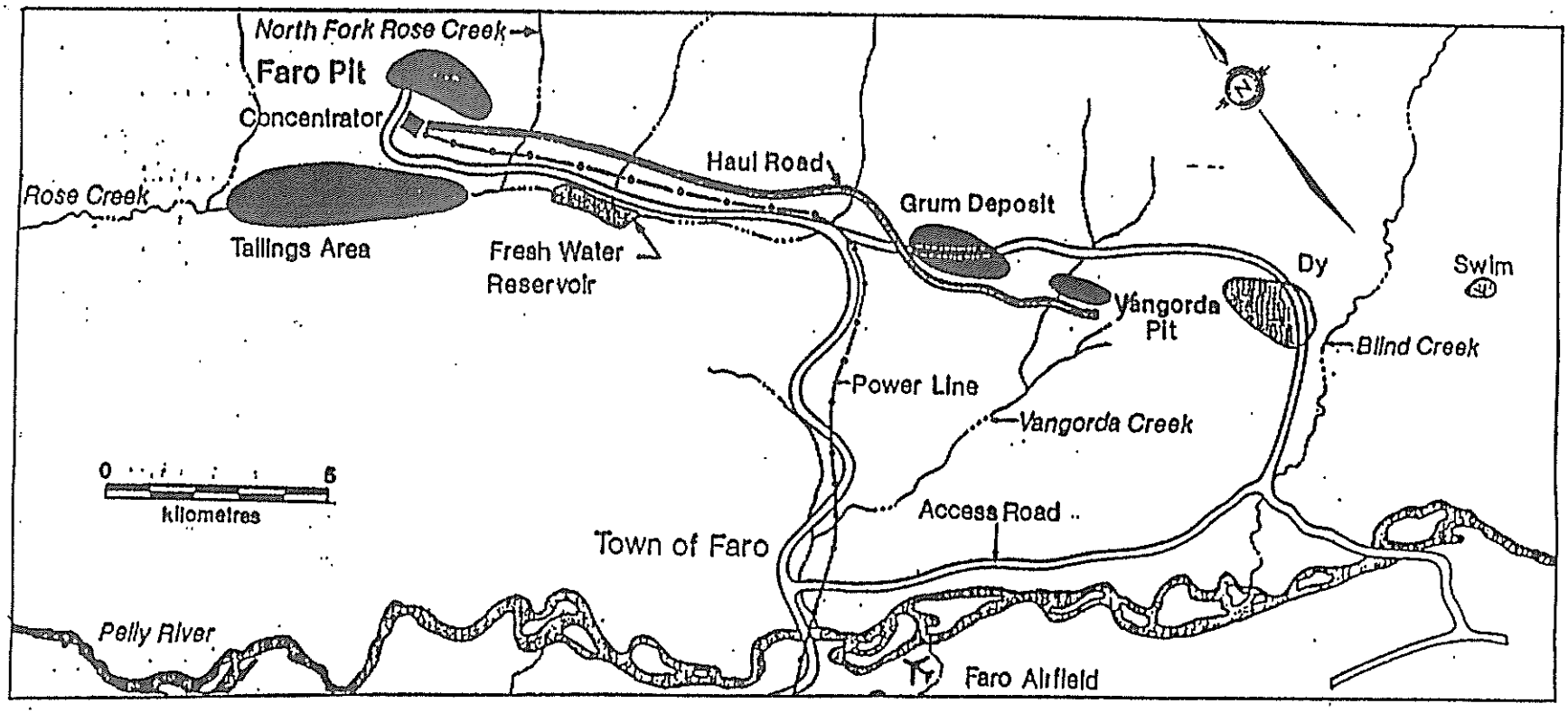


Figure 1. Faro Mine Site

Overview of Environmental Matters at the Faro Mine Site (Cont'd)

water treatment facilities, if necessary for treatment to meet regulatory effluent discharge standards, and then to discharge points to the environment.

At the Faro Pit and Concentrator area, drainage from the waste dumps and general site area is directed into the Tailings Area, where the effluent is temporarily impounded and treated by addition of lime before being discharged, normally on a batch basis, into the natural receiving environment. At the Grum Deposit area, the site drainage from the waste dumps and Grum Pit area is collected and, since treatment is not necessary to meet standard, discharged directly into the natural environmental. At the Vangorda Pit, all waste dump drainage and Vangorda Pit water is collected in a receiving pond and then pumped to a water treatment plant located near the Grum Deposit. After treatment with lime at the treatment plant, the effluent is discharged through a settling pond on a continuous basis and then into the environment.

