Project Assessment 2006-0050

Western Copper Corporation:
Carmacks Copper Project

Screening Report and Recommendation

Prepared by the
Executive Committee
Yukon Environmental and Socio-economic Assessment Board

18 July, 2008

YESAB
Yukon Environmental and Socio-economic
Assessment Board

PREFACE

Western Copper Corporation's Carmacks Copper Project is a proposed open pit mine with ore processing and copper concentrating infrastructure that is expected to produce about 14 000 tonnes of copper cathode per year. The Project is located 13 km north of the Freegold Road, approximately 38 km northwest of the Village of Carmacks and approximately 192 km north of Whitehorse in the Yukon Territory.

The Executive Committee of the Yukon Environmental and Socio-economic Assessment Board has completed an assessment of the potential environmental and socio-economic effects of the Carmacks Copper Project in accordance with the *Yukon Environmental and Socio-economic Assessment Act*.

The following screening report contains the Recommendation of the Executive Committee to the Decision Bodies with respect to the proposed Carmacks Copper Project.

EFFECTS ASSESSMENT SUMMARY

Assessment Process

On February 13th, 2007, the Executive Committee of the Yukon Environmental and Socio-economic Board (YESAB) determined Western Copper Corporation's Carmacks Copper Project (the Project) proposal adequate to begin a screening, pursuant to the *Yukon Environmental and Socio-economic Assessment Act* (YESAA).

The requirement for a screening by the Executive Committee was triggered pursuant to Section 47(2) of YESAA. The triggering activity is listed under Schedule 3, item 3(a) of the Assessable Activities, Exceptions and Executive Committee Projects Regulations, namely:

> *"Construction, decommissioning or abandonment of a metal mine, other than a gold mine, with an ore production capacity of 1500 t/day or more"*

The Carmacks Copper Project proposal was made available for public review and comment for an initial period of 30 days beginning February 16, 2007. At the request of Little Salmon/Carmacks First Nation (LSCFN), the public review and comment period was extended an additional three weeks until April 3, 2007. During this period the Executive Committee held public meetings in Carmacks and Pelly Crossing to provide LSCFN, Selkirk First Nation (SFN), the Village of Carmacks, the public and others an opportunity to ask questions and provide comments regarding the Project and/or the assessment of the Project.

On April 25, 2007 the Executive Committee determined that supplementary information was required from the Proponent in order for the assessment to continue. Western Copper submitted the final portion of information requested October 3, 2007. On October 22, 2007 the Executive Committee deemed that the supplementary information provided was sufficient to allow for production of a draft screening report.

A multi-stakeholder tour of Project related transportation routes occurred August 28, 2007 in order to identify the transportation-related interests of the community, governments and the Proponent.

The draft screening report was made available for public review and comment for a period of 30 days beginning December 17, 2007. In response to requests from the Village of Carmacks, LSCFN and the Carmacks Renewable Resources Council, the period was extended through February 6, 2008 During this period a number of detailed and extensive comments were received on heap detoxification and closure prompting the Executive Committee to request a further supplementary information request to the Proponent on February 25, 2008. The Executive Committee also provided LSCFN and the Yukon Conservation Society (YCS) with the opportunity to submit further information, particularly on heap detoxification and closure concerns.

Project Description

The Project is located at latitude 62º 21' N and longitude 136º 1' W, approximately 38 km northwest of the Village of Carmacks, and approximately 192 km north of Whitehorse in the Yukon Territory. The mine site is to be accessed via a 13 km private access road north of kilometre 33 of the Freegold Road.

The Project includes the construction, operation and closure of an open pit mine, soil stockpiles, WRSA, ore crushing and transport infrastructure, acid heap leach, events pond (for leach solution), copper extraction facility, drainage ditches and sediment control ponds, high-density sludge (HDS) water treatment facility, access and haul roads and associated support infrastructure (e.g. power generation, on-site accommodation and communications). Soil will be stripped and stored. Sixty million tonnes of waste rock will be stored on site. Metals will be dissolved from 13.3 million tonnes of crushed ore placed on a sloped, lined pad using a sulphuric acid heap leach process. The leach solution will then undergo a solvent extraction and electrowinning to produce copper cathode. The Project is expected to produce about 14 000 tonnes of copper cathode per year.

Construction is anticipated to require two years to complete. Based on known reserves, mining is expected to occur for about eight years, with an additional seven years dedicated to decommissioning and reclamation, closure and post-closure.

Screening Report and Recommendation

Numerous issues were identified and further explored in the screening. Some of these issues were identified as a result of the comments received on the proposal. Comments included questions and concerns related to the location of the single status accommodation, the routing of Project related traffic, the heap detoxification process, sludge management, heap leach liner performance and estimates of closure costs. The comments received helped focus the development of a draft screening report.

To focus and clarify the effects assessment, potential effects on values are explored in three geographic areas: the ‘Mine Site and Access Road’, the ‘Freegold Road and Bridges’ and the ‘Community and Region’. Mitigating potential effects of improper or inadequate ‘Closure and Reclamation’ of the mine is an important issue addressed in this screening and it is discussed in its own section.

The ‘Mine Site and Access Road’ portion of the screening focussed on potential effects associated with the mine site infrastructure, activities and processes and the construction and use of a new access road north from Freegold Road. Potential effects on water resources (water quality/quantity and fish/fish habitat, in particular salmon), wildlife resources (in particular moose), current land use (trapping), air quality, soil stability, heritage/historic resources and public and worker health and safety were examined.

The ‘Freegold Road and Bridges’ portion of the screening focussed on potential effects related to the year-round use of this transportation infrastructure by Project traffic. Potential effects on public health and safety (other road and bridge users), wildlife, current land use (fish camps, recreational users and the Yukon Quest), surface water quality and heritage/historic resources were examined.

The ‘Community and Region’ portion of the screening focussed on potential effects related to the routing of Project related traffic through the Village of Carmacks as well as potential socio-economic effects, primarily in Carmacks, that could result from Project personnel and activities. Potential effects on public health and safety (Project traffic on Village roads), community structure and dynamics (who lives in Carmacks, and how they live), economy and employment, community services and infrastructure and education and training were examined.

The 'Closure and Reclamation' portion of the screening focused on key issues related to the long-term stability of the mine site and elimination of environmental liability once mining is completed. The Project proposes a sulphuric acid heap leach process. There are no current examples of projects using this process that have been completely closed in northern Canada. The immense public cost borne to control resulting environmental issues from improperly closed and abandoned mines in Yukon is an important potential adverse economic effect to Yukon. The Executive Committee agrees with Yukon Government that perpetual active treatment is not acceptable for heap reclamation and closure planning. Potential effects of ineffective closure that could lead to adverse effects on water resources, public health and safety and aesthetics were examined.

The Executive Committee has considered scientific and traditional knowledge in assessing the potential effects of the issues identified during the screening. The Executive Committee considers these issues to be adequately addressed.

Conclusion

The Executive Committee is satisfied that:

- The Proponent adequately consulted with the First Nations in whose territory, and the residents of any community in which the Project will be located or might have significant environmental or socio-economic effects, pursuant to Section 50(3) of YESAA;
- The Proponent provided sufficient information in the Project proposal to allow for the identification and assessment of potentially significant effects;
- Significant adverse environmental or socio-economic Project and cumulative effects identified within the scope of the screening were adequately assessed;
- Practical means have been identified to prevent or reduce to an acceptable level any potentially significant adverse effects of the Project.

The Executive Committee recommends, pursuant to Section 58(1)(b) of YESAA, the Project be allowed to proceed without a review, subject to specified terms and conditions, since it has determined that the Project will have significant adverse environmental and socio-economic effects in the Yukon that can be mitigated by those terms and conditions.

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ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this Screening Report:

Al	Aluminum
As	Arsenic
CaO	Lime
Cd	Cadmium
CCME	Canadian Council of Ministers of the Environment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRRC	Carmacks Renewable Resource Council
Cu	Copper
DFO	Department of Fisheries and Oceans
EASA	Environmental Assessment Study Area
EEA	*Environmental Assessment Act* (Yukon)
EMS	Environmental Management System
Executive Committee	Executive Committee of the YESAB
Fe	Iron
HDPE	High-Density Polyethylene
H_2SO_4	Sulphuric Acid
HDS	High Density Sludge water treatment system
LDRS	Leak Detection and Recovery System
LLDPE	Linear Low Density Polyethylene
LSCFN	Little Salmon/Carmacks First Nation
LSCFNFA	Little Salmon/Carmacks First Nation Final Agreement
MMER	Metal Mining Effluent Regulations (*Fisheries Act* (Canada))
Mo	Molybdenum
Na_2CO_3	Sodium Carbonate
Ni	Nickel
NRCan	Natural Resources Canada, Government of Canada
NV	Normalized Volume, also called pore volume

Pb	Lead
pH	Measure of acidity or alkalinity in a solution (lower pH is more acidic)
Project	Western Copper Corporation's Carmacks Copper Project
PVC	Polyvinyl Chloride
Se	Selenium
SFN	Selkirk First Nation
SFNFA	Selkirk First Nation Final Agreement
SO_2	Sulphur dioxide gas
SO_x	Sulphur oxide gases
SX/EW	Solvent Extraction and Electrowinning
VESEC	Valued Environmental and/or Socio-economic Component
VLDPE	Very Low Density Polyethylene
WKA	Wildlife Key Area
YESAA	*Yukon Environmental and Socio-economic Assessment Act*
YESAB	Yukon Environmental and Socio-economic Assessment Board
YFNFA	Yukon First Nation Final Agreement(s)
YG	Yukon Government
YMTA	Yukon Mine Training Association
YOR	YESAB Online Registry
Yukon Quest	Yukon Quest International Sled Dog Race
Zn	Zinc

PART I – ASSESSMENT PROCESS

1.0 INTRODUCTION

1.1 LEGISLATIVE CONTEXT FOR THE ASSESSMENT

The *Yukon Environmental and Socio-economic Assessment Act* (YESAA) sets out a process to assess the environmental and socio-economic effects of projects and other activities in the Yukon, or that might affect the Yukon. The Executive Committee of the Yukon Environmental Assessment Board (YESAB) is responsible for assessing large, complex projects identified under the Assessable Activities, Exceptions and Executive Committee Projects Regulations (Activity Regulations).

In February 2006, the Proponent submitted its Project proposal to the Executive Committee for screening.

Section 50 (3) of YESAA requires that:

> *Before submitting a proposal to the executive committee, the Proponent of a project shall consult any first nation in whose territory, or the residents of any community in which, the project will be located or might have significant environmental or socio-economic effects.*

Based upon the information provided in the proposal and supplementary information submitted by the Proponent, the Executive Committee determined on January 12, 2007 that the Proponent had satisfied the requirement to consult under Section 50(3) of YESAA. In February 2007 the Project was deemed adequate and the screening commenced.

The *Rules for Screenings Conducted by the Executive Committee* established timelines for conducting this assessment (see Figure 1).

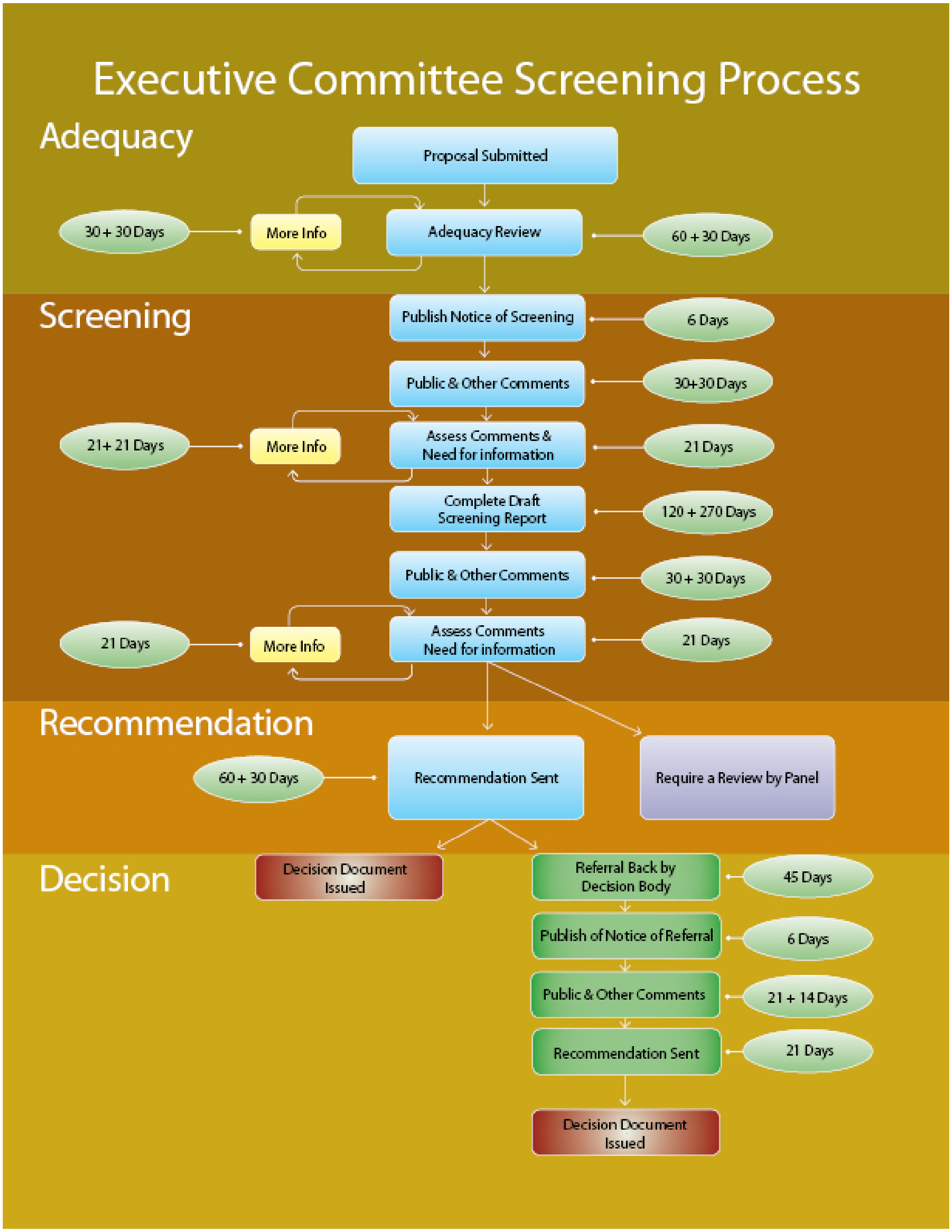

Figure 1 Executive Committee Screening Process

1.2 PURPOSE OF THE REPORT

YESAA requires that Decision Bodies consider the recommendation arising from a screening conducted under YESAA, and issue a decision document, prior to taking any action that would enable a project to be undertaken.

The purpose of this Screening Report is to provide the Decision Bodies with a recommendation arising out of the screening and the reasons for that recommendation.

This report will:

- Describe the Project;
- Summarize the matters considered during the screening;
- Specify terms and conditions to mitigate potentially significant adverse environmental and/or socio-economic effects of the Project; and
- Summarize public comments received on the proposal.

1.3 ORGANIZATION OF THE REPORT

The report is structured as follows:

Part I – Assessment Process

Section 1.0: Provides an introduction to the Screening Report.

Section 2.0: Provides a description of the Project.

Section 3.0: Provides the environmental and socio-economic setting in which the Project is proposed.

Section 4.0: Provides an overview of the effects assessment process.

Section 5.0: Provides the scope of the assessment.

Part II – Effects Assessment

Section 6.0: Provides the assessment of potential effects on valued environmental and socio-economic components (VESECs) with respect to the mine site and access road.

Section 7.0: Provides the assessment of potential effects on VESECs with respect to the Freegold Road and bridges.

Section 8.0: Provides the assessment of potential effects on VESECs with respect to the Village of Carmacks and the region.

Section 9.0: Addresses mine closure and reclamation.

Section 10.0: Provides the assessment of potential effects of the environment on the Project.

Part III – Assessment Recommendation

Sections 11.0 – 12.0: Provides the recommendation of the Executive Committee and the terms and conditions of the recommendation.

Appendices have been included to elaborate on information referenced in the main body of the report:

- Appendix A: Presents a summary of comments submitted during the assessment by interested persons and others.
- Appendix B: Presents the bibliography of articles referenced in the Screening Report

2.0 PROJECT DESCRIPTION

2.1 PROPONENT INFORMATION

Western Copper Corporation is the spin-off company of Western Silver Corporation, which was acquired by Glamis Gold on May 3, 2006.

Contact information for the company is as follows:

Western Copper Corporation
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Fax: (604) 669-2926
Email: info@westerncoppercorp.com
Website: www.westerncoppercorp.com

2.2 PROJECT DESCRIPTION

The following project description summary is based on the 'Western Copper Corporation - Carmacks Copper Project, Yukon Territory Project proposal Revision No. 2' submitted in November 2006, as well as reference material provided by the Proponent and supplementary information submitted during the screening. Further details regarding the Project, can be found in the project proposal documents (YOR documents #2006-0050-001 through 2006-0050-072 and all documents described as 'Additional Proposal Information').

2.2.1 INTRODUCTION/BACKGROUND

2.2.1.1 Location

The Project is located in the Dawson Range at latitude 62° 21' N and longitude 136° 41' W, 198 km north of Whitehorse, Yukon. The Project site is located adjacent to Williams Creek, 8 km west of the Yukon River, and 38 km northwest of the Village of Carmacks (Figure 2). The mine site is accessible by an existing 13 km exploration road that leads north from km 33 of the Freegold Road. The Village of Carmacks, on the Yukon River, is 175 km by paved road north of Whitehorse, and the latter is 180 km north of the year-round port at Skagway, Alaska.

The existing exploration road from the Freegold Road to the mine site will be utilized during the initial development of the Project. A new 5 m wide mine access road will be constructed to the east of the exploration road alignment (currently cleared and grubbed).

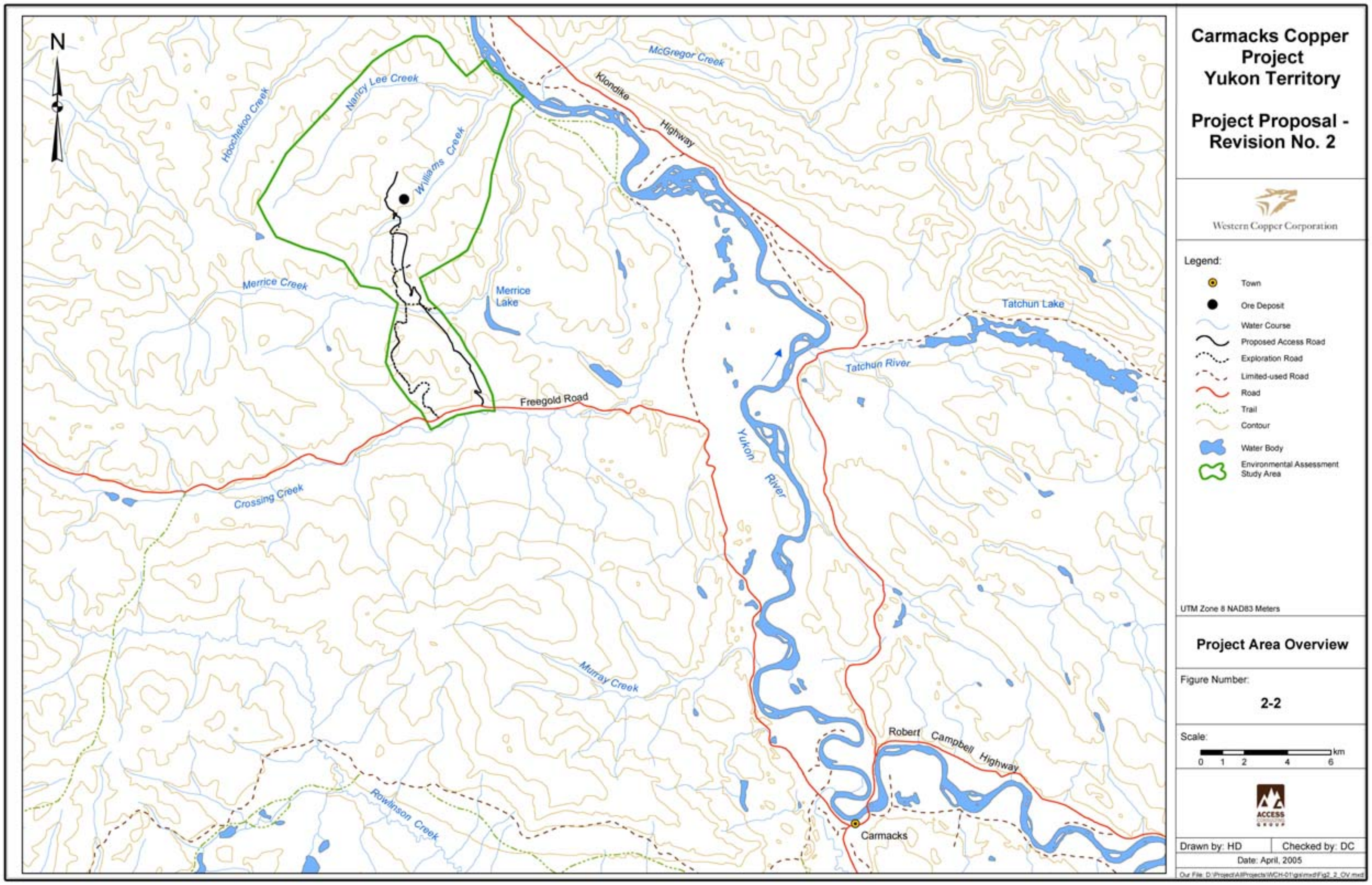


Figure reproduced from the Project Proposal

Figure 2 Project Area Overview

2.2.1.2 History

The first report of copper in the project area was made in 1887 and the first claims were staked in 1898 on Williams Creek and Merrice Creek canyons, east of the present Carmacks Copper deposit. The discovery of a copper deposit 104 km northwest of the Carmacks Copper deposit initiated a staking rush that led to the staking of the Williams Creek property in 1970.

In 1989, the property was optioned to Western Copper Holdings Ltd. (which subsequently became Western Silver and then Western Copper Corporation) and Thermal Exploration Company. During 1989 Western Copper and Thermal Exploration Company collected three tonnes of surface oxide material for testing of leaching characteristics. In 1990, metallurgical tests were carried out and diamond drill holes were drilled. A 1992/93 Pilot Test Plan demonstrated that copper can be leached successfully through heap leaching with a weak sulphuric acid solution.

In 1994, Western Copper began the permitting process and held preliminary economic development discussions with both the Yukon Government and the LSCFN.

Western Copper continued geotechnical and engineering studies from 1996-1998. During 1997 the company cleared the access road, leach pad and plant site in preparation for a planned mine development in 1998. However, the development was suspended when copper prices fell that year. Also in 1997, Western Copper run-of-mine bulk sampled the zoneonedeposit. Leaching and decommissioning test work was then carried out by Beattie Consulting Ltd. to provide a further basis for predicting copper recovery and neutralization requirements.

In 2001, Department of Indian Affairs and Northern Development, Environment Directorate finalized the *Environmental Assessment and Review Process and Guidelines Order* assessment of the project. The determination of this assessment was that the proposal would require further study and reassessment before authorization could be issued.

In June of 2005, Western Copper submitted a Project Description/Environmental Assessment Report for review under EAA thus triggering a comprehensive study process under that act.

In February 2006, the company submitted a project proposal for assessment under YESAA. This assessment was triggered with the implementation of the new YESAA assessment regime on November 28, 2005. This proposed Project has been treated as a “transition project” and has been assessed under EAA and YESAA.

2.2.2 PROJECT COMPONENTS/STRUCTURES

The following sections describe the various components and structures that comprise the Project. Figure 3 is a site map reproduced from the proposal.

Site Layout

The open pit mine will be located on a hillside on the southeastern side of the property and will have a pit crest elevation of 860 m and bottom elevation of 645 m. The maintenance/service facilities,

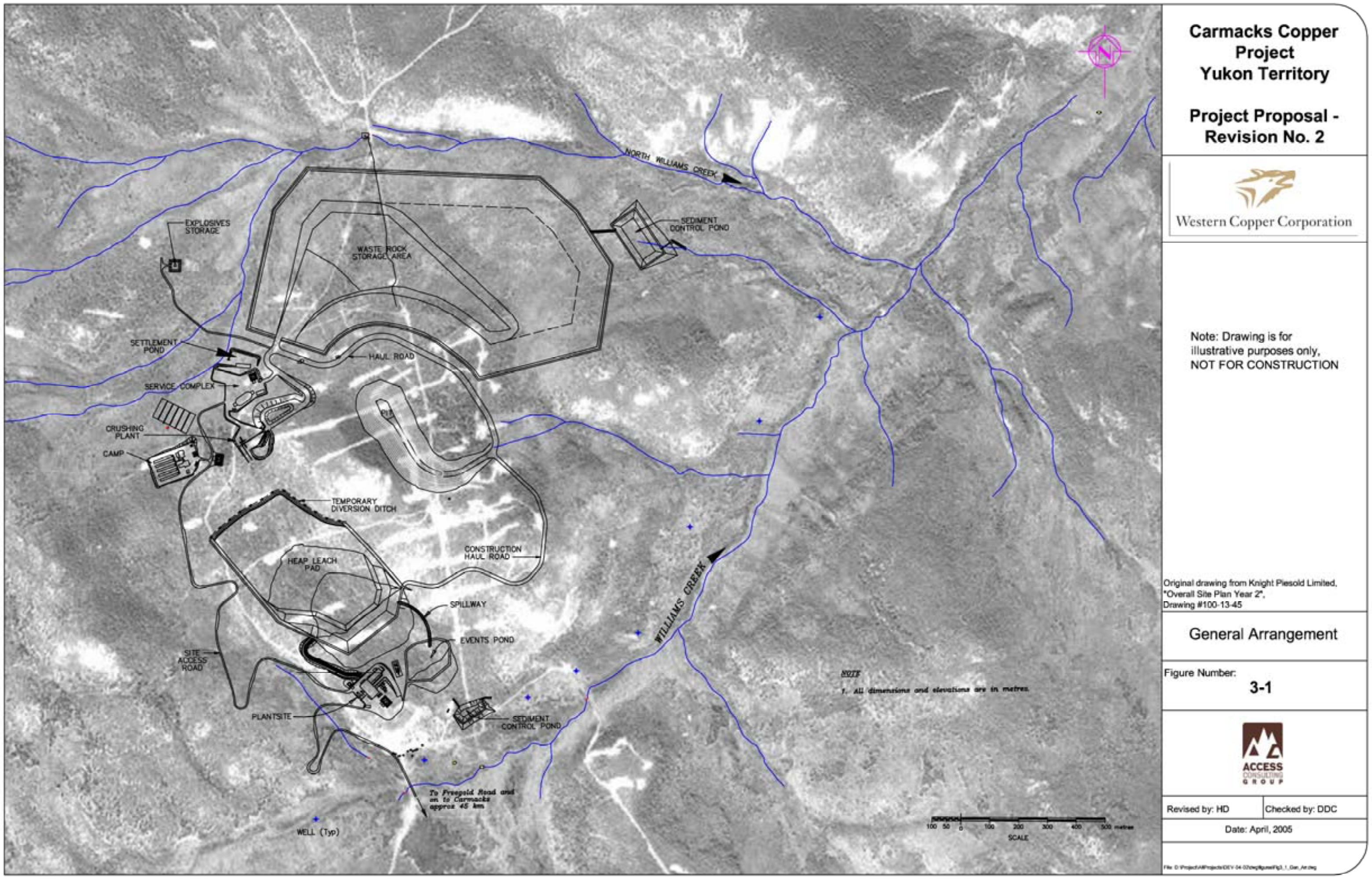


Figure reproduced from the Project proposal

Figure 3 Project Site Diagram

primary crusher and construction/operations camp will be located above the leach pad area on a saddle west of the open pit at elevation 850 m to 880 m. The process plant, acid plant, laboratory, process office and gatehouse will be situated below the heap leach pad at elevation 766 m. The administrative offices will be located off-site at Carmacks.

The heap leach pad will be located to the north of the process plant and below the maintenance/service facilities in a local south-facing valley which drains towards the process plant.

The crushing plant, at elevation 860 m, and the beginning of the leach pad loading conveyors will be located on the west side of the small hill between the heap leach pad and the open pit.

2.2.2.1 Open Pit

Mining will occur in a single open pit. The pit will be mined in 12 m benches at an average strip ratio of 4.6 tonnes of waste per tonne of ore. Reserves have been calculated as 13.3 million tonnes at an average grade of 0.97 percent total copper, at a marginal cut-off grade of 0.29 percent total copper. The resulting mine life will be eight years.

The majority of the waste rock and all of the ore will most likely require mining by drilling and blasting. The near surface waste and topsoil will be ripped by bulldozers for removal.

2.2.2.2 Waste Rock Storage Area

The waste rock storage area (WRSA) is located immediately north of the open pit on a gentle, northeast facing slope. The WRSA covers an area of approximately 70 hectares and is designed to provide for permanent, secure storage and total confinement of the mine waste rock.

Vegetation will be stripped to thaw potential permafrost under the WRSA. Ditches will transport the melt water, and any seepage and surface runoff diverted around the area will be collected in the sediment control pond for treatment before discharge to the environment. The sediment control pond will provide storage for the one in 10-year, 24 hour storm event and provide a spillway that can safely pass the one in 200 year, 24 hour storm event.

A buffer zone around and beyond the dump will be maintained until year four of the mine development to permit thawing, monitor dump performance during development, and to permit possible installation of foundation improvements and other design contingencies as necessary. Such contingencies include construction of a stabilizing berm placed at the toe of the dump and keyed into thaw stable material.

2.2.2.3 Heap Leach Operation

The design of the heap leach facility (heap) provides for the ore to be placed behind an embankment with ore being added as 20 m deep ”lifts” up a slope. Sulphuric acid will be used to dissolve the copper into a solution. Much of the solution will pass through the heap more than once. Excess solution storage capacity will be provided in the events pond, which is located downhill from the heap leach pad.

Solution from the leach pad will be piped to the process plant or events pond. The events pond will be connected to the leach pad via pipes and a double lined spillway.

Diversion ditches collect and convey runoff around the facility to a sediment control pond.

The operation of loading the heap and leach solution handling includes: raffinate (i.e., sulphuric acid being re-used) distribution, pregnant leach solution (i.e., solution containing dissolved copper) collection, interconnecting piping, heap stacking, solution management and the liner system preliminary design.

2.2.2.4 Events Pond

Normally, solution will flow directly from the heap to the plant. When there is a high-rainfall or high-precipitation event, or when the plant cannot accept solution, the flow can be directed from the heap to the events pond. The events pond will have a capacity of approximately 160 000 m^3 to store the following combinations of events:

- The operating solution volume and capacity for excess runoff inflows from the critical duration 100 year 24-hour storm event occurring at the most critical point in time; and
- An allowance for heap drain-down as follows:
  - During the first year of operation, 100 percent of the total potential heap drain down volume; or
  - During subsequent years of operation, 48 hours of drain down at the full rate of solution application. For a solution application rate of 540 m^3/hr this volume is 26 000 m^3.

The total available solution storage volume of 160 000 m^3 will provide storage for 100 percent of the total potential drain down volumes in the winter months during the entire mine life.

Under normal operational conditions the events pond will contain only 14 000 m^3 (12 hrs) operational solution volume. During storm events, however, the pond will fill to some level above this (depending on the severity of the storm) and for the maximum storage level in the pond, the maximum leakage rate would apply. In this case, the pumping rate of 235 m^3/hr would be implemented in order to remove the excess solution in the pond and minimize the leakage rate into the leak detection and recovery system.

2.2.2.5 Processing Facilities

Copper will be extracted from the ore using sulphuric acid heap on the heap leach pad. Solvent extraction and electrowinning (SX/EW) will be used to recover the copper metal from the leach solution.

The Project proposes to mine ore from the open pit, operate the crushing plant and load the heap leach pad 200 days per year. Solution processing facilities including solution flow to the heap, solvent extraction and electrowinning will operate year round.

Crushing

The crushing plant will be a modular, trailer-mounted unit consisting of open circuit primary jaw crushing followed by open circuit secondary gyratory crushing. The plant will be composed of six trailers with interconnecting conveyors. Ore haul trucks will normally discharge into a 140 tonnes capacity dump hopper fitted with a sloped stationary grizzly with 600 mm openings. Surge capacity for variations in the mine production schedule will be provided by a coarse ore stockpile located prior to the crusher.

Agglomeration

The ore, crushed to a nominal 25 mm, will be agglomerated with five kilogrammes of concentrated sulphuric acid per tonne of ore. Agglomeration is expected to bind the fine material to the coarse particles, thus preventing the fine materials from compacting in the pore space of the heap which could result in a loss of permeability. Agglomeration will be effected by applying a solution containing 350 g/L sulphuric acid (H_2SO_4) directly onto the ore at conveyor transfer points and mixed as it is transferred between portable conveyor sections.

Heap Leaching

The agglomerated ore will be leached by repeatedly applying a sulphuric acid solution. Application in the summer months will be accomplished using drip or spray emitters placed on the surface of the heap. During the winter months, the drip emitters will be used exclusively and buried approximately 1.5 m beneath the pad surface to prevent freezing.

Solvent Extraction

Pregnant leach solution will be channelled from the heap leach over-liner directly to the pregnant leach solution sumps and then flow by gravity to the solvent extraction plant. Fifty-five percent of the total pregnant leach solution flow will bypass the solvent extraction circuit and report to the raffinate tank. Water and make-up acid will be added to the raffinate pond. The raffinate will then be pumped to the heap at the full rate of approximately 540 m^3/h. The remaining 232 m^3/h of pregnant leach solution will report to the solvent extraction circuit.

The extraction circuit consists of two mixer settlers in series and the stripping circuit consists of two stripping mixer settlers in series.

Pregnant leach solution entering the solvent extraction circuit will initially be contacted with organic solution in the E-1 mixer where the copper in the pregnant leach solution will be transferred to the organic solution. Organic solution transfers the copper from the pregnant leach solution to the electrolyte. The electrolyte is a strong acid solution containing approximately 45 g/L copper from which the copper is recovered as cathode metal by electrowinning.

Electrowinning

High purity copper cathodes will be produced in an electrowinning plant for shipment via truck to the ice-free port of Skagway, Alaska.

Sulphuric Acid Plant

Sulphuric acid will be produced by burning elemental sulphur in a sulphur burner and converting the sulphur dioxide into sulphuric acid using water. Molten elemental sulphur will be purchased from Fort Nelson and trucked directly into the acid plant. Approximately one 40-tonne truckload per day will be required to produce 120 tonnes of sulphuric acid. Sulphur will be stored molten at the mine site in a heated storage facility. Molten sulphur will be pumped into a sulphur burner where it reacts with air to form sulphur dioxide.

2.2.2.6 The High-Density Sludge Water Treatment Plant

A High-Density Sludge (HDS) plant is proposed to treat any process liquids during the Project, including excess rinse water, that require treatment prior to release. The HDS treatment system will add lime (or alternatively caustic soda) to the water to decrease the acidity and precipitate out the metals in a sludge. The precipitation of copper and other metals from the low pH heap solution is standard best practice technology.

Water to be treated will be pumped from the events pond to the HDS plant where it will be mixed with a lime slurry in a mixing tank. This mixture, once the acidity has been neutralized, is fed to two reactors to maximize the removal of contaminants through precipitation and then clarification.

Sludge will be pumped to a lined area up-slope of the heap for temporary storage. Liquids will be pumped to a sediment pond where additional settling of solids will occur and liquids will be discharged if they meet water quality parameters established in the water license.

2.2.2.7 Ancillary Facilities and Services

Access

Access to the mine site area is by public highway with the last 33 km from Carmacks via the gravel, all-weather, government maintained, Freegold Road. Access to the mine property will be by a new 13 km road constructed, maintained, and controlled by the Proponent.