The primary environmental focus of the Site personnel will be to continue to meet the regulatory discharge standards for effluent being discharged into the natural environment and diligently continue to do those things to keep the Site in good environmental order. The personnel will have to inspect and maintain the environmental collection and impoundment structures, to operate and maintain the necessary Caterpillar equipment, to maintain road access from the Town of Faro to and on the Site, to operate and maintain the water treatment facilities, to operate and maintain the electrical generation and distribution systems, to order and receive supplies/reagents, to sample and monitor effluent discharges, to make necessary reports to regulatory bodies, and all other necessary ancillary things.

Chemicals stored in vessels in the Concentrator building will have to be removed if the Concentrator building is not heated and secured over the winter. In any case disposal of these chemicals (CuSo4 and Xanthate) will take at least one month during which time the Concentrator building has to be heated to prevent an environmental spill from storage vessels ruptured by freezing.

The foregoing is identified herein as Priority 1.

Overview of the Major Assets at the Faro Mine Site

The Major Assets of the Faro Mine Site comprise of land and mineral rights holdings, and plant and equipment required for a large northern self-sustaining and self-sufficient mining and minerals concentrating operation. To prevent unnecessary deterioration of some of those assets, remedial and/or continual maintenance work is required. It is assumed here that the environmental structures and facilitates and all necessary plant and equipment related to such are maintained and not allowed to deteriorate. The primary remedial work that is immediately

Overview of the Major Assets at the Faro Mine Site (Cont'd)

required on the assets is related to winterization and fire suppression systems, particularly in the Concentrator. Work on an ongoing basis will be security to prevent vandalism and pilferage, monitoring of the fire suppression systems (if any), checking of buildings and facilities including structures such as the fresh water reservoir dam, and maintenance and care of equipment. The foregoing is identified herein as Priority 2 and Priority 3.

Over the next four weeks, either the Concentrator heat plant will have to be refurbished and brought into production to prevent freezing of water lines or the water lines will have to be drained. Both of those options require approximately the same resources. Without the heating plant, the Faro Mine Site will be approximately $50,000 per month less to maintain. However, without water the Concentrator fire suppression system will not be functional and the Concentrator will likely not be insurable, exposing the asset to risk.

The heat plant will have to be brought up when required (estimated to be by the week of September 20/93) to keep stored chemicals ($CuSO_4$, Xanthate) from freezing until such time as these can be removed, an estimated period of one month. If allowed to freeze, these chemicals could cause rupture vessels likely resulting in damage to assets, as well as environmental problems indicated above (Priority 1).

The Major Assets at the Faro Mine Site include:

1. Fresh Water Reservoir.

2. Faro Pit area plant:

    - Concentrator
    - administration/dry/warehouse/mobile equipment maintenance shop building
    - security building
    - fresh water pump house
    - electrical substation
    - electrical distribution system
    - emergency 2.8 megawatt diesel-powered generator
    - main fuel storage/service facility
    - geological core sheds
    - outside storage and laydown areas
    - tire shop/light vehicle shop

Overview of the Major Assets at the Faro Mine Site (Cont'd)

3. Grum/Vangorda area plant:

- water treatment plant
- administration/dry/Security Building
- mobile equipment repair shop
- main fuel storage/station
- electrical substation
- electrical distribution
- geological core sheds
- Grum deep water wells

4. Major Mobile Equipment (owned by Curragh Inc.)

• Euclid 170 ton haul trucks	- 17
• Unit Rig 170 ton haul trucks	- 4
• Wabco 120 ton haul trucks	- 2
• Wabco 120 ton water trucks	- 2
• Wabco recovery truck	- 1
• P&H 2100 Excavator	- 3
• Caterpillar D10N dozer	- 1
• Caterpillar D6 dozer	- 1
• Le Tourneau L800 FEL	- 1
• Marian Drills	- 2
• B&E Drill	- 1
• Caterpillar 16G grader	- 1

5. Major Mobile Equipment (leased)

• Caterpillar 789 haul trucks	- 4 Cat Financing
• Caterpillar 16G grader	- 3 Finning Tractor
• Caterpillar RTD 824	- 2 Finning Tractor
• Caterpillar 980C FEL	- 1 Finning Tractor
• Caterpillar 936E FEL	- 1 Finning Tractor
• P&H 2800 Excavator	- 1 Barclays PLC
• Le Tourneau L1100 FEL	- 1 Triatholon

6. Office Equipment and Furniture

CONTINGENCY PLAN - September 10,1993

Specific Priority 1 Tasks by Week

Week #1 - September 11 - 17, 1993:

A. Tasks List:

1. Operate water treatment plant at Vangorda/Grum.

2. Operate lime mixing and addition system at the Down Valley Tailings Impoundment (Tailings Area).

3. Operate pump system at Cross Valley Dam (Tailings area).

4. Collect environmental samples as required by the two water licenses, and send to Zenon Laboratories and BC Research in Vancouver for analysis and reports.