Power Supply and Distribution

The primary source of electrical power for the Project will be a diesel generating plant. The average electrical demand will be 7 860 kW in summer and 6 610 kW in winter. The winter demand is lower because the crushing plant will not be operating. There will be five diesel generating units, each with a minimum continuous operation rating of 1 650 kW. The generators will be equipped with waste heat recovery boilers to generate hot water (i.e., co-generation). The process and laboratory will be serviced by the cogeneration system with back-up diesel fired hot water boilers for building space heating.

Explosives Manufacture and Storage

Ammonium nitrate/fuel oil (AN/FO) explosives will be manufactured on-site and used for mining operations. Prilled ammonium nitrate and fuel oil will be transported separately to the site. There will be two sites associated with the storage of explosives on the mine property: the Explosives Storage Magazine area and the Bulk Explosives Facility (see Figure 3 - Project Site Diagram). The Explosives Storage Magazine area will be located a minimum of 960 m from the camp facility, a minimum of 480 m from other stationary operations, and a minimum of 320 m from the WRSA. The Bulk Explosives Facility will be sited a minimum of 400 m form the Explosives Storage Magazine area and other mine facilities.

The two explosives magazines will be safety-certified, pre-fabricated, purpose-built units. It is anticipated that a maximum of 500 kg of explosives and explosives accessories will be stored in each of the magazines at any one time during the initial site construction period before the bulk explosives facility is operational. Once pit stripping activities commence the quantity of stored explosives in the magazines is anticipated to increase to approximately 3 000 kg of stored explosives and explosive accessories in each of the magazines.

Blastholes will be charged with ammonium nitrate and fuel oil blasting agent by means of a truck-mounted slurry mixing/dispensing unit.

Maintenance Shops and Warehouses

The mining maintenance shop and the warehouse will be housed in a “Sprung” fabric covered, insulated aluminum structure to be located near the primary crusher. The shop will be equipped to handle routine maintenance and most repair work on mine, mobile and process equipment. The warehouse will act as the main distribution centre for spare parts and supplies. Storage space for reagents will be provided at the process plant. A compound adjoining the warehouse will provide additional lay down area.

Offices

Administration

The administration office will be a single story prefabricated trailer structure with a total area of 390 m^2, located in Carmacks. The trailer will contain offices allocated to management, accounting, purchasing, employee relations, safety and engineering staff.

Process

The process offices will be contained in a prefabricated trailer located directly adjacent to the SX/EW building and laboratory trailer. The trailer will have a total floor area of 120 m^2 and contain offices for process supervisory and metallurgical staff as well as washrooms and lunch room space.

Laboratory

The metallurgical laboratories will be located next to the SX/EW facilities in a single story, prefabricated trailer with a floor area of 71 m^2. It will be equipped to perform daily analyses of pit and process samples, screen analyses and environmental analyses of solids and liquids. Sample preparation and column leach test equipment will also be provided in the laboratories.

Mine Dry Offices

The dry offices will be a separate trailer complex in the southeast corner of the operations camp area, complete with separate women's dry offices and assembly areas. The dry offices will serve all employees. Showers, change rooms and individual lockers for 100 men and 20 women will be provided. Offices for the mine and maintenance shift supervisors, the drill and blast supervisor and the process maintenance supervisor will also be included.

Building Heating, Fuel Storage and Distribution

Heating fuel will be supplied from a central propane storage system. Propane will be delivered to the mine site by tank truck to the independent facilities. Currently, it is planned that the facilities, including tanks, will be the property of the propane supplier. The tanks, at the estimated demand, will have a month’s reserve when full.

Vehicle Fuel Storage and Distribution

Diesel fuel and gasoline will be delivered to the mine site in tanker trucks for transfer to storage tanks. The vehicle fuel storage compound will be constructed on the same graded pad as the truck wash facility, which will be located adjacent to the maintenance shop and warehouse.

This compound will contain a 190 m^3 diesel fuel tank and a 38 m^3 gasoline fuel tank. The diesel fuel tank will be steel, above ground, vertical type, and the gasoline fuel tank will be steel, above ground, horizontal or vertical type.

Site Accommodation

Construction personnel will be accommodated in the prefabricated camp located at the project site. The camp will be complete with kitchen, dining and recreational facilities. Depending on the mining seasonal requirements for accommodation during operations, a portion of the camp may be retained to meet any shortfalls in local housing availability.

Lighting

As all the pit equipment is equipped for night time operation, requirements for additional lighting is minimal. Areas that will require lighting are the digging areas and the active waste dump where trucks are dumping. Four portable self-contained lighting plants will be required. These units will be pulled and positioned by a pick-up truck.

Maintenance Facilities

Routine preventative maintenance and servicing of the open pit equipment will be carried out on location. Preventive maintenance on mobile equipment will be carried out in the shop.

The mine maintenance shop will have sufficient floor area for four haul trucks at one time. Scheduled and breakdown repairs will be carried out in the workshops or in situ as appropriate.

Security and First Aid

Security at the mine site will involve controlled access into the work areas.

In areas where vehicular passage could be accomplished easily, security style mesh fencing and a prefabricated trailer gatehouse will be installed and locked to deter unauthorized entrance to the mine site. This security fencing will extend to reasonably visible distances into the forest. Inaccessible areas will have perimeter fencing consisting of wood and/or barbed wire construction with the exception of the process area, which will be completely enclosed by a 2.4 m high wildlife fence.

Additional security fencing will be installed around the warehouse storage yard and the cathode shipment door.

The first aid station will be contained in the gatehouse, as well as the ambulance and fire truck.

Communications

An internal telephone network will serve the various facilities at the property, the cables being routed through conduit within the yard areas and along the overhead pole lines to the process plant and administration offices. Radios will also be installed in supervisor’s vehicles and major items of mining equipment for communicating with the operators working in the pits.

Externally, the operation will be linked via a satellite link to provide data, fax, and voice communication. A satellite dish near the administration offices will be installed during the initial construction phase for this purpose. Satellite TV will also be provided for workers during construction and operation at the camp.

2.2.3 WATER MANAGEMENT

2.2.3.1 Water Balance

General

Leaching and extraction processes have been designed to operate on the basis of 100 percent recycling of process streams. This project proposes no direct discharge of process effluents to Williams Creek during operations, however, a treatment plant is planned as a contingency measure should the release of excess process waters be required. The only other releases to Williams Creek will be from the sediment ponds located below the events ponds and WRSA. Water recycling from these sediment ponds is planned along with wastewater from the open pit, which will be used as make-up water. The events pond will remain practically empty and will only be used during emergency storm events or pump failure.

Discharges from the laboratory wastes and floor drains will be re-routed to the pregnant leach solution stream and returned to the process stream in order to minimize losses.

Site Drainage and Diversion

The development of the mine, WRSA, heap pad and process facilities will require the altering of local surface water drainage patterns. North Williams Creek, which is north of the project facilities, will receive drainage of surface water from around the WRSA. Waters running through the waste rock will be routed away from North Williams Creek and collected in drainage ditches to a sediment pond. The majority of these waters will be routed into the process plant as make-up water. All solutions from the heap will be routed to events the process plant and recycled onto the heap to maintain a closed loop without discharge to the surrounding environment.

Potentially contaminated runoff from the mine and process facilities will be collected in gravity interceptor ditches and directed to sediment ponds adjacent to Williams Creek. The sediment ponds will store the runoff allowing the sediment to settle out. Water from these ponds will be used as a source of make-up water for the heap. Overflow spillways from the ponds will ultimately drain into Williams Creek at the lowest point of the property, before release to the environment. Any effluent planned to be released from the sediment ponds will be monitored to ensure that effluent discharge standards are met.

2.2.3.2 Water Supply

The use of recycled process solutions and contaminated runoff will be maximized to limit the use of make-up fresh water from groundwater wells. The Proponent estimates 1.56 million cubic metres of water will be needed for the heap when leaching the final lift of ore (assumptions outlined in YOR doc #2006-0050-207-1).

Water Requirements

The estimated water requirements are:

- Potable 45 m^3/day
- Process (maximum average) 650 m^3/day
- Road (dust control) watering (peak dry weather) 190 m^3/day
- Total project water use requirements 885 m^3/day

The estimated peak hourly demand in the event of a fire on-site would be 250 m^3/hr.

Water Sources

In addition to the collection and storage of runoff, snow melt, and direct rainfall on the leach pad, events pond and settlement ponds, the following sources of water will be available:

- *Wells* – Water wells are located in the bedrock confined aquifer underlying the Williams Creek drainage. Each of the eight wells is estimated to provide approximately 150 m^3/day of fresh water. Submersible well pumps, installed in the eight bedrock wells to be developed within the Williams Creek Valley, will be connected directly to the fresh water supply pipeline. The wells will be the primary source of fresh water for the Project.

- *Mine pit dewatering* – Submersible pumps will be installed in the pit sump and the water will be used at the crusher, for truck washing and road watering. Excess mine water will be directed to the service complex settlement pond.
- *Sediment control ponds* – Storage ponds will be located at the lowest point of the area, below the shop/warehouse leach pad and waste rock storage. Pumps will be installed in the ponds to pump the water to storage tanks around the project site. Polyvinyl chloride (PVC) pipelines connected to the pumps will serve as a secondary water supply for the Project. This source of water will be seasonal.
- *Events pond* – Excess rain and snowmelt from the events ponds will be used as make-up water for the leaching process.

A mine water discharge pipeline will be connected to the maintenance shop/warehouse area from the open pit dewatering pumps for road watering, truck washing and dust suppression. A branch line off this pipeline will supply water to the crushing plant area.

All water pipelines will be buried or heat traced and insulated for freeze protection.

2.2.4 WASTE MANAGEMENT

Proper identification and management of various waste streams is important for worker health and safety and environmental protection. The following section describes planned waste management practices.

2.2.4.1 Fluids Management

An environmental management system will be developed to ensure that all liquids are accounted for in the operation of the mine. The overall management strategy is based on the following:

- Maximizes the recycling and reuse of liquids;
- Isolates non-compatible or dangerous fluids;
- Minimizes the quantity of liquids requiring handling;
- Provide secondary containment where necessary;
- Provide appropriate solid disposal for wastes and hazardous wastes generated;
- Provides emergency mitigation measures; and
- Monitors environmental effects.

Prior to operation the environmental management system will be finalized including the identification of waste streams, locations, safety and contingency plans, and monitoring plans.

Wastewater Treatment and Disposal

Water from the open pit and sediment ponds will be used for process make-up water to the fullest possible extent. Any excess pit water will be discharged to the environment in full compliance with discharge performance standards as set by the appropriate regulator.

The leach pad and process plant solutions are designed to be 100 percent recycled so there will be no release of process streams to the environment during operations. However, a water treatment plant is presented as a contingency measure should the release of effluent be required. Following mine closure, the leach pad will be covered over to seal it from direct exposure to precipitation.

Contingency Water Treatment Plant

The contingency water treatment system proposed for the operational phase utilizes conventional lime precipitation of metals using a high density sludge process within the emergency containment pond. For operational purposes, the sediment control pond located down gradient of the events pond will serve as the emergency containment pond. To facilitate this use, the sediment control pond will be lined with a single high-density polyethylene liner.

This treatment entails adding a lime slurry (lime slurry is planned but flexibility of using caustic soda will be maintained) into a mixing tank along with the heap effluent or pond overflow solution. Neutralizing the acid will cause the metals to precipitate out as solids in a clarifier. The solid sludge will then be returned to a leached section of heap for long-term storage and the solution will be reused or released meeting acceptable discharge standards.

Water Treatment Plant – Closure

Upon closure, a solution treatment plant will be constructed for water treatment. The existing contingency water treatment plant neutralization tanks will be expanded to increase the capacity to suit closure conditions.

The plant will have a treatment capacity sufficient to handle seepage and any contaminated runoff from the area of the closed leach pad. The flow rates will vary with the season and the weather.

All process equipment will be capable of operating with minimal operator assistance. Effluent sampling and monitoring will be monitored remotely by plant operations personnel residing in Carmacks. Flow measurements and water quality of influent/effluent will be recorded continually to ensure that the plant is operating correctly and to make adjustments to the process as needed.

2.2.4.2 Sewage Treatment

Sewage disposal facilities will include both permanent and portable facilities. The permanent facilities will occupy the maintenance shop and warehouse, camp and administration buildings. Sewage disposal will consist of a conventional septic tank and drainage field. Sewage effluent will flow by gravity in buried 150 mm diameter PVC sewer lines to two 34 m^3 septic tanks located at the south side of the plant site area. Septic tank overflow will be dispersed to ground via a buried tile field.

The sewage treatment system for the ancillary facilities will be designed for an average daily flow of 22 m^3, which is based on 146 person shifts per day at 150 L per person shift.

2.2.4.3 Waste Rock

Waste Rock Storage

Mining operations will generate approximately 7.5 million tonnes per year of waste rock per year over the eight years of mining for a total waste production of approximately 60 million tonnes. This waste will be permanently stored in a location north of the open pit.

Acid-Base Accounting of Waste Rock and Ore

Composite ore and drill core samples were submitted for acid-base accounting to determine leachability and acid consumption characteristics. The waste rock material testing satisfies the 'Guidelines for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia' and 'Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia'.

Waste dump runoff will be collected and directed to the sediment pond down gradient from the WRSA. Sediment pond water is intended for recycling to be used at the mine site; if waste water is to be released, the effluent quality will be monitored and tested for metal levels. If necessary the effluent would be treated using conventional lime treatment before release to the environment.

2.2.4.4 Heap Detoxification

The objectives of rinsing the heap is to reduce the residual acidity and dissolved metals that could migrate from the heap if rainfall or snowmelt move through the heap after it has been decommissioned and to ensure that acceptable levels are met for discharge into receiving waters.

The discharge from the high density sludge (HDS) water treatment facility will be water of high quality and will flow initially into the sediment pond below the events pond. This water will be suitable for discharge to Williams Creek but will also be reused for flushing the heap. Reuse of the water will be achieved by pumping it, using submersible pumps placed in the sediment pond, back to the raffinate pond, from where the existing raffinate pumps will feed the solution distribution pipe work and drip emitters already in place from the leaching operation. The drip emitters will be relocated from time to time to obtain a more thorough flushing of the heap. The flow rate to the heap will be the same as the application rate of solution to the heap during leaching. A bleed stream from the sediment pond, which will be monitored for quality, will be allowed to drain into Williams Creek.

The water balance in the system during this flushing process will be maintained by the addition of water from any of the following:

- Existing wells and fresh water system;
- Meteoric precipitation captured on the pad; and
- Meteoric precipitation captured in the waste rock sediment pond.

Once residual acidity in the heap has been flushed out with water and the acidity has stabilized, the heap will then be flushed using a sodium carbonate solution. The sodium carbonate will be added at the raffinate pond and the solution will be circulated through the heap using the same process as during leaching. Sodium carbonate will continue to be added to the heap until discharge acidity has stabilized at a lower level.

During the heap flushing, a portion of the discharge from the heap will be re-circulated through the heap and a portion will be treated in the water treatment plant to remove dissolved minerals. Discharge from the water treatment plant will then be re-added to the solution circulating through the heap. If there is excess solution, treated water from treatment plant may be released through a bleed stream to Williams Creek. Flushing of the heap will continue until the discharge reaches a quality suitable for direct release to the environment.

The Proponent anticipates that rinse times to flush the heap will be approximately 4.5 years. Rinse times will also be affected by the practice of concurrent leaching and rinsing of the heap. The Proponent is undertaking additional large scale column tests which will provide more information to re-evaluate and identify a more verified rinse time.

A number of contingency measures are planned to polish the final effluent coming off of the heap as it is expected that, even with a cover, the heap will continue to discharge over the long-term. Monitoring will confirm heap effluent quality to ensure performance standards are met. In the unlikely event that heap drainage water quality does not meet discharge standards, contingency water treatment and polishing of effluent will be put into effect which includes limestone drains, biological treatment cells and infiltration galleries.

2.2.4.5 Solid Waste

Commercial and camp solid waste generated by the proposed operations will be disposed of on-site in a permitted facility.

Industrial refuse consisting of inert material such as broken drill rods, bits, shop scraps and pipe discards, will be collected regularly by surface crews and buried within the WRSA.

Combustible industrial and domestic refuses from construction and operations will be disposed of by incineration using a forced air fired burner on regular basis. Incinerator ash will be disposed of in the WRSA.

Municipal refuse originating as camp and office waste, plus warehouse scrap, will contain some organic wastes. This solid waste will be collected in covered metal containers located at strategic points around the operations. To minimize the attraction of wildlife, the refuse will be incinerated regularly and the incinerator ash will be hauled to the waste rock dump.

2.2.4.6 Special Waste

Any special wastes, as defined by the *Environment Act* (Yukon), Special Waste Regulations, will be collected and stored in specially marked containers and then shipped to an appropriate treatment or disposal facility. Wildlife-proof rig bins will be used at the site. These bins provide segregated storage for solid waste that cannot be burned and special wastes in compliance with Special Waste Regulations.

Sludge and crud produced by the operational treatment system and the solvent extraction/ electrowinning plant will be tested and based on the analysis of those tests; they will be disposed of in compliance with the Special Waste Regulations.

Waste oil will be burned and used as a source of heat. Western Copper will obtain a Special Waste Permit for this project and will comply with the Special Waste Regulations and track wastes through the use of Transportation of Dangerous Goods Waste Manifests.

2.3 REQUIRED AUTHORIZATIONS AND THE PERMITTING STAGE

In order for the Project to proceed as proposed the Proponent and/ or contractors of the Proponent will be required to obtain the following permits/authorizations:

- Type A Water Use Licence – *Waters Act* (Yukon);
- Quartz Mining Licence - *Quartz Mining Act* (Yukon);
- Factory Licence – *Explosives Act* ;
- Air Emissions Permit – *Environment Act* (Yukon); Air Emission Regulation;
- Commercial Dump – *Environment Act* (Yukon), Solid Waste Regulations; and
- Fuel Storage Permit - *Environment Act* (Yukon), Storage Tank Regulations.

While no authorization is required under the Metal Mining Effluent Regulations (MMER) the Proponent has proposed to discharge effluent which will be compliant with MMER, schedule IV.

3.0 ENVIRONMENTAL AND SOCIO-ECONOMIC SETTING

3.1 BIOPHYSICAL ENVIRONMENT

3.1.1 PHYSICAL ENVIRONMENT

The Project is located in the south-central region of the Yukon Territory and within the Yukon Plateau-Central ecoregion (YEWG 1992). This ecoregion is characterized as an area of glaciated, rounded and rolling hills, plateaus and broad valleys and surrounded by higher mountain ranges. Elevations in the Project area range from 485 m at the Yukon River to 1000 m on the western edge of the claim block. Surface drainage flows both north and east of the Project area.

The dominating soil in the Project area is euthic bruinsols, an alkaline forest soil originating from dissected colluvial parent materials. Soil texture in the area is classified as a gravelly, sandy loam (YEWG 1992; Knight Piesold Ltd, 1993) Surficial materials found within the Project area include: organic/ash layer, glaciofluvial/glaciolacstrine deposits, well graded/glacial till, weathered/decomposed bedrock and bedrock.

Air quality in the Project vicinity is considered to be pristine because no major development in the region exists. Precipitation is characterized as moderate, with annual precipitation amounts of 250 to 400 mm, with the summer months being the wettest. The average annual total precipitation is 372 mm with evaporation on average 402.4 mm yielding a negative precipitation/evaporation balance of 30.4 mm. Nearly half of the annual precipitation falls as snow as daily temperatures are below freezing from October through May. Temperatures in the region are subject to extreme variation. Mean annual temperatures are approximately -4°C, while mean monthly temperatures range from a low of -30°C in January to a high of approximately 15°C during July (YEWG 1992).

The Project area is situated on an area of discontinuous permafrost, corresponding to mean annual isotherm temperatures of between 0°C to -10°C (mean annual temperature -5.8˚C). The measured permafrost temperature within the Project area is near 0°C, classifying the permafrost as “warm”. Permafrost was encountered at depths of 40 cm to 50 cm on most north facing slopes where glacial till or medium textured colluvium is present. Ground ice occurs throughout the Williams Creek area at depths of 10 to 20 cm.

The Project is located adjacent to Williams Creek, in the Williams Creek watershed. Along with its tributaries, Williams Creek is the dominant topographic feature of the region. The main valley is a broad flood plain, containing sands and silts that are covered by a layer of organic accumulation. Williams Creek narrows as it approaches the Project area, cutting though bedrock and fluvial glacial sands and gravel deposits. Although erosion processes occur within Williams Creek Valley, none are known to affect the Project area.

3.1.1.1 Water Resources

The Project area is situated within the Williams Creek watershed which contains two primary basins, Williams Creek and its tributary, Nancy Lee Creek. As mentioned above, the mine site is located directly adjacent to Williams Creek, which originates in the Dawson Range and drains northeast into the Yukon River approximately 40 km northwest of the Village of Carmacks. Each creek drains approximately half of the 88 km^2 drainage area. Williams Creek has a main channel length of approximately 15.5 km, an average slope of three percent, and a basin elevation range of approximately 500 to 1 000 m. The creek is typically a straight, deeply incised, narrow channel about one to 4 m in width and 0.5 to 1.5 m in depth with occasional meanders or side channels. Nancy Lee Creek has a channel length of approximately 13 km, an average gradient of 2.8 percent and a basin elevation that ranges from 518 to 882 m. It flows east into Williams Creek, approximately 1.3 km upstream of the Yukon River confluence.

Baseline surface water quality data from Williams Creek indicates five metal concentrations (aluminum, arsenic, copper, iron and zinc) in Williams Creek exceed the recommended Canadian Council of Ministers of the Environment (CCME) 'Canadian Water Quality Guidelines for the Protection for Aquatic Life'. Water hardness values range from 75 to 225 mg/L calcium carbonate, translating into a moderate capacity for natural buffering.

The drainage pattern in the Project area has evolved into a contoured pattern influenced by complicated structural features associated with the intrusive and metamorphic rock types. Further complicating the groundwater flow system in the Project area is the presence of permafrost in the valley bottoms. The presence of permafrost produces a confining effect and possibly perched water tables.

Regional groundwater occurs as an unconfined deep flow system within bedrock in which groundwater is recharged at higher elevations in the upland areas and flows toward the valleys at lower elevations. The result of exploration drilling and recent geotechnical site investigations indicate that the groundwater table lies at significant depths over most of the Project area. In some areas the presence of discontinuous permafrost has resulted in the development of perched water tables, however, these are isolated and discontinuous. In addition, minor groundwater flow occurs in the active zone just below the ground surface on a seasonal basis resulting in the development of local swamp areas. The discontinuous permafrost also acts as a barrier inhibiting infiltration in some areas thereby significantly reducing recharge resulting in the overall depression of the region groundwater table. The groundwater table forms a subdued replica of topography whereby the depth to groundwater increases with increasing elevations. Baseline groundwater quality data generally indicates that parameters exceed levels stipulated by the CCME guidelines.

3.1.2 BIOLOGICAL ENVIRONMENT

3.1.2.1 Aquatic Resources

As a result of three fisheries investigations between August 1991 and August 1992, juvenile chinook salmon, arctic grayling, slimy scuplins, longnose suckers, burbot and northern pike were identified in lower Williams Creek to the confluence of Nancy Lee Creek. No fish were observed or captured above the Nancy Lee Creek confluence. Spawning was not observed in the Yukon River near the Williams Creek confluence during the October 1991 survey, which is consistent with local traditional knowledge. Results from fisheries investigations during 2005 and 2006 yielded generally consistent results with the 1991-1992 investigations with the exception of a single arctic grayling located in Nancy Lee Creek. Benthic invertebrate samples were collected in lower Williams Creek approximately 250 m upstream of the Yukon River confluence in 1991. This site was relocated approximately 1.2 km further upstream during the 1992 study and two additional sites were also established; one site was upstream of the Nancy Lee Creek confluence and the other site was in the lower reach of Nancy Lee Creek.

3.1.2.2 Vegetation

The forest type in the Project area ranges from boreal to alpine. The boreal zone contains many plant communities because of the diverse habitats provided by mixed glacial landforms; however no rare vegetation was found within the Project area. More than half of the Project area is comprised of black spruce forest, with approximately one-quarter being lodgepole pine. Other vegetation types in the area include; white spruce, trembling aspen, willow fen and grasslands.

Forest fires in the area are frequent due to a high incidence of thunderstorms coupled with relatively dry conditions. The Project area, however, has not been recently burned. The vegetative cover is open canopy upland forest with little merchantable timber except for low quality fuel wood.

3.1.2.3 Wildlife

The Proponent has defined a reasonable area within which to examine potential effects on wildlife and referred to it as the Environmental Assessment Study Area (EASA) (see Figure 4). A variety of boreal habitats for mammals and birds occur within the EASA and the Freegold Road corridor including: valley floodplains and slopes, wetlands, uplands, steep grassy slopes and cliffs. No regionally rare habitat areas have been identified. Floodplains and cliffs in the EASA have a high habitat use and value classification. However, the mine site itself is located on generally drier upland habitat with much of the boreal vegetation re-generating from clearing activities in the late 1980s.

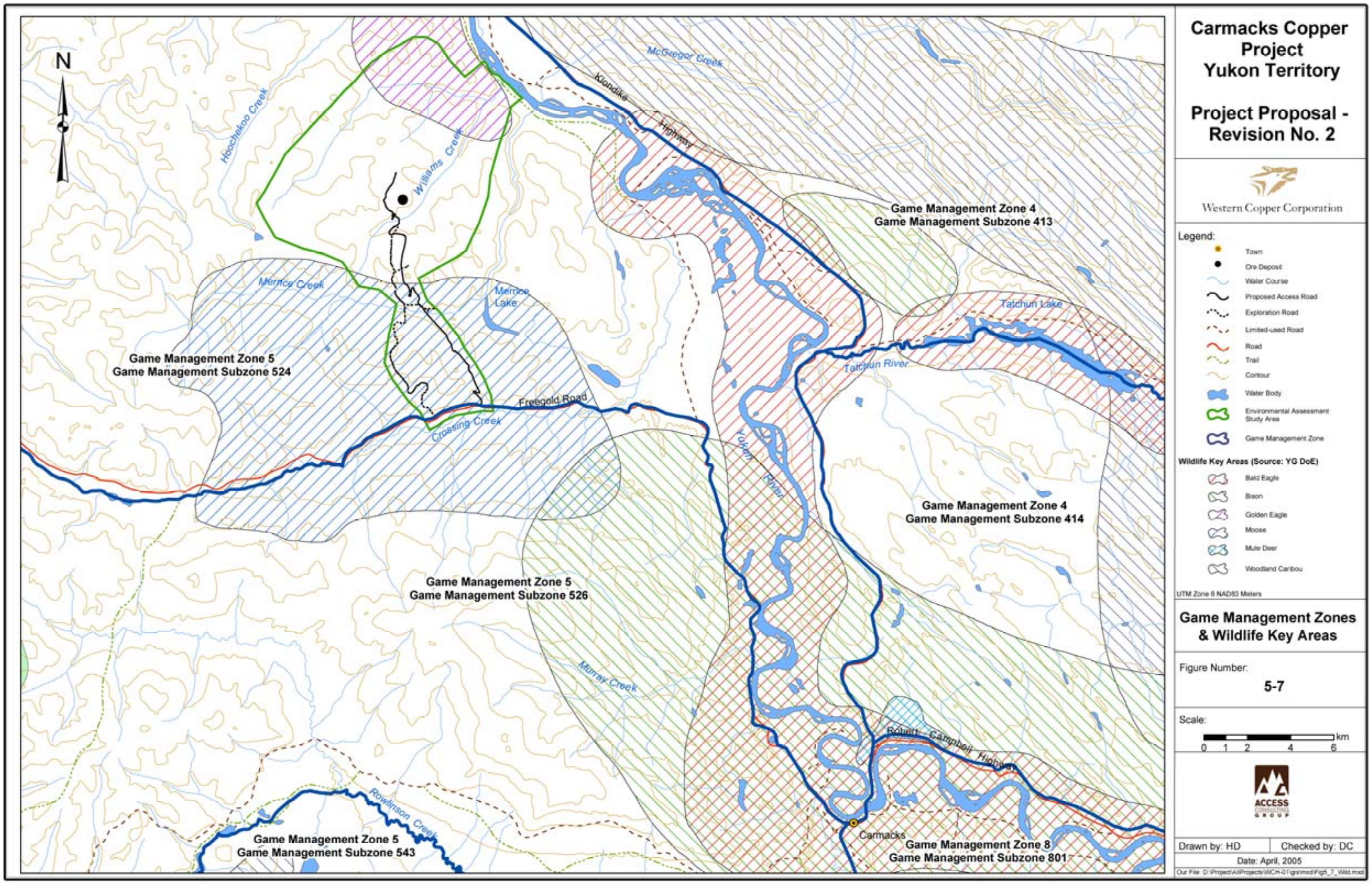


Figure reproduced from the Project proposal

Figure 4 **Wildlife Key Areas Overlapping the Project Area**

Wildlife surveys by the Proponent indicate a variety of wildlife use of the habitat in the EASA and Freegold Road corridor. Field observations of wildlife by the Proponent were recorded in 1990-1992, 1994, 2005 and 2006. More systematic studies occurred in 1992 over a two-day period (10-12 August, 1992) and fecal count\ungulate browse\wildlife tracks were noted in a number of 5 m^2 quadrants in 1994. A one-day aerial survey in December 2005 provides important information about wildlife use during the winter season.

Results from the Proponent's survey and other resources indicate the EASA is a consistent low-use area, utilized by a variety of wildlife including:

- Ungulates (moose, caribou, bison, mule deer)
- Large carnivores (wolf, grizzly bear, black bear)
- Furbearers (lynx, coyote, red fox, wolverine, marten, mink, ermine, river otter, beaver)
- Other mammals (snowshoe hare, red squirrel, ground squirrel, porcupine)
- Birds (grouse, golden eagles, bald eagles)

Notable habitat areas are three Wildlife Key Areas (WKA) and two species of special concern as identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The overlapping WKAs are for moose, golden eagles and bison. A late winter moose habitat area is located south of the mine site and overlaps the mine access road. This WKA encompasses the main stem and lower tributaries of Merrice and Crossing Creeks as well as Merrice Lake. The second WKA is for golden eagles in summer and is located along the Yukon River north of where Merrice Creek flows into the Yukon River. The WKA for Aishihik wood bison overlaps the Village of Carmacks and a portion of the Freegold Road. However, wood bison are not known to currently occur in the Project area and it is not anticipated that they will move into the area during the mine's lifetime (T. Jung, pers. comm. 2007 as quoted in Appendix H of the Project proposal).

Grizzly bears (northwestern population) are designated as a species of special concern under COSEWIC. The Yukon grizzly bear population is estimated to be between 6 000 to 7 000 bears, occurring across the entire Yukon. Populations are considered generally stable. Since 1980, an average of about 100 grizzly bears kills has been reported in the Yukon annually. This number is considered an underestimate (COSEWIC 2002). The life history characteristics of the grizzly bear make it particularly sensitive to human-caused mortality (including hunting, poaching, accidents and nuisance kills). Its behaviour frequently brings it into conflict with people, leading to increased mortality where human activities expand (COSEWIC 2002).

Wolverines (western population) are designated as a species of special concern under COSEWIC and occur across the Yukon in a diversity of habitats. Mountainous areas of the Yukon contain relatively high densities of wolverines. Like grizzly bears, wolverines have large home ranges and their habitat seems to be determined by the availability of prey (rodents, hares and young ungulates) and carrion (COSEWIC 2003). Yukon populations of wolverine are generally considered healthy and stable and between 3 500 to 4 000 individuals. Wolverines have low reproductive rates that decrease their ability to respond to decreases in population size.

3.2 SOCIO-ECONOMIC ENVIRONMENT

The Project is located within the traditional territories of the LSCFN and the Selkirk First Nation (SFN). Carmacks is largely a Northern Tutchone community situated on the banks of the Yukon River. The 2006 Census of Canada recorded the population in Carmacks to be 425 people. The LSCFN makes up approximately 75 percent of the population in this community, and has occupied this area for thousands of years. Documented history indicates that the mouth of the Nordenskiold River or *Thuch-eh-dituh* ('we hope and expect to meet again') was a trade rendezvous centre where Northern Tutchone and Tlingit people met.

Carmacks is a major service centre on the Klondike Highway. The administration and delivery of government services for both the Yukon Government and the LSCFN are sources of local employment. Tourism provides some summer employment. Carmacks is located in a mineral-rich area, and seasonal employment has come from mining exploration, as well as from providing services to exploration crews. The amount of employment available from this source depends on the highly variable economic state of the mining industry. Much of the activity in the community is associated with the surrounding wilderness, abundant in fish and wildlife and other country foods.

At the time of the 2006 Census, about 75 percent of adults in Carmacks (those aged 15 and over) reported that they were involved in the labour market. Reported unemployment, at almost 19 percent, was significantly higher in Carmacks than the Yukon average of 9.4,percent, at the time of the Census. Both measures (involvement in the labour market and unemployment) reflect the relatively small number of jobs, especially long-term jobs, in the community.

Almost 30 percent of the labour force in Carmacks (65 people) reported their occupation as "Trades, transport and equipment operators and related occupations". This is almost twice as high as the Yukon average for this sector in the 2006 Census. Almost 20 percent reported experience in each of "Sales and service occupations" and "Occupations in social science, education, governmental service and religion". The number of men and women employed in Carmacks was almost equal.

Further socio-economic discussion relating to the Project is provided in Section 8.0 Community and Region.

4.0 EFFECTS ASSESSMENT PROCESS

4.1 REQUIREMENT FOR A SCREENING

Under YESAA, a Decision Body shall not authorize a project to proceed until it has issued a decision document on the recommendation arising from an assessment. An Executive Committee screening is required under the following circumstance:

1. An activity is proposed to be undertaken that is listed in Schedule 3 of the Assessable Activities, Exceptions and Executive Committee Projects Regulations (Activity Regulations); and,
2. An authorization or the grant of an interest in land by a government agency, independent regulatory agency, municipal government or first nation is required for the activity to be undertaken.

The Proponent proposes to undertake activities listed in Section 3 (a) of Schedule 3 of the Activity Regulations, specifically:

"Construction, decommissioning or abandonment of a metal mine, other than a gold mine, with an ore production capacity of 1 500 t/day or more"

In order for the activities outlined in the proposal to be undertaken, a number of territorial and federal authorizations are required, including a Type 'A' water licence, quartz mining licence, explosives factory licence and air emissions permit.

A screening by the Executive Committee is therefore required prior to any action taken by the Decision Bodies that would enable the Project to proceed.

4.2 ASSESSMENT CHRONOLOGY AND MILESTONES

Timelines for screenings are set out in the *Rules for Screenings Conducted by the Executive Committee*. Table one provides an overview of the assessment tasks and timelines. All tasks required of the Executive Committee during this screening have been completed within the timelines prescribed under the Rules.

Table 1 Project Assessment Chronology

Adequacy Review Period	
27 February, 2006	Submission of project proposal to the Executive Committee of YESAB.
28 February, 2006 – 28 April, 2006	Executive Committee conducts an adequacy review.
28 April, 2006	Executive Committee issues an adequacy review report.
11 September, 2006	The Proponent submits a draft project proposal for review and discussion with the Executive Committee.

16 November, 2006	The Proponent formally submits a revised project proposal for review by the Executive Committee.
17 November, 2006 – 12 January, 2007	Executive Committee reviews submission for adequacy.
12 January, 2007	Executive Committee issues an adequacy review report.
6 February, 2007	The Proponent resubmits a revised project proposal for review by the Executive Committee.
13 February, 2007	Executive Committee determines that the project proposal is adequate to commence a screening.
Screening	
16 February, 2007 – 19 March, 2007	Public Comment Period
16 February, 2007	Preliminary Statement of Scope of Project is issued.
12 March, 2007	LSCFN requests an extension to the public review period.
16 March, 2007	Executive Committee extends the public comment period until April 3, 2007.
26 March, 2007	Executive Committee holds a public meeting in Carmacks to provide an opportunity for questions and comments regarding the Project and/or the assessment of the Project.
27 March, 2007	Executive Committee holds a public meeting in Pelly Crossing to provide an opportunity for questions and comments regarding the Project and/or the assessment of the Project.
4 April, 2007	Comment Period closes.
5 April, 2007 – 25 April, 2007	Executive Committee reviews comment submissions.
25 April, 2007	Executive Committee determines that supplementary information will be required from the Proponent for the assessment of the Project to continue.
16 October, 2007	All the supplementary information requested of the Proponent is submitted.
22 October, 2007	Executive Committee determines that the supplementary information provided is sufficient to develop a Draft Screening Report.
17 December, 2007	Executive Committee releases a Draft Screening Report
17 December, 2007 – 16 January, 2008	Public Comment Period on the Draft Screening Report.
11 January, 2008 – 16 January, 2008	Village of Carmacks, LSCFN and Carmacks Renewable Resource Council request an extension to the comment period on the Draft Screening Report.
16 January, 2008	The Executive Committee extends the period for comment on the Draft Screening Report until February 6, 2008
6 February, 2008	Public Comment Period for the Draft Screening Report ends.

27 February, 2008	Assessment of comments received is complete and the Executive Committee determines that supplementary information will be required from the Proponent for the assessment of the Project to continue.
12 May, 2008	All the supplementary information requested of the Proponent is submitted.
13 May, 2008	Executive Committee determines that the supplementary information provided is sufficient to develop the Screening Report and Recommendation.
8 July, 2008	Executive Committee extends the period to develop the Screening Report and Recommendation until 18 July, 2008
Report and Recommendation	
18 July, 2008	Executive Committee issues the Screening Report and Recommendation to the Decision Bodies and makes it publicly available.

This chronology is intended to outline key assessment dates and stages. For more detailed assessment information please visit the YESAB Online Registry at www.yesab.ca/registry or the YESAB Document Registry located at the YESAB Head Office.

4.3 ACCESS TO ASSESSMENT DOCUMENTATION

Section 118 of YESAA requires that YESAB maintains:

> *(a) a register containing all documents that are produced, collected or received by the executive committee, panels of the Board and joint panels in relation to assessments, together with any documents provided to them under subsection 91(1);*
>
> *(b) a list of the projects, existing projects, other activities and plans for which an assessment is pending before, or has been completed by, the designated offices, the executive committee, panels of the Board and joint panels, together with their location and stage of assessment; and*
>
> *(c) a record of authorizations, grants of interest in land and provisions of financial assistance as reported to it pursuant to Section 89.*

YESAB maintains a public registry which contains all documents related to assessments, a list of projects, activities and plans, project location and stage of assessment, and lists of any authorizations, grants of interest in land and financial assistance. These records are stored in such a way as to facilitate public access to them.

The YESAB Public Registry is comprised of two components:

1. The YESAB Online Registry (YOR) – this is an entirely electronic registry and document management system that is accessible through the internet. This is considered the primary means through which project-related information is made available to the public.

2. Document Registry – This is a primarily paper-based registry of files maintained by YESAB staff.

Files on the YOR are available 24 hours a day via the internet, while the document registry is accessible during regular working hours.

5.0 SCOPE OF THE ASSESSMENT

5.1 PROJECT SCOPE

For the purposes of this screening, the scope of the Project includes the following on-site and off-site components and activities associated with the construction, operation, maintenance, reclamation and closure of these works and activities:

- A 28 400 tonnes per day (waste rock and oxide ore) open pit mine to develop a deposit containing a mineable reserve of 13.3 million tonnes of ore at an average grade of 0.97 percent total copper, at a marginal cut-off grade of 0.29 percent total copper (mining 230 days per year).
- A sulphuric acid heap leach facility with ore placement of 5 400 tonnes per day (maximum 9 872 tonnes per day) – placed up to 200 days per year leaching year-round.
- A SX/EW processing and raffinate solution management facility with events pond.
- Crushing plant for ore and fill processing (521 tonnes per hour).
- A WRSA located adjacent to the open pit mine, to contain all mined waste material (design capacity of 60 million tonnes placed at 2.0 tonnes/m^3).
- Annual waste rock production of about 7.5 million tonnes.
- Creation of several overburden stockpiles for use in reclamation.
- A series of water collection, diversion and management structures to manage water at the mine site including drainage ditches and sediment control ponds.
- High density sludge (HDS) water treatment facility
- The use of a portion of the existing Freegold Road, roads within Carmacks, and territorial highways and the construction, operation, decommissioning and abandonment (if required) of a new 13 km access road from the Freegold Road to the Project site.
- On-site power generation with five 1.6 MW diesel generators complete with heat recovery.
- Sulphuric acid production using a commercial 120 tonnes per day contact catalytic plant.
- Other infrastructure and facilities including:
    - Site haul roads and related infrastructure
    - Water supply wells and distribution system
    - Power supply distribution
    - Sewage treatment
    - Communications system
    - Offices
    - Dry-rooms

  - Fire protection
  - Explosives manufacture and storage
  - Petroleum storage
  - Acid storage
  - Operations/Workforce camp
  - Gatehouses/first-aid
  - Work shops/warehouses; and
  - Laboratory
- Project administration offices and warehousing in Carmacks.
- Construction of pullouts along the Freegold Road.
- Development of the multi-use trail adjacent to (where feasible) the Freegold Road.
- Two alternative locations for single-status accommodations for transient workforce:
  - On-site facility
  - Off-site facility located in or near Carmacks
- Any on-site or off-site compensation or mitigation works, as required.

5.2 OUTSIDE THE PROJECT SCOPE

The following components will not be considered in the scope of the Project:

- The proposed Freegold Road bypass (i.e., the Casino Way bypass)
- Possible upgrade of the Freegold Road (excluding the construction the pullouts)
- Possible upgrade or replacement of the Nordenskiold River Bridge and/or Crossing Creek Bridge
- Electrical transmission line to the mine site

5.3 SCOPE OF THE ASSESSMENT

5.3.1 MATTERS CONSIDERED IN THE SCREENING

The scope of the assessment encompasses the matters to be considered pursuant to Section 42(1) and 42(2) of YESAA. The Executive Committee considered all of these matters when assessing the potential effects of the Project and developing their recommendation for the Decision Bodies:

1. The purpose of the Project;
2. All stages of the Project;
3. The significance of any environmental or socio-economic effects of the Project that have occurred or might occur in or outside Yukon, including the effects of malfunctions or accidents;

4. The significance of any adverse cumulative environmental or socio-economic effects that have occurred or might occur in connection with the Project in combination with the effects of:
    a. other projects for which proposals have been submitted under subsection 50(1), or
    b. other existing or proposed activities in or outside Yukon that are known to the designated office, executive committee or panel of the Board from information provided to it or obtained by it under YESAA;
5. Alternatives to the Project, or alternative ways of undertaking or operating it, that would avoid or minimize any significant adverse environmental or socio-economic effects;
6. Mitigative measures and measures to compensate for any significant adverse environmental or socio-economic effects;
7. The need to protect the rights of Yukon Indian persons under final agreements, the special relationship between Yukon Indian persons and the wilderness environment of Yukon, and the cultures, traditions, health and lifestyles of Yukon Indian persons and other residents of Yukon;
8. The interests of residents of Yukon and of Canadian residents outside Yukon;
9. Any matter that a decision body has asked it to take into consideration;
10. Any matter specified by the regulations;
11. The need for effects monitoring; and
12. The capacity of any renewable resources likely to be significantly affected by the Project to meet present and future needs.

5.3.2 ASSESSMENT APPROACH

In the effects assessment of proposed projects, common practice generally involves the identification of valued components. These VESECs are parts of the local environment and socio-economic fabric that are valued because of their ecological and/or socio-economic importance. The assessment focuses on the potential effects resulting from the interaction of these values and the proposed project (i.e., how will the mine affect caribou?).

Potential effects resulting from construction, operation, closure and post-closure of the Project have been assessed. In order to focus and direct the effects assessment of the Project, the Executive Committee identified three geographical areas that generally correspond to different types of proposed activities:

- Mine Site and Access Road – This section addresses potential adverse effects to VESECs in the vicinity of the mine site and access road.
- Freegold Road and Bridges – This section addresses potential adverse effects to VESECs associated with transportation of Project equipment, materials and personnel along the

Freegold Road – from the Nordenskiold River Bridge (km 0), over the Crossing Creek Bridge (km 25.5) to the mine access road (km 35).

- Community and Region – This section addresses potential effects of the Project on the Village of Carmacks and the Yukon.

For clarity, each of these areas is examined in its own section of this report. In each section, the respective VESECs are introduced, potential significant adverse effects (direct and indirect) to the VESEC are characterized and analyzed, and any required mitigative measures are identified.

A cumulative effects assessment then examines any residual project effects on a VESEC in combination with the residual effects of other existing or proposed projects. The Executive Committee determined if the cumulative effects were significant. During this assessment of potential project and cumulative effects, the Executive Committee has recommended as mitigation, where applicable, alternatives to the project activities as proposed.

Issues related to reclamation and closure of the Project are assessed in a separate section due to their importance.

5.3.3 VALUED ENVIRONMENTAL AND SOCIO-ECONOMIC COMPONENTS

The Executive Committee identified VESECs that may be potentially significantly and adversely affected by the Project, at the regional or site-specific levels. These VESECs include:

- Water Resources (surface and groundwater quality and flow/quantity and aquatic resources [benthos, fish and fish habitat])
- Wildlife
- Air Quality
- Soil Stability
- Current Land Use
- Heritage/Historic Resources
- Community Structure and Dynamics
- Economy and Employment
- Community Services and Infrastructure
- Education and Training
- Public and Worker Health and Safety

5.3.4 DETERMINATION OF SIGNIFICANCE

The determination of whether or not a particular effect is significant is made in the context of the effect, and the circumstances encountered. In developing mitigative measures to address effects, the level of adversity (duration, magnitude, extent, likelihood, reversibility) and acceptability (i.e., as linked to social expectations) are key criteria that facilitate the determination of which effects should be mitigated. Societal expectations are often a reflection of the adversity of an effect as compared to the level of effort required to address the effect.

Two broad categories of effects exist along the spectrum of significance: *not significant* and *significant*. *Not significant effects* are potential effects for which mitigation is not necessary. This category would include beneficial effects as well as adverse effects that are within established norms (e.g., natural variation of baseline conditions), and levels of acceptable change/societal expectations (e.g., effects resulting from a person walking through the forest).

Significant effects are potential adverse effects for which mitigation is necessary. These effects range from minor adverse effects outside of local environmental norms/societal expectations to major consequential effects. The Executive Committee has recommended mitigative measures for all adverse effects in this category, as required by YESAA.

5.3.5 EXECUTIVE COMMITTEE SUGGESTIONS

Projects can have environmental or socio-economic effects that are not determined to be significant. For these effects, the Executive Committee is not able to recommend mitigation. The Executive Committee recognizes that its assessment of effects that, after final analysis, are not significant may provide useful and relevant information to decision-makers and regulators. The Executive Committee has included suggestions for the Decision Bodies in this screening report for particular effects that are not significant.

5.3.6 IMPACT AND BENEFIT AGREEMENTS IN ASSESSMENTS

Impact and benefits agreements (IBAs) and related instruments (e.g., socio-economic agreements) are increasingly recognized as part of the standard package of regulatory and benefits requirements associated with major mining Projects in Canada (Kennett 1999). These agreements are largely a result of government legislation/authorizations being unable to incorporate and enforce commitments made by developers to local communities and First Nations. Recent mines developed in the Northwest Territories have used a variety of agreements to address these issues. In Yukon, oil and gas activities under the *Oil and Gas Act* (Yukon) require a benefits agreement to be in place before certain activities take place (Section 68(2)).

This excerpt from *A Guide to Impact and Benefits Agreements (1999)* describes two generally accepted purposes of IBAs:

> *"IBAs have two principle purposes from the perspective of government and aboriginal parties. First, they are intended to address the concerns of aboriginal and other local residents regarding the adverse effects that large-scale mineral development may have on their communities, culture, way of life, natural environment and land-based economic activities. Second, IBAs are intended to ensure that local people and communities have the opportunity to obtain both short-term and long-term benefits from mineral development occurring in their region."*

Kennett (1999) outlined a number of goals that provisions in socio-economic agreements aim to achieve:

- Promote the development of a pool of potential aboriginal and local employees who have the basic education and skills required for mining employment and who are aware of – and interested in – wage employment opportunities in the mining industry.
- Institute appropriate and effective training programs for entry-level employees and for skills upgrading.
- Ensure cross-cultural sensitivity in order to assist aboriginal people adapt to involvement in an industrial work-force.
- Design contracting procedures and other measures to overcome barriers to the development of aboriginal businesses associated with the mining project.
- Protect aboriginal cultural values, subsistence economic activities and traditional lifestyles where they may be detrimentally affected by mineral development.
- Help affected communities adapt to a post-closure environment through:
    - Building community capacity to manage opportunities and impacts;
    - Providing training and competency development; and
    - Developing alternative and secondary industries (e.g., First Nations suppliers).

An IBA can be one tool employed to mitigate significant adverse socio-economic effects. The Executive Committee acknowledges the role these agreements can play in overall project development and implementation. In particular, these agreements can build local First Nation and community support for projects by clarifying Proponent intentions and commitments. The Executive Committee has included suggestions for formalizing certain measures into a benefits agreement where they concluded that it would mitigate an adverse effect.

PART II – EFFECTS ASSESSMENT

Part II of the screening report presents the Executive Committee's assessment and findings regarding potential Project effects. This Part is organized consistent with the assessment approach outlined in Section 5.3.2. The Executive Committee identified three geographical areas corresponding to different proposed activities in order to focus and direct the effects assessment of the Project:

- Mine Site and Access Road– This section addresses potential adverse effects to VESECs in the vicinity of the mine site and access road.
- Freegold Road and Bridges – This section addresses potential adverse effects to VESECs associated with transportation of Project equipment, materials and personnel along the Freegold Road – from the Nordenskiold River Bridge (km 0), over the Crossing Creek Bridge (km 25.5) to the mine access road (km 35).
- Community and Region – This section addresses potential effects of the Project on Carmacks and the Yukon.

The effects assessment continues by fully exploring and considering the potential effects of improper or inadequate closure and reclamation of the mine. This is an important issue addressed in this screening and it is discussed in its own section. Part II concludes with a discussion about the effects of the environment on the Project.

6.0 MINE SITE AND ACCESS ROAD

This section addresses potential effects to VESECs in the vicinity of the mine site and access road. This area was generally defined as the Environmental Assessment Study Area (EASA) by the Proponent (Figure 4). The spatial scope of the assessment specific to each VESEC is identified in the respective sections; the temporal scope is over the entire life of the mine through to post-closure (approximately 25 years).

6.1 WATER RESOURCES (MINE SITE AND ACCESS ROAD)

6.1.1 OVERVIEW

The Project area is located in the upper reaches of Williams Creek, approximately nine kilometres upstream of its confluence with the Yukon River. Williams Creek is a small tributary originating in the Dawson Range and draining northeast into the Yukon River about 40 km northwest of Carmacks. The watershed is 88 km^2 and is comprised of two principle basins, Williams Creek and its tributary, Nancy Lee Creek.

Effects on three aspects of water resources, during construction and operations, are examined in this section. Water quality (surface and ground) examines potential Project effects on the chemical composition of the surrounding waters. Water flow/quantity addresses Project related changes in the timing and amount of water in the surrounding area and aquatic resources examines potential effects on benthos, fish and fish habitat. Potential effects to water resources during the closure and reclamation phase are addressed in Section 9.0 (*Closure and Reclamation)*.

The spatial scope for the water resources assessment includes the portion of the Williams Creek watershed within and downstream of the mine site potentially affected by Project activities, and includes the Williams Creek confluence with the Yukon River.

6.1.2 PROJECT WATER BALANCE AND MANAGEMENT

In 2006, the Proponent updated and expanded the water balance for the mine site to include all components of the mine development and the Williams Creek and Yukon River receiving waters.

Inflows and Water Supply

Water supply for the Project will include a combination of freshwater and collected runoff from:

- Eight groundwater wells providing approximately 150 m^3/day of fresh water, as required
- Water seepage collected in the open pit
- Meteoric precipitation collected in the sedimentation ponds

Overall precipitation/evaporation balance for the mine site is slightly negative (-30.4 mm) suggesting that meteoric precipitation, on an annual basis, will contribute relatively little to the water supply. However, over half of the annual precipitation occurs as snow which, during spring melt, is anticipated to provide substantial volumes of water during early summer. It is unknown to what extent water seepage into the pit will contribute to water supply, but volumes generated are anticipated to be much less than water volumes needed for process make-up water.

The primary water requirement of the Project is for the heap leach process. The Project requires water for the generation of sulphuric acid to saturate and leach the ore on the heap. Additional water will be used to rinse the heap once leaching is complete. The Project requires an estimated 1.56 million cubic metres of water. If well water is the sole source, this water volume will require 3.5 years to produce. Ore crushing and heap loading operations are proposed for the summer (~200 days per year) driving up summer demand for sulphuric acid, and accordingly, water. The heap leaching and extraction processes have been designed to operate on the basis of 100 percent recycling of process streams. Once the heap is saturated, it is anticipated that relatively low volumes of make-up water will be required. Water supply for heap rinsing and closure is discussed in Section 2.2.3.2.

Potable water will be supplied by the groundwater wells.

Water Discharge

The Project could result in discharges of water to surrounding waters through:

- Runoff from meteoric precipitation

- Process solution discharge
- Sewage discharge

The Proponent has confirmed that water will be tested and monitored to ensure that it meets discharge criteria set in the water licence.

Meteoric Precipitation Management

The Project will require the diversion of uncontaminated surface runoff from the drainage areas up-slope from the mine and process facilities by means of open gravity ditching. North Williams Creek, which is north of the Project facilities, will be the main drainage of uncontaminated surface water. Potentially contaminated runoff from the mine and process facilities will be collected in gravity interceptor ditches and directed to sediment ponds located below the events ponds and WRSA. The settlement ponds will trap suspended sediment and also contain any accidental spills of process solutions. Diversion ditches will collect and convey runoff from upslope of and around the heap to the leach pad sediment control pond. Water recycling from these sediment ponds into the process stream is planned. Overflow spillways from the ponds will ultimately drain into Williams Creek at the lowest point of the mine site before release to the environment. Any effluent planned to be released from the settlement ponds will be monitored to ensure that effluent discharge standards set out in the water licence are met.

Process Solution Discharge

Process solution is the sulphuric acid that is used to transfer metals from the crushed ore (a solid phase) into a liquid phase in the heap (Bridge 1999). The Proponent is proposing to use the “valley heap leach method”, which places the ore on a liner, up a slope and behind a confining embankment. The sulphuric acid will be applied to the heap via a series of drip emitters. The solution that percolates through the ore will be diverted to the processing facility to have the metals (copper) removed from the solution via solvent-extraction – electrowinning (SX/EW). The leaching solution will be re-cycled through the heap.

It is not anticipated that the Project will discharge water until closure (see Section 6.8.4.1). Excess process solution is managed by SX/EW plant in combination with the heap and controlled using the events pond and if needed, a sediment pond. Furthermore, the Proponent indicates that the high-density sludge (HDS) water treatment plant will be operational for year one, concurrent with ore placement to manage emergency scenarios, such as a liner leak or to facilitate detoxification of the existing heap due to premature closure or extended temporary cessation of mine operations. Studies indicate that in the unlikely event of several consecutive years of above-average precipitation, excess process solution could accumulate which would be treated to discharge standards using the HDS water treatment plant and released to Williams Creek.

Sewage

Sewage disposal will consist of a conventional septic tank and drainage field. Sewage effluent will flow by gravity in buried 150 mm diameter PVC sewer lines to two 34 m^3 septic tanks. Septic tank overflow will be dispersed to ground via a buried tile field.

6.1.3 WATER QUALITY (SURFACE AND GROUND)

Surface water quality is an indicator of environmental health and can determine the aquatic resources (plankton, benthos and fish) in a water course. Extreme changes in water quality can result in changes in emergent and riparian vegetation. Studies by the Proponent indicate that the flow of groundwater under the mine site is influenced by complex hydrogeology including different rock types and permafrost features. Impacts on groundwater quality may potentially affect the water quality of Williams Creek.

Water quality data have been collected from monitoring stations in the Williams Creek watershed between 1989 and 2006. Water samples were taken from the mainstem and tributaries of Williams Creek and analyzed for physical parameters, nutrients, dissolved anions, total organic carbon, pH and total dissolved metals. Baseline levels of a number of water quality variables in the Williams Creek receiving environment are above CCME guidelines for the protection of aquatic life (e.g., Al, As, Cu, Fe, Pb and Zn). This is likely a reflection of the highly mineralized natural geology of the region. In lower Williams Creek, where fisheries resources are known to exist, levels of Cu, Pb and Ni are within CCME guidelines; Zn marginally exceeds the CCME standards. Suspended solids values were low during all sample periods. Water hardness values ranging from 75 to 225 mg/L calcium carbonate for Williams Creek indicate a moderate degree of natural buffering capacity.

Water samples collected from monitoring wells were analyzed for physical parameters (pH, conductivity, total suspended solids, total dissolved solids, turbidity, hardness); nutrients (ammonium, nitrate, nitrite, phosphorous, orthophosphate); and total and dissolved metals. In-situ measurements (pH, conductivity, total dissolved solids, dissolved oxygen, oxygen reduction potential) have also been collected during sample programs.

Groundwater quality parameters generally did not exceed CCME guidelines. Total aluminium, iron, lead, zinc and copper concentrations were above the guidelines at some of the wells. The sampled groundwater ranges from moderate softness/hardness to extremely hard.

6.1.3.1 Effects Characterization

The Project could potentially affect water quality by introducing contaminants, changing the water chemistry or adding sediment to local watercourses. Potential impacts from leaching operations on the environment are most likely to be experienced as changes to surface and groundwater quality (Bridge 1999). Acid rock drainage/metal leaching from mining activities is one of the most potentially significant environmental effects. The Executive Committee considers decreases in water quality as a result of the project a potentially significant adverse effect.

Contamination of Surface/Ground Water

The Project could introduce contamination into surrounding waters through:

- Acid rock drainage potential/runoff from meteoric precipitation
- Process solution discharge

- Sewage discharge
- Accidents and malfunctions

Site Runoff

Meteoric precipitation can become contaminated as it moves over, or through the Project site. This water is collected from the site in a series of drainage ditches and diverted to sedimentation ponds. Meteoric precipitation will be added into the process stream to the greatest extent possible.

Runoff from the WRSA and Open Pit

Water percolating through the waste rock will be routed away from North Williams Creek and collected in drainage ditches that connect to a sediment pond. The WRSA will be equipped with a sediment pond and a foundation drainage system lined with 8 oz non-woven geo-textile to collect waste rock dump seepage. The waste rock dump will also be equipped with perimeter drainage ditches to intercept and collect surface runoff. The majority of these waters will be routed into the process plant as make-up water. The sediment control pond will be equipped with a spillway that can safely manage the one in 200 year 24-hour storm event.

During operations, runoff from the WRSA will be collected and stored in the adjacent sediment pond and used as make-up water for the process solutions or re-circulated onto the dump to increase evaporation. If it is required that the water in the sediment pond be discharged (during high precipitation events, for example), it will be tested and treated to discharge standards established under the water licence prior to release.

During mine operation, water that collects in the pit will be pumped out and used as make-up water for the heap.

Of greatest concern, is the potential for the water percolating through WRSA or over the pit walls/floor to result in acid rock drainage and metal leaching. ARD results in runoff with high acidity (low pH) and high metal concentrations. Geochemical testing of representative samples of waste rock by the Proponent has shown that the waste rock is acid-consuming (YOR docs #2006-0050-034-1 and 167-1). Independent, third party, experts retained under EAA and by the Executive Committee reviewed the testing procedures and test results and concluded the waste rock is not acid-producing.

In general, the Carmacks Copper ore body is characterized as a relatively well-defined oxide ore body (gneiss) surrounded by sulphide (granodiorite) and the drilling and testing programs to determine acid generation potential for all the rock types to be mined have been adequate. The waste rock material testing satisfies the ‘Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia’ (Price and Errington 1998) and ‘Draft Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia’ (Price 1997). However, three areas of the pit identified as areas #1, #2 and #3 in Figure 3-1 titled Static and Kinetic Testing Sampling Locations, were not been drilled or tested (Golder 2007 - YOR doc #2006-0050-167-1). These areas lie on the western and northern edges of the proposed pit. According to the report, these areas were to be drilled in 2007.

Since the waste rock is non-acid generating, the Proponent does not plan to include a liner in the foundation system of the WRSA. The Proponent has recently committed to capping the WRSA to decrease infiltration by precipitation and likelihood of non-acid metal leaching.

Key to minimizing the ARD/ML potential in the WRSA is the segregation of the waste rock material from the ore and from sulphide ores lying beneath the proposed pit. The placement of ore in the waste rock dump, while also not desirable for the Proponent, places mineralized rock where it may be more prone to metal leaching. The placement of sulphide materials in the WRSA presents a risk of acid production and metal leaching. The Proponent has committed to terminate the excavation of material in the open pit when mining progress reaches within 6 m of the sulphide zone. They have also committed to continual testing of the material excavated from the open pit to ensure that only negligible concentrations of oxide and/or sulphide ore reach the WRSA.

Meteoric Precipitation on the Heap

Meteoric precipitation that falls on the heap will become part of the process solution. The water balance information provided in the project proposal (Appendix D3-YOR doc #2006-0050-014-1) suggests that even under the wettest year's scenario there would be no discharge until at least the third year of operation. Process solution volumes are managed using the heap, events pond and SX/EW plant.

The events pond will provide storage for water during high precipitation events/years and has been sized to adequately store the largest conceivable storm snowmelt event. The events pond will be designed to conform to the recommended draindown storage criteria of 100 percent of potential draindown in year one of operations and storage of two days of solution flow at the assumed maximum constant rate (Appendix D5-YOR doc #2006-0050-016-1). This volume would provide approximately ten days storage of actual draindown flows from the heap. Maximum total storage volumes required to meet this criterion are estimated to be 131 000 m^3. The events pond will be designed to provide 160 000 m^3 storage. During storm events, however, the pond will fill to some level (depending on the amount of meteoric precipitation). For the maximum storage level in the pond, the maximum leakage rate would apply.

Near-surface groundwater flows will be intercepted and directed through a foundation drainage system beneath the pad to a foundation drainage collection sump located at the toe of the confining embankment. This system will reduce the possibility of uplift pressures beneath the liner. The drains will be located in natural drainage swales and extended to intercept any springs, seeps or damp spots identified during pad grading and mapping. Water collected in the sump will be recycled as process water.

Should there be more meteoric precipitation or groundwater than can be stored in the heap, events pond and SX/EW plant, the Proponent is proposing to use the HDS treatment plant to treat the excess water to the standards required under the water licence and then discharge into Williams Creek.

Treatment test work conducted by the Proponent in 2007 has shown that the pregnant leachate solution (the most concentrated solution created as a result of ore leaching) and raffinate can be treated to such a degree that the concentrations of potentially harmful substances can be made low enough for safe discharge to the environment. Combined with methods to create non-acidic and non-metal leaching conditions in the heap as a part of decommissioning, the Executive Committee is of the opinion that this treatment system will be adequate for responding to requirements to release even the most highly concentrated process waters during operations and as a part of closure of the heap.

It is not anticipated that the HDS plant will be used during mine operations. If sludge is generated during operations the Proponent has identified lined and bermed areas upslope of the heap where the sludge can be stored temporarily.

Where discharge to the environment is required, the Proponent has committed to testing and treating (if necessary) the water to ensure it meets discharge criteria established under the water licence. The Executive Committee notes that any discharges from the Project must be capable of meeting acceptable water quality standards, such as the CCME 'Canadian Water Quality Guidelines for the Protection of Aquatic Life' and the Metal Mining Effluent Regulations (MMER) under the *Fisheries Act.* The Executive Committee understands that the specific water quality discharge standards for the Project will be set through the water licensing process. In Section 9.2.1.4 - Site Specific Water Discharge Criteria, the Executive Committee suggests a methodology to determine site specific water discharge criteria and includes some water quality parameters calculated to minimize potential effects of water discharge from the Project.

The Executive Committee is satisfied that should discharge be required, the water will be treated if necessary, to comply with federal and territorial discharge standards as set out in the water licence in order to avoid adverse effects on groundwater and/or surface water quality.

Process Solution Discharge

The heap leach process is designed to contain and recycle the sulphuric acid leaching solution. Heap leach process solutions will be acidic and will contain high concentrations of dissolved metals. The introduction of dissolved metals into surrounding waters can result in chronic or acute toxicity to aquatic life at the point of discharge, as well as downstream. Increases in acidity (lowering pH) can result in complete changes in the phytoplankton and zooplankton communities in a waterbody. The Executive Committee considers leakage of process solutions into the receiving environment a potentially significant adverse effect. Potential leakage or accidental release of contaminated rinse water is addressed in Section 8.

The heap liner and systems to contain, control and recover the leach solution are critical to avoid this solution from entering surrounding waters. The heap will be contained within a perimeter berm and bench. The entire heap leach pad area will be lined (Appendix D-YOR doc #2006-0050-018-1). In general, the heap liner system will consist of an overliner containing a network of pipes to collect the process solution, underlain by a high-density polyethylene geotextile liner, a leak detection and recovery system, another high-density polyethylene geotextile liner supported by a soil liner and subgrade foundation including drains.

In addition to the leak detection and recovery system (LDRS), the entire heap leach pad below the secondary soil liner will be equipped with foundation drains, which are located in natural draws within the heap leach pad area. This secondary drainage system, which is designed to provide drainage for groundwater, flows into the events ponds and acts as a secondary leak detection and recovery system. Any seepage picked up by either the LDRS or the foundation drains will be directed to heap storage.

Three separate zones in the heap have been identified based on their potential for process solution leakage: the upper works, the lower works and trenches. The upper works comprise the upper portion of the heap leach pad, at elevations greater than 830 m. In this zone, the base slope exceeds 7:1 with a consequence that process solution flow velocities are high and hydraulic heads are low. The lower works comprise the lower portion of the heap leach pad adjacent to the confining embankment. In this zone, process solution velocities are low and the hydraulic head will approach 1.0 m. Therefore, there is a potential for higher leakage rates through the primary liner in this area. The trenches are constructed in the LDRS to move process solution laterally. In the trenches, solution velocities will be high but, because these are the collector system for the LDRS, the hydraulic head will also be high. There is therefore a higher potential for leakage of the primary liner in this area.

Subject to the results of product specific laboratory testing of the liner system, the components of the liner system for each zone will generally comprise the following:

The upper works liner system comprises (listed from the top down):

- High-permeability, durable overliner cushion layer with solution collection piping
- 60 mil (1.5 mm) textured High-density polyethylene (HDPE) upper liner
- LDRS comprising a high transmissivity tri-planar geocomposite
- 60 mil (1.5 mm) textured HDPE lower liner
- Subgrade (with foundation drains)

The lower works liner system comprises (listed from the top down):

- High-permeability, durable overliner cushion layer with solution collection piping
- 60 mil (1.5mm) textured HDPE upper liner
- LDRS comprising a high transmissivity tri-planar geocomposite
- 60 mil (1.5mm) textured HDPE lower liner
- Compacted lower soil liner with a permeability not greater than 10-8 m/s
- Subgrade (with foundation drains)

The trench design profile comprises (listed from the top down):

- High-permeability, durable overliner cushion layer with solution collection piping
- 60 mil (1.5mm) textured HDPE upper liner
- 12 oz nonwoven polypropylene geotextile

- Drainage layer comprising durable crushed ore or sand and gravel with permeability of at least five x 10-4 m/second and solution recovery piping
- LDRS comprising a high transmissivity tri planar geocomposite
- 12 oz nonwoven polypropylene geotextile
- 60 mil (1.5mm) textured HDPE lower liner
- Subgrade

The Proponent's proposed conceptual liner system design was prepared to comply with YG guidelines and reference standards referenced in Table 2. The liner system could be unacceptably strained in areas where thaw-unstable soils could lead to local subgrade settling. The Proponent has committed to identifying, testing, analyzing and re-building any areas of potential differential settlement so that the movement can be spread over a wider area to reduce the liner strains to an acceptable amount. t

Table 2 Performance standards provided to the Proponent by YG-Energy, Mines and Resources (8 April, 2005).

Issues	Performance Objective	YG Guideline/ Standard
Liner design	Prevent discharge of noncompliant waters	• Liner system (including materials; conceptual construction methods and conditions; operation and maintenance procedures) achieving a permeability at least equivalent to a synthetic liner over a 12 inch (30.5 cm) soil liner with permeability o f 10^{-6} cm/sec. • Leak detection and recovery system with contingency plans.
Physical stability of heap and associated earthworks, such as berms constructed to constrain leachate	Minimize risk of liner damage	• Suitable design, criteria based in Canadian Dam Association's 'Dam Safety Guidelines' (1999)

The Proponent estimates that seepage rates through the outer liner from the heap leach pad will be in the order of 0.1 m³/day, or a conservative 0.5 m³/day. The Proponent has committed to "action level triggers" if water with high copper or sulphate concentrations (i.e. escaping solution from the heap not groundwater) is detected in the LDRS or foundation drains (Appendix L-YOR doc #2006-0050-045-1). Any seepage that escapes the leak detection and recovery system and the foundation drainage system will migrate down gradient toward the events pond. The Proponent has estimated using leakage/groundwater flow modelling that if process solution were to pass both recovery systems it would be diluted by a factor of 500 before it entered Williams Creek (YOR doc #2006-0050-063-1).

The liner system design is consistent with industry best practices, and the Executive Committee considers a 60 mil (1.5mm) HDPE dual liner with LDRS adequate for the loads and solutions that are anticipated on the heap. If further subgrade analyses indicate portions of the pad have an increased likelihood of instability, the regulator may want to consider more flexible liner options for these areas. Options could include Polyvinyl Chloride (PVC), Linear Low Density Polyethylene (LLDPE) and Very Low Density Polyethylene (VLDPE). If other liner materials are considered their performance in highly acid environments should be demonstrated before use. The Executive Committee acknowledges the appropriate introduction of the LDRS into the liner system and is satisfied that the design of the heap leach pad foundation/liner system will effectively minimize process solution release into the environment – especially ground and surface water. The Executive Committee notes that additional laboratory liner design testing has been committed to by the Proponent and that the final engineered liner system design will be provided to the regulators during the licensing process.

Events Pond

The events pond will be used for excess process solution that cannot be contained within the heap or SX/EW plant. The events pond is located downslope of the heap pad, connected via gravity flow solution pipes and a double-lined spillway. The events pond is expected to contain some process solution while the heap is leaching, but is particularly important for containing excess process solution after high rainfall or high-precipitation events or when the SX/EW plant cannot accept solution.

The solution containment for the events pond is comprised of a foundation drainage system independent of the leach pad system, a prepared basin surface, construction of an earthfill confining embankment, and lining of the basin facility with a double HDPE liner system with independent LDRS (Appendix D1-YOR docs#2006-0050-011-1 and 012-1). The events pond LDRS operates independently from the LDRS under the heap pad, but is of similar design with two HDPE 60 mm liners placed on a prepared soil liner and separated by a plastic geonet for an integral LDRS. The LDRS will recover leakage along the low point of the embankment toe from a collection pipe and ditch which will drain to a sump.

The removal of solution from the LDRS is accomplished by a submersible pump at the bottom of the sump comprising a sloping riser pipe located between the two liners on the confining embankment. The pump will be activated by level switches to prevent the build-up of water in the LDRS. The flow from the pump will be continuously monitored.

The Executive Committee is satisfied that the design of the events pond will adequately mitigate the risk of potential leakage of process solution that otherwise may result in adverse effects to surface/groundwater quality.