5. Sample water at Cross Valley discharge point and analyze for water quality (daily).

6. Operate 2.8 megawatt diesel-powered electrical generator set to provide electrical power to pumping and mixing systems, and water treatment plant.

7. Continue with preparation of heat plant for start-up early October or drain out all liquid systems (fire protection, reagent tanks, process systems).

8. Perform remedial/maintenance work on drainage systems around Vangorda waste dumps.

9. Buy miscellaneous supplies, lime, fuel, and parts, lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

10. Keep possession of Whitehorse office to allow time for relocation of assets.

11. Prepare and maintain all required and necessary records and reports.

12. Provide accounting interface and governmental interface with creditors and/or court representatives.

Week #1 - September 11 - 17, 1993: (Cont'd)

B. Required Resources:

1. Labour: 17 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

2. Supplies/Freight:
   Miscellaneous supplies. Freight for water samples to Zenon Laboratories and BC Research in Vancouver.

3. Reagents: 90 tonnes lime from Continental Lime, Tacoma, barge by Alaska Marine Lines to Skagway, truck to Faro Mine. Sufficient for 1 month.

4. Parts: Parts for genset.

5. Fuel: 90,000 litres fuel from Whitepass Petroleum, Whitehorse. Sufficient for 1 week of power generation.

6. Leases: 2 front end loaders from Finning, Whitehorse. One month lease.
   1 pump from Aquatech, Whitehorse.
   Telephone system.
   4 light vehicles; one month lease.

C. Costs:

With Labour:	$120,885
Without Labour:	$ 80,445

Week #2 - September 18 - 24, 1993:

A. Tasks List:

1. Operate water treatment plant at Vangorda/Grum.

2. Operate lime mixing and addition system at the Down Valley Tailings Impoundment (Tailings Area).

3. Operate pump system at Cross Valley Dam (Tailings area).

4. Collect environmental samples as required by the two water licenses.

5. Sample water at Cross Valley discharge point and analyze for water quality (daily).

6. Operate 2.8 megawatt diesel-powered electrical generator set to provide electrical power to pumping and mixing systems, and water treatment plant.

7. Continue with preparation of heat plant for start-up early October or drain out all liquid systems (fire protection, reagent tanks, process systems).

8. Perform remedial/maintenance work on drainage systems around Vangorda waste dumps.

9. Buy miscellaneous supplies, lime, fuel, and parts, lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.
10. Keep possession of Whitehorse office to allow time for relocation of assets.

11. Prepare and maintain all required and necessary records and reports.

12. Provide accounting interface and governmental interface with creditors and/or court representatives.

B. Required Resources:

1. Labour: 19 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

2. Supplies/Freight:

Miscellaneous supplies. Freight for water samples to Zenon Laboratories and BC Research in Vancouver.

Week #2 - September 18 - 24, 1993: (Cont'd)

3. Reagents:	None to be purchased; use inventory on-site.
4. Parts:	Parts for pumping systems, heating plant, and mobile genset. Miscellaneous consumable.
5. Fuel:	108,000 litres fuel from Whitepass Petroleum, Whitehorse. Sufficient for 1 week of power generation.
6. Leases:	2 front end loaders from Finning, Whitehorse. One month lease. Already paid for last week. 1 pump from Aquatech, Whitehorse. Already paid for last week. Telephone system. 4 light vehicles; one month lease. Already paid last week. Repairs. Back-up genset; one month lease. Kalmar forklift (to handle lime); one month lease.
7. Consultants:	SRK and Golder for inspection of Tailings Dams, Fresh Water Reservoir, Little Creek Dam and Vangorda Water Treatment Settlement Pond, and Rose Creek Diversion. Required by the water licenses.