Increased Sediment Loading

Physical disturbance of the terrain, removal of vegetation and compaction of soils, will increase surface runoff of water in the Project area. This could accelerate local erosion rates and, if not managed properly, result in siltation that could deteriorate the water quality of the receiving environment. In addition to decreasing water quality, sediment can introduce, interact with and act as a “sink” for certain contaminants altering their effects. Increased sedimentation in receiving waters due to Project activities is considered a potentially significant adverse effect by the Executive Committee.

Sedimentation of surface water can be an issue during any phase of the Project, but is a particular concern during the construction phase. Sediment particles and pore water within sediment can interact with surface water to act as sinks for various contaminants, releasing them back into the aquatic environment.

Erosion and the introduction of sediment into watercourses is a concern during construction or maintenance activities at or near river or creek crossings. Removal of vegetation, de-stabilization of banks and resulting slumping can introduce sediment into water courses. The Executive Committee recognizes that guidance in the form of Department of Fisheries and Oceans Operating Statements to protect fish and fish habitat during these activities should minimize sedimentation.

Effects associated with increased sediment loading to local watercourses or high volume discharges of runoff from the site, resulting in erosion, should be mitigated by collecting most of the runoff in sediment ponds and conveying it to the heap. Furthermore, the Metal Mining Effluent Regulations (MMER) contain total suspended solids criteria expected to inform acceptable levels of total suspended solids to be established under the water licence.

Discharges into the aquatic environment have the potential to reduce sediment quality as well, through the introduction of contaminated materials. This includes deposition of liquids or particulates containing total and dissolved metals and anions from the Project area. Indirect metal loading from suspended solids is also possible, based on the transfer of metals from effluent receiving waters to the sediment layer.

A potential result of introducing contaminants into water is the accumulation, or loading, of these contaminants in sediments. Baseline sediment sampling has been carried out by the Proponent. Measurements of water pH for all stations during all sampling years fall within the range of 6.1 and 8.0. With the exception of two of the sample stations, all stations have upper range limits for arsenic that are above the CCME interim ‘Canadian Sediment Quality Guidelines for the Protection of Aquatic Life’. For copper, the upper range limit of all but two of the stations exceed the CCME interim sediment guideline. Other parameters (e.g., Pb, Zn, Cd) do not exceed CCME sediment quality guidelines.

The Proponent has committed to conduct an annual sediment monitoring program in the fall. Sediment quality studies are also part of the federal MMER program.

The Executive Committee is satisfied that with the application of appropriate measures to control surface runoff and erosion of watercourse banks, including diversions to settlement ponds, adverse effects to water quality resulting from increased sedimentation are not anticipated.

Nitrogen Loading

The use of explosives can introduce nitrogen compounds into surrounding waters. Nitrogen compounds have the potential to impair water quality due to the potential toxicity of nitrates, nitrites and ammonia, and their role in promoting algal growth. The Executive Committee considers this a potentially significant adverse effect.

The majority of blasting will be done within the pit. Any airborne nitrogen compounds as a result of pit blasting are expected to differentially settle in the pit itself or on the mine site. The Executive Committee does not anticipate that these compounds will enter Williams Creek directly to a significant degree.

Any nitrogen compounds deposited on the mine site and mobilized by runoff will be diverted to a sedimentation pond. Either the water will be recycled into the process solution or tested (and treated if necessary) for discharge.

Sewage

Sewage has the potential to affect water quality through nutrient and phosphate loading. The Executive Committee considers this a as a potentially significant effect..

The Executive Committee is satisfied that the Proponent's plans for managing sewage and compliance with the Camp Sanitation Regulations and the Sewage Disposal Systems Regulations will mitigate potential effects to water quality.

Establishing Water Quality Discharge Standards.

Should the Proponent wish to discharge treated or untreated water, they have committed to test and monitor the water to ensure that it meets water quality standards set by the appropriate regulator (i.e., in the water licence). Since it is anticipated that these discharges will predominantly occur during detoxification and closure, the setting of appropriate water quality discharge standards is examined in Section 9.2.1.4 - Site Specific Water Discharge Criteria in Closure and Reclamation).

Ongoing Monitoring

The Proponent has committed to ongoing water quality analysis as part of their environmental management system (EMS) for the Project. This monitoring will detect any Project-related water quality changes downstream of the Project. The Executive Committee notes that baseline studies have been undertaken in order for the monitoring program committed to by the Proponent to be effective.

The Proponent has also committed to a groundwater monitoring program that will be ongoing from construction through the post-closure period. This program will consist of wells/sampling stations in the vicinity of the heap leach pad and down slope of all facilities. Groundwater piezometers will be regularly sampled to ensure that the LDRS/foundation drains are detecting/collecting potential process solution seepage and that overall groundwater quality is not being affected by the Project.

6.1.4 WATER FLOW/QUANTITY (SURFACE AND GROUND)

Surface water flow and quantity (i.e., hydrology) is considered a VESEC because of its importance for the maintenance of conditions for aquatic and terrestrial life especially in riparian areas. The development of the mine, WRSA, leach pad and process facilities will require the altering of local surface water drainage patterns. Surface water quantities may also be affected by the changes in evapotranspiration and infiltration due to land clearing and open pit excavations. Mine usage of water from wells could potentially impact groundwater elevations, aquifer storage or flow patterns. Factors contributing to groundwater flow in this area are understood to be complicated and decreases in groundwater flow may affect surface water flows.

A hydrological assessment was undertaken to describe the surface water hydrology of the Project area and to calculate values for key hydrological parameters such as annual runoff totals, monthly flow rates and flood flows. Stream flows in the Yukon are generally characterized by peak flows in the spring and low flows in the winter. Maximum discharges typically occur during the spring as the result of snow melt or rain-on-snow events, with flows gradually decreasing following the disappearance of snow. Sizeable flood events may also occur in the late summer due to intense rainstorms. These rainfall events are particularly significant on small basins. The smallest discharges of the year occur in March. Ice develops on all rivers and many streams freeze entirely, reducing their surface winter flows to zero.

Water moves down Williams Creek at an average velocity of 5 to 20 cm/sec under low flow conditions and 10 to 40 cm/sec under high flows. Depending on flow rates, water can take between six hours to two days to travel the course of the creek approximately nine kilometres into the Yukon River.

Studies by the Proponent indicate that the regional groundwater drainage pattern in the area has evolved into a contorted pattern influenced by complicated structural features associated with the intrusive and metamorphic rock types. The regional groundwater flow system of the Project area is further complicated by the presence of discontinuous permafrost, which produces a confining effect and possibly perched water tables. Regional groundwater occurs as an unconfined deep flow system within bedrock in which groundwater is recharged at higher elevations in the upland areas and flows toward the valleys at lower elevations. The groundwater table loosely follows topography. The result of exploration drilling and recent geotechnical site investigations indicate that the groundwater table lies at significant depths over most of the Project area. In some areas, the presence of discontinuous permafrost has resulted in the development of perched water tables, however, these are isolated and are discontinuous. Groundwater was not encountered during the geotechnical evaluations except in two locations, in which perched water tables over permafrost were encountered. Additionally, minor groundwater flow occurs in the active zone just below the ground surface on a seasonal basis resulting in the development of local swamp areas. The discontinuous permafrost also can act as a barrier inhibiting infiltration in some areas. This can significantly reduce local recharging of the groundwater table and result in its overall depression.

6.1.4.1 Effects Characterization

Potential Project effects on surface water quantity are assessed in terms of changes to flow paths and drainage areas, annual flow volumes, seasonal distribution of flow, high flow conditions, and low flows. Surface flow pathways within Williams Creek Valley may be altered by diversions and ground disturbances at the mine site. Annual flow volumes, seasonal flow distributions, high flows and low flows may also be altered due to changes in the flow pathways. The Executive Committee considers that effects to water flow could be potentially adverse and significant.

Hydrological studies of the Project area have facilitated the development of a conceptual water budget for the Project. These studies suggest that the Project will operate in a water deficit; therefore capture and recycling of water is important to moderate water needs. Make-up water, from groundwater wells, will be used during early years of operation to saturate the heap. This has a positive consequence of the Project not releasing water under normal operating conditions.

During operations, there may be losses and gains to annual flow volumes from the mine site into Williams Creek due to factors such as: water held in pore space within the waste rock; water discharged to Williams Creek; pit dewatering wells pumping rates higher than natural groundwater flows to the Creek; potentially higher runoff rates from the mine site, and increased evaporation from the ponds. During operations some precipitation will be diverted from surface flow to make-up water for the leaching process. Changes in surface and sub-surface water flow into Williams Creek, are not anticipated to be significant given the size of the watershed/catchment area.

During construction, there will be no storage of runoff within the Williams Creek valley. Disturbed areas have higher runoff rates than natural vegetated areas; however, in the case of the Project site, much of the property has already been cleared. As a result, annual runoff volumes at the mouth of Williams Creek are expected to be similar to baseline conditions.

Upon closure, the majority of the water being recycled in the system will continue to be used for heap rinsing. When heap rinsing is complete, the WRSA and heap sedimentation ponds will discharge freely over a spillway. The hydrology of the watershed during closure may be minimally affected by higher runoff from disturbed areas and higher evaporation from the sedimentation ponds. Relative to annual hydrological fluctuations experienced in the Williams Creek Valley, the effect is not expected to be significant. In addition, over time with re-vegetation of disturbed areas, runoff should return to baseline conditions.

The primary impact on groundwater levels and storage is expected to result from dewatering of the open pit when it extends below the local groundwater table and the extraction of well water. Construction and operation of the sediment ponds and events pond, construction of water control and routing structures, water recycling and any additional abstraction of groundwater as a supplementary water source for usage during construction and operation may also contribute to changes in groundwater flow. Additionally, melting permafrost, especially beneath the heap, could divert near-surface groundwater flows.

Development of the open pit will result in a cone of depression in the groundwater table radiating from the floor of the pit outwards. The change in groundwater flow patterns around the open pit areas is not expected to impact the regional groundwater flow direction towards North Williams Creek.

The entire heap leach pad area will be lined to prevent leakage of solutions to groundwater. Consequently, surface recharge to the groundwater table in the area of the heap leach pad will not occur over an area of approximately 37 ha. Further testing to confirm the presence of permafrost in the area of the leach pad is necessary for design and construction of the leach pad, because there is the potential for the elevation of permafrost to become lower under the heap leach pad due to heating of the ground through the application of leach solutions and the ore onto the pad. This could partially divert near-surface groundwater flows and possibly lead to differential settlement of the heap through melting permafrost causing deformation/tearing of the liner. The Proponent has committed to completing a drilling program to delineate potentially thaw-unstable soil and assess suitability for the soil liner material. All potentially thaw-unstable materials within 5 m of ground surface identified during the delineation program will be excavated and filled in with appropriate material. The Executive Committee is satisfied this measure will mitigate potential effects to near-surface groundwater flows resulting from localized permafrost thaw.

The Executive Committee recognizes the potential contributions of groundwater flow to flow rates in Williams Creek and acknowledges that the Proponent has indicated that the hydrogeological program will continue and water levels will be measured in monitoring wells on a quarterly basis. Ongoing monitoring of Williams Creek is also proposed as part of the Environmental Monitoring Program. The monitoring of Williams Creek water levels should identify if creek water flow rates drop below normal ranges. The water licence is expected to establish the criteria and thresholds under which adaptive management actions should be to be taken by the Proponent to decrease the volumes of water being pumped from the wells.

6.1.5 AQUATIC RESOURCES

For the purposes of this assessment, aquatic resources include benthos and fish and fish habitat. Aquatic resources were selected as a VESEC because they are indicators of environmental quality and can be used to assess various impacts related to degraded water and/or sediment quality. Furthermore, Yukon fisheries (both in the past and present) contribute to economic activities, have strong cultural associations of significance to Yukon's First Nation people, and provide food and recreation for many First Nation and non-First Nation people. In particular, the lower reaches of Williams Creek have been shown to be a rearing area for Chinook salmon. Chinook are a locally and regionally important species for subsistence and commercial harvest as well as playing a central role in annual ecological cycles across the Yukon.

Salmon fisheries have a long, culturally significant history in the Yukon. According to the Yukon River Panel website:

> *"The people of the Yukon River drainage have been utilizing salmon since inhabiting the area; approximately 128 000 people live in the Yukon River drainage today. For nearly all the people who reside in the Yukon River drainage, fish and wildlife resources, provide the foundation for their survival and livelihood. Salmon, the staple food in many communities, is one such resource that has been harvested since time immemorial through traditional subsistence and aboriginal practices."*

The federal MMER require that benthos surveys be used to monitor for potential aquatic impacts from metal mines. The benthic invertebrate community survey is used to provide an indication of the health of fish habitat. Benthic invertebrate samples were collected in lower Williams Creek approximately 250 m upstream of the Yukon River confluence. A total of 23 different taxonomic groups were identified in the drainage. The Executive Committee considers potential adverse project effects on benthos anywhere in the Williams Creek watershed significant.

The Proponent conducted several fisheries investigations, including a biophysical inventory, electrofishing, minnow traps, and spawning surveys to determine the distribution and abundance of fish in the Project area. Spawning was not observed in the Yukon River near the Williams Creek confluence in the October 1991 survey. Information from local residents and traditional knowledge gathered by the Proponent also did not report observing spawning in this area.

No fish were observed or captured in Williams Creek above the Nancy Lee Creek confluence. However, potentially adverse project effects on fish and fish habitat are of particular concern in the lower Williams Creek. Of the thirteen fish species typically found in the Yukon River drainage, six species were identified in the lower section of Williams Creek to the confluence with Nancy Lee Creek. These species include: juvenile Chinook salmon (*Oncorhynchus tshawytscha*), arctic grayling (*Thymallus arcticus*), slimy sculpins (*Cottus cognatus*), longnose suckers (*Catostomus catostomus*), burbot (*Lota lota*), and northern pike (*Esox lucius*). Other species, such as inconnu, round whitefish, and broad whitefish may also be found in small tributary habitats of the Yukon River system at certain times of the year.

6.1.5.1 Effects Characterization

Aquatic resources could potentially be affected by changes to metal or contaminant concentrations or increased sediment loads in Williams Creek. The Executive Committee considers these potential Project effects on aquatic resources to be significant and adverse.

Deleterious substances, specifically chemical contaminants, can cause immediate death of vegetation, fish and wildlife if a lethal dose is received (acute effects). Chemical contaminants in a sub-lethal dose can affect the long-term survival and/or reproductive success of organisms (chronic effects). Bioaccumulation of chemical contaminants can result in effects that may take a long time to be observed and affect organisms throughout the foodweb, including humans.

The Project water management system is designed to recycle process streams and water will only be discharged to the environment if it meets discharge criteria set out in a water licence. Testing and, if necessary, treating the water will ensure it meets water licence discharge criteria. In Section 9.2.1.4 - Site Specific Water Discharge Criteria, the Executive Committee suggests a methodology to determine site specific water discharge criteria and includes some water quality parameters calculated to minimize potential effects of water discharge from the Project. The Executive Committee is satisfied that this system will mitigate the potential impacts on aquatic resources resulting from the Project.

Increased sedimentation could directly scour or smother attached algae from the stream substrate reducing food and habitat for benthic macro-invertebrates resulting in a reduction in the fisheries food source.

The results of sedimentation on fish and fish habitat can range from simple disruption to direct mortality (particularly eggs and fry) and can vary among fish species. The introduction of unnatural sediment loads into water can indirectly affect fish survival by altering water chemistry (e.g., increased turbidity can increase temperature and reduce oxygen content) and decreasing food density or availability. Direct effects of increased sediment can include abrasion of fish gills, potentially resulting in suffocation and rendering the fish more susceptible to infection and gill parasites and decreasing fish reproductive success by altering oxygen levels which are important to viability of eggs and young fish. Furthermore, certain fish species (e.g., salmon) need gravel and rocks to spawn and as rearing areas for their young. Excess sediments in a watercourse clog the spaces between rocks and gravel, potentially burying the eggs. In addition, as sediments clog open spaces between the spawning gravel, water flow and oxygen are prevented from reaching eggs or fry. This last potential effect is of particular importance as lower Williams Creek is documented as a rearing area for salmon.

With the application of appropriate erosion control measures during construction and the site runoff diversion and control measures during operation, the Executive Committee is satisfied that significant adverse effects to aquatic resources from sediment loading are not anticipated.

The Executive Committee concludes that the Project will not result in significant adverse effects to aquatic resources.

6.1.6 REQUIRED MITIGATIVE MEASURES

To minimize any effects due to water discharge:

1. Prior to any release to the environment, the Proponent shall ensure that water is tested and treated to Yukon and federal release standards and meets downstream water quality objectives as set out in the water licence.
2. Prior to any water discharge, the Proponent shall monitor receiving waters to determine downstream water volume and quality to confirm that Yukon and federal release standards will be met (i.e., CCME).
3. An assimilative capacity assessment shall be conducted to determine site-specific discharge criteria at the point of compliance.
4. Total suspended solids of any discharged water shall be controlled so as not to exceed regulated levels. If required, settling aids shall be used.

To decrease potential for ARD/ML in waste rock/pit walls:

5. The Proponent shall conduct appropriate sampling and materials testing to determine the acid rock drainage (ARD) potential of rock in the extreme western and northern portions of the proposed pit and report the results to the regulators prior to excavating those areas of the pit.
6. The Proponent shall, if required by the regulator, confirm the characterization of the waste rock through additional testing to confirm that the waste rock storage area (WRSA) has no

acid rock drainage potential and that the potential to release metal contaminants via metal leaching mechanisms is negligible before placing material in the WRSA.

7. Sampling and monitoring measures shall be in place with the objective of minimizing the placement of acid generating rock in the waste rock storage area (WRSA) and exposing sulphide ores in the pit. The Proponent shall maintain a 6 m buffer of oxide ore above the sulphide ore in the pit.
8. All aggregate and building material sources and potential rock 'cuts' related to road or infrastructure development shall be characterized for acid potential by the Proponent prior to development. Only non-reactive aggregate materials may be used for infrastructure development and construction. Where acid generating materials are disturbed, appropriate management actions shall be identified, implemented and approved by regulators.

To decrease likelihood and magnitude of process solution leaks:

9. Detailed design of the heap liner system, including site specific liner leakage rates and allowable limits, as well as a response plan and contingency measures, shall be submitted to the regulators for review and approval.

To temporarily store HDS treatment plant generated sludge:

10. The Proponent shall have adequate storage facilities available on-site to temporarily store sludge generated from the high-density sludge (HDS) treatment system in the event that water is treated for discharge during operations. Sludge shall not be disposed of on the heap until those cells of the heap have been shown to be effectively detoxified.

To minimize sedimentation of surface waters:

11. The Proponent shall control erosion and the introduction of sediment into receiving waters, in particular during construction. Options available to the Proponent include best construction management practices like sedimentation ponds, silt fencing, drainage ditches.
12. Discharge location, volume and flow rates of released water will be controlled to prevent erosion damage to banks, stream beds or disturbance to fish.
13. Any road or bridge construction and maintenance at the Merrice and Williams Creek crossings shall be performed to standards established by the regulators to ensure minimal riparian and aquatic disturbance.
14. Disturbance on or near banks of watercourses or waterbodies will be minimized. Bank clearing will be conducted in accordance with Fisheries and Oceans Canada (DFO) Operational Statements (i.e., no bank cutting).

To ensure effectiveness of process solution seepage detection and collection:

15. The Proponent shall install groundwater monitoring wells, or other complementary approaches, down gradient of mine features, including the heap pad, waste rock storage area (WRSA), events and sediment control ponds. Location, elevation, borehole logs,

screening depth, lithologies, installation methods, monitoring schedules and permeability analysis of these measures shall be submitted to the appropriate regulator.

16. Sediment from the events and sediment control ponds shall be tested prior to removal and disposed of in accordance with the appropriate regulation.

6.1.7 CUMULATIVE EFFECTS ASSESSMENT

The spatial scope of the cumulative effects assessment includes the Williams Creek and Nancy Lee Creek watersheds. The temporal scope involves all project phases from construction to post-closure, primarily during the ice-free season.

The Project is expected to have some residual effects on water quality, quantity and aquatic resources. The implementation of the recommended mitigative measures which in part require adherence to stringent non-discretionary legislation and regulations will largely result in the avoidance or reduction of effects on water resources from the Project.

Treated discharges will reach Williams Creek and are expected to some extent to alter water quality. However, the discharges must meet standards prior to release and the Proponent has shown that Williams Creek has moderate buffering capacity and has adequate flows to assimilate controlled discharges without significant harm to downstream aquatic life forms.

The construction and operation of the mine and mine site activities will alter the surface characteristics (soil structures and capacities and altered vegetation cover) of the area and the surface and groundwater regimes may be affected as a result. Surface runoff could erode un-vegetated areas and sediment rich water could escape to the creek. The on-site drainage channels and the sediment ponds will be designed to capture sediment rich surface runoff.

Existing projects in the watershed include clearing/linear features from previous exploration activities, no other proposed activities are known to the Executive Committee. The Executive Committee concludes that any residual effects of the Project, in combination with residual effects of other existing or proposed activities, will not result in significant adverse cumulative effects to water resources.

6.1.8 CONCLUSION

The Executive Committee concludes that with the application of the recommended mitigative measures, in addition to those proposed by the Proponent, no significant adverse Project or cumulative effects are anticipated to occur with respect to water resources.

6.2 WILDLIFE (MINE SITE AND ACCESS ROAD)

6.2.1 OVERVIEW

Wildlife is valued for its role in local and regional ecosystems, cultural importance, significance to subsistence harvesters, as well as its part in the local traditional economy. Some species of wildlife have particular conservation value because their local populations are in decline or they are relatively rare either regionally or nationally. This section describes effects to wildlife generally in the Environmental Assessment Study Area (EASA), as defined in the Project proposal, which incorporates the mine site and access road, the Freegold Road corridor, and the local area around these features.

The LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009 (LSCFN et al. 2004) contains information and discussion on many of the wildlife-related issues considered during this screening including: bison herd management, disturbance to caribou and moose, moose harvest, and winter road access.

The Executive Committee has focused the examination of potential effects on wildlife at the mine site for the species outlined below:

6.2.1.1 Moose

Moose are the most important large ungulate in the area. The most recent Yukon Government survey (2003, Block 17-Carmacks West) estimated a low moose density of 40 moose per 1 000 km^2 (R. Ward, pers. comm., as quoted in the proposal). Visual and scat observations have confirmed use of the Project area by low numbers of moose throughout the year.

The southern portion of the study area, and about two thirds of the access road, is within a Wildlife Key Area (WKA) for moose (late winter). This WKA encompasses lower lying riparian and wetland areas, around Merrice and Crossing creeks, as well as Merrice Lake. The creeks and WKA extend east-west, south of the Project. Late winter habitat is particularly important for moose because this is the time of the year when energy reserves are low and deep snow or a late spring can affect calf survival.

The eastern portion of the EASA Williams Creek/Yukon River confluence overlaps with an area identified in the LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009 as important habitat for moose during calving and during summer and winter. The Plan also refers to reports that over the last 15 to 20 years, moose tracks and sightings along the Yukon River downstream from Carmacks to Minto have noticeably decreased (LSCFN et al. 2004). The Executive Committee notes that moose populations appear to be dropping yet available habitat in this area is not suggested to be limiting moose densities (Markel and Larsen 1988, as quoted in P. Harder and Associates 1993).

The local moose harvest management regimes also reflect low moose populations. Non-aboriginal harvest is closed in the harvest zones around the Project (Yukon Hunting Regulations Summary 2007-2008).

The Proponent has included moose as part of its Environmental Monitoring Program. The entire Project area, including the mine access road, is proposed to have a daily wildlife log and observations record, mortality reporting and every three years, a post-rut moose survey.

6.2.1.2 Caribou

The Project area lies outside the known ranges of the caribou herds in the region (Klaza, Tatchun, Pelly and Aishihik). Though potential winter caribou habitat exists in the EASA, evidence of woodland caribou use of the Project area is limited. Caribou have been hunted in and around the Williams Creek watershed in the past.

6.2.1.3 Bison

Although the Project area lies within the Aishihik Wood Bison Herd Management Area – North, bison are not known to currently use the EASA and it is not anticipated that they will move into the area during the temporal scope of the Project (T. Jung, pers. comm. 2007, as reported in Appendix H5 of the Project proposal). Potential Project effects on bison are not considered any further in this assessment.

6.2.1.4 Bears

Based on observations of tracks and scat, black and grizzly bears use the EASA as part of their range(s). The Proponent noted that black bears are probably present. Denning surveys of the EASA in fall or spring were not undertaken.

Grizzly bears are habitat generalists using, and occurring in, a diversity of habitats. Grizzly bears are omnivores, but most grizzly bears eat primarily vegetation which results in bears occurring where and when their preferred plants are growing or producing berries. Both male and female grizzly bears occupy large home ranges from 10s to 100s of km^2 and up to 1 000 s of km^2 in poorer quality habitats. Male home ranges are typically several times larger than those of females.

The northwestern population of grizzly bears is identified as a species of special concern under COSEWIC. Grizzly and black bears are hunted in the area and their numbers are thought to be high (LSCFN et al. 2004). In the past, during the summer (May to October), bears could have been destroyed if attracted to fish camps on the Yukon River, while in the winter they have been hunted, as they are now, while trapping (J. Sam, pers. comm. 2007).

6.2.1.5 Other Mammals

Wolves are expected to use the mine site area infrequently. Wolves are hunted in the EASA and their numbers are thought to be high (LSCFN et al. 2004). Lynx and coyote are the two most important furbearers for local trapline catch. Lynx populations appear to be cycling with snowshoe hare populations. In recent surveys, coyote sign was moderately common and lynx sign was regularly observed in the early 90s when populations were high.

6.2.1.6 Golden Eagles

A WKA for golden eagles overlaps the northeastern portion of the EASA, near the Yukon River. Golden eagle nests were observed on cliffs along the Yukon River in this area. The mine site is over 2 km from the WKA and the primary potential effect is through contaminant release into the Williams Creek watershed. The assessment of potential effects on water and water quality are dealt with in Section 6.1 and potential Project effects on golden eagles are not considered any further in this assessment.

The Proponent has committed to contacting the local Yukon Government (YG) Conservation Officer in the event of wildlife encounters or mortalities, and this information will help to identify any effects trends and inform management decisions for the area. The Game Guardian Program, suggested in the LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009, has been implemented to monitor wildlife, hunting and traffic in the area and report findings to the community. Additionally, the Carmacks Renewable Resources Council (CRRC) has indicated that a community-based monitoring program for the Carmacks area is in effect. The information gathered through these programs could prove important in supporting management decisions for the area.

The Project may affect wildlife in the EASA in the following ways:

- Habitat alteration (direct/indirect loss of terrestrial and wetland habitat)
- Disruption, blockage and impediment of movements
- Induced mortality (from hunting, defence kills, vehicle collision, entrapment)

6.2.2 EFFECTS CHARACTERIZATION

6.2.2.1 Habitat Alteration

The greatest direct loss of habitat will occur from the clearing for the mine site facilities and the mine access road. Direct loss of habitat is estimated in the proposal to be 117 ha for the Project. Loss or removal of habitat that would result in decreased wildlife populations is considered a potentially significant adverse effect by the Executive Committee.

Much of this area has already been cleared at various times in the past 20 years during previous exploration activities and pre-construction clearing and grubbing activities conducted in the late 1980s. Development of the mine site will result in clearing of primarily upland vegetation types (Lodgepole pine and black spruce), where habitat quality is generally moderate. These vegetation types are not locally rare. The mine site is regularly, but not extensively, used by wildlife. Higher quality habitats associated with south facing slopes and lower riparian areas and wetlands around the mine site are not proposed to be cleared.

Riparian areas/creek crossings over North Williams Creek (to the explosive storage area) and Williams Creek and Merrice Creek along the mine access road are proposed to be cleared by hand to minimize habitat loss. The Executive Committee expects the Department of Fisheries and Oceans (DFO) Operational Statement, ‘Maintenance of Riparian Vegetation in Existing Rights-Of-Way’ to be applicable during creek crossings. This is particularly important as much of the mine access road passes through a Wildlife Key Area for moose (late winter).

Though the Proponent has not conducted a bear denning survey, they have committed to avoiding sensitive habitats, such as denning or nesting sites, if encountered during operations. This is most important during initial site preparation activities in pre-construction and construction phases if they occur over winter.

In addition to direct habitat loss, human and machine activity can result in a decrease in suitability of surrounding wildlife habitat leading to avoidance or abandonment by wildlife. In the Project area, traffic and mining construction and operations may result in habitat degradation (e.g., noise pollution and dust generation) or other indirect loss. Worker education and the elimination of recreational off-road vehicles on the mine site will minimize indirect habitat loss.

As mining construction and operations commence, noise levels will rise in the Project area. Noise has very different and often highly species-specific effects on wildlife. The source, duration, and intensity of noise are factors in determining the nature and magnitude of any observed effect. For example, a brief, intense, localized sound such as blasting may result in habitat avoidance or abandonment of an area. Though species show varying sensitivities to the presence of humans and machinery, the Executive Committee anticipates the majority of wildlife will avoid the mine site during construction and operations and any species-specific issues will be able to be resolved on an as needed basis with YG Conservation Officers (e.g., installation of electrified fence as bear deterrent).

Noise and presence of traffic on the mine access road is expected to deter use of the habitat immediately surrounding the road and increase the role of the road as a barrier to wildlife movement. As noted in McLellan and Shackleton (1988, as quoted in the Project proposal), bears reduce their use of areas within 100 m of roads and this avoidance appears to be regardless of traffic volume. The Proponent has committed to using traffic restrictions during peak times of movement for most wildlife species (i.e., in the evening and early morning) to minimize effects on wildlife.

As the mine access road approaches the plant site, it is currently designed with a switchback to the south-west, presumably due to a combination of topographical and soil moisture constraints. The Proponent may consider, where possible, routing the mine access road and other on-site roads closer to other site infrastructure. This would decrease clearing in lower areas and allow for routing along existing cleared corridors.

The Executive Committee is satisfied that the Project will not result in significant adverse effects to wildlife due to direct or indirect loss of habitat.

6.2.2.2 Disruption, Blockage and/or Impediment of Wildlife Movement

Project development and operation activities may result in wildlife movements being disrupted. Wildlife movements can be considered to be short-range movements (i.e., day-to-day movements within a particular season) while long-range movements typically are travel between seasonal ranges (i.e., migration). Wildlife move between habitats to access different resources (e.g., safety from predators, food type, food accessibility). Wildlife unable to access these resources may experience decreased health and reproductive rates, increased energetic expenditure and increased predation resulting in decreased population size. The Executive Committee considers impeding wildlife access to habitats and resources required in order to maintain wildlife populations a potentially significant adverse effect.

It is anticipated that most wildlife will avoid the mine site due to a combination of barriers (fencing, infrastructure etc.) and deterrents (noise, vehicle traffic, human presence, cleared vegetation, etc.). Studies by the Proponent indicate that summer movements of wildlife tend to occur at the highest densities in lower lying areas, invariably associated with the local streams and drainage which, given the location of the mine site, further decreases the probability the mine site will adversely affect short or long-range wildlife movement.

Linear features, like the mine access road, can act as barriers to wildlife movement for some species and facilitators of movement for others. About two thirds of the mine access road bisects a Wildlife Key Area for moose (late winter). The Executive Committee agrees with the Proponent that moose generally do not perceive roads as barriers (Appendix H5 - Wildlife Update 2006), although traffic can lead to increased avoidance and result in moose mortality. The most significant potential barrier is where the mine access road crosses Merrice Creek. Moose and other species using Merrice Creek as a travel corridor could be adversely affected. The proposed span bridge across Merrice Creek will have to be constructed high enough to allow wildlife passage.

To reduce the impediment of movement of wildlife along the access road during the winter months, the Proponent has committed to creating breaks in the snow banks at regular intervals. The breaks will allow wildlife to easily enter the access road right of way, and facilitate ease of escape. Furthermore, the access road will be ploughed using a wing blade to plough the snow back (to increase visibility) and will leave breaks in the snow banks at crossing points.

6.2.2.3 Induced Mortality

The Project may increase wildlife mortality by unintentionally attracting them into fatal situations, or facilitating their hunting by humans and other carnivores. Odours and food sources associated with Project activities (e.g.., cooking, incineration, planted vegetation, “salt” licks, garbage or sewage) may become attractants for wildlife. Human-induced mortality that decreases wildlife populations is considered a potentially significant adverse effect by the Executive Committee.

Wildlife access to improperly stored solid waste can lead to increases in local populations of scavengers (omnivores like ravens, gray jays, foxes, etc.), but the primary concern is bears accessing food wastes. Food conditioned bears increase the risk of negative human-bear interactions.

Nuisance bears may be captured and relocated to areas away from human activity, however the homing ability in bears is well developed and they may quickly return (Ross 2002). Much of bear behaviour is driven by their nutritional requirements, which draws them back to any opportunity for ‘higher’ quality food. As relocation is not always effective, food-conditioned bears are often killed due to human-safety concerns. The life history characteristics of the grizzly bear make it particularly sensitive to human-caused mortality (including hunting, poaching, accidents and nuisance kills). Its behaviour frequently brings it into conflict with people, leading to increased mortality where human activities expand (COSEWIC 2002).

Proper waste management is necessary to reduce the likelihood of wildlife becoming attracted to mine site activity. As per the Proponent's waste management plan, solid waste will be collected in covered metal containers at strategic areas throughout the mine site and be regularly incinerated. The Executive Committee is satisfied that the waste management plan in addition to conformance with applicable regulations, will manage sewage and refuse odour so it does not become a wildlife attractant and resulting in significant wildlife mortality. If the Project experiences too many nuisance bears, the Proponent has identified that they may need to install electric fencing around the mine site to deter bears.

Ungulates can also be attracted to newly re-vegetated areas. This is particularly important along the mine access road, where human/traffic presence is intermittent and collisions with vehicles would most likely be fatal. The Proponent has committed to using natural (passive) re-vegetation as well as active re-vegetation techniques where appropriate. Active re-vegetation programs would use indigenous flora decreasing the likelihood of the vegetation acting as an attractant. In addition, the mitigations proposed by the Proponent with respect to maintaining driver sightlines, installing speed limits and signage, maintaining escape routes for wildlife on the access road when ploughing snow and minimizing traffic during periods of peak wildlife activity, as previously discussed, will help decrease the number of traffic/wildlife collisions along the mine access road.

Ungulates and waterfowl may be attracted to standing water. The two sediment control ponds are anticipated to be dry most of time as water will be re-introduced into mine processes. The contents of the events pond may be harmful to animals and birds. The Proponent has proposed a 2.4m high fence to exclude wildlife from the events pond and commits to encompass the heap leach pad and process area with fencing to prevent wildlife entrance into these areas. The Proponent has also proposed to check netting over the ponds which, at a minimum, will include netting above the events pond.

Hunting of moose, and to a lesser extent bears and caribou, has been reported in the vicinity of the mine site. Hunters were observed using the existing exploration road, that roughly parallels the proposed mine access road, during the Executive Committee – initiated, *Carmacks Copper Project Transportation Issues Field Tour,* conducted in August 2007. The closure of non-aboriginal hunting of moose in the subzones in and around the vicinity of the mine site indicates a desire to actively manage harvest levels. The LSCFN Community Fish and Wildlife Management Plan 2004-2009 outlines concerns regarding levels of moose harvest and suggests that all moose harvesting be reported.

The Executive Committee recognizes that some level of access currently exists through the un-maintained exploration road that runs between Freegold Road and the mine site. While new areas would not be opened up by the mine access road, all-season vehicle access is potentially increased.

The creation of an all-season mine access road could provide easier hunter access to some areas, particularly along those drainages that the road intersects. This increased accessibility coincides with the winter season when the area surrounding the access road is particularly important habitat for moose. The December 2005 moose survey by the Proponent confirms that moose and moose sign are present in drainages intersected by the mine access road. The Executive Committee notes that the Proponent has committed to manage the mine access road as a private controlled access road and recognizes that hunters will not have access to it. The Executive Committee further recommends that the mine access road continue to be operated as a private controlled road during closure and that the access road be decommissioned post-closure to limit access to the area.