C. Costs:

With Labour:	$153,025
Without Labour:	$120,396

Week #3 - September 25 - 30, 1993:

A. Tasks List:

1. Operate water treatment plant at Vangorda/Grum.

2. Operate lime mixing and addition system at the Down Valley Tailings Impoundment (Tailings Area).

3. Operate pump system at Cross Valley Dam (Tailings area).

4. Collect environmental samples as required by the two water licenses.

5. Sample water at Cross Valley discharge point and analyze for water quality (daily).

6. Operate 2.8 megawatt diesel-powered electrical generator set to provide electrical power to pumping and mixing systems, and water treatment plant.

7. Continue with preparation of heat plant for start-up early October or drain out all liquid systems (fire protection, reagent tanks, process systems).

8. Perform remedial/maintenance work on drainage systems around Vangorda waste dumps.

9. Buy miscellaneous supplies, lime, fuel, and parts, lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

10. Keep possession of Whitehorse office to allow time for relocation of assets.

11. Prepare and maintain all required and necessary records and reports.

12. Provide accounting interface and governmental interface with creditors and/or court representatives.

B. Required Resources:

1. Labour: 19 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

Week #3 - September 25 - 30, 1993: (Cont'd)

2. Supplies/Freight: Miscellaneous supplies. Freight for water samples to Zenon Laboratories and BC Research in Vancouver.

3. Reagents: None to be purchased; use inventory on-site.

4. Parts: Parts for pumping systems, heating plant, and genset. Miscellaneous consumable.

5. Fuel: 100,000 litres fuel from Whitepass Petroleum, Whitehorse. Sufficient to start heat plant and run diesel equipment for 1 month. Heat plant will also burn current inventories of waste oil and coal. Propane to heat the Water Treatment Plant. Gasoline for light vehicles.

6. Leases: 2 front end loaders from Finning, Whitehorse. One month lease. Already paid.
1 pump from Aquatech, Whitehorse. Already paid for last week.
Telephone system.
4 light vehicles; one month lease. Already paid.
Back-up genset; one month lease.
Kalmar forklift (to handle lime); one month lease.

7. Consultants: SRK and Golder for inspection of Tailings Dams, Fresh Water Reservoir, Little Creek Dam and Vangorda Water Treatment Settlement Pond, and Rose Creek Diversion. Required by the water licenses.

C. Costs:

With Labour: $ 76,107

Without Labour: $ 48,435

Week #4 - October 1 - 7, 1993:

A. Tasks List:

1. Operate water treatment plant at Vangorda/Grum.

2. Operate lime mixing and addition system at the Down Valley Tailings Impoundment (Tailings Area).

3. Operate pump system at Cross Valley Dam (Tailings area).

4. Collect environmental samples as required by the two water licenses.

5. Sample water at Cross Valley discharge point and analyze for water quality (daily).

6. Operate 2.8 megawatt diesel-powered electrical generator set to provide electrical power to pumping and mixing systems, and water treatment plant.

7. Star-up heat plant depending on weather conditions or drain out all liquid systems (fire protection, reagent tanks, process systems).

8. Perform remedial/maintenance work on drainage systems around Vangorda waste dumps.

9. Buy miscellaneous supplies, lime, fuel, and parts, lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

10. Keep possession of Whitehorse office to allow time for relocation of assets.

11. Prepare and maintain all required and necessary records and reports.

12. Provide accounting interface and governmental interface with creditors and/or court representatives.

B. Required Resources:

1. Labour: 19 people as shown in Schedule 1 attached.

2. Supplies/Freight:

Miscellaneous supplies. Freight for water samples to Zenon Laboratories and BC Research in Vancouver.

Week #4 - October 1 - 7, 1993: (Cont'd)

3.	Reagents:	None to be purchased; use inventory on-site.
4.	Parts:	Parts for genset and mobile equipment. Miscellaneous consumable.
5.	Fuel:	147,000 litres fuel from Whitepass Petroleum, Whitehorse. Sufficient for power generation for in excess of 1 week.
6.	Leases:	2 front end loaders from Finning, Whitehorse. One month lease. Already paid. 1 pump from Aquatech, Whitehorse. Already paid for last week. Telephone system. 4 light vehicles; one month lease. Already paid. Back-up genset; one month lease. Kalmar forklift (to handle lime); one month lease.
7.	Consultants:	SRK and Golder for inspection of Tailings Dams, Fresh Water Reservoir, Little Creek Dam and Vangorda Water Treatment Settlement Pond, and Rose Creek Diversion. Required by the water licenses.

C. Costs:

With Labour:	$116,509

Specific Priority 2 and 3 Tasks by Week

Week #1 - September 11 - 17, 1993:

A. Tasks List:

1. Inspect and secure Faro Mine Site on a 24 hour-per-day, 7 days-per-week basis. Compile necessary reports.

2. Winterize mobile equipment.

3. Lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

B. Required Resources:

1. Labour: 4 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

2. Office Equipment Leases:
None this week.

3. Leases: 2 light vehicles; one month lease.
Storage cost for DCS control system with Fisher Controls Toronto

C. Costs:

With Labour: $ 10,082

Without Labour: $ 2,585

Week #2 - September 18 - 24, 1993:

A. Tasks List:

1. Inspect and secure Faro Mine Site on a 24 hour-per-day, 7 days-per-week basis. Compile necessary reports.

2. Winterize mobile equipment.

3. Lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

4. Maintenance and winterization at the Skagway port facility.

B. Required Resources:

1. Labour: 4 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

2. Office Equipment Leases:
None this week.

3. Leases: 2 light vehicle. Already paid.
Light Vehicle Maintenance.
P&H Shovel maintenance.
- Storage cost for DCS system already paid
- Hiab and crane lease.
- Maintenance and winterization of Skagway port facility.

C. Costs:

With Labour:	$ 18,722
Without Labour:	$ 11,225

Week #3 - September 25 - 30, 1993:

A. Tasks List:

1. Inspect and secure Faro Mine Site on a 24 hour-per-day, 7 days-per-week basis. Compile necessary reports.

2. Winterize mobile equipment.

3. Lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

4. Maintenance and winterization of the Skagway port facility.

B. Required Resources:

1. Labour: 4 people as shown in Schedule 1 attached. Although labour costs are included in Schedule 1, Curragh Inc. has already paid these costs and it is highly unlikely that these costs will be incurred again.

2. Office Equipment Leases:
   Lease computer.

3. Leases: 2 light vehicle. Already paid.
   P&H Shovel maintenance.
   - Storage cost for DCS system already paid
   - Hiab and crane lease already paid.
   - Maintenance and winterization of the Skagway port facility.
   - Computer software lease for mine engineering system and main frame administration computer.

4. Taxes and Insurance:
   Water and power return for Curragh owned houses in Faro.

C. Costs:

With Labour: $ 41,696

Without Labour: $ 34,541

Week #4 - October 1 - 7, 1993:

A. Tasks List:

1. Inspect and secure Faro Mine Site on a 24 hour-per-day, 7 days-per-week basis. Compile necessary reports.

2. Winterize mobile equipment.

3. Lease equipment, and operate and maintain Faro Mine equipment as required to perform the above.

4. Maintenance and winterization of the Skagway port facility.

B. Required Resources:

1. Labour: 3 people as shown in Schedule 1 attached.

2. Office Equipment Leases:
None this week.

3. Leases: 2 light vehicle. Already paid.
- Storage cost for DCS system already paid
- Hiab and crane lease already paid
- Maintenance and winterization of the Skagway port facility.

4. Taxes and Insurance:
Water and power rates for Curragh owned houses in Faro already paid.

C. Costs:

With Labour: $ 14,997

SÄ DENA HES MINE SITE

The Sä Dena Hes Mine Site is currently under care and maintenance with a full-time on-site caretaker.

The Sä Dena Hes Mine Site is relatively simple, small and does not involve acid generating rocks or tailings thus the environmental monitoring and overall presence is considerably less than at Faro.

As for the two Faro Licenses, this one requires a regular water quality and quantity monitoring net with regular reporting. Physical inspections and maintenance of tailings dams and diversions are also required; some instrumentation is present but not as extensive as at Faro.

The Sä Dena Hes Site is also covered by both a Water License (IN90-002) and a reclamation agreement. These both require an update of the closure plan in late 1995, this is not a major effort as the overall plan has not changed much from that submitted previously. Both also require annual reporting of water quality and reclamation matters. This water license, along with governments Acts and guidelines, essentially set the environmental standards for the Site. Most of environmental-related matters involve monitoring and collecting samples from the environmental collection structures, having same analyzed and recording and reporting the results, and ensuring that discharge standards are met.

To maintain compliance with the Water License annual increments of $147,000 to the financial security now totalling $444,000 are required until a total security of $1.3 million is in place.

The Major Assets of the Sä Dena Hes Mine Site comprise of land and mineral rights holdings, and plant and equipment required for a northern self-sustaining and self-sufficient underground mining and minerals concentrating operation.