The Proponent has also committed to implement and enforce no hunting, no fishing and no firearms policies for its employees on-site and in transit to the site. The Executive Committee is satisfied that these measures will effectively eliminate the potential adverse effect of harvesting of wildlife along the mine access road and at the mine site.

6.2.3 REQUIRED MITIGATIVE MEASURES

To decrease habitat alteration or loss

17. The Proponent shall use existing trails and disturbed areas, where suitable, to minimize the addition of new linear corridors.
18. The Proponent shall take every precaution to ensure disturbance of wildlife habitat, including but not limited to denning or nesting sites, is avoided.
19. As proposed by the Proponent, a minimum 30 m avoidance and vegetative buffer zone shall be maintained between stream riparian areas and facilities to minimize wildlife disturbance and protect wildlife corridors.
20. The Proponent shall hand cut vegetation near access road stream crossings to reduce disturbance to riparian areas.
21. The Proponent shall ensure personnel movement will be restricted to the Project area and access routes.

To decrease potential increases in wildlife mortality due to hunting

22. The Proponent shall operate the mine access road as a “private controlled access road”. At the junction of the mine access road and the Freegold Road the Proponent shall install and maintain appropriate infrastructure and/or personnel to control vehicular access until the mine access road is de-commissioned.
23. As proposed by the Proponent, firearms shall be restricted on-site. The Proponent shall implement policies and procedures which will identify employee, management and contractor restrictions pertaining to fishing and hunting. These policies and procedures shall be in effect throughout the life of the Project.

24. The Proponent shall provide employees with instruction and education regarding the Project's "Wildlife Harassment" policy, which will encompass the avoidance of contact, attraction (i.e. feeding) and harassment of wildlife by Project personnel.

To decrease wildlife mortality due to vehicle collisions

25. The Proponent shall post speed limits and signage at wildlife crossings along the mine access road to minimize direct road mortalities.
26. The Proponent shall provide transportation to the mine site and encourage its use to minimize hunting opportunities and direct road mortalities.

To decrease attractants and control mine site access by wildlife, which could result in increased wildlife mortality:

27. The Proponent shall undertake routine garbage patrols to remove materials, (e.g., metals, plastics, grease) which may be potentially harmful to wildlife.
28. The Proponent shall regularly incinerate solid waste in a manner which minimizes odours and eliminates the attraction of bears and other wildlife to the mine site. As proposed by the Proponent, an approved petroleum-fired incinerator with high efficiency burner for camp facilities in accordance with the appropriate regulations will be used.
29. As per the Waste Management Plan, the Proponent shall regularly collect garbage and debris destined for disposal, and prior to incineration, shall store it in wildlife-proof containers in a manner that does not attract wildlife to the mine site.
30. The Proponent shall implement a progressive re-vegetation program for disturbed sites where native vegetation has been removed or destroyed. If any additional seeding is required, the seeding mix shall be reviewed by the regulator prior to application. Natural re-vegetation of disturbed areas will be promoted, where likely to be successful, as part of re-vegetation plans.
31. The Wildlife Management Plan shall identify measures to deter wildlife access to mine site and facilities, including but not limited to, the kitchen/camp facilities, heap leach pad, events pond and processing areas. These measures may include fencing, electric fencing and/or netting of specific facilities as required. Specifically, the Proponent shall enclose the heap leach pad, events pond, and processing areas with fencing. As proposed by the Proponent netting over the events pond shall be erected to exclude birds and waterfowl. Monitoring of wildlife interactions will inform further adaptive management strategies to ensure deterrence.

To minimize any barriers to wildlife movement:

32. The Proponent shall construct the span bridge over Merrice Creek in a manner that does not restrict moose passage.

33. The Proponent shall implement measures to reduce the impediment of wildlife movements, including specifically the ploughing back of snow banks, and ensuring sufficient breaks in the snow banks to provide adequate sightlines for drivers and wildlife escape.
34. The Proponent shall not create windrows that would restrict wildlife movements or create fire hazards.
35. The Proponent shall use traffic restrictions during peak times of movement for most wildlife species (i.e., in the evening and early morning) to minimize effects of Project traffic on wildlife.
36. The Proponent shall report all encounters with wildlife, and/or mortalities to a YG Conservation Officer.

6.2.4 CUMULATIVE EFFECTS ASSESSMENT

Mining activities include clearing/construction at the mine site and along the mine access road. There will be noise associated with blasting, working machinery and from vehicles moving around the mine site and along the mine access road. This may result in the destruction and/or alteration of habitat and disturbance of wildlife from noise, hunting and other mining activities.

Moose are the most notable large ungulate in the area and recent surveys have shown the density to be low. About two thirds of the mine access road, is within a WKA for moose (late winter). This WKA encompasses lower lying riparian and wetland areas, around Merrice and Crossing Creeks, as well as Merrice Lake. The creeks and WKA extend east-west, south of the Project.

The Williams Creek/Yukon River confluence (about 10 km from the mine site) overlaps with an area identified in the LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009 as important habitat for moose during calving and during summer and winter.

The Project activities along the mine access road and at the mine site will have residual habitat alteration effects resulting from the clearing of about 117 ha of land. Ongoing mining activities may cause disturbances from traffic and noise. These alterations and disturbances along the mine access road may cause moose to avoid, to some extent, the area in spring, summer and fall. In the winter months cleared roads often attract wildlife including moose as the traveling is easier on the road surface than in the deep snow off-road, which may alter movement patterns.

The mine site will be fenced which will exclude wildlife from a large part of this area. However, the habitat contained within the fenced area is not thought to be of the highest quality for moose and there is ample similar habitat elsewhere in the vicinity of the mine site that may be utilized instead.

The spatial scope of this cumulative effects assessment includes the mine access road and mine site and an extended area within 20 km radius of the Project, delineated by the Proponent for wildlife studies prior to the Project proposal submission.

The temporal scope includes all phases of the Project. Habitat alteration will occur during the construction phase and the resulting reduction in available habitat will last for the duration of the operations and closure phases. Disturbances and noise from all mining activities will occur and will be ongoing through all Project phases.

There are three other activities that may have effects on moose habitat in terms of disruption of movement but not in terms of further habitat alteration. These are the existing Project exploration road, the Freegold Road and hunting activity along the Freegold Road. While the roads occupy some wildlife habitat area they have each existed for many years and will not contribute to new alterations of habitat. The exploration road will be decommissioned once the new mine access road is built and regeneration will be allowed to occur.

The local moose harvest management regimes also reflect low local moose populations and the non-aboriginal harvest is closed in the harvest zones around the Project (Yukon Hunting Regulations Summary 2007-2008).

It is noted in the proposal that moose populations appear to be dropping yet availability of moose habitat in this area is not suggested to be limiting moose densities (Markel and Larsen 1988; as quoted in P. Harder and Associates 1995).

Given the low impact of this Project on high quality moose habitat and given that habitat is not considered to be the limiting factor on the local moose population the residual effects of the Project are not anticipated to combine with effects of other projects/activities to result in significant cumulative effects on moose habitat.

The low moose numbers are likely a result of previous and/or ongoing hunting pressure which has resulted in the management decision to partially close hunting in the zones surrounding the mine. The Project will not result in any increase in moose hunting opportunities as the mine access road will be restricted to only mine employees and contractors and a no hunting policy will be in effect for all staff along the road and at the mine site.

Given the fact that hunting opportunities along the mine access road and in the mine area will be restricted, any residual effects from the proposed Project in combination with the residual effects of other projects/activities in the area are not considered to be significant.

6.2.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant direct, indirect or cumulative adverse effects are anticipated to occur with respect to wildlife.

6.3 CURRENT LAND USE (MINE SITE AND ACCESS ROAD)

6.3.1 OVERVIEW

The land and resources of the mine site and surrounding area are utilized in many ways by a variety of users. The project area lies within an overlap area of the Traditional Territories of the LSCFN and the Selkirk First Nation (SFN). Yukon First Nations – primarily the LSCFN – use the land and resources for traditional subsistence and cultural purposes (e.g., trapping, fishing, hunting, berry-picking and community gatherings) and for recreation. Residents of the Village of Carmacks, other Yukon residents and non-Yukon residents use the land for recreational hunting, fishing and other recreational pursuits. Land and resource developers conduct mineral exploration in the area. For the purposes of this assessment, traditional and non-traditional land and resource use have been examined.

Although the Project area lies within the SFN Traditional Territory, members of the SFN are not known to use the area regularly, thus impacts to them are considered in the effects assessment to members of LSCFN and other land users.

Currently, there is no land use plan for the area, however, the LSCFN indicated it is developing land use plans for its Traditional Territory.

The scope of the assessment includes the mine site and mine access road, and the area within a 20 km buffer of the mine site, excluding the Freegold Road corridor (see Section 7.3 for effects on current land use along the Freegold Road). The temporal scope of the assessment includes current and potential future use of the assessment area and takes into account past land use patterns.

6.3.1.1 Traditional Land Use

Traditional lifestyle, values and practices on the land contribute to the transmission of traditional knowledge and maintenance of First Nation culture. Participation in traditional activities promotes connection to the land and resources, family and community cohesion, individual and community health and wellness, and builds community resilience. Apart from these cultural and wellness benefits, traditional activities on the land continue to provide economic benefits. The livelihoods of many Yukoners depend on a combination of wage and traditional economy.

Trapping

For many decades, trapping has provided the primary source of winter cash income for many Yukoners, both First Nation and non-First Nation. Trapping is an important winter revenue source in many smaller communities, providing income at a time of year when unemployment is high. For many First Nations, trapping is an important part of a traditional way of life.

Lynx is currently the most sought-after pelt in the area (J. Sam, pers. comm., 2007); wolverine is also an important trapped species. Squirrel, beaver, fox, lynx, marten, mink, muskrat, weasel, wolf, coyote and otter are also trapped in the area. Trapping can occur from late fall (October) through to late spring (May).

The assessment area includes parts of three registered trapping concessions: #147 (currently held by Kathleen Sam), #149 (currently held by Larry Tricker) and #150 (currently held by Grace and Bruce Wheeler). The proposed mine site is located within concession #147, operated by Johnny Sam, of LSCFN. Two of Mr. Sam's trapline trails are located in proximity to the mine site; no known trapping cabins or camps are located within the Project area.

Project activities at the mine site may affect trapping in terms of loss of land available for trapping, disturbance to furbearers, restricting trapper travel, interference with traplines, and deterioration of the aesthetics of the area which affects the experience of trapping.

Hunting

The general area is used for traditional subsistence hunting purposes. Moose is the most common ungulate now hunted in the Williams Creek Valley. At present, the area is open exclusively to First Nations for moose hunting. The LSCFN have expressed concern regarding the low numbers of moose in the area; disturbance to moose and the moose harvest were highlighted as chief concerns in the LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009. Grizzly bear, black bear and wolves are also hunted in the area and their numbers are thought to be high (LSCFN et al., 2004).

Project activities at the mine site may affect traditional subsistence hunting in terms of loss of land available for hunting, disturbance to wildlife, deterioration of the aesthetics of the area.

Fishing

Chinook and chum salmon runs in the Yukon River support important commercial and First Nations food fisheries. Traditional fish camps along the banks of the Yukon River are used by the LSCFN to support subsistence and traditional economy fishing during the late summer and fall months. Locations of the fish camps change annually depending on flow conditions of the river. It is possible that the fish camps may be established on the river banks in the vicinity of the Project area during the life of the Project.

Some brief, high volume intermittent noise may be heard from the bank of the Yukon River; however, it is anticipated that Project-generated noise will generally not carry to the west bank of the river. Consequently, no interaction between Project activities at the mine site and fish camps along the Yukon River is anticipated. Potential effects to water quality that may indirectly affect fish harvesting are addressed in Section 6.1.3. Potential effects to fish camps southeast of the Project area resulting from Project traffic on the Freegold Road are addressed in Section 7.3.

Gathering

Members of the LSCFN indicated that the assessment area is generally used by families for picking berries, herbs and medicinal plants, as well as for picnics. No known gathering sites were identified within the mine footprint or within the range of Project noise disturbance. Project activities at the mine site may affect traditional gathering activities in the general area in terms of disturbance, potentially deteriorating the area's aesthetics.

6.3.1.2 Recreational Land Use

Recreational/ Tourist Use

In general, recreational use of the area is minimal to moderate. Summer watercraft travel along the Yukon River from May through October is a significant recreational/tourist activity. Although designated campsites along the Yukon River route are often associated with tributary confluences, examination of the Williams Creek confluence indicated low usage by campers (e.g., there was no evidence of regular campsites or fire pits). Project activities at the mine site may affect recreational/ tourist use of the Yukon River in terms of negatively impacting the aesthetics of the area.

Sport/ Recreational Hunting

The Project is located within Outfitting Concession #13, owned and operated by Tim Mervyn (Mervyn's Yukon Outfitting, Whitehorse). Mr. Mervyn indicated that the Project area is not generally hunted. Grizzly bears, in particular, represent a valuable hunt to the business. Mr. Mervyn did raise concern regarding the potential for bears to be attracted to the mine site and potentially killed if they become a nuisance. This would reduce the number of bears in the area, potentially affecting his business.

6.3.2 EFFECTS CHARACTERIZATION

6.3.2.1 Aesthetics

The mine site will not be visible from the Freegold Road or the Yukon River; thus, effects to visual aesthetics will be minimal. The Proponent has indicated that Project waste will be managed as per the Project Waste Management Plan, and any refuse on the ground will be regularly collected. Following mine closure, all infrastructure, equipment and materials will be removed and the mine site will be reclaimed and re-vegetated to a state comparable with pre-disturbance conditions (see Section 9.0).

Long-term, low-magnitude, continuous noise generated during the Project is not expected to be heard beyond 1.5 km of the site. Brief, intense, localized sound, such as blasting, will be intermittent. Project noise emissions are thus not expected to adversely impact the aesthetics of the area.

The Executive Committee is satisfied that the potential for adverse effects to the aesthetics of the assessment area due to Project noise is not significant.

6.3.2.2 Traditional Land Use

Trapping

The Executive Committee concludes activities are not likely to result in significant disturbance to Larry Tricker's trapping activities in concession #149, due to its distance from the Project (approximately

9 km at the closest point). Likewise, it is not anticipated that Grace and Bruce Wheeler's trapping concession #150 will be affected by disturbance from the Project site.

The Executive Committee has determined that there is low to moderate potential for the Project to result in significant adverse effects to trapping in concession #147. The adverse effects of the Project could include:

- Decreased presence of furbearers through habitat removal or disturbance
- Impeding access for Mr. Sam to parts of his concession
- Disturbance/destruction of traps/trails
- Decreased ability to pass on the traditional knowledge and trapping lifestyle to Mr. Sam's grandchildren

The mine site and mine access road, which cover less than one percent of the total area of the concession, do not represent a significant loss of land available for trapping or habitat for local furbearers. The Executive Committee notes that a considerable portion of the northern section of the trapping concession was burnt during a forest fire in 1995, potentially affecting habitat suitability in that area.

While the mine site footprint and mine access road represent a very small proportion of the total land available for trapping in concession #147, the location of these features may restrict Mr. Sam's travel east-west across the southern portion of the concession. In order to mitigate this potentially significant effect, the Executive Committee recommends that the Proponent discuss with Mr. Sam appropriate crossing locations along the mine access road and commit to using appropriate snow removal equipment to plough the snow back (to increase visibility) and leaving breaks in the snow banks at crossing points.

Mr. Sam has indicated two of his trapline trails are in proximity to the mine site. While the Executive Committee is of the opinion that the distribution and abundance of wildlife in the mine site is not likely to be significantly affected, harvest yields on Mr. Sam's trails in proximity to the mine site could be significantly affected by furbearer avoidance of these areas. The Executive Committee does not have access to Mr. Sam's trapper Harvest Records but is of the opinion that the effects on these particular trails\lines is potentially significant. The Executive Committee is of the opinion that the Proponent should relocate and/or re-establish these two trails, in such a manner as is agreed to by the concession holder.

It is also possible that these trapline trails may be obstructed by Project equipment or infrastructure, or that Project personnel may interfere with trapping equipment or snared animals resulting in a significant effect to Mr. Sam's trapping activities. The Executive Committee is of the opinion that potential interference of Project personnel with traplines, equipment or snared/trapped animals can be effectively mitigated through personnel training and the implementation of a policy against interference with this traditional activity.

Impacts on trapping in concession #147 would affect Mr. Sam's ability to pursue a traditional lifestyle and affect his income from this activity. He has expressed his desire to pass on the concession and his traditional knowledge of life on the land to his grandchildren (J. Sam, pers. comm., 2007). Mr. Sam expressed his opinion that trapping cannot coexist with mining activities. The Proponent has committed to “negotiating an equitable settlement with the holders of trapping concession #147 for the residual effects to trapping activities…”.(YOR doc #2006-0050-138-1). The Executive Committee is of the opinion that re-location of Mr. Sam’s affected traplines would partially mitigate the potential adverse effects to his trapping activities in concession # 147. With the application of this mitigative measure, the Executive Committee has determined that potential for residual adverse effects to trapping is low to moderate. Pursuant to YESAA section 42 (1)(f), the Executive Committee is of the opinion that compensation for the Sam family in relation to the potential residual significant adverse effects to trapping activities in concession #147, is an appropriate measure to approach to mitigating these effects further.

Hunting

As discussed in Section 6.2, significant effects to the distribution and abundance of wildlife due to disturbance from mine site and mine access road are not anticipated. The mine site and mine access road comprise a very small proportion of total land available for hunting in the area. The Executive Committee has thus determined that significant adverse effects to traditional hunting in the area resulting from Project activities at the mine site are not anticipated.

Gathering

Given the relatively short duration and small geographic disturbance of the Project, potential effects to gathering activities in the area are not anticipated to be significant.

6.3.2.3 Recreational Land Use

In general, recreational use of the assessment area is not likely to be adversely affected by Project activities at the mine site.

Recreational/ Tourist Use

As previously discussed, Project infrastructure and activities will not be visible from the Yukon River, and Project-generated noise is generally not expected to reach the River. The potential for significant effects to aesthetics along the River is therefore low.

Sport/ Recreational Hunting

The Executive Committee is of the opinion that appropriate waste management protocols will reduce the risk of attracting bears to the mine site (see Section 6.2), effectively mitigating the potential effect on Mervyn’s Yukon Outfitting’s business.

6.3.3 REQUIRED MITIGATIVE MEASURES

To avoid effects to, and compensate for residual effects to the holder of Trapping Concession #147:

37. The Proponent shall discuss with the concession holder #147 appropriate crossing locations along the mine access road for use while trapping. When ploughing snow off the mine access road, the Proponent shall leave breaks in the snow banks at these crossing points to provide adequate sightlines for drivers and safe passage by snowmobile.
38. The Proponent, in agreement with the concession holder #147, shall be responsible for the relocation and/or re-establishment of the two trapline trails, that are in proximity to the mine site.
39. As committed to in a letter from the Proponent (YOR doc #2006-0050-138-1), concession holder #147 shall be compensated for the residual effects to trapping activities caused by the Project..
40. The Proponent shall make every reasonable effort to avoid interference with trapline trails. The Proponent shall restore any trails used or crossed, by slashing any and all trees that may fall across these trails in the course of construction and operation. The Proponent shall remove all debris and snow piles that may be pushed across the trails.
41. Project personnel shall be instructed not to interfere with trapping equipment, or trapped animals.

6.3.4 CUMULATIVE EFFECTS ASSESSMENT

The scope of the cumulative effects assessment includes the general area along the Freegold Road and in the vicinity of the mine site and mine access road. Residual effects on traditional land use resulting from the Project and other projects in the area may include:

- Decreased land available for use (direct effect)
- Barriers to access/ movement in the area (direct effect)
- Disturbance effects on wildlife, which may in turn affect hunting and trapping activities (indirect effect)
- Aesthetic effects, potentially deterring land users from using the area for traditional purposes (indirect effect)

Members of the LSCFN have indicated that the mine site assessment area is used for traditional purposes and that traditional use of the area has been declining since the 1980s when exploration began. The mine site footprint is relatively small and comprises a very small proportion of land available for traditional use purposes in the area. Large-scale industrial activities in the area are limited. However, exploration activities in the past and present have occurred in the area. Exploration activities tend to be seasonal. Residual effects of these activities on traditional land use are thus not considered to be significant. Cumulative effects in terms of decreased land available for use and barriers to access/movement in the area are not anticipated. As discussed in Section 6.2.4, cumulative effects on wildlife are not anticipated; thus, effects on traditional hunting and trapping resulting from cumulative effects on wildlife are also not expected.

It is possible that activities at the mine site in combination with other exploration activities in the area may deter some people from using the general area for traditional purposes. Due to the limited geographic extent and short duration of exploration activities in the area, as well as the relatively small footprint of the mine, however, the Executive Committee is of the opinion that this potential effect on traditional land use is not anticipated to be significant. The Executive Committee notes that that year-round maintenance and improved condition of the Freegold Road may encourage people to use this area for traditional purposes.

6.3.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse effects are anticipated to occur with respect to current land use in the vicinity of the mine site and mine access road.

6.4 AIR QUALITY (MINE SITE AND ACCESS ROAD)

6.4.1 OVERVIEW

Typical of remote, northern areas, the ambient air quality of the Project area can be considered pristine. There are no other sources of air emissions in the area, beyond minimal dust emissions from the occasional vehicle travelling along the Freegold Road. Project activities will result in air emissions that may impact air quality. The atmospheric environment can be a pathway for the transport of substances arising from various Project activities to the freshwater, terrestrial and human environments. Maintaining the air quality of the area is a key consideration; thus, air quality has been selected as a VESEC.

Project activities may produce air emissions during construction, operation and closure; no significant air emissions are anticipated post-closure.

The main sources of Project emissions that may affect air quality include:

- Fugitive dust from mining operations and along the access and hauling road (e.g., crushing operations, open pit mining, blasting and hauling).
- Gaseous emissions from the Process Facility and Sulphuric Acid Plant (primarily sulphur dioxide).
- Gaseous emissions from the diesel generators (primarily particulate matter and SO_x).
- Gaseous emissions from the solid waste incinerator (primarily particulate matter).

Impacts on air quality Project emissions may result in the following indirect effects:

- Release of high concentrations of SO_x or volatile hydrocarbons could cause injury or mortality to living organisms by fire, explosion, toxicity or asphyxiation.
- Settling of high concentrations of SO_x produced by the acid plant can cause high ground level concentrations that could damage vegetation and soils and affect human health and the environment, including vegetation and wildlife.
- Emissions from diesel, gasoline, and propane could potentially affect human health and the environment, including vegetation and wildlife.
- Emissions of fugitive dust can potentially affect human health and health of the environment, including vegetation and wildlife.
- Emissions of greenhouse gases from diesel generators, mine heaters, construction equipment and vehicular traffic contribute to global climate change.

6.4.2 EFFECTS CHARACTERIZATION

Overall atmospheric emissions from mining operations will be primarily limited to fugitive dust from open pit mining, hauling and crushing operations, and will be typical of most mine sites. As there will be no roasting or smelting operations, gaseous emissions will be limited to ventilation of the reagent area, the process plant (solvent extraction and electrowinning areas), acid plant, the fume hoods in the assay laboratory, equipment emissions, and diesel generators. The Executive Committee considers these effects to air quality adverse and potentially significant.

The Proponent is proposing to undertake several activities that may result in a decline of air quality caused by increased levels of particulate and/or chemical pollutants in the Project area. The main sources of air emissions from the Project include:

- Fugitive dust from mining operations and along the access and on-site roads
- Emissions from fuel burning (diesel generators and vehicles); solid waste incineration and from the Process Facility and Sulphuric Acid Plant (primarily sulphur dioxide)

6.4.2.1 Fugitive Dust

Fugitive dust will be mobilized during the construction, operations and closure phases of the Project. No significant dust emissions are anticipated post-closure with the re-establishment of a vegetative cover over much of the mine site (see Section 9.0).

Dust will be mobilized as a consequence of road construction and mine site preparation and may move short distances from the source into the surrounding area. During the operations phase, dust will be produced from mining activities during blasting and loading/transport/conveying of the ore to the heap and the waste to the WSRA. In lower concentrations, dust is generally considered an annoyance, though not significant. In higher concentrations however, dust may pose a safety risk, particularly where local traffic is exposed and vision/line-of-sight is temporarily decreased.

Dust control mitigative measures, including watering, will largely control fugitive dust on-site or within a few hundred metres radius from the source on the mine site and mine access road. The spatial scope of the dust emissions and transport will therefore be limited to the areas immediately surrounding the mine site and mine access road. The residual dust that is mobilized will eventually land on the ground and/or vegetation with little anticipated effect. Reseeding, as part of the Project progressive reclamation program, will also help to reduce wind erosion resulting in dust emissions.

6.4.2.2 Emissions from Fuel Burning, Solid Waste Incineration and the Process Facility

The Project will involve burning of gasoline and diesel fuels for vehicles and diesel generators, the incineration of solid wastes and gaseous emissions from the sulphuric acid plant and the SX/EW processing facility. While the mine site is located on a hillside which generally allows for greater dispersion and diffusion of emissions compared to valleys; these emissions, in sufficient concentration and exposure, may pose a health risk to people in the area.

Sulphuric acid will be generated in a closed system; thus, minimal SO_x emissions are anticipated. Emissions from sources such as continuous operation of the diesel generators, vehicles and other equipment onsite, will affect the air quality in the vicinity of the mine site, but it is anticipated that these emissions will disperse relatively quickly and any significant indirect effects on terrestrial resources or human health would be localized.

These emissions could affect workers and vegetation within the mine site or emissions could be transported as airborne particles or pollutants off-site. The Executive Committee notes that the Proponent will be required to obtain an Air Emissions Permit from YG-Environment, pursuant to the Air Emissions Regulations under the *Environment Act* (Yukon) (2002). It is assumed the permit will outline terms and conditions associated with Project emissions, including concentration thresholds and monitoring requirements.

6.4.3 REQUIRED MITIGATIVE MEASURES

To control and avoid air emissions:

42. The Proponent shall develop the detailed design of the Sulphuric Acid Plant and SX/EW Processing Facility in consultation with YG-Environment to ensure that the design minimizes emissions.
43. The Proponent shall monitor the emissions from the Sulphuric Acid Plant and the SX/EW Processing Facility. If concentrations are found to be of a level that may be harmful to humans, vegetation or wildlife, then scrubbers, filters or other such measures shall be employed to reduce these levels.
44. During periods of high activity and/or dry conditions, the Proponent shall apply dust suppressants, such as water or calcium chloride, to dust prone areas (e.g., unconsolidated working surfaces, development rock and ore stockpiles). When using water as a dust control measure, the Proponent shall ensure water quality standards identified for release into the receiving waters are met.
45. The Proponent shall use low sulphur diesel fuel with a sulphur content <15 ppm and propane with negligible sulphur content and where appropriate, the Proponent shall employ waste heat recovery and energy efficient techniques to decrease diesel use.

6.4.4 CUMULATIVE EFFECTS ASSESSMENT

Dust control mitigative measures will largely control fugitive dust on-site or within a few hundred metres radius from the source on the mine site and mine access road. The spatial scope of the dust emissions and transport will therefore be limited to the areas immediately surrounding the mine site and mine access road. The residual dust that is mobilized will eventually land on the ground and/or vegetation and be washed to the ground in a short time, with little anticipated effect. Any residual effects of this Project are not anticipated to combine with effects from any other activities to result in significant cumulative effects.

There are no other projects or activities near the mine site or along the mine access road that would create fugitive dust.

The residual emissions from fuel burning, solid waste incineration and the process facility that are transported will likely dissipate within a short distance of the mine site (i.e., within a 10 km radius). The spatial scope therefore includes the mine site and any other point or non-point source emissions within 10 km from the mine site.

There are three other emission sources within a 10 km radius of the mine site including two mining exploration projects and the Freegold Road. The other mining activities will not contribute burning or process emissions to the airshed as they are not conducting any burning or processing activities on the exploration sites. Vehicular emissions on the Freegold Road or at the exploration sites are anticipated to dissipate within a short distance of the road.

Emissions from the Project activities will be largely controlled by implementing the recommended mitigative measures. Given the limited spatial scope of these residual emissions and the absence of any other activities contributing emissions effects, there will be no combination of Project residual effects with the effects of other projects/activities that are anticipated to result in significant cumulative effects.

6.4.5 CONCLUSION

The Executive Committee concludes that with the application of the recommended mitigative measures, no significant adverse direct, indirect or cumulative effects are anticipated to occur with respect to the air quality of the mine site area.

6.5 SOIL STABILITY (MINE SITE AND ACCESS ROAD)

6.5.1 OVERVIEW

Soil stability can be sensitive to disturbance and is important as it provides a medium for vegetative growth and influences habitat for wildlife. Project activities which involve the movement of earthen material have the potential to adversely affect soil stability. Characteristics of soil stability assessed include soil structure (e.g., texture, parent material), capability (e.g., ability to support vegetation, infiltration rate) and condition of existing permafrost. The spatial scope of the assessment includes the ground area directly disturbed by Project activities. The temporal scope of the assessment includes all phases of the Project.

The mine site and mine access road have been cleared of vegetation and potentially affected by heavy machinery due to advanced exploration activities and previous pre-construction clearing and grubbing activities related to this project. The Executive Committee considers that much of the mine site and mine access road have been subject to some degree of disturbance.

Project activities may result in direct and indirect effects to soil stability through compaction, rutting, erosion, disturbance to root structure and removal of soil and vegetation. Direct effects may include the alteration of soil structure and general soil capability, including effects to permafrost, potentially causing decreased soil penetrability, decreased soil aeration and altered site surface drainage. Construction activities have the most potential to affect soils; however, operations and closure activities may impact soils as well.

Effective soil stripping, management and storage during construction and re-distribution of soils during site reclamation in a manner that facilitates re-vegetation will help enable the Proponent to meet its site closure objectives.

6.5.2 EFFECTS CHARACTERIZATION

Several Project activities will act as pathways for potential significant and adverse effects to soil stability to occur. Examples of these activities include the development of the mine access and hauling roads, open pit, WRSA, process plant, ancillary facilities, heap leach pad (including events and sediment control pond) and borrow areas. The Executive Committee considers these adverse effects on soil stability potentially significant.

Construction and Continued Use of Access Roads – The construction and year-round maintenance of the mine access road and haul roads are the responsibility of the Proponent. Additionally, the Proponent will be responsible for the installation and maintenance of a bridge and culvert on the mine access road.

Use of Heavy Equipment off Maintained Roads – Heavy equipment may be used off maintained roads during the construction phase. This could lead to increased compaction, rutting, and erosion, especially in wet conditions, potentially resulting in significant effects to soil structure.

Removal and Disturbance of Topsoil and Vegetation – As mine development occurs, land within the mine footprint will be cleared, resulting in removal of vegetation and soil disturbance. The removal or disturbance of soil may expose permafrost, increase erosion potential, and decrease soil stability. The removal of vegetation may further affect soil stability since roots act as an anchor to soil, especially on slopes.

The Project area is located in an area of discontinuous permafrost; thus, the clearing and disturbance to soils may directly affect permafrost. The exposure or alteration to the active layer may increase permafrost temperatures, potentially causing permafrost to thaw. This may result in effects to stability, such as thawslides and thermokarst subsidence. Likewise, covering permafrost areas with too much overburden may cause freeze-thaw and/or uplifting of the surface. Freeze-thaw and uplift may deteriorate stability and/or cause damage to infrastructure such as roads and buildings.

As per the proposal, permafrost is not anticipated to be present below the heap leach pad and events area, because the land was cleared in 1997 and melting would have occurred at that time. Geotechnical investigations of the proposed WRSA location, however, indicate that permafrost is present, therefore careful development and planning will be necessary.

Vegetation increases absorption of precipitation, thereby reducing ground water infiltration and surface runoff. This physically protects the ground surface from wind, precipitation, and direct sunlight, and anchors and provides stability to soil. The removal of vegetation, therefore, may reduce soil capability, deteriorate soil structure and induce erosion.

Re-vegetation associated with progressive reclamation will help to improve or restore soil quality, thereby addressing some of the effects to soil stability resulting from the Project. Proper planning and an understanding of local soil geochemistry will increase re-vegetation success. Progressive reclamation is addressed in Section 9.0 (*Closure and Reclamation).*

6.5.3 REQUIRED MITIGATIVE MEASURES

To decrease and minimize disturbance due to new construction:

46. The Proponent shall use existing trails and disturbed areas, where suitable, to minimize soil disturbance.
47. During the construction and maintenance of mine site access and haul roads, the Proponent shall minimize cut and fill slopes to reduce road footprint.
48. The Proponent shall minimize riparian removal and ensure drainage channels are maintained and debris free.
49. The Proponent shall incorporate erosion protection measures (e.g., rip rap, cross ditches, breaks) along roads and facilities.

To decrease the likelihood of infrastructure instability/failure due to permafrost melt and subsidence:

50. Where permafrost is encountered, the Proponent shall ensure that roads and infrastructure pads are appropriately designed and constructed.

51. The Proponent shall engineer and construct roads to avoid permafrost exposure to the greatest extent possible and maintain permafrost condition. When disturbance does occur, appropriate engineering techniques shall be used to address the disturbance.
52. As proposed by the Proponent, additional geotechnical drilling shall be conducted to confirm permafrost existence under the heap and waste rock storage area (WRSA). Design and contingency adjustments, particularly of the subgrade and foundation, shall be submitted to the regulator for review and approval. As part of detailed design planning, foundation stabilization options shall be considered. Contingency stabilization methods may include removal of any thaw-unstable soils at both the heap and WRSA and construction of a toe berm at the WRSA.

To decrease effects of heavy equipment use:

53. The Proponent shall not move any equipment or vehicles unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging and shall suspend overland travel of equipment or vehicles if rutting occurs.

To increase the likelihood of reclamation/re-vegetation efforts:

54. Prior to reclamation, the Proponent shall test soil for quality and quantity and determine if the soils have sufficient content, nutrients and organic matter to support plant growth for the purposes of progressive reclamation.
55. The Proponent shall retain and stockpile organic material stripped from the site in such a manner as to ensure it will provide for its effective re-use for reclamation and re-vegetation.

6.5.4 CUMULATIVE EFFECTS ASSESSMENT

Project activities may result in adverse effects to soil ecology through soil disturbance and soil structure alterations leading to soil capacity reductions including: removal of soil and vegetation, disturbance to surface and root structure, compaction and rutting. These activities may lead to soil and ground instability and erosion.

The removal of vegetation and disturbance or compaction may cause reduced aeration or absorption capabilities. The lack of vegetative cover and compaction may lead to altered surface water run–off and erosion leading to potential sedimentation in the Williams Creek drainage.

In addition, the removal of vegetative cover and soil and/or compaction may lead to effects to any permafrost. As per the proposal, permafrost is not anticipated to be present below the heap leach pad and events pond area (the land was cleared in 1997 and melting would have occurred at that time). However, the WRSA has permafrost soils which will be thawed and removed.

The implementation of the recommended mitigative measures will largely control and reduce the effects on soil structure and stability. However, ongoing activities at the mine site will result in residual effects in terms of alteration of the ground surface (vegetation removal) and soil characteristics which contribute to the current soil ecology of the mine site area, and to some degree, the mine access road route. These effects may not be mitigated until reclamation and closure measures are completed and the full natural regeneration of the mine site and road can begin and take hold over the longer term.

The spatial scope of the changes to and disruption of soil ecology is primarily confined to the mine site roads and infrastructure sites as well as along the mine access road. The nature of these effects is such that they are not likely to spread or combine in any way within these areas.

Soil disturbance and soil structure alterations will occur during mine site and mine access road construction. Soil compaction and the potential for rutting may continue throughout the operations and closure phases of the Project. It is expected that effects on permafrost will be limited to the construction phase, providing that adequate geotechnical design and engineering standards are met by the Proponent.

There are no other projects/activities that will occur within the mine site or along the mine access road as these areas will have restricted access and only mine personnel and authorized visitors will be permitted to enter this area.

Given the limited spatial scope of these residual effects, there will be no other projects/activities effects that are anticipated to combine with the residual effects of the Project to result in significant cumulative effects.

6.5.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse direct, indirect or cumulative effects are anticipated to occur with respect to soil stability at the mine site.

6.6 HERITAGE/HISTORIC RESOURCES (MINE SITE AND ACCESS ROAD)

6.6.1 OVERVIEW

The protection and maintenance of heritage/historic resources is addressed under YESAA, the *Historic Resources Act* (Yukon) and the Yukon First Nation Final Agreements (YFNFA). For the purposes of this assessment, the term *heritage/historic resources* is intended to encompass “heritage resources” as defined in YESAA and the YFNFA, as well as “historic resources” as defined in the *Historic Resources Act* (Yukon).

YESAA defines heritage resources as:

- A moveable work or assembly of works of people or of nature, other than a record only, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic, or aesthetic features;
- A record, regardless of its physical form or characteristics, that is of scientific or cultural value for its archaeological, paleontological, ethnological, prehistoric, historic or aesthetic features; or,
- An area of land that contains a work or assembly of works referred to in (a) or an area that is of aesthetic or cultural value, including a human burial site outside a recognized cemetery.

Yukon First Nation Final Agreements define heritage resources as:

- Moveable heritage resources;
- Heritage sites; and,
- Documentary heritage resources.

The *Historic Resources Act* (Yukon) defines historic resources as:

- A historic site;
- A historic object; and,
- Any work or assembly of works of nature or of human endeavour that is of value for its archaeological, paleontological, pre-historic, historic, scientific, or aesthetic features.

Heritage/historic sites include areas of land which contain works or assemblies of works of people or of nature that are of scientific or cultural value, and may include such things as cabins, graves, bush camps and culturally important gathering sites. Heritage/historic sites are typically greater than 50 years antiquity; however, sites which are of less than 50 years of age may also be of interest and value. Heritage/historic resources include artifacts related to heritage sites and human activities, documentary heritage resources, and heritage sites. Humans have been present in the proposed Project area for a relatively short period of time (i.e., 1000s of years), therefore heritage/historic resources are essentially on or near the surface of the ground. The value of these resources rests within their context upon the land in which they are located, in essence, when they are *in situ*. Once disturbed or removed the value may be impacted.

Heritage/historic resource sites are generally located in areas used for living, harvesting or traveling purposes; for example, alongside waterbodies, on high terraces and near harvested resources. Heritage resource sites are generally limited to relatively small, well-defined areas. As such, the effects assessment boundaries for heritage/historic resources were restricted to the zone of disturbance within the Williams Creek and Nancy Lee Creek valleys (the extent of the Project site) and within a 50 m wide corridor along the proposed mine access road. Potential effects on heritage resources along the Freegold Road are described in Section 7.5. The temporal scope for the assessment includes potential effects to heritage/historic resources over the lifespan of the Project, from initiation of construction to post-closure.

Two archaeological/heritage resource assessments were conducted in the Williams Creek Valley for the Project. An archaeological impact assessment was conducted for the Project in 1992 (Merchant et al., 1993), and an archaeological/heritage resource overview assessment study was conducted in 1994 (Rousseau and Handly, 1995). A follow-up study was conducted in September 2007.

No archaeological sites were identified directly within the Project footprint; two historic archaeological sites were identified and recorded within the greater study area outside of the mine footprint during the 1992 assessment. The first of these sites was found at the confluence of Williams Creek and one of its tributaries approximately 1.25 km from the Yukon River, and the second on the Yukon River approximately 1.25 km from the mouth of Williams Creek. Western Copper stated that these two sites are known and documented and will not be disturbed.

An area with a high potential for heritage sites is located at the confluence of Williams Creek and the Yukon River. No Project activities are planned to take place at this location.

Three locations near the proposed mine access road are considered to be of medium potential for heritage/historic resources. Western Copper indicated that further archaeological investigation of the three locations in the vicinity of the proposed mine access road, considered to have medium potential as heritage sites, will be undertaken prior to commencement of road construction.

The Project development activities have the potential to disturb and/or destroy both known and unknown heritage/historic resources if suitable mitigation measures are not implemented. Any material damage to heritage/historic resources is considered a significant adverse effect.

6.6.2 EFFECTS CHARACTERIZATION

There is a potential for heritage/historic resources to be adversely affected during the development of the Project in the following ways:

- Land clearing;
- Road and trail construction/use; and,
- Excavation and placement of soils/rock in areas proposed for development

The Executive Committee considers potentially adverse effects to heritage/historic resources to be significant.

The Executive Committee concurs with the Proponent that a heritage/historic resources assessment must be conducted for all land with “high or medium heritage site potential” proposed to be disturbed by Project activities. A qualified professional should conduct the assessment and prepare a report of the results. The results of the assessment(s) must also be submitted for review and approval by the YG-Heritage Resources prior to initiating any land-altering activities in these areas. If heritage/historic resources are discovered during the assessment, Project activities must be planned to avoid disturbance to the site(s).

The Executive Committee has considered the requirements of the *Historic Resources Act* (Yukon) and the Archaeological Sites Regulations pertaining to heritage/historic resources and is satisfied that compliance with these regulatory instruments will largely mitigate potential significant adverse effects of the Project on heritage/historic resources.

6.6.3 REQUIRED MITIGATIVE MEASURES

To identify and protect heritage/historic resources:

56. The Proponent shall retain a qualified professional to conduct a heritage/historic resources assessment of the proposed mine access road routing prior to commencement of construction. The assessment results must be submitted to the appropriate authorities for review and approval before any land disturbance is conducted. The scope of the assessment shall be commensurate with the requirements of the *Historic Resources Act* (Yukon).
57. If areas identified as having a high or medium potential for heritage sites are proposed to be disturbed by Project activities, a heritage/historic resources assessment of those areas must be conducted by a qualified professional. The assessment results must be submitted to the appropriate authorities for review and approval before any land disturbance is conducted. The scope of the assessment shall be commensurate with the requirements of the *Historic Resources Act* (Yukon).
58. All known heritage/historic resources must be appropriately marked in the field, before commencing any Project activities which may disturb them. Markings may be removed after construction, or as stipulated by the appropriate authority.
59. The Proponent shall not carry out activities in the vicinity of known heritage/historic resources unless the appropriate authorities indicate, in writing, that such activities may be carried out.
60. The Proponent shall immediately mark and protect from further disturbance any sites containing heritage/historic resources discovered in the course of carrying out an operation. As soon as practical, the Proponent shall report the discovery to the appropriate authority in accordance with any relevant legislation. The Proponent shall not carry out any activities in

the vicinity of any sites containing heritage/historic resources until the appropriate authorities indicate, in writing, that the activities may be resumed.

61. The Proponent shall, as part of general employee training, include instructions on the identification of heritage/historic resources.

6.6.4 CUMULATIVE EFFECTS ASSESSMENT

The nature of heritage/historic resources is such that it is very difficult to predict the exact location of discoveries. It is quite likely that certain heritage/historic resources have been discovered in the larger general area (e.g., traditional-use sites) in the course of historical access and land development, though the exact quantity and nature of these discoveries has not been made known to the assessment. Determining the potential cumulative effects to heritage/historic resources is difficult, unless the exact nature of the resource is known ahead of time (i.e. location and boundaries). Also, most individual heritage/historic resources that are separated by any meaningful spatial distance are more appropriately considered a ‘singular resource’ rather than a ‘collective resource’, since they may not share commonalities (other than being a heritage resource). Consequently, cumulative effects on these singular resources are relatively rare since direct effects (i.e. the discovery) generally result in a complete and permanent modification of the resource.

In this case, since no other adjacent resources have been identified or previously affected by past or present Projects in the vicinity of the proposed Project, there are no known resources to which the proposed Project may contribute to cumulative effects. It is therefore the conclusion of the Executive Committee that significant adverse cumulative effects, with respect to the proposed Project on heritage/historic resources, are not likely to occur.

6.6.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse direct, indirect or cumulative effects are anticipated to occur with respect to heritage/historic resources.

6.7 PUBLIC AND WORKER HEALTH AND SAFETY (MINE SITE AND ACCESS ROAD)

6.7.1 MINE EMPLOYEE HEALTH AND SAFETY

Mine worker health and safety is the responsibility of Western Copper. To ensure worker health safety, Western Copper will implement the proposed Environmental Management System including the Hazardous Materials Management and the Spill Contingencies and Emergency Response Plans. Western Copper has committed to liaising with the local and regional health services to update them of the potential demands on the system (i.e., number of workers on site) and health and safety measures in place at the mine. The Executive Committee has concluded that in addition to these strategies, existing legislation and regulation regarding worker health and safety will minimize the risks to mine workers. Further discussion is provided in Section 6.8 – Effects of Accidents and Malfunctions (Mine Site and Access Road).

6.7.2 PUBLIC ACCESS TO THE MINE SITE

The mine access road will be a radio controlled private road. In addition, heavy truck traffic along the Freegold Road will be radio monitored by vehicle operation and mine site staff as an added safety precaution. Through the use of controlled gates and/or personnel installed at the intersection with the Freegold Road, the public will not be allowed uncontrolled use of the mine access road.

At the immediate property boundary (mill lease site) there will be a staffed gatehouse with security gate and security fencing extending a reasonably visible distance into the forest. Property fencing will be installed in less accessible areas consisting of some combination of wire and wood fencing to restrict unauthorized personnel from entering the mine site.

Security at the mine site will also involve controlled access into on-site work areas. The process area will be completely enclosed by a 2.4 m high wildlife fence. Additional security fencing will be installed around the warehouse storage yard and the cathode shipment door.

These measures will ensure that the public is not allowed to stray unintentionally onto the property and be exposed to mine operations resulting in potentially serious accidents.

The Executive Committee concludes that these access control measures are adequate to ensure that public health and safety are not at risk of injury from any accidents that could occur if accessing the mine area.

6.7.3 REQUIRED MITIGATIVE MEASURES

To minimize the likelihood and magnitude of effects on worker health:

62. The Proponent shall implement the proposed Environmental Management System (EMS) including the Hazardous Materials Management Plan, the Spill Contingency Plan and the Emergency Response Plan (as per Appendix L of the Project proposal) to both minimize

health and safety risks and provide effective and efficient response to accidents or emergency situations. Employees shall be trained in appropriate emergency/spill response protocols.

63. The Proponent shall develop mine health and safety protocols and procedures to guide how it will provide on-site emergency response and first aid measures, and how it will provide emergency medical transportation from the mine site to Carmacks or another appropriate health facility, for emergency response. This will include the identification of key contacts, and the identification of specific high risk situations and chemicals that will be present at the mine along with associated treatment protocols. The Proponent will provide these protocols and procedures to YG-Health and Social Services (Community Nursing) and to YG-Community Services (Emergency Medical Services) before mine construction begins and will work with YG-Health and Social Services and YG-Community Services to ensure that the responsibilities for all parties for emergency medical response are clearly understood and agreed to.
64. The Proponent shall ensure Project personnel are adequately trained in emergency response and first aid measures. A designated health and safety officer and safety manager shall be on-site at all times.
65. The Proponent shall monitor environmental components such as water and air quality to ensure compliance with the terms and conditions of the water use licence and air emissions permit, respectively and to ensure that if levels of hazardous/dangerous substances rise above safe levels the appropriate emergency response can be deployed.

6.7.4 CONCLUSION

The Executive Committee has determined that with the proposed access controls in place, the full implementation of the EMS/Emergency Response Plans and the application of relevant workplace health and safety legislation and regulations that the Project will not result in any significant adverse direct, indirect or cumulative effects to public or worker safety.

6.8 EFFECTS OF ACCIDENTS AND MALFUNCTION (MINE SITE AND ACCESS ROAD)

The project proposal identified the following mine site activities which, if involved in an accident or malfunction may result in significant adverse effects.

- Storage, and handling of dangerous/hazardous materials including:
  - Elemental (molten) sulphur, sulphuric acid
  - Petroleum fuels and lubricants;
  - Other process reagents or hazardous materials;
  - Explosives materials (ammonium nitrate and fuel oil);
- Construction, operation, decommissioning water collection, conveyance, and storage infrastructure (e.g., process plant, pipelines, pumps, sediment ponds, pregnant leach solution storage pond/events ponds);
- Construction, operation, decommissioning of the heap including the leach pad and confining embankment;
- Development, operation, decommissioning of the open pit;
- Construction, operation, decommissioning of the WRSA.

In the event of an accident or malfunction involving these activities there is potential for significant adverse environmental and/or socio-economic effects on surface/ground water, soil, air quality, fish and wildlife and human health and safety. All of the mine site activities will continue for the life of the mine, until the mine is reclaimed and closed.

6.8.1 STORAGE AND HANDLING OF DANGEROUS/ HAZARDOUS MATERIALS (SPILLS)

6.8.1.1 Effects Characterization

The risk of accidents and malfunctions at the mine site lie in the event of failures of transportation vehicles and procedures, structures/facilities, processes, equipment and in human error.

The risk is that during handling or processing of dangerous/hazardous materials an accident or malfunction could cause a release or emission to local drainages, to air or to ground. The release of these substances may result in various adverse environmental effects, including the degradation of surface and ground water quality, contamination of soils, air pollution and effects on human health. The Executive Committee recognizes that the transportation, handling and storage of many of these materials are subject to existing legislation and regulations.

The most common result of an accident or malfunction is the uncontrolled release or spill of dangerous/hazardous materials including: sulphur, reagents, sulphuric acid, ammonium nitrate and fuel. Uncontrolled materials spills could have effects on aquatic life and wetlands including decreased aquatic productive capacity downstream of spill sites or through groundwater transport. Repeated small spills at high-use areas could affect soils and potentially vegetation and wildlife. Regular spills may lead to the accumulation of sub-lethal concentrations of the associated chemical compounds in fish and invertebrates living downstream of the mine.

The Proponent is required to have a Spill Contingencies and Emergency Response Plan as well as appropriate spill response equipment available. Specifically for the mine site, many of the facilities have ditching and precipitation\groundwater control in the event of a spill. The right-of-way for on-site haul roads is proposed at 26 m in order to include ditching. Ditches on the down-slope side of the south haul road (between pit and leach pad), west haul road (between plant and camp) and the explosives storage access road may be particularly important to slow the flow, or temporarily contain, any down-slope spills. This temporary containment may allow the mobilization and application of spill response equipment and personnel.

However, uncontrolled accidental discharges of dangerous/hazardous materials may cause significant adverse effects to surface/ground water and soil quality.

The Proponent used a risk assessment approach to meet this requirement, and has committed to developing a comprehensive and detailed Contingencies and Emergency Response Plan as part of Project permitting/licensing. A commitment has also been made to update and test this plan periodically during operations as part of the company's ongoing risk management program. This plan would be incorporated into the overall Environmental Management System (EMS) for the Project.

The Proponent has committed to adopt best management practices for the storage, handling and use of dangerous/hazardous materials from arrival on the mine site to final disposal at a licensed off-site waste facility. Non-discretionary legislation applies to mine site handling and use of these substances including:

- *Environment Act* (Yukon)
    - Spills Regulations
    - Air Emissions Regulations
    - Contaminated Sites Regulations

6.8.2 EQUIPMENT/MACHINERY COLLISIONS OR FAILURE

Accidents and malfunctions that could occur relating to human error and/or equipment/machinery may involve direct physical injury to people and in extreme cases mortalities. Frequency and severity of accidents can be minimized by putting the appropriate safety management policies in place, encouraging and enforcing compliance and properly training employees. Furthermore, when accidents do occur, having the appropriate systems and resources available and ready to respond is essential.

These accidents and malfunctions could include:

- vehicle accidents occurring through mine site movements of workers and materials;

- construction and mining equipment/machinery failures

The project proposal states that Project operational labour requirements are expected to range from 113 positions in the first year to a peak of 181 positions in the fourth to sixth year of production. The seasonal nature of the mining and pad loading part of the operation will result in peak labour requirements during the summer months of each year.

The mine will have established emergency protocols and its own on-site primary emergency care, including an ambulance, fire truck, and emergency personnel. The Proponent has identified the use of health infrastructure and programs provided in Carmacks as a resource to be used in response to accidents. Medical services are provided through the Carmacks Health Centre which provides acute care presentations and community health service from Monday to Friday and employs two nurses. Acute care services are basic and would include care such as suturing, assessment and treatment of common conditions. Emergency medical services are available 24-hours per day, seven days per week as the nurses provide on-call response. Emergency medical services are provided by volunteer ambulance personnel in the community. Whitehorse provides back-up support when volunteers are unavailable. Physician services are provided bimonthly by alternating physicians from Mayo and Faro. Medevac services are available from Whitehorse to provide transport via road or air. Severe conditions, such as chemical exposure or major trauma, would be stabilized and transferred to Whitehorse for care and treatment.

YG-Health and Social Services has indicated that the Carmacks Health Centre would need to be apprised of mine health and safety protocols before mine construction begins to delineate the responsibilities of all parties.

The Proponent has committed to ensuring that the emergency and full care services in Carmacks and Whitehorse are alerted as soon as is practicable should a serious accident or malfunction result in injured workers needing to be transported quickly to these locations.

The Executive Committee assumes that health and safety parameters (e.g., injury rates, accidents, near-misses) will be monitored as per the Project EMS.

6.8.3 EXPLOSIVES

6.8.3.1 Overview

The mining process requires the use of explosives to break apart the rock in the open pit for recovery of the ore for processing and separation from the surrounding waste rock. Due to the relatively large volumes of ammonium nitrate/fuel oil explosives required and the remote location of the mine site, explosives will be manufactured on-site. Small, cartridge-based explosives are required during construction for initial site grading and road construction purposes. The Proponent has indicated that it will contract with a third party for the provision of explosives, including operation of the manufacturing facility and explosives storage magazine. The Proponent does not propose to use explosives during mine closure.

Natural Resources Canada (NRCan) is responsible for regulating the manufacture and storage of explosives under the *Explosives Act.* An explosives factory licence issued by the Explosives Regulatory Division of NRCan is required for the on-site manufacturing proposed. The following information must be provided to meet NRCan requirements:

- The type and volume of explosives that will be used for the Project;
- How the explosives will be transported, stored and used at the site;
- Safety measures that will be used to reduce the frequency of misfires and other potential incidents involving explosives; and
- An explosives monitoring program and safety/accident reporting program.

There are other regulatory considerations in the manufacturing and use of explosives on the site, including:

- Explosives Regulatory Division of NRCan under the *Explosives Act*;
- Transportation Canada *National Transportation Act*, Ammonium Nitrate Storage Facilities Regulations;
- *Occupational Health and Safety Act* (Yukon), Blasting Regulations;
- Transport Canada *Transport of Dangerous Goods Act*, Transportation of Dangerous Goods (TDG) Regulations; and
- Explosives facility to meet Bulk Guidelines published by the Explosives Regulatory Division of NRcan and local and federal regulations.

Explosive materials that will be stored on-site prior to consumption include: detonators, primacord, boosters and connectors. These will be stored in prefabricated magazines that will be selected and located in compliance with local and federal regulations. Ammonium nitrate prills will be stored in a silo facility provided by the explosives supplier. Blastholes will be charged with ammonium nitrate and fuel oil blasting agent by means of a truck-mounted ammonium nitrate and fuel oil supply and slurry mixing/dispensing unit. The explosives supplier is responsible for obtaining any necessary authorizations.

6.8.3.2 Effects Characterization

Accidents and malfunctions involving explosives or explosives constituents could occur during the transport (off-site or on-site), storage or handling of these materials. The VESECs that would most likely be affected by such accidents or malfunctions are surface water quality, aquatic resources, soil quality, and human health and safety.

While the likelihood of accidents and malfunctions resulting in spills or releases of explosives constituents during transport or on-site may be low, the consequence of a release of these contaminants to water and/or soil may be considered potentially significant and adverse. Likewise the effects to human health and the environment associated with an accidental explosion could be significant, though the likelihood of this is low.

Ammonium nitrate and fuel oil are considered chemical contaminants and if released to the ground or a waterbody could affect soil or water quality. The seriousness of a spill of ammonium nitrate or fuel oil would be dependant upon the amount released and the physical conditions under which these materials enter the environment. Prilled ammonium nitrate is solid and dry and would be easily recovered from the ground in the unlikely event of a spill and soil contamination would likely not result. Fuel oil spills, in contrast, are difficult to clean up will flow downslope and may seriously impact soil and water quality.

Ammonium nitrate is not an explosive material until combined with fuel oil in a specific ratio down-the-blasthole and requires significant initiation energy to produce an explosion under tightly controlled conditions.

The Proponent will be responsible for the safe management of explosives and explosives constituents at the mine site. The Proponent has indicated that it intends to contract the supply, delivery, on-site storage and management of explosives to a qualified explosives contractor. The contractor will be responsible for manufacturing ammonium nitrate and fuel oil explosives on-site for use in mining activities and for servicing the explosives during initial site development and mine pre-stripping. The Executive Committee assumes that the Project Spill Contingency and Emergency Response Plans will be developed further as part of the permitting process and will include details on the procedures to address any incidents involving explosives.

As previously mentioned, the manufacture and storage of explosives for the purposes of the Project are subject to the terms and conditions of an explosives factory licence.

6.8.4 WATER CONTROL SYSTEMS

6.8.4.1 Overview

It is not anticipated that the Project will discharge water until closure. Excess process solution is managed by SX/EW plant in combination with the heap and controlled using the events pond and if needed, a sediment pond. Furthermore, the Proponent indicates that the HDS treatment plant will be operational for year one, concurrent with ore placement to manage emergency scenarios, such as a liner leak or to facilitate detoxification of the existing heap due to premature closure or extended temporary cessation of mine operations. While the likelihood of a process solution leak is low, the magnitude of the effect is moderate. Section 6.1 specifically addresses water-related issues. The potential effects of accidents and malfunctions on water quality and aquatic resources VESECs are discussed here.

6.8.4.2 Effects Characterization

Generally, accidents and malfunctions involving water collection, conveyance and storage infrastructure could range from embankment failures in events/sediment ponds to failures of process plant machinery/equipment, pumps and pipelines and power outages. Such failures could lead to uncontrolled releases of sediment and/or untreated process solution. Process solution will be acidic and relatively high in dissolved metals.

During operations all water collected at the heap, WRSA and from other operational areas of the mine site, will be directed to the events pond for use as process water. A failure of the water collection and storage system could result in a release of sediments and contaminated water to the soil or surface water in the vicinity of the events pond with potential to infiltrate ground water. Such an occurrence could result in various environmental effects, including:

- the degradation of water quality,
- effects on aquatic resources (fish and fish habitat and other aquatic organisms)

6.8.5 HEAP LEACH PAD

6.8.5.1 Overview

Accidents or malfunctions in any of the structures, processes and/or equipment used could result in mass materials flows, metals and acidic water releases to local drainages or to soil. Failures in the operation of the heap, heap pad, events and sediment ponds could result in adverse effects to the soil and water quality VESECs.

6.8.5.2 Effects Characterization

Failures in the heap related structures could be caused by permafrost melting, a runoff event exceeding design flood or snowmelt event or design/construction errors or equipment malfunction including. These potential failures include:

- Failure of heap or events/sediment ponds embankments, diversion ditches, or emergency overflow structures.
- Inadequate solution capacity design in heap leach pad, events pond, process plant or water treatment plant.
- Pad liner leakage or tear (mechanical or human error).
- Leak detection and recovery system failure and seepage to groundwater.
- Pumping and redundant system failure (mechanical or human error).

The effects of these failures could involve overland flow of materials, metals and acidic water to Williams Creek. The Creek has low aquatic production and small size and no fisheries resources in the upper drainage, however, lower Williams Creek and the receiving Yukon River have sensitive important fish species (juvenile Chinook salmon). This small stream has a limited ability to dilute materials, sediments and complex metals or buffer pH. Hence, there is a high hazard posed by the accidental release of untreated solutions and medium to high consequences to the aquatic ecosystem, particularly if the Yukon River is affected.

During operation of the leach pad, the leak detection and recovery system should provide adequate feedback to the operators of the mine regarding the performance of the liner. In the unlikely case of a leak through the primary liner (the top liner) the leak detection system should observe the leak and the recovery system will recapture the process solutions. Addition of process solution to this area of the pad can then be halted and the leak attended to. However, in the event that the secondary pad is also compromised, process solutions could enter the environment and adversely affect groundwater and/or surface water quality. The Proponent has proposed the installation of foundation drains below the synthetic liners which would have any leakage flow to the events pond.

It is understood that the Proponent will have the ability to actively pump solutions to the heap continuously until a leak is fixed. Furthermore the Proponent has proposed a redundant pumping system at the ready to adequately gather and discharge these heap solutions in such cases of emergency. The Executive Committee recognizes the infrastructure redundancy proposed by the Proponent with respect to liners, pumps, and containment ponds.

6.8.6 OPEN PIT

6.8.6.1 Overview

The Proponent determined that the environmental effects of slope failure of a pit wall would have minimal or negligible environmental effects. Failures would have safety implications but monitoring would provide advance warning of the generally progressive types of failures in these facilities.

If the heap is located and loaded too close to the west wall of the pit, the loading could contribute to wall failure.

6.8.6.2 Effects Characterization

A failure of the pit wall would be contained within the pit. Workers in the pit could be at risk of this failure.

6.8.7 WASTE ROCK STORAGE AREA

6.8.7.1 Background

Accidents or malfunctions in the operation of the WRSA and sediment pond could result in adverse effects to the soil and water quality VESECs. Failures in the design and/or equipment used could result in mass materials flows and potentially, though unlikely, the release of metals and acidic water to local drainages or to soil.

The Proponent determined that the environmental effects of slope failure of the WRSA would have minimal or negligible environmental effects. The waste rock dump will be located upstream of the main sediment control pond facility. The pond embankment will ensure that any temporary environmental effects, principally the increase in total suspended solids, can be contained within the Project footprint.

However, comment submissions indicate that slope failure may have a higher probability and that potential environmental effects of such an event could be significant and adverse.

6.8.7.2 Effects Characterization

Permafrost in the mine site area reportedly varies in depth from approximately five to 15 m. and the active layer (the thickness of soil that thaws each summer and freezes each winter) is approximately 3 m thick on north facing slopes and 5 m thick on south facing slopes. The proposal acknowledges that thaw of soils below the waste dump is likely.

Thawing of permafrost in fine-grained soils with high moisture content can lead to very low soil stability. The construction of structures, including waste rock dumps, on these types of materials, when thawing may occur, can be very challenging. The major malfunction that could occur because of melting permafrost is slope failure.

Should the embankments also fail, then materials movement down gradient to North Williams Creek could occur. A large materials flow would impair forested drainages in the WRSA including surrounding smaller creeks. North Williams Creek is very small and has with limited ability to transport materials down gradient and dissipate the impact of a materials flow.

Other failures could occur arise from a runoff event exceeding design flood or snowmelt event, other design/construction errors or equipment malfunction. A failure of the WRSA water and sediment management system could cause sediment and/or metals releases as follows:

- *Sediment release* – design, construction or maintenance errors/events combined with a flooding event could lead to failure of infrastructure such as inadequate sedimentation capacity design (sediment pond filling up);
- *Metals release* – improper separation of waste rock from ore and design/construction errors could lead to failure of infrastructure and cause metals rich sediments and water movement down gradient to a watercourse. The Executive Committee recognizes that this can be avoided through proper ore/waste rock separation and the exclusion of acid generating rock or ore in the WRSA.

Section 10.0 considers permafrost melting as influenced by climate change warming. While this effect may also influence the stability of mining infrastructure such as the WRSA it is considered to be more a post mine closure matter.

6.8.8 REQUIRED MITIGATIVE MEASURES

In addition to the applicable measures recommended in Section 6.1 (Water Resources – Mine Site and Access Road) and Section,6.7 (Public and Worker Health and Safety – Mine Site and Access Road) the Executive Committee recommends the following mitigative measures:

To decrease likelihood and severity of exposure to dangerous materials:

66. The Proponent shall immediately implement the Spill Contingency Plan and/or Emergency Response Plan, as appropriate, should an accidental spill or release of dangerous/hazardous materials occur.

67. The Proponent shall ensure that all employees involved in handling dangerous/hazardous materials receive the appropriate training.
68. The Proponent shall ensure that all dangerous/hazardous materials storage and containment areas are protected, signed, and monitored as part of the Environmental Management System.
69. The Proponent shall ensure that all dangerous/hazardous materials are segregated and stored to ensure the integrity of product containers, avoidance of accidental mixing and their safety from weather effects.
70. The Proponent shall ensure that secondary containment measures for dangerous/hazardous materials shall be in place, as appropriate, to ensure worker health and safety and environmental protection.
71. The Proponent shall ensure that dangerous/hazardous materials handling facilities and fuelling stations are equipped with secondary containment.
72. In the event of a spill or release, the Proponent shall immediately implement the Project Spill Contingency Plan and/or Emergency Response Plan, as appropriate.

To minimize potential effects of forest fires:

73. As proposed by the Proponent, a Fire Water System shall be installed at appropriate places at the mine site and redundant pumping equipment and power sources shall be made available.
74. As proposed by the Proponent, emergency response personnel shall be trained in fire fighting.

To minimize risks associated with explosives:

75. The Proponent shall develop an Explosives Management Plan as part of the Environmental Management System for the safe manufacturing, handling, storage and use of explosives at the mine site.
76. Ammonium nitrate, and other explosive materials as appropriate, shall be transported and delivered to the mine site in licensed bulk container vehicles; the transport vehicles shall be equipped with spill kits.
77. As part of the Explosives Management Plan, the Proponent shall identify and implement appropriate signage, containment and safety measures for explosive storage and management; this may include but is not limited to fencing, gates, berms, dispensing vehicle management. As proposed by the Proponent, the explosives storage magazines shall be located in a bermed area.
78. As proposed by the Proponent, security measures shall be in place to limit access to the explosives storage magazines. Only authorized personnel shall have access to the magazines.

79. The Bulk Explosives Facility shall meet Bulk Guidelines published by the Explosives Regulatory Division of NRCan and local and federal regulations (e.g., Ammonium Nitrate Storage Facilities Regulations).

80. As proposed by the Proponent, un-detonated explosive in blastholes shall be washed out prior to pit excavation.

81. As proposed by the Proponent, fuel oil shall be stored in the Mine Fuel Storage facility located in a bermed, lined containment area.

To decrease likelihood of infrastructure failure:

82. The Proponent shall meet design/engineering, construction performance and best practices standards for the water collection and storage structures and equipment.

83. The Proponent shall meet design/engineering, construction performance and best practices standards for the heap structures and equipment.

84. The Proponent shall implement preventative engineering and design measures including:

    a. Stand-by emergency power generation;

    b. Redundant systems where appropriate and in line with standard engineering practices (pumping, piping, equipment and power); and,

    c. Construction of a high density sludge (HDS) treatment plant prior to placing ore onto the heap.

85. The Proponent shall design and construct the events pond, with a capacity to store solution volumes resulting from a combination of extreme events. Specifically, the events pond will have the capacity to store at a minimum:

    a. The operating solution volume, plus;

    b. Meteoric precipitation inflow from the 1 in 100 year event occurring at the most critical point in time, plus;

    c. An allowance for heap draindown as follows:

        - During the first year of operation, 100 percent of the total potential heap draindown volume, or

        - During subsequent years of operation, 48 hours of draindown (predicted 10 days of actual draindown) at the full rate of solution application.

86. The Proponent shall ensure that qualified personnel are on-site at all times during operations to implement redundant control and treatment systems as necessary.

87. The Proponent shall implement the leak detection and recovery system (LDRS) as proposed.

88. The Proponent shall develop and implement a pit wall monitoring program to provide an early warning system for pit wall failure to minimize worker injuries. The details of the pit wall monitoring program will be provided in the Proponent’s mining license application.
89. The Proponent shall conduct geotechnical testing between the heap and the pit to ensure that heap loading will not contribute to pit wall failure.

6.8.9 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse effects are anticipated to occur with respect to the effects of accidents and malfunctions at the mine site.

7.0 FREEGOLD ROAD AND BRIDGES

This section addresses potential adverse effects to VESECs associated with transportation of Project equipment, materials and personnel along the Freegold Road – from the Nordenskiold River Bridge (km 0), over the Crossing Creek Bridge (km 25.5) to the mine access road (km 35).

7.1 PUBLIC HEALTH AND SAFETY (FREEGOLD ROAD AND BRIDGES)

7.1.1 OVERVIEW

Three main issues associated with Project transportation have been raised through the assessment process: use of the Freegold Road, use of the Nordenskiold River and Crossing Creek bridges, and Project traffic routing through the Village of Carmacks (addressed under *Community and Region* in Section 8.1).

7.1.1.1 Freegold Road

The Freegold Road is used by local people, other Yukoners, developers, and tourists to access the general area west and north of Carmacks for a variety of purposes. The Proponent has proposed to use the Freegold Road to access the mine site year-round. All Project equipment, materials and personnel will be transported to the mine site via the Freegold Road. Concern has been raised regarding the potential effects to current users of the Freegold Road and adjacent land (see also Section 7.3 *Current Land Use (Freegold Road and Bridges)*).

The Freegold Road is a secondary access road currently maintained during the summer by YG-Highways & Public Works. In general, the road is below an 80 km/hr secondary road standard; the current posted speed limit is 40 km/hr. As indicated by YG-Highways and Public Works in its comment submission to the Executive Committee, with the exception of the 5 km section upgraded in 1995, the existing Freegold Road is currently a seasonal use road "that was never constructed to any particular standard, but has evolved to its existing level over years of use". There are several narrow, single-lane portions with limited visibility and little or no passing opportunities along the road, which may pose a safety risk to users with the increased volume and size of truck traffic proposed by the Proponent. The anticipated overall Project traffic volumes will amount to an average of 30 to 35 roundtrips per day during construction and an average of less than 30 roundtrips per day during operations. On average, one heavy load roundtrip per day (maximum of seven to eight heavy load roundtrips per day) is anticipated during construction; during operations, an average of six heavy load roundtrips per day is estimated, with a maximum of nine large loads per day. The Project traffic represents an approximately 2.5-fold increase in current traffic volumes on the Freegold Road, which is still a relatively low traffic volume when compared with other secondary roads in the Yukon (B. Laird, pers. comm., 2007).

The Freegold Road is currently not ploughed during the winter. The current practice by the YG-Highways and Public Works in maintaining the Freegold Road is to perform two passes with a grader per year during the spring/ summer months. YG-Highways and Public Works also inspects all culverts with greater than 1 m diameter once every second year. From these inspections, deficiencies in the structures are identified and recommendations are made in order to ensure the culverts are properly maintained and remain in acceptable condition.

7.1.1.2 Nordenskiold River Bridge and Crossing Creek Bridge

There are two single-lane bridges along the Freegold Road route – a Bailey bridge at the Nordenskiold River (km 0) and a steel girder bridge at Crossing Creek (km 25.5). The Nordenskiold River Bridge was constructed in 1959 and the Crossing Creek Bridge was installed in 1990. It is understood that both bridges have a load rating of 33 000 kg for a tractor and semi-trailer arrangement. YG-Highways and Public Works indicated in its comment submission to the Executive Committee that the Nordenskiold Bridge was intended to be a temporary structure and that it is “long past any reasonable expectation for service life”. YG-Highways and Public Works indicated that the additional traffic loads proposed by the Proponent will contribute to the deterioration of the structure to the point of potentially requiring upgrades or replacement. Concern has been raised about the ability of these two bridges to withstand the increased usage that would result from the Project.

YG-Highways and Public Works inspects the bridges once every two years. Bridge inspections records from 2005 indicate that the superstructure and substructure of the bridges were in operable, but generally poor to slightly above poor condition, and that important repairs, upgrades, or improvements should be made in the near future. Special recommendations made by the Bridge Inspector for the Nordenskiold River Bridge included reconstruction of the abutments for 2007 and consideration of a longer span for the bridge. The abutments of the Nordenskiold River Bridge have not been reconstructed since this inspection in 2005; however, YG-Highways and Public Works has indicated that the current abutments are safe for the intended uses of this bridge (R. Magnuson, pers. comm., 2007). Special recommendations made for the Crossing Creek Bridge included monitoring the horizontal and vertical alignments of the abutments due to concerns over watercourse scouring, and calculating a specific load rating for the bridge due to concerns over the poor condition rankings for abutment stability at the time of inspection.