Tasks over the next four weeks related to environmental protection and assets preservation will require two people and cost (see Schedule 2, attached):

Week	S11-S17	S18-S24	S25-S30	O1-O7
Estimated Costs:				
With Labour	$ 35,077	$ 3,412	$ 13,316	$ 20,000
Without Labour	$ 32,315	$ 650	$ 10,949	

STRONSAY PROJECT SITE

The Stronsay Project Site is currently under care and maintenance with a full-time on-site caretaker.

The Stronsay Project Site requires a caretaker to be present during the spring, summer and fall months to prevent damage to the camp and to monitor water quality. When required, the caretaker must operate a small water treatment facility to ensure that collected run off and seepage from an acid generating waste pile is in compliance with waste management approvals and the reclamation permit. Most of the budget is related to camp and transportation costs.

In winter the site is not as easily accessible and run off no longer occurs thus government agencies have agreed to the caretaker leaving.

Some consulting costs are provided for continued baseline water quality monitoring and a small study into the chemical speciation of silver in waters of the area, as required by one of the permits.

Several permits and licenses require annual payments and provision is also made for property taxes on the site. These permits and licenses, along with governments Acts and guidelines, essentially set the environmental standards for the Site. Most of environmental-related matters involve monitoring and collecting samples from the environmental collection structures, having same analyzed and recording and reporting the results, and ensuring that discharge standards are met.

The Major Assets of the Stronsay Project Site comprise of land and mineral rights holdings, and some plant and equipment required for a northern self-sustaining and self-sufficient underground exploration/development project.

Tasks over the next four weeks related to environmental protection and assets preservation will require two people and cost (see Schedule 3, attached):

Week	S11-S17	S18-S24	S25-S30	O1-O7
Estimated Costs:				
With Labour	$ 10,788	$ 10,788	$ 10,788	$ 10,788

FEDERAL GOVERNMENT

Department of Indian Affairs and Northern Development (DIAND)

This department is the major contact in Yukon as it administers most resources related to mining. It is the enforcement agency for all Water Licenses (under the Yukon Waters Act and Regulations) and looks after all matters related to mineral claims and leases (under the Yukon Quartz Mining Act) and land tenure on Crown land (under the Territorial Lands Act and Regulations) including Surface Leases, Coal Leases and Land Use Permits.

Curragh has 3 Water Licenses covering the Faro mine, mill and tailings site (IN 89-001), the Vangorda and Grum mine sites (IN 89-002) and the Sä Dena Hes mine and mill site (IN 90-002). We also have four Surface Leases covering the Faro mine site and additional lease applications covering Vangorda and Grum mine site, the Vangorda Plateau Haul road and the Sä Dena Hes mine site. Curragh has several Coal leases and lots covering a former coal producer in the Carmacks area of Yukon. Curragh also has 2422 mineral claims or leases covering 41,500 hectares in the Faro area, 722 claims and leases covering 14,300 hectares in the Sä Dena Hes area and 64 other claims (1,350 hectares) at 2 locations elsewhere in Yukon. Land holdings as of May 31, 1993 are detailed in report WH9301A.

Contact person in DIAND for enforcement of the licenses is David A. Sherstone, Regional Manager, Water Resources, 200 Range Road, Whitehorse, Yukon Y1A 3V1, phone: (403) 667-3100, fax: (403) 667-2126. Most official correspondence is through the Water Board however, DIAND Water Resources becomes involved in cases of non-compliance and site inspections and should be advised of any changes to normal procedure at the mine such as reduction in site staff, waste disposal or water treatment practices.

The Yukon Territory Water Board is the agency that issues Water Licenses, is responsible for amendment or assignment of licenses and is a central agency for the submission of reports related to licenses. The Water Board is separate from DIAND's Northern Affairs program but the Board's staff are DIAND employees. The contact person there is Ms. Judy Doering, Manager, Water Board Secretariat, 200-4114 Fourth Ave., Whitehorse, Yukon Y1A 4N7, phone: (403) 667-3890, fax: (403) 668-3628. Note that the Water Board is a quasi-judicial body thus it is not appropriate to attempt to discuss matters related to Curragh's licenses directly with the Chair or members of the Water Board, formal correspondence can be sent to the Chair of the board at the above address. The Chair of the board id Mr. Paul Hunter. The Board should be advised of the company status and monthly water quality reports must continue to be sent in. A major report summarizing Water License related activities at the mine for the year must be submitted by the end of March of the year following. Once a new owner is settled the licenses must be assigned by the Water Board. Any desired changes in reporting, necessary studies, closure plans or other terms and conditions of the Water Licenses requires an amendment of the License and is done through the Water Board as outlined in the Yukon Waters Act. Spills must be reported to the 24 hours Yukon Spill Report Line (403) 667-7244 or to DIAND Water Resources at (403) 667-3100.

Department of Indian Affairs and Northern Development (DIAND) (Cont'd)

The primary contact people for matters related to mineral claims and leases are the Mining Recorders of the respective Mining Districts. The two main contacts are Mr. R. H. Whittingham, District Mining Recorder, Whitehorse Mining District, 1st Floor, Federal Building, 300 Main Street, Whitehorse, Yukon Y1A 2B5, phone: (403) 667-3190, fax: (403) 667-3267 (for Faro area claims) and Ms. P. Macleod, District Mining Recorder, Watson Lake Mining District, Watson Lake, Yukon, phone: (403) 536-7366. Agreements concerning the ownership of the beneficial interest in the claims and leases are normally registered with the mining recorder (this has been done by Curragh's Yukon counsel, Anton Campion MacDonald & Philip), claims can be transferred to a new owner through the mining recorder's office. Assignment of Coal leases is not done through the Mining Recorders however, they can advise one of the correct agency, such assignment must have approval of the minister of DIAND.

The primary contact for matters related to the surface leases is Ms. M. Macyshen, A/Supervisor of Lands, Northern Affairs Program, 200 Range Road, Whitehorse, Yukon, Y1A 3V1, phone: (403) 667-3174. An assignment of the Surface Leases would be done through this office, they should also be advised of the desires for the applications for new leases and renewal of one old lease that are currently awaiting completion. Assignment of a surface lease may require ministerial approval. Annual rental on surface leases is paid through this office.

The company currently has no active Land Use Permits however there are still reclamation obligations inherited from Cyprus-Anvil's Land Use Permit for the small open pit coal mine at Carmacks. Land Use Permits are handled by DIAND at 200 Range Road, Whitehorse, contact the Head, Land Use for information.

As the major Federal resource agency DIAND is usually the lead agency in environmental screenings under the Environmental Assessment and Review Process Guidelines Order (EARPGO). There are currently several screenings under-way on Curragh projects, mostly related to decommissioning of the Faro complex but also for the Dy Advanced Exploration Project. The contact is Ms. Jennifer Guscott, Director, Environment and Land Claims Directorate, 200 Range Road, Whitehorse, Yukon, Y1A 3V1, phone: (403) 667-3136, fax: (403) 668-4070 (filling in for Ms. Lois Craig who has dealt extensively with Curragh but is on one years leave now). This position is also chair of the Regional Environmental Review Committee (RERC), an inter-departmental and inter-governmental committee which coordinates most EARPGO screenings related to Curragh. The only notice needed should be a courtesy letter to advise RERC to put the Dy Project on hold for now and generally provide an update on the status of the company.

As a result of EARPGO screenings in the past there are agreements between Curragh and the Crown regarding mine site reclamation measures (particularly financial security) beyond those included in the Water Licenses. These agreements require certain reports and abandonment plans that lead to a reassessment of financial security on occasion. The Contact for these

Department of Indian Affairs and Northern Development (DIAND) (Cont'd)

agreements is through DIAND Headquarters in Ottawa, Dr. Joseph Lazarovich, Director Mining and Infrastructure Directorate, DIAND, Les Terraces de la Chaudiere, 10 Wellington St., Ottawa, Ontario, K1A 0H4.

Environment Canada, Environmental Protection (EP)

EP is the agency responsible for administering the Metal Mine Liquid Effluent Regulations of the Fisheries Act. EP must receive monthly reports of water quality as required by the regulations; currently the practice is to report water quality data to the Water Board as required by the Water Licenses, the Board's staff then makes the information available to other agencies.

Contact at EP is Mr. George Mackenzie-Grieve, Director, Environmental Protection, Box 6010, 100 Hamilton Blvd., Whitehorse, Yukon Y1A 5L7, phone: (403) 667-3401, fax: (403) 667-7962. In general, if everything is going well with regard to water quality at the mines there will be little need to contact EP. Since Department of Fisheries and Oceans generally focuses on fish habitat, leaving the water quality side to EP, it is also unlikely that DFO will need to be contacted.

It is, however, advisable to keep EP and DFO aware of what is happening at the mine sites in a general way. A good vehicle for this is the Technical Advisory Committee which is an informal group established under the Faro and Vangorda Water Licenses. This is advisable because EP has adopted a more prosecutorial stance in the last few years and has issued three Warnings of a possible violation of the Fisheries Act at Faro or Vangorda. The issues most likely to be of interest are zinc in discharge from the Faro Tailings pond. Zinc and ammonia in discharge from the Vangorda Water Treatment Plant, suspended solids in Vangorda Creek from a number of sources, and sedimentation in lower Vangorda Creek salmon rearing habitat.