7.1.1.3 Staging Area

If current weight restrictions are exceeded for the Freegold Road, the Nordenskiold River Bridge and/or the Crossing Creek Bridge, some of the larger Project loads may require splitting into smaller, lighter loads. Weight restrictions may be placed on the Freegold Road during the spring thaw (approximately six – eight weeks), likely amounting to 75 percent of the legal allowable limit. At present, the Nordenskiold Bridge does not have a cold weather load restriction in place. With the increase of Project traffic anticipated, however, it is likely that a restriction will be implemented. This would mean that when temperatures drop below -35ºC, the gross weight limit for the Nordenskiold River Bridge could be substantially cut (up to one-half the current allowable limit). The Crossing Creek Bridge is not subject to cold weather weight restrictions. Load splitting would result in increased Project traffic volumes, which the Proponent has incorporated into the estimates provided in the Preliminary Traffic Management Plan.

The Proponent has proposed the use of a staging area to support load splitting to meet road/ bridge weight restrictions. The staging area would also be used as a meeting point to organize convoys. The Proponent is considering two sites for the staging area: one near Casino Way, 1.5 km south of Carmacks, and one at the intersection of Rowlinson Drive and the Klondike Highway. The Proponent has indicated that the location of the staging area will not be determined until Project permitting is complete. At this time, the Casino Way staging area is the preferred option.

7.1.2 EFFECTS CHARACTERIZATION

7.1.2.1 Freegold Road

The transport of Project equipment, materials and personnel to and from the mine site has the potential to adversely affect the safety of other users of the Freegold Road in the following ways:

- Vehicle-vehicle collisions could result in property damage, personal injury and/or death.
- Project vehicle collisions with off-road vehicles (e.g., snowmobiles, ATVs) or pedestrian users of the road, could result in property damage, personal injury, and/or death.
- Accidents or incidents on the roadway may cause closure of the road and/or significant delays in completing transit along the road for both routine transport vehicles and for both special or emergency response vehicles and personnel.

The Executive Committee considers these adverse effects to public health and safety to be potentially significant.

These risks are common to all public and private roads, but there are unique factors associated with the Freegold Road which increase the potential for significant adverse effects to public safety, including:

- The Freegold Road is, for most of its length, a single-lane roadway. Passing along the road is dangerous at almost any location along the route. Large vehicles attempting to pass one another safely during any season would likely be impossible along much of the route.
    - The road is comprised of numerous short, sharp curves that do not provide adequate radii and/or width for a long vehicle to pass any other vehicle. The safety risks associated with the short, sharp curves are further exacerbated by their presence in several steep sections of the road. Vehicle encounters would require the smaller vehicle to back-up, potentially for several hundred metres in order to pull to the side of the road in an area wide enough to facilitate passing.
    - Several sections with full-bench cuts (or deep side cuts) make attempting to pass another vehicle extremely risky.
- Vegetation alongside the road poses a safety hazard because it obstructs sightlines for drivers traveling around corners or accessing the Freegold Road from a trail or access road.

The Proponent has prepared and submitted to the Executive Committee and YG-Highways and Public Works a Preliminary Traffic Management Plan (YES and Access, 2007), which incorporates route improvement and safety measures (e.g., signage, temporary and permanent road improvements and maintenance plans) and traffic monitoring and control measures (e.g., personnel traffic and large load control, public traffic protection measures) to decrease health and safety risks associated with Project related use of the Freegold Road, and to mitigate potential effects to current use of the road. The following is a summary of the measures outlined in the Preliminary Traffic Management Plan:

- Current signage will be evaluated to determine the placement of new warning signs indicating narrow roadway, steep gradients, sharp corners, and no passing zones. Where road conditions cannot accommodate large project vehicles travelling at the posted speed limit, additional signage will be installed. Signs advising the public of the increased large vehicle traffic will also be installed.
- Radio control will be implemented for all mine personnel and subcontractor vehicles. Kilometre posts and truck radio frequencies signage will be installed to allow the mine vehicles to accurately relay their positions.
- Safety pullouts to allow vehicles to pass will be constructed at reasonable intervals. A preliminary investigation of likely pullout locations suggests that nine to ten pullouts would be required. Signs indicating the distance to the next pullout will be installed to discourage drivers from making unsafe passes.
- Convoys accompanied by pilot vehicles will be used where appropriate to increase safety.
- The road will be graded every four to six weeks during the summer and any damaged locations along the roadway (e.g., formation of ruts, softening of the road surface) will be repaired.
- The road will be maintained during the winter months (i.e., ploughed/graded likely two to three times during the winter).
- Glaciation will generally be addressed by the regular winter maintenance, since the ice should be removable using a grader. In the event of an extreme case of glaciation or a location that consistently suffers from glaciation effects, fencing or some similar barrier may be installed to inhibit the formation of ice on the roadway.
- Overall traffic will be minimized by using a shuttle bus to convey most mine personnel to the mine site (if personnel reside in Carmacks); alternatively, workers will be housed onsite. Additionally, Project personnel will be strongly discouraged from driving their personal vehicles to and from the site.

The Executive Committee accepts these measures and is of the opinion that they will help to lessen the potential effects of Project use of the road. The Executive Committee is of the opinion however, that certain aspects of the measures require further consideration to more effectively mitigate safety risks.

YG-Highways and Public Works has indicated that grading at four to six week intervals, as proposed, will not be sufficient based on traffic volumes and type and when considering the lack of road structure. The Freegold Road will be graded during the winter at the discretion of YG-Highways and Public Works.

YG-Highways and Public Works also indicated that with respect to addressing glaciation, grading the Freegold Road to gravel is not financially feasible. Additionally, sanding the road is not a reasonable option, due to the grades that exist. YG-Highways and Public Works advises that all truck traffic will apply tire chains as required to reduce or eliminate accidents due to loss of traction. Pullouts will have to be constructed at glaciation locations to facilitate storage of equipment to deal with glaciation.

The Executive Committee expects that the proposed use of convoys accompanied by an escort/pilot vehicle will reduce the potential for traffic accidents along the Freegold Road. The Executive Committee has determined however, due to the nature of the Freegold Road as discussed previously, the safety risk to public users is the same for one large load truck as it is for a convoy of Project vehicles. The Highways Regulations under the *Highways Act* (Yukon) classifies an overdimensional vehicle as one which is wider than 2.6 m, and stipulates that an escort vehicle must lead vehicles wider than 3.2 m. Section 20 (6) of the Regulations allows for permits to set out additional conditions, including the requirement for escort vehicles for reasons of public safety. As such, the Executive Committee is of the opinion that escort/pilot vehicles should be required for all overdimensional vehicles (i.e., vehicles wider than 2.6 m) – whether they are part of a convoy or travelling individually.

The Proponent has proposed the construction of nine to ten pullouts along the Freegold Road, resulting in approximately one pullout every 3.5 km. The Executive Committee agrees with the Proponent that there is a need to allow following or oncoming traffic to pass and that consequently, the pullouts must be of sufficient size to accommodate the largest convoys anticipated. Unless an exception is granted, the Highways Regulations require that an escort vehicle lead an overdimensional vehicle by at most 500 m. It is likely that an approaching non-Project vehicle would not be aware of the oncoming overdimensional vehicle or convoy until it meets the escort/pilot vehicle, which may or may not be at a pullout location, and could potentially be one kilometre to two kilometres from the nearest pullout. The Executive Committee concludes that in order for pullouts to be effective in mitigating the potential risks to public health and safety, an additional escort/pilot vehicle is required to travel ahead of the pilot vehicle to the next pullout to inform non-Project users of the oncoming traffic and advise them to wait in the pullout until the convoy or overdimensional vehicle has passed.

YG-Highways and Public Works advises additionally that pullout locations will first be determined at sites which best reduce risks to safety, after which additional locations will be sited based on maximum possible spacing.

Since the pullouts are required to adequately address potential effects to human health and safety associated with Project use of the Freegold Road, the development of the pullouts are included in the scope of the effects assessment for this Project. Potential environmental or socio-economic effects associated with the construction of the pullouts are anticipated to be minimal. The construction activities will be localized and will occur in an area of existing disturbance (i.e., within the Freegold Road right-of-way). Affected VESECs may include:

- Wildlife, in terms of construction activities resulting in sensory disturbance.
- Water quality, in terms of construction activities resulting in erosion and increased sediment loading of adjacent watercourses/ waterbodies.
- Heritage/historic resources, in terms of construction activities uncovering or disturbing heritage/historic resources.

Construction of the pullouts will be undertaken by YG-Highways and Public Works. As stated in the Proponent's Preliminary Traffic Management Plan (YES and Access, 2007), a site evaluation of each proposed pullout location will be conducted prior to finalizing the locations. It is assumed that the pullouts will be constructed to appropriate design standards established by YG-Highways and Public Works. Sensory disturbance caused by pullout construction will be localized and short-term; thus, significant impacts on wildlife are not anticipated. It is assumed that the appropriate mitigative measures will be applied to minimize erosion around the pullout sites (see Section 7.4). The Executive Committee notes that the mitigative measures outlined in Section 7.5 to protect heritage/historic resources must be applied to development of the pullouts. It is assumed that prior to commencement of construction a qualified professional will conduct a heritage/historic resources assessment of the proposed pullout locations.

It is anticipated that the upgrades and year-round maintenance proposed to support the Project will result in an increased use of the road by people accessing the area for recreational, traditional and possible exploration purposes and may increase the level of conflict and increase the risk to public health and safety.

7.1.2.2 Nordenskiold River Bridge and Crossing Creek Bridge

As discussed in the overview, it is possible that increased usage of the Nordenskiold River and Crossing Creek bridges could lead to damage requiring repair or potentially replacement. It should be noted that bridge damage or failure could be due directly to increased use by Project vehicles, to induced increased use by public users accessing the Freegold Road as result of being maintained year-round, or to the cumulative impact of both these factors. Regardless of the source of the effect, bridge damage or failure could result in potential impacts to users of the Freegold Road. The Executive Committee notes that there is a large residential area on the west side of the Nordenskiold Bridge, which would be adversely affected if access to the west side of the river was impeded by construction activities on the bridge.

The Executive Committee is of the opinion that increased bridge inspections and maintenance, conducted as appropriate by YG-Highways and Public Works, will be effective in reducing the risk of bridge failure, thereby mitigating the resulting potential impacts to public safety. Potential effects associated with repairs to or replacement of either bridge would be assessed as a separate project (as appropriate). The Executive Committee acknowledges that the Proponent has adequately considered the case of bridge failure in terms of the logistics associated with replacing the bridge in a timely manner. As such, no significant adverse effects associated with delays are anticipated.

7.1.2.3 Staging Area

The Proponent assessed the potential effects associated with the construction and operation of a staging area in general terms and applied it to both alternative locations. The Executive Committee is satisfied with the mitigation measures proposed by the Proponent and offers no additional measures.

7.1.3 REQUIRED MITIGATIVE MEASURES

To ensure input from those potentially affected by traffic and decrease effects of project traffic on other users of Freegold Road:

90. The Proponent shall finalize its Traffic Management Plan in consultation with YG, the Village of Carmacks and the LSCFN, incorporating the route improvement and safety measures, and traffic monitoring and control measures outlined in the Preliminary Traffic Management Plan. The following additional measures shall be included in the finalized Traffic Management Plan:
    a. Appropriate convoy sizing shall be identified by the regulator;
    b. Convoys shall be accompanied by an escort/pilot vehicle;
    c. Overdimensional vehicles requiring an escort/pilot vehicle shall be identified;
    d. Vehicle wider than 2.6 m shall be accompanied by an escort/pilot vehicle;
    e. Escort/pilot vehicles shall inform oncoming traffic of convoys and advise them to stay in the pullout until the Project traffic passes; an additional escort/pilot vehicle may be required to accomplish this task;
    f. To facilitate public vehicle passing of Project convoys, every third pullout shall be large enough to accommodate the largest anticipated Project convoy;
    g. Vegetation alongside the road which obstructs sightlines of users on or approaching the road from adjoining trails or access roads shall be cleared;
    h. Employee private vehicle use to and from the mine site shall be restricted; and,
    i. Kilometre posts shall be oversized and spaced at 1 km intervals.
91. The route improvement safety measures shall be implemented as per the finalized Traffic Management Plan and in consultation with YG-Highways and Public Works to ensure access and safety for users of the Freegold Road. The appropriate measures for the Freegold Road shall be in place prior to construction activities to ensure safety along the route.

To maintain safe passage of project traffic along the Freegold road:

92. The Road shall be graded as required during the summer and any damaged locations along the roadway (e.g., formation of ruts, softening of the road surface) shall be repaired, as required.
93. During the winter months, all Project truck traffic shall apply tire chains as required.

To minimize the likelihood of project traffic resulting in bridge closure or failure:

94. Inspections of the Nordenskiold River Bridge and the Crossing Creek Bridge shall continue and repairs shall be made as required, at the discretion of YG-Highways and Public Works.

7.1.4 CUMULATIVE EFFECTS ASSESSMENT

The Freegold Road is currently used during the snow-free months for recreational and traditional purposes, and to access the area for exploration purposes. There is potential for residual effects on public health and safety from Project use of the Road to occur. Project traffic on the Freegold Road will result in a considerable increase in existing road traffic volumes.

The Executive Committee is aware of several projects that are likely to use Freegold Road at the same time as the project:

- Tinta Hill – Quartz exploration permitted until November 2010 (YOR Project #2006-0156)
- Freegold – Quartz exploration permitted until December 2010 (YOR Project #2006-0220)
- Sonora Fuel Mobilization – Land use permit to transport fuel along Freegold Road in March 2008 (potentially 2009) (YOR Project #2007-0239),
- Webber Creek – Placer mining permitted until October 2018 (YOR Project #2008-0011)
- Iris Creek – Placer exploration permitted until November 2012 (YOR Project #2008-0053)

All of these projects propose summer use of the Freegold Road. “Freegold” proposes potential exploration activities as late as December, which may be facilitated if the road is maintained year-round for the Project.

Much of the discussion of potential effects of Project traffic on public health and safety has specifically focussed on mitigating potential effects with other road users. The Executive Committee is of the opinion that effects will not be significant given the relatively low speed limit (40 km/hr), adequate signage warning road travelers of industrial traffic on the Road, and implementation of the final Traffic Management Plan.

7.1.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse direct, indirect or cumulative effects are anticipated to occur with respect to public health and safety in relation to Project transportation along the Freegold Road.

7.2 WILDLIFE (FREEGOLD ROAD AND BRIDGES)

7.2.1 OVERVIEW

Refer to Section 6.2 for a general overview of wildlife in relation to the Project.

Traffic rates on the Freegold Road since 2000 have averaged approximately 12 roundtrips per day during the summer; travel on the Road during the winter has been limited to snowmobile traffic. The Freegold Road experiences relatively low traffic volumes when compared with other secondary roads in the Yukon (B. Laird, pers. comm., 2007). As proposed, the Project will increase vehicle traffic on the Freegold Road by an estimated 2.5 times and will result in the portion of the road between the Nordenskiold River and the mine access road being maintained year-round.

An increase in traffic volume and a road open to vehicle traffic all seasons may result in adverse effects to wildlife in the following ways:

- Habitat alteration (indirect loss of habitat due to increased noise and traffic);
- Disruption, blockage and impediment of movements;
- Induced mortality (from vehicle collision, winter hunter access).

7.2.2 EFFECTS CHARACTERIZATION

The Executive Committee considers project effects that could decrease the health or populations of wildlife adverse and potentially significant.

Year-round and increased traffic on the Freegold Road will result in increased noise level and more frequent human and vehicle presence, which may deter wildlife from using the habitat immediately adjacent to the road and present a barrier to terrestrial wildlife crossing the road. The potential for sensory disturbance resulting from Project traffic to affect the distribution and abundance of wildlife adjacent to the Freegold Road is low. The Executive Committee recognizes that this portion of the Freegold Road is currently open for vehicle traffic during the summer and does not expect that the increase in level of summer traffic will result in significant habitat loss or the increased disruption of wildlife movements.

Current winter traffic along the Freegold Road is limited to off-road vehicles. The Executive Committee considers the potential for increased winter traffic to deter moose movement to and from the northeast corner of the Late Winter\Spring Wildlife Key Area (Figure 4) to be a potentially adverse effect. The Proponent has committed to the monitoring and reporting of wildlife on the mine site and mine access road, scheduling vehicles to avoid peak times of wildlife movement (early mornings and evenings) and reduced speed limits where appropriate. The Proponent has committed to plough snow in such a manner as to provide for wildlife escape from roadways. Escort/pilot vehicles employed for convoys and overdimensional vehicles may also incidentally decrease collisions with moose. Vehicle collisions with wildlife on the Freegold Road will be reported to YG Conservation

Officers. Repeated winter collisions between moose and Project vehicles along the Freegold Road will result in consideration of changes to the Traffic Management Plan to minimize these effects.

The only direct risk to wildlife resulting from increased use of the Freegold Road is mortality due to collisions with vehicles. Limited data is available concerning the impacts of traffic in remote areas on wildlife. There are examples of snow clearing along a right-of-way previously not maintained during the winter resulting in an increase of wildlife using the right-of-way (R. Ward, pers. comm., 2007, as referenced in the proposal). In some cases this has led to increased wildlife mortality due to collisions with vehicles.

The current posted speed limits along the Road are slow at 40 km/hr, which greatly decreases the risk of collisions with animals. The Proponent has indicated that mine traffic will follow posted speed limits in accordance with the law and with the Traffic Management Plan.

The introduction of new access into a previously inaccessible area generally results in an increased intensity of use in that area by hunters, gatherers, and recreational users. This can be compounded if the area into which the access is developed is particularly rich in resources, since the harvesting of resources in these areas represents a lesser effort in comparison to alternative areas. For example, a high hunting success rate in a particular area will typically result in more hunting in that area, until resources are depleted to a point where a higher hunting success can be achieved elsewhere. The depletion of resources may be accelerated further in areas that are easily accessible and within a convenient radius of communities. For example, in the 1970s and 1980s, roads built into areas such as Alligator Lake, Granite Creek, and the Wheaton River, which are known to have been very productive moose habitat, resulted in significant declines in local populations. To this day, those populations have not fully recovered, despite significant hunting restrictions.

The opening of the Freegold Road to vehicle traffic in winter increases the degree to which hunters can access an area known to be important winter habitat for moose. This increase in accessibility is particularly important because many sources agree that moose populations in this area are relatively low (see Section 6.2). The Executive Committee recognizes that the area is currently open in winter to off-road vehicle travel. The proposed no firearms and no hunting policies by the Proponent will minimize mine personnel hunting, but will not mitigate increased public access. The hunting of moose in the zones around the Freegold is open exclusively to First Nation hunters.

The Executive Committee recognizes that the Proponent has agreed to conduct a post-rut moose survey every three years. The Proponent shall provide the results of this survey to the CRRC, LSCFN and YG-Environment. This is a minimum in order to empower wildlife managers with the information to respond to potential changes in moose populations. The Executive Committee believes that in order for wildlife managers to respond to potential effects of increased local moose harvesting they will need to be provided with more frequent moose population information at the beginning of the Project. The Proponent shall conduct November post-rut moose surveys, including composition, annually for the first three years of Project construction/operations. The Proponent shall provide the result of these studies to the CRRC, LSCFN and YG-Environment.

7.2.3 REQUIRED MITIGATIVE MEASURES

In addition to the applicable mitigative measures outlined in Section 6.2, the following measures are required:

To decrease the likelihood of collisions between Project traffic and wildlife:

95. Snow on the Freegold Road shall be ploughed and breaks shall be left in the snow banks, where appropriate, to ensure adequate sightlines for drivers and wildlife escape.
96. Collisions between wildlife and Project vehicles along the Freegold Road will result in the consideration of changes to the Traffic Management Plan to minimize these effects. Wildlife mortalities shall also be reported to a YG Conservation Officer.

To better adaptively manage, and decrease any potential adverse Project effects on moose:

97. The Proponent shall conduct November post-rut moose surveys, including gender/age composition, annually for the first three years of Project construction/operations. The Proponent shall provide the result of these studies to the CRRC, LSCFN and YG-Environment.
98. The Proponent shall conduct post-rut moose surveys, including gender/age composition, every three years after construction. The Proponent shall provide the result of these studies to the CRRC, LSCFN and YG-Environment.

7.2.4 CUMULATIVE EFFECTS ASSESSMENT

Please refer to Section 6.2.4.

7.2.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse direct, indirect or cumulative effects of the Project use of the Freegold Road and bridges anticipated to occur with respect to wildlife.

7.3 CURRENT LAND USE (FREEGOLD ROAD AND BRIDGES)

7.3.1 OVERVIEW

The Freegold Road provides access to the area northwest of Carmacks for a variety of traditional and non-traditional land and resource users. During the winter, the Freegold Road provides primarily off-road vehicle access to traplines, hunting grounds, cabins and trails. The Freegold Road also supports other winter activities, such as the Yukon Quest International Sled Dog Race (Yukon Quest), snowmobiling and ice fishing. During the summer months, the road is used to access fish camps, hunting grounds and gathering locations, and supports general recreational activities, such as picnicking, fishing, hiking, and recreational vehicle use. The Proponent's proposed use of the Freegold Road has the potential to affect current land use; increased traffic volumes and year-round use of the road may impact road users.

7.3.2 EFFECTS CHARACTERIZATION

7.3.2.1 Traditional Land Use

The Freegold Road provides access to trapping concessions, traditional hunting grounds, fish camps, and gathering locations. During the winter, Project related road maintenance activities may increase or decrease the ability of users to access trails or cabins. During the summer, fugitive dust from the road due to increased traffic may affect activities at the fish camps along the road. The Executive Committee is of the opinion that impacts to the traditional use of areas accessed by the Freegold Road are significant and adverse. The Executive Committee has determined that the mitigative measures presented in the following section will adequately address these effects. Additionally, the safety of the fish camp visitors and other users of the Freegold Road may be adversely affected by inadequate sight lines at fish camp access points. Such potential effects can be mitigated by appropriate signage and brushing of roadside vegetation, as recommended in Section 7.1.

7.3.2.2 Recreational Land Use

During the winter, many users share the Freegold Road, including snowmobilers, skiers and the Yukon Quest. The Executive Committee has determined that the proposed Project use of the Freegold Road during the winter does have the potential to result in significant adverse effects to the Yukon Quest. The Executive Committee considered the following alternatives with representatives of the Yukon Quest, but deemed them all to be unfeasible for the reasons provided:

- Shutting down Project related traffic for the duration of Yukon Quest activities. This alternative was deemed unfeasible because of the duration of Yukon Quest activities from trail preparation to post-race clean-up (January to mid-March). Closing the road for this length of time would significantly affect Project activities and potentially worker safety.
- Coordinating mine related traffic to avoid interference with dog teams and/or support snowmobiles on the road during the race activities (via radio contact, for example). This

alternative was deemed unfeasible because of the duration of Yukon Quest activities and because of the incompatibility of road conditions required for the Yukon Quest versus the Project (i.e., snow-packed versus graded to near-gravel).

- Sharing the Freegold Road by creating a snow-packed trail parallel to a graded strip and a campsite pullout for the duration of the Yukon Quest. This alternative was deemed unfeasible primarily because the road is too narrow to allow for a snow trail for the Yukon Quest and a graded strip for Project trucks and equipment, posing a serious safety risk to the dog teams and mushers, as well as Project personnel and equipment.

Project traffic on the Freegold Road will effectively exclude the Yukon Quest, as well as other winter road users (e.g., snowmobilers), from using the road as a trail. The Executive Committee recognizes that some winter road users may choose to drive on-road vehicles over now-maintained portions of the Freegold Road in winter. However this does not mitigate the effect on current users of the road as a winter trail. The Executive Committee views the creation of an alternate trail/route as the only feasible measure to effectively mitigate the adverse effects to the Yukon Quest and other existing winter users that would result from the Project use of the Freegold Road each winter. Western Copper has proposed that a trail be created adjacent to the Road (i.e., in the roadway ditches) to address this issue; however, following a ground-truthing exercise in August 2007, the Executive Committee concluded that along many sections of the road, it would be difficult or impossible to create an adjacent trail.

Since establishment of a multi-use trail is a measure required to mitigate potential adverse effects on current land use practices, the development of the trail has been scoped into the assessment of this Project. Potential environmental and socio-economic effects associated with development of the trail are anticipated to be minimal. There will be minimal effects to users who currently travel the Freegold Road during the winter, since the multi-use trail will be appropriate for off-road vehicles or dogsleds exclusively, as the Freegold Road currently is. With the application of the mitigative measures outlined in the following section, significant environmental effects associated with development of the trail are not anticipated.

The Mile 8 and Mile 9 lakes have been cited as popular lakes for fishing by local and visiting area users throughout the year. The existing parking area at Mile 8 Lake, used to access both lakes, is very small and directly adjacent to the Freegold Road. It was explained by community members that many users park on the road if the parking area is full. This current parking situation would not be feasible or safe with Project traffic passing by. The Executive Committee is of the opinion that there is a significant risk to the safety of lake users as a result of Project related traffic. It is recommended that there be improvements to the public parking area to allow users of Mile 8 and Mile 9 lakes to park safely off the road. An additional consideration is that the parking lot could be developed into one of the proposed pullouts. If so, the pullout should be large enough to facilitate some public parking, and to allow public vehicles traveling on the Freegold to pull off to let Project traffic pass. This would allow users of Mile 8 and Mile 9 lakes to park safely off the road and would reduce environmental impact by utilizing existing disturbed area to develop one of the pullouts.

7.3.3 REQUIRED MITIGATIVE MEASURES

To decrease effects of project traffic and winter road maintenance on the Yukon Quest:

99. Due to the opening of the Freegold Road during the winter months, safe routing for the Yukon Quest shall be established. The route shall follow existing linear disturbances (e.g., Freegold Road right-of-way, trails and cutlines) where possible, or result in the cutting of new trail less than 1.5 metres in width.

To identify and decrease any project traffic effects on local users of the Freegold Road:

100. Increased usage and traffic patterns caused by project traffic shall be reviewed at the Mile 8 and Mile 9 lakes location. If increased usage and traffic patterns cause adverse effects, YG-Highways and Public Works shall take appropriate measures to ensure public safety. Consideration shall be given to establishing one of the pullouts at this location if it decreases conflict between vehicles traveling on the Freegold Road and parked vehicles.
101. Access to trails and cabins along the Freegold Road shall not be unreasonably impeded by winter maintenance activities. YG-Highways and Public Works shall speak with local land users to determine where access points are located and determine an appropriate solution. Consideration shall be given to widening the ploughed portion of the road at these points to allow users to remove their vehicles from the travelled portion of the road.
102. Dust control measures shall be implemented for the Freegold Road and shall be in effect for the duration of active fishing and fish preparation at fish camps along the road. Discussions and subsequent follow-up with the fish camp operators/owners is required upon first implementation to ensure the appropriateness and effectiveness of the mitigation measure.

7.3.4 CUMULATIVE EFFECTS ASSESSMENT

Year-round maintenance and upgrades to the Freegold Road may result in increased access to the area by people using the area for traditional, recreational and industrial (e.g., exploration) purposes, though the likelihood of this effect is difficult to predict. The Executive Committee notes that Project traffic may also deter from people using the Freegold Road. Increased access could have positive and potentially negative effects on land use. Improved access to the area may promote recreational and tourist use, which may result in economic spin-offs for Carmacks. It could also lead to an increase in snowmobile and ATV use in the area, which may be perceived as negative in terms of deteriorating the area's aesthetics. Increased access could lead to increased hunting pressure, particularly with respect to moose, which could affect traditional subsistence harvesting. Potential effects on moose are dealt with further in Section 6.2. While increased development activities in the area may deter people from using it for traditional purposes, the improved access may have the positive effect of encouraging people to use the general area. The Executive Committee concludes that the way in which people access various areas along the Freegold Road during the winter may change, but that overall adverse effects to recreational and/or traditional land use resulting from the winter maintenance of the Freegold Road is not likely to be significant.

7.3.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse effects are anticipated to occur with respect to traditional or recreational land use.

7.4 SURFACE WATER QUALITY (FREEGOLD ROAD AND BRIDGES)

7.4.1 OVERVIEW

The spatial scope for this VESEC includes those portions of watersheds downstream of waterbodies\watercourses that intersect with the Freegold Road between the mine access road and the Nordenskiold Bridge. Surface water quality is an indicator of environmental health and can determine the aquatic resources (e.g., plankton, benthos and fish) in a waterbody. Extreme changes in water quality can result in changes in emergent and riparian vegetation.

The Proponent and the Yukon Government have suggested that certain improvements (e.g., pullouts) and increased maintenance will be required of the Freegold Road. The Freegold Road crosses at least three creeks and passes alongside several lakes. The de-stabilization of banks and slopes during project-related construction can result in sediment being introduced into waterbodies. The Freegold Road currently exists as a public road requiring a level of maintenance by YG-Highways and Public Works in summer. This maintenance is proposed to be extended over the winter season.

The construction and subsequent operation of the Project will require the transportation of a number of dangerous/hazardous materials along the Freegold Road and across bridges in order to supply mining activities. These materials pose risks to surface water quality, and also soil, if unintentionally released during transportation. The potential effects of an uncontrolled release of dangerous/hazardous materials will depend on the characteristics of the material and on the conditions in which it is spilled.

7.4.2 EFFECTS CHARACTERIZATION

7.4.2.1 Road Construction and Maintenance

Pullouts will be constructed along the Freegold Road to facilitate passing vehicles. During pullout construction physical disturbance of the terrain, removal of vegetation and introduction of new unconsolidated road building materials could accelerate local erosion rates, result in permafrost thaw and, if not managed properly, result in siltation that could deteriorate the water quality of the receiving environment. Increased sedimentation in receiving waters due to project activities is considered a potentially significant adverse effect by the Executive Committee.

Bank slumping or the introduction of road building material into a watercourse could block passage by water and aquatic resources. Increased sedimentation could directly scour or smother attached algae from the stream substrate reducing food and habitat for benthic macro-invertebrates, both actions resulting in a potential indirect adverse effect on fish.

The results of sedimentation on fish and fish habitat can range from simple disruption to direct mortality (particularly eggs and fry) and can vary among fish species. The introduction of unnatural sediment loads into water can indirectly affect fish survival by altering water chemistry (e.g., increased turbidity can increase temperature and reduce oxygen content). Direct effects of increased sediment can include abrasion of fish gills, potentially resulting in suffocation and rendering the fish more susceptible to infection and gill parasites and decreasing fish reproductive success by altering oxygen levels which are important to viability of eggs and young fish. Furthermore, certain fish species (e.g., salmon) need gravel and rocks to spawn and as rearing areas for their young. Excess sediments in a watercourse clog the spaces between rocks and gravel; potentially burying the eggs. In addition, as sediments clog open spaces between the gravel on spawning grounds, water flow and oxygen are prevented from reaching eggs or fry.

The Executive Committee is of the opinion that adverse effects of road construction/maintenance activities to local water quality and fish habitat are potentially significant but can be mitigated with the application of measures outlined in the applicable Department of Fisheries and Oceans Operational Statements (e.g., Maintenance of Riparian Vegetation in Existing Rights-Of-Way and Culvert Maintenance).

7.4.2.2 Spills

The mining activities will involve transportation of dangerous/hazardous materials, including:

- Elemental (molten) sulphur;
- Petroleum fuels and lubricants;
- Other process reagents or hazardous materials; and,
- Components used in explosives (Ammonium Nitrate and Fuel Oil).

The release of these substances to local drainages, to air or to ground may result in various environmental effects, including the degradation of surface and ground water quality, effects on fish and fish habitat, contamination of soils and air pollution. Uncontrolled materials spills could have effects on aquatic life and wetlands including decreased aquatic productive capacity downstream of spill sites or through groundwater transport. The extent of the effect of a spill of dangerous/hazardous materials would be dependant upon the amount released, the physical conditions under which these materials enter the environment (especially season and proximity to waterbodies) and the nature of the material released.

The proposed method of transport of sulphur and ammonium nitrate is in dry or solid prill form carried in bulk containers. In this dry form a spill to the ground would be easily cleaned up and the material recovered from the ground. The soil would not likely be contaminated from a dry spill. However, spills of liquid materials to soil may kill vegetation and other soil organisms. Ground water may also be affected by such a spill. Quick response to a spill to ground of liquid materials would result in clean up of the soaked soil and avoidance of ground water contamination.

Of concern is an accident resulting in a spill of any of these materials into waterbodies. Spills into flowing water can affect larger areas downstream and cannot easily be avoided by aquatic organisms in those watercourses. For example the introduction of ammonium nitrate into a waterbody, can result in acute ammonia toxicity at high concentrations and nutrient loading at lower concentrations. All creeks crossed by the Freegold Road between the Village of Carmacks and the mine drain into the

Yukon River, and are known salmon bearing streams. A fuel oil spill reaching a waterbody would have direct toxic effects on organisms and decrease the quality, or eliminate, habitat.

The Executive Committee recognizes the commitment by the Proponent to develop a comprehensive Traffic Management Plan with the input of several interested parties including the Village of Carmacks, LSCFN and YG. Furthermore the commitment by the Proponent that all contractors and companies hired by Western Copper will be required to abide by the Traffic Management Plan. The Executive Committee also recognizes that the shippers will be subject to the *Transportation of Dangerous Goods Act* and regulations and that spill response kits will be present on vehicles transporting dangerous/hazardous goods.

7.4.3 REQUIRED MITIGATIVE MEASURES

103. Riparian vegetation removal shall be minimized and drainage channels are to be maintained and debris free.
104. Erosion protection measures (riprap, cross-ditches, and breaks) along roads are to be applied as required.
105. The Proponent shall ensure that each truck carrying bulk loads of dangerous/hazardous materials is equipped with a spill kit and that all personnel responsible for the transport of such material are be trained and fully understand spill response measures.

7.4.4 CUMULATIVE EFFECTS ASSESSMENT

Please refer to Section 6.1.7.

7.4.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse direct, indirect or cumulative effects are anticipated to occur with respect to surface water quality along the Freegold Road.

7.5 HERITAGE/HISTORIC RESOURCES (FREEGOLD ROAD AND BRIDGES)

7.5.1 OVERVIEW

Please refer to Section 6.6.1.

7.5.2 EFFECTS CHARACTERIZATION

Numerous heritage/historic and current First Nation traditional use sites are located along the Freegold Road, including traditional campsites, trailheads, a caribou monitoring station, and fish camps. A historic site was located near Crossing Creek along the Freegold Road, approximately 200 m southeast of the beginning of the proposed mine access road. Additionally, the remnants of *Morris' Roadhouse*, another roadhouse established along the Dawson Overland Trail in the early 1900s, was identified at Mile six beside a fish camp on the Yukon River. In September 2007, the Proponent conducted a follow-up study to the 1992 study. Other currently unknown heritage/historic resources may exist along the road corridor.

The Freegold Road and related bridges are owned and maintained by YG-Highways and Public Works. As discussed in Section 7.1, there a number of recommended road improvements and maintenance requirements for this Project in order to ensure safe and efficient traffic flow along the road. As the maintenance of this infrastructure is a requirement of the Project, it has been included in the scope of the Project and the scope of this assessment. As part of undertaking these requirements, there is potential for heritage/historic resources to be adversely affected during the Project in the following ways:

- Land clearing associated with trimming and/or removing brush adjacent to the existing roadway;
- Road widening and associated activities as part of the construction of pullouts; and,
- Maintenance of bridges and their abutments and approaches.