Territorial Government

In general, the Territorial Government agencies are not yet extensively involved with the mines as the land, mineral, water and most fish resources have not yet been devolved for most of Yukon. There is, however, a strong involvement with wildlife, especially sheep at Vangorda and Grum and an increasing involvement with non-anadromous fish habitat. YTG is an active participant in the EARPGO screenings through the RERC. Principal contact at YTG Renewable Resources is Len Mychawiw, Land Use Specialist, Habitat Management and Research, Fish and Wildlife Branch, 10 Burns Road, Whitehorse, phone: (403) 667-5798, fax: (403) 668-4363.

CONTINGENCY PLAN - September 10,1993

Faro Mine, Concentrator and Tailings Area

The major issue here is quality of water discharge from the Rose Creek Valley tailings impoundment, particularly with regards to zinc. Treatment involving Ph elevation by lime slurry addition is currently being practised to control dissolved zinc. Work is on-going to improve efficiency of lime addition and mixing and to improve settling of precipitate in the Cross-Valley pond. Other issues of importance are detection of seepage from the waste dumps most of which flows naturally to the tailings area and control of the level of low Ph, zinc rich, water in the buried Zone II pit to prevent it's seepage into the North Fork of Rose Creek.

There is a system of sampling points to be tested monthly or twice annually and reported to the Water Board monthly. These points are largely surface water sites and are oriented toward water quality surveillance; at some points flow quantities are measured or counts of insects living in the stream bed are made. There is also a network of groundwater observation wells around the mine site. The down Valley tailings impoundment in Rose Creek Valley comprises a number of dams, diversions, interceptor ditches and spillways which are partly built on permafrost. These structures require monitoring to ensure continued performance as designed. This is largely visual inspection and observation of seepages but there is an extensive network of instrumentation that must be regularly observed per Schedule C of the Water License.

A network of groundwater observation wells is required between the gradually flooding Main Faro pit and North Fork of Rose Creek or buried Zone II pit. This work has been deferred to the latest possible point in 1994 but the urgency of this drilling may increase once government becomes aware of the high zinc content in the Faro pit water and the water level in the pit (currently still slightly below the elevation of the North Fork).

A major comprehension abandonment plan coupled with a feasibility study of tailings reprocessing is required for the Faro site in December 1994. This is a major undertaking which is currently beyond the financial and staff capabilities of the company thus a one year deferral has been requested from the Water Board. It is likely that this will be granted thus this work has been scheduled for 1995. Several other studies or minor reports will be done internally with available staff.

The water license for Faro calls for $500,000 in financial security which is currently provided by a Letter of Credit, allowance for renewal of this facility is provided, as is a Water License mandated environmental trust fund contribution of about $30,000 in account of 1993 production.

Grum Deposit and Vangorda Pit

Major environmental issues at the Vangorda Plateau site are quality of effluent discharge (zinc and ammonia) from the Water Treatment Plant, suspended solids from erosion of certain diversion or interceptor ditches and roadways and the collection of zinc rich seepage from the

Grum Deposit and Vangorda Pit (Cont'd)

vangorda waste dumps to prevent groundwater contamination. Although local improvements are needed there is a very capable water collection, pumping and treatment system in place; this requires trained staff to operate and maintain as well as parts, power and reagents all of which are budgeted.

As at the Faro site there are a number of structures to monitor and where necessary maintain. The most critical of these are the embankments of the settling pond for the Water Treatment Plant. The budget allows for these inspections by qualified engineers as well as a performance evaluation of the Water Treatment Plant. There is also a water quality/quantity monitoring network at Vangorda Plateau but it is not as extensive and does not require as frequent observations. Monthly reporting is also required for Vangorda/Grum by the Water License as well as the Metal Mine Liquid Effluent Regulations.

As at Faro there is a Water License for the Vangorda/Grum site, additionally there is a reclamation agreement between Curragh and the Crown which calls for extra financial security and additional reclamation studies. These studies can be completed internally as much as possible, they are due in early to mid 1994.

Annual increments to financial security are required to maintain the Water License this amounts to $560,000 per year and unlike the Faro license is not tied to production. Financial security under the reclamation agreement would also be re-examined in light of the 1994 closure plan update noted above.