The routine maintenance activities proposed to facilitate year-round Project use of the Freegold Road are not anticipated to disturb adjacent heritage/historic resources. For example, brushing activities are only expected to take place within a few metres of the existing road and as such, it is unlikely that these activities would disturb any heritage/historic resources.

The Proponent has suggested pullouts be constructed at intervals along the Freegold Road to facilitate safe vehicle passing as a component of their Traffic Management Plan. Road side. heritage/historic resources might be adversely affected if the location of the proposed pull-outs coincided with that of a heritage resource.

The Executive Committee notes the high density of high value heritage/historic resources in the immediate vicinity of the Nordenskiold Bridge that could potentially be adversely affected by bridge maintenance activities. Future upgrades to the Freegold Road, Nordenskiold Bridge or Crossing

Creek Bridge (other than what has been proposed by the Proponent to mitigate potential public safety and current land use effects), and which may have the potential to disturb heritage/historic resources, are outside the scope of this Project and have thus not been considered in this assessment. They would be assessed separately, as required.

The Executive Committee has considered the requirements of the *Yukon Historic Resources Act* and the Archaeological Sites Regulations pertaining to heritage/historic resources and is satisfied that compliance with these regulatory instruments will effectively mitigate potential significant adverse effects of the Project on heritage/historic resources.

7.5.3 REQUIRED MITIGATIVE MEASURES

106. Any new construction activities (e.g. pullouts, land clearing, excavation or placement of earthen materials) along the Freegold Road shall be reviewed by YG-Tourism and Culture to determine if a heritage resources assessment is required. If required, a heritage resource assessment shall be undertaken pursuant to the *Historic Resources Act* (Yukon).

7.5.4 CUMULATIVE EFFECTS ASSESSMENT

Please refer to Section 6.6.4.

7.5.5 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse effects are anticipated to occur with respect to the heritage/historic resources.

8.0 COMMUNITY AND REGION

This section addresses potential socio-economic effects on Carmacks and the Yukon. Regionally important projects like Carmacks Copper have been shown to have socio-economic effects that extend far beyond the mine site and the nearest community(ies). The Executive Committee has examined Project-related effects to the way people live and work. The Executive Committee has examined information provided in the Carmacks Copper Project Socio-Economic Effects Assessment submitted by the Proponent (Kishchuk and Taggart, 2007).

Potential cumulative effects on VESECs assessed in this section are discussed in Section 8.6.

8.1 PUBLIC HEALTH AND SAFETY (COMMUNITY AND REGION)

8.1.1 OVERVIEW

The primary issue with respect to public health and safety in the Village of Carmacks relates to potential adverse effects of Project traffic through the community. Access to the Freegold Road from the North Klondike Highway currently requires users to transit through the Village of Carmacks along several municipal roads. Streets in the Village of Carmacks have a relatively equal mix of both pedestrian and vehicle traffic throughout the year.

As discussed in previous sections the anticipated overall Project traffic volumes will amount to an average of 30 to 35 roundtrips per day during construction, and an average of less than 30 roundtrips per day during operations. On average, one large load roundtrip per day (maximum of seven to eight large load roundtrips per day) is anticipated during construction; during operations, an average of six large load roundtrips per day is estimated, with a maximum of nine large loads per day.

The community has raised concerns regarding potential effects to human health and safety and aesthetics resulting from Project traffic being routed through Carmacks. The general preference expressed by the community is that heavy or large vehicles bypass the Carmacks altogether. The community suggested the Casino Way bypass – a portion of which was constructed from the Klondike Highway to the Nordenskiold River in the 1990s – as an alternative routing option. Due primarily to the substantial costs and time delays associated with constructing the Casino Way bypass route, the Proponent has proposed to route all Project traffic through the Carmacks. The proposed route would follow the Freegold Road (through Carmacks) to River Road, then along River Road across the Nordenskiold River Bridge and then along the Freegold Road.

8.1.2 EFFECTS CHARACTERIZATION

In general, community members would prefer that heavy or large vehicles do not travel through Carmacks, due primarily to the potential for increased risks to public health and safety associated with industrial traffic. These risks are due to increased collisions and exposure to dangerous/hazardous material spills. Residents of Carmacks have also cited potential effects to aesthetic and tourism values as reasons for preferring that Project traffic is not routed through town. Collisions and spills as a result of project traffic could result in injury of even mortality of Carmacks residents which the Executive Committee would be consider a significant adverse effect.

The Proponent has indicated that if it was determined that Project traffic could not travel through Carmacks and that a bypass route must be constructed to support the Project by commencement of Project construction, there would be significant delays in Project start-up and in a worst-case scenario, the Project could lose its funding and consequently not proceed. Thus, the Proponent has proposed to direct Project traffic along existing road infrastructure through Carmacks.

The proposed route through the community has the potential to adversely affect public health and safety in Carmacks. The Proponent assessed three separate routing alternatives through the community and chose the one least likely to significantly impact health and safety. Industrial traffic through the community involves increased risk of vehicle-vehicle or vehicle-person collisions, potentially resulting in property damage or personal injury or death, and increased risk or accidents or spills of transported dangerous/hazardous goods, potentially resulting in harm to human health and/or the environment. Potential effects to the municipal roads resulting from increased wear and tear are addressed in Section 8.4.2 (*Community Services and Infrastructure*)

8.1.2.1 Collisions

While vehicle-vehicle collisions could result in the loss of property and personal injury, the significance of any of these collisions is expected to be less than vehicle-pedestrian collisions. Most of the mitigations proposed for vehicle-pedestrian will also mitigate vehicle-vehicle collisions. This analysis by the Executive Committee focuses on vehicle-pedestrian collisions. The Executive Committee believes the most effective mitigation for vehicle-pedestrian collisions is to prevent them.

Turner, Roozenburg and Francis (2006) summarized recent research trying to understand and model pedestrian-vehicle accidents from around the world. Statistics have shown that vehicle-pedestrian accidents can be predicted to increase with speed of vehicles, inability of vehicles to avoid/brake, number of vehicles and number of “manoeuvres” being made by pedestrians and vehicles in a particular section of road. Vehicle-pedestrian accidents are predicted to decrease with number of pedestrians (“safety in numbers”). Importantly, some research has concluded that pedestrians feel a “false sense of protection” at marked crosswalks (Ekman, 1996).

Canadian research into pedestrian safety has resulted in several potential strategies that might be successful at reducing vehicle-pedestrian collisions (Van Houten and Malenfant, 1999). This research has been focussed in larger, more urban centres but the results may be relevant to Carmacks. Particular attention has been paid by researchers at intersections where vehicles are turning. Prompting pedestrians to look for turning vehicles with signs, pavement markings, or animating the pedestrian signal have all been documented to reduce conflicts between vehicles and pedestrians. Various pavement marking options were tested for crosswalks. Adding advance stop lines reduced vehicle/pedestrian conflicts but simply making the crosswalks more obvious did not. Van Houten and Malenfant (1999) did not find that pedestrian-activated crosswalk beacons decreased pedestrian vehicle conflict, as has been found in other jurisdictions. They do report on other research that indicates that "multifaceted" pedestrian safety programs can change community safety culture by modifying the behaviour of drivers and pedestrians.

The Executive Committee believes that a combination of approaches increasing project vehicle driver awareness of pedestrians, particularly at intersections, controlling project vehicle speed and encouraging certain pedestrian behaviour and awareness can mitigate potential risks associated with project traffic. The most effective approaches can be identified through discussions between the Proponent and the community members, the Village of Carmacks, LSCFN and YG-Highways and Public Works.

The final Traffic Management Plan should address measures including signage, both at crossing locations, and some distance from those locations, to prepare drivers for possible pedestrians. Consideration should be given to the benefits pedestrian-activated signage at high pedestrian traffic locations. Drivers aware of pedestrians are better able to avoid them. Slower vehicles can stop in shorter distances which suggest lower speed limits for project traffic through Carmacks might be appropriate. High pedestrian traffic/crossing locations should also have appropriate prompts for pedestrians reminding them of the risks of vehicles. Encouraging pedestrians to use particular, and still convenient, locations will increase awareness of both pedestrians and drivers of the risk of accidents.

As proposed by the Proponent, the final Traffic Management Plan should also address timing windows for large vehicle traffic through the Village of Carmacks. Weekday versus weekend traffic, day time versus night time traffic and avoiding passage during particular times (i.e. immediately before and after school) may mitigate risk to public safety. The Proponent has noted that all project vehicles, including those of contractors will be required to adhere to the Traffic Management Plan.

The Executive Committee has taken into consideration the concerns of the community regarding the routing of Project traffic through Carmacks and agrees that the construction of a bypass route around the community would most effectively mitigate the potential effects to human health and safety, as well as aesthetics and tourism valued components. With the application of appropriate signage, traffic control and enforcement, and effects management (i.e., via monitoring, reporting, ongoing consultation with local people and governments), the Executive Committee is of the opinion that the potential for vehicle-vehicle or vehicle-pedestrian collisions would be unlikely and therefore not significant.

8.1.2.2 Spills

The potential effects of an uncontrolled release of dangerous/hazardous materials on public health and safety are related to exposure to materials that lead to discomfort, injury, illness or death. A spill resulting in these effects would be considered a potentially significant adverse effect by the Executive Committee.

The construction and subsequent operation of the Project will require the transportation of a number of dangerous/hazardous materials that pose risks to human health if unintentionally released during transportation. The mining activities will involve transportation of dangerous/hazardous materials, including:

- Elemental (molten) sulphur;
- Petroleum fuels and lubricants;
- Other process reagents or hazardous materials; and,
- Components used in explosives (Ammonium Nitrate and Fuel Oil).

The particular effects of a release of these substances into the local community depends on the nature of the particular material, amount released, the physical conditions under which these materials enter the environment (season and proximity to waterbodies) and proximity of the public to the release.

The proposed transportation route through Carmacks passes near focal points in the community like the nursing station increasing the potential magnitude of the effects to public health. The Executive Committee recognizes the efforts made to choose a route resulting in the least potential effect to the community. Materials released in a spill may affect people if they catch fire or come into contact with their skin/eyes or through inhalation.

Molten sulphur is a flammable solid, shipped at high temperatures that can burn on contact and the vapours of which can irritate respiratory systems. Ammonium nitrate is a strong oxidizer also capable of burning and eye, skin and respiratory tract irritation. Diesel fuel is combustible at higher temperatures and is harmful or fatal if swallowed.

As stated previously, the Executive Committee recognizes two important commitments by the Proponent. Firstly, the development of a final Traffic Management Plan with the input of several interested parties including the Village of Carmacks, LSCFN and YG. Secondly, that all contractors and companies hired by the Proponent will be required to abide by the Traffic Management Plan. The Executive Committee also recognizes that the shippers will be subject to the *Transportation of Dangerous Goods Act* and regulations and that spill response kits will be present on vehicles transporting dangerous/hazardous goods. Furthermore, the Executive Committee recognizes that mitigations for project vehicle-pedestrians collisions will likely decrease the likelihood of spills in Carmacks as well.

The Executive Committee is of the opinion that with the application of these mitigative measures, the potential adverse effects to health and safety and visual aesthetic components are not anticipated to be significant.

8.1.3 REQUIRED MITIGATIVE MEASURES

In addition to the applicable mitigative measures outlined in Section 7.4, the following measures are required:

To decrease the likelihood of Project traffic effects in Carmacks:

107. The Proponent shall finalize its Traffic Management Plan in consultation with YG-Highways and Public Works, the Village of Carmacks and the LSCFN, incorporating the route improvement and safety measures, and traffic monitoring and control measures outlined in

the Preliminary Traffic Management Plan, as well as the following measures should Project traffic pass through Carmacks:

a. Signage shall be installed along the Project traffic route through Carmacks informing the community of the increased industrial traffic;

b. Signage shall be installed informing drivers of high-probability/high-volume pedestrian crossing locations;

c. Consideration shall be given to further increasing the visibility of high-probability/high-volume pedestrian crossing locations using beacons, signage or other appropriate devices to increase the awareness of both drivers and pedestrians;

d. Consideration should be given to setting timing windows and special speed limits for larger project vehicles; and,

e. The use of engine brakes within Carmacks shall be restricted.

8.1.4 CUMULATIVE EFFECTS ASSESSMENT

Project traffic will have to travel through Carmacks to access the mine site via the Freegold Road. In general, very little industrial traffic travels through the community. Currently, there are no other large-scale industrial developments planning to use the Freegold Road during the lifetime of the Project; thus, no additional industrial traffic is anticipated above current levels. Although it can be expected that there will be some industrial traffic through Carmacks associated with exploration in the area, the volume and nature of this traffic is not anticipated to result in residual effects to public health and safety in Carmacks. The Executive Committee has consequently concluded that the potential for cumulative effects on public health and safety associated with industrial traffic through Carmacks is not significant.

8.1.5 EXECUTIVE COMMITTEE SUGGESTION

The Proponent, the Village of Carmacks, LSFN and YG should engage in discussions regarding the viability of constructing a bypass route, and associated infrastructure, as an alternative to avoiding potential adverse effects to public health and safety in Carmacks.

8.1.6 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, including the implementation of a comprehensive Traffic Management Plan, no significant adverse effects are anticipated to occur with respect to public health and safety in relation to Project related traffic through Carmacks.

8.2 COMMUNITY STRUCTURE AND DYNAMICS (COMMUNITY AND REGION)

8.2.1 OVERVIEW

Development projects which take place near small communities have the potential to result in direct and indirect effects to community structure and dynamics. Community structure and dynamics are influenced by factors such as demographics, individual and community health and wellness, family stability, community cohesion, cultural well-being, and social capital and infrastructure. The maintenance and positive development of communities is critical to ensuring they are able to adapt to the changes brought about by large-scale mineral development, while capitalizing on the potential benefits. Community structure and dynamics has consequently been selected as a VESEC.

Carmacks is likely to be most affected by the Project, because of its proximity to the proposed Project site, in addition to the fact that all Project traffic will be routed through the community and some mine personnel will reside in Carmacks. Potential effects on Pelly Crossing and Whitehorse have been addressed in terms of out-migration of workers (Section 8.2.2.3) and cumulative effects (Section 8.6).

Carmacks is a small, rural, predominantly First Nation, Yukon community. Many residents participate in traditional activities that supplement earned and unearned (e.g., Social Assistance and Employment Insurance) income and periodically participate directly and indirectly in resource exploration and development activities. People in Carmacks are proportionately more dependent on tax-exempt income than Yukoners in general (Kishchuk and Taggart, 2007).

The Proponent has indicated that approximately 60 percent of the Project labour force may be sourced locally – primarily from Carmacks, Pelly Crossing and Whitehorse. An estimated 10 to 20 employees will likely relocate to Carmacks with their families to pursue work with the mine. Additionally, the Project will require up to 120 shift workers (up to 60 per shift) who will work on a rotational work schedule, but will not permanently reside at the mine site. The Proponent has proposed to construct a single-status accommodation facility to house the transient workers either at the mine site or in Carmacks. The Executive Committee has been asked to assess both alternatives, because the Proponent has not yet made a decision on this issue (see Section 8.2.2.2). Some positions with the mine will follow the standard eight hour-day, 40 hour-week work schedule, while the majority of positions will follow a 12 hour-day, 4-day-on/4-day-off rotational work schedule, as proposed by the Proponent.

The ability of a community to cope with changes to community structure and dynamics brought on by development is determined in part by its vulnerability and resilience/adaptability. Characteristics of Carmacks that contribute to the community's resilience include:

- Positive experiences with past mining-related development.
- Existing social capital (e.g., social networking, volunteering and participation in community events).

- Existing social infrastructure (e.g., Carmacks Recreation Centre, recreational associations, Health Centre, health and social services).
- Experience dealing with population increases; it reached its peak population of roughly 480 people in 1997.
- Strong cultural connection to the environment and community, especially among First Nations.
- Carmacks does not experience high crime rates; crime rates are within the average range for the Yukon.

Sources of community vulnerability include:

- Negative experiences with past mining-related development, which may have compromised the social fabric of the community.
- Small, relatively young population.
- Existing substance abuse issues – alcohol abuse has been highlighted as a serious issue in Carmacks. No data is available on the range and depth of substance abuse problems, but community perception indicates that the use of illicit drugs such as crack cocaine is especially serious among local teens.
- Lower proportion of married-couple families and a correspondingly larger proportion of common-law families, which tend to be less stable, than in the Yukon as a whole.
- Single-parent families, which tend to be more vulnerable to social and economic change, are more prevalent in the community than in the Yukon as a whole.
- Although no separate data on the health status of people in Carmacks is available, in general, considerable disparity exists between the health status of rural Yukon communities and Whitehorse.
- Average earnings among men and women in Carmacks are substantially lower than for the Yukon as a whole; there is a lack of high income earners and abundance of low income earners. Median family/household incomes are substantially lower than in the Yukon. Women earn substantially less on average than men in the Yukon.
- Unemployment is relatively high in Carmacks.

The Executive Committee developed the topics discussed in this section considering concerns raised with respect to potential effects of the Project by the community, LSCFN, YG-Health and Social Services, YG-Justice, and the YG-Women's Directorate. Issues such as substance abuse, gambling, family and community health and well-being, health and well-being of children and youth, social assistance dependence, crime, in-migration, changes to community dynamics, and others were highlighted by these stakeholder groups. These comments are included in the YESAB Online Registry (YOR) and summarized in Appendix A.

8.2.2 EFFECTS CHARACTERIZATION

The potential effects and mitigative measures presented in this section have been generated through a review of primary and secondary material, examination of contemporary northern development case studies, incorporation of stakeholders and expert comments/opinions, and information from the Proponent's Socio-economic Effects Assessment (Kishchuk and Taggart, 2007). The potential effects listed are not exhaustive.

Community structure and dynamics may be affected in the following ways:

- Employment with the mine, including increased income;
- In-migration of permanent and transient mine workers;
- Out-migration of workers from other communities;
- Planned or unanticipated mine closure.

8.2.2.1 Employment with the Mine and Increased Income

Employment with the Mine

Employment of Carmacks residents with the mine will affect the community. It is estimated that 40 to 50 Carmacks residents, or 10 to 12 percent of the current population, may be employed by the Proponent during the life of the mine. Employees and their families will have to adjust to year-round full-time employment, a rotational work schedule, the type of work offered at a mine, and for some, the transition from a traditional lifestyle to a non-traditional lifestyle. Table 3 presents a summary of possible impacts on community structure and dynamics associated with individuals in Carmacks pursuing employment with the mine.

Increased Income

On average, Carmacks residents will experience a considerable increase in personal income. This will have obvious benefits, as well as potential negative indirect impacts for the employed individuals, their families and the community as a whole. The primary benefit of increased income would be the opportunity for improved individual and family health and well-being. On the other hand, the influx of new income into communities in which rates of unemployment have been high can cause negative social effects, such as increased substance abuse; social, family and community disruptions; and a potential decline in health status. Table 4 presents a summary of possible impacts on community structure and dynamics associated with increased income.

Analysis

The Executive Committee has determined that while the significance of potential effects on community structure and dynamics resulting from employment with the mine is difficult to determine, especially in terms of magnitude and extent, some degree of adverse social impact can be expected.

Table 3 Potential Effects of Employment with the Mine

Potential Positive Effects	Potential Negative Effects
• Improved individual well-being - individuals will likely gain confidence in their skills and abilities. - Improved family well-being, including improved health status - Positive contributions to society (e.g., volunteering on days off, participation in community events) • Mine personnel may be motivated by employment with the mine to address substance abuse issues. • Lower crime rate – lower unemployment tends to decrease crime rates.	• Employees' families may experience stress in dealing with the lifestyle changes associated with employment at the mine (e.g., adjusting to demanding work schedules, nature of the work, etc.). These factors could lead to: - Substance abuse - Disruption of family/ relationship stability - Family break-ups, which would increase the prevalence of single-parent families - Increased demand on community health and social services, including child care services (see Section 8.4.2.2 *Community Services and Infrastructure*) • In family situations where conflict, violence or other domestic problems are already present, issues may be exacerbated by the demands of employment with the mine, resulting in increased social dysfunction and instability. • Deterioration of cultural well-being - The transition from traditional to wage economy can undermine a traditional lifestyle and can be a difficult change for some, leading to stress and potentially indirect effects such as substance abuse or family disruption. - Mine personnel may spend less time on the land pursuing traditional activities, which could result in less opportunity to pass on traditional skills and knowledge and the loss or deterioration of traditional skills. - The working language at the mine will be English; First Nations workers who speak their traditional language will likely have fewer opportunities to use their traditional language which could contribute to the loss the traditional language. • Employees not used to the type of work offered at the mine may be uncomfortable in the working environment at the mine, due to cultural differences, preference of some to maintain existing social, economic and cultural arrangements and discrimination or harassment potentially experienced at the work place. This could lead to impacts on family well-being as described above. • Employment at the mine may detract from opportunities for employed individuals to participate in community life. • Decline of women's health and well-being – husbands or partners working at the mine can result in effects such as disruption of marriage and family life, increased responsibilities for women in the home, increased substance abuse and violence against women. • Women working at the mine may experience adverse working conditions, such as gender discrimination and/or harassment. This could in turn lead to factors such as stress/ depression, substance abuse and family disruption.

Table 4 Potential Effects of Increased Income

Potential Positive Effects	Potential Negative Effects

• Increased incomes can help alleviate poverty and reduce financial stress within families.
  - Increased individual and family well-being.
• Increased income could lead to an overall improved health and standard of living. For example, increased incomes can be used to provide a healthier diet for the household, new or improved living accommodations and other consumer goods that ease the burden of daily life. Increased income may provide individuals and families with the freedom and means to make positive contributions to society (e.g., volunteering, participation in community events).
• Savings may be set aside for educational pursuits for employees' children; this could lead to an increase in the number of high school graduates and individuals who go on to complete further education and training.
• The wage economy can provide a supplementary means by which to enhance hunting, trapping and/or fishing harvests (i.e., traditional economy). The influx of money can be used to purchase equipment such as boats, motors, snowmobiles, rifles, tents, etc. and to secure needed supplies such as gas, ammunition, trapping equipment, basic foods and staples. Modern equipment increases the hunter's mobility and the productivity of the hunt. The increased income allows aboriginal people to maintain their connection to the land and continue to pass their heritage onto their children.
	• Some employees may choose to spend their income on alcohol, drugs or gambling. Increased substance abuse and/or gambling in the community could lead to indirect social problems, such as.
	  - Disruption of family/ relationship stability
	  - Family violence
	  - Child behaviour problems
	  - Family break-ups, which would increase the prevalence of single-parent families
	  - Increase in crime rate
	  - Increased demand on community health and social services, including child care services (see Section 8.4.2.2 *Community Services and Infrastructure*)
	• Ineffective money management could lead to negative effects, such as debt, which could cause family stress and disruption.
	• Family disruption may result from disputes concerning the spending of income. In families with existing conflicts between spouses, decisions concerning the use of money may exacerbate conflict.
	• Individual and community well-being may suffer if the shift from subsistence activities to wage employment results in dietary and other lifestyle changes which have an adverse impact on health (e.g., traditional food may be replaced with store-bought, unhealthy alternatives).
	• Some individuals earning disproportionately higher incomes than community members not employed with the mine could create a social divide – the "haves" versus the "have-nots". Additionally, the cost of living in Carmacks will likely increase as a result of the Project, making it more difficult for individuals/families with lower incomes to maintain an acceptable quality of life. These effects could lead to other indirect social problems

Social impacts such as substance abuse and disruption of family stability on affected communities resulting from mining projects are well documented (Status of Women Council of the NWT, 1999; IORVL, 2005; IORVL, 2006; GNWT, 2006; NRCan, 2006). These effects often exacerbate existing social problems in the community. The Executive Committee is of the opinion that these potential impacts on the community could be significant and require mitigation.

The responsibility of providing health and wellness support services will fall primarily to YG-Health and Social Services and the LSCFN Health and Social Programs Department. The measures committed to by the Proponent, including the provision of substance abuse awareness training and treatment, and counselling services are anticipated to help to alleviate the demands on the local and regional health and social services. The Women's Directorate has suggested additional consideration be given to support for women and children, specifically in terms of re-opening the Carmacks Safe House or providing transport services to Kaushee's Place in Whitehorse.

The Executive Committee also acknowledges the Proponent's commitment to work in collaboration with the agencies and institutions currently providing health and social services to provide support and to better serve the community's needs. The Proponent's support will help in managing increased demand on these services.

The Executive Committee commends the Proponent on their commitment to sponsor such programs as after school programs, a youth drop-in centre and crisis line, and community athletic and leisure programs. The Executive Committee feels these measures will promote overall community health and well-being and positively contribute to Carmacks' social infrastructure.

The four-day-on/four-day-off rotational work schedule proposed by the Proponent may alleviate the adverse effects identified above related to extended periods away at work, often associated with two-week-on/ two-week-off rotational work schedules. In particular, the four-day-on/four-day-off schedule, combined with a policy of flexible leave, as proposed by the Proponent, should provide adequate opportunity for employees to pursue traditional or recreational activities, general leisure or spend time with their families.

It is possible the Project may have a positive impact on traditional pursuits. As mentioned, the compressed work week combined with an increased income may provide the means and opportunity for employees to pursue traditional activities. Indeed, as reported in *Communities and Diamonds* (GNWT, 2006), there has been an increase in the number of workforce-aged people engaged in traditional activities since the first diamond mine was established in the NWT. Other findings however, indicate that participation in traditional pursuits may decrease in a community directly affected by industrial development, and community concern has been expressed to this effect. A decrease in the level of participation in traditional pursuits among First Nations staff could be considered an adverse effect. The Executive Committee is of the opinion that flexible work arrangements that allow mine employees to participate in traditional pursuits be implemented by the Proponent to mitigate these effects.

Mine workers from other small, northern communities – particularly First Nations and female employees – have reported experiencing discrimination or harassment at the workplace (Kennett, 1999; Status of Women Council of the NWT, 1999). Discrimination or harassment at the workplace could cause individual stress and could deter people from working at the mine. The Executive Committee suggests that in cooperation with the LSCFN and possibly the SFN, the Proponent should implement mandatory cross-cultural awareness/diversity training for mine employees to help address this potential effect. The training should include information on First Nation history, culture and spirituality and on the adjustments necessary in making the transition from traditional to wage economy. The Proponent should also implement a training module on gender awareness, which addresses gender discrimination and harassment in the workplace. To discourage discrimination or harassment at the workplace, the Executive Committee suggests that the Proponent take prompt disciplinary action, which may include dismissal, against any supervisor or other employee who exhibits negative or discriminatory attitudes or behaviour or who acts in a negative or discriminatory fashion towards employees at the mine. The Executive Committee suggests that the Proponent monitor the number of reported incidents of discrimination or harassment at the mine and submit the results annually to the LSCFN and YG.

8.2.2.2 In-migration

Permanent Mine Employees

A common concern in small communities near a proposed industrial development is that the mine will bring an influx of outsiders and migrant workers who will change the composition and character of the community, resulting in an overall negative social effect. The Proponent anticipates that 10 to 20 permanent employees will move to Carmacks with their families, amounting to an increase in population of 30 to 70 people. A population influx of this magnitude would affect the community to some extent.

There are numerous potential direct and indirect effects on community structure and dynamics associated with an influx of new people to the community. Table 4 presents a summary of some of the main potential effects associated with the expected influx of permanent mine workers and their families.

The Executive Committee believes the influx people to Carmacks will result in some changes to community structure and dynamics; however, it is anticipated that the community will be able to adapt effectively to these changes. Firstly, an influx of 30 to 70 people would result in Carmacks' population reaching or just exceeding its peak in 1997 at approximately 480 people, which implies that the community has experience dealing with a population increase of this magnitude. Secondly, the potential negative effects identified are primarily associated with cultural and social adjustment and the Executive Committee believes that the existing social networks and infrastructure (e.g., community events, recreational centre, etc.) and health and social services in Carmacks will foster the acceptance of "outsiders" to the community. The strategic implementation of the Proponent's commitment "to work to establish initiatives which focus on raising social capital", would contribute to

Table 5 Potential Effects of In-migration of Permanent Mine Workers

Potential Positive Effects	Potential Negative Effects
• An influx of new residents could help to bolster support for social capital and infrastructure, which could contribute to strengthening community cohesion and vitality in Carmacks. • The influx of families to Carmacks will increase the tax base, which could lead to improved community services and infrastructure. • The migrants to Carmacks would spend their money locally, which would contribute to the local economy and indirectly to community stability and prosperity. • Increased cultural/social diversity within the community.	• Threats to cultural identity, social integrity and individual self-esteem can result from an influx of outsiders who have different economic, social and cultural values and circumstances and whose presence may create or exacerbate existing problems, such as substance abuse, and may erode the cultural well-being of community members. • An increase in community population resulting from the influx of mine workers and their families could lead to an increased demand on health and social services, child care, businesses and emergency and policing services (see Section 8.4 *Community Services and Infrastructure*). • Increased demand on infrastructure (see Section 8.4 *Community Services and Infrastructure*).

fostering meaningful relationships among community members. This commitment should be developed in collaboration with the Village of Carmacks and the LSCFN. The influx is also not anticipated to change the demographics of the community significantly, since men, women and children would constitute the families that would move to Carmacks. Lastly, as previously discussed, both the LSCFN Health and Social Services Department and YG-Health and Social Services are aware of the potential population increase and acknowledge the Proponent’s commitments to support various social programs, which may help alleviate some of the increased demand on these services.

Transient Mine Employees

The Proponent has identified the need for a crew of transient shift workers who will work at the mine on a rotational schedule. Those who do not normally live in Carmacks will travel to the mine site from their homes in other communities. The Proponent has proposed to build a single-status accommodation facility to house up to 120 transient workers (up to 60 people at any given time), either at the mine site or within Carmacks. The on-site option would involve the construction of a more permanent camp-style accommodation with catered meals. Employees would be bussed in at the start of their rotation and would remain on-site until they returned to their home communities at the end of the rotation. It can be presumed that nearly all the transient shift workers would be male.

Plans for the single status accommodation facility consist of a complex of about 60 rooms with some common areas and kitchen and eating facilities. The accommodation will operate on a hotel-like basis where employees “check in” when their shift rotation starts and “check out” in a locker when their rotation ends and then travel back to their home community. The workers will be on-site on alternate shifts; therefore, approximately 30 people will be in residence in the single-status accommodation while 30 are working. If the facility is constructed in Carmacks, it would be a permanent structure that would remain after closure of the mine; if the facility is constructed on-site however, it would be decommissioned and removed from the mine site upon cessation of operations.

The Proponent has not yet decided whether the accommodation will be constructed on-site or in town; consequently, the Executive Committee has been requested to assess both alternatives.

Housing the transient shift workers in Carmacks may have economic spin-offs for the community, but may also have disadvantages that could negatively affect community structure and dynamics. Table 6 presents a summary of possible impacts on community structure and dynamics associated with housing the transient mine workers in Carmacks.

Table 6 Potential Effects of In-migration of Transient Mine Workers

Potential Positive Effects	Potential Negative Effects
• Increased expenditure in local businesses. • Increased social and recreational opportunities for the workers. • The accommodation building could potentially be used by the community after mine closure. • Increase in property tax base. • New residents could help bolster support for social capital and infrastructure, which could contribute to strengthening community cohesion and vitality.	• Some of the transient mine workers may contribute to substance abuse and gambling in the community. • Interaction between male transient mine workers and women in the community could lead to increased instances of harassment, sexual assault, unwanted pregnancies, or increased prevalence of sexually transmitted infections. - Increased demand on health and social services - Increased instances of single mothers - Increased instances of young mothers • Increased community crime rate (single males aged 15-24 have the highest crime rate). • Increased demands on the existing recreational, health, social and business services. • Increased demands on community infrastructure (see Section 8.4 *Community Services and Infrastructure*)

Housing the transient mine workers on-site is anticipated to have a negligible impact on community structure and dynamics. This alternative would allow the Proponent greater control over employee activities and the transient mine workers would not have the opportunity to spend much time in Carmacks.

The Executive Committee is of the opinion that transient workers will not contribute to the community in the same way as permanent workers, because they may have limited time to participate in community life. The rotational shifts and long hours at the mine site will not leave them with much free time in Carmacks and because many of the transient workers will likely be relatively young and/or have families at home, they are less likely to be interested in family- or community-oriented pursuits while they are in Carmacks.

In the Draft Screening Report, the Executive Committee noted that mitigating the potential significant adverse effects of housing the transient mine workers in Carmacks involves some control over the exposure of the workers to the community. The Executive Committee cited concerns about the potential of housing the transient mine workers in the community to contribute to substance abuse or gambling in the community, as well as adverse impacts on women, because these particular effects have been highlighted in other similar communities affected by industrial development. These issues were also raised by the community, the LSCFN, YG-Health and Social Services and YG- Women's Directorate.

The Executive Committee proposed that measures such as promoting recreational/social engagement and providing meals within the accommodation facility, banning alcohol or drugs on the premises and setting curfews for workers, will reduce the potential for these effects by encouraging the employees to spend non-work time at the accommodation facility. Based on comments received on the Draft Screening Report, the Executive Committee understands that some of the recommended mitigative measures (e.g., implementing a curfew, restricting alcohol and drugs) may not be feasible and would thus not effectively mitigate the potential social effects. Consequently, the Executive Committee is recommending that the single-status accommodation be located at the mine site in order to more effectively mitigate the potential adverse social effects of housing the transient mine workers in Carmacks. Locating the single-status accommodations on-site is also likely the preferable option of the transient workers, because it eliminates the daily travel requirements to and from the site.

The Executive Committee notes the potential for economic spin-offs to Carmacks if the single-status accommodation facility is located in Carmacks as well as the potential for the buildings to serve an alternate function after the mine has closed (i.e. Yukon College housing). However, as discussed previously, the nature of the shift work schedules of transient workers would limit their opportunities to interact with the community and any resulting economic spin-offs to local businesses.

As YG-Health & Social Services suggested, the Proponent should put appropriate measures in place to promote the health and well-being of their employees through the provision of positive physical recreation facilities within the accommodation, healthy food options and cooking facilities in the accommodation, TV and internet access, and appropriate health promotion materials (e.g., condoms).

8.2.2.3 Out-migration

The Proponent is anticipating drawing on the labour pools of Pelly Crossing and Whitehorse for its additional personnel requirements. The draw on Whitehorse will represent a small proportion of the skilled workforce available and significant adverse impacts on community structure and dynamics are not anticipated. The Executive Committee has determined that the rotational work schedule chosen by the Proponent will minimize these impacts and furthermore, that sufficient counselling and related social services are available in Whitehorse. Employment with the mine will contribute to lower unemployment in Whitehorse, build the capacity of skilled labourers in mining work, and will provide economic benefits to the employed individuals and their families.

Out-migration from small, predominantly aboriginal northern communities can affect community structure and dynamics and can weaken culture. In contrast to Whitehorse, Pelly Crossing is a small community of approximately 284 people (Yukon Bureau of Statistics, 2007). The Proponent stated that 55 people in Pelly Crossing have experience in occupations relevant to work at the mine. The out-migration of even 20 to 30 workers from Pelly Crossing would represent a considerable proportion of the community and the skilled labour force, potentially having serious implications for the community. These potential effects are exacerbated by the fact some workers in Pelly Crossing are currently employed with the Minto Mine; thus, the out-migration of Pelly Crossing residents to the Project may leave the community in short supply of skilled labourers, which could be considered a significant adverse effect.

The Executive Committee recommends that the Proponent engage in discussions with SFN and members of the community of Pelly Crossing to ensure the opportunities for employment with the Project are maximized, while ensuring the community is prepared for the potential out-migration of workers. Possible education and training provisions to build community and individual capacity are discussed in Section 8.5 *Education and Training*.

The effects outlined in Section 8.2.2.1 *Employment with the Mine* and *Increased Income* apply to the community of Pelly Crossing in the consideration of the potential effects associated with out-migration. Workers from Pelly Crossing, however, would not be able to travel home each night and would be away from the community and living in accommodations on-site or in Carmacks half-time. This factor may amplify some of the effects related to stress and family disruption described in the previous Sections. As discussed, the four-day-on/four-day-off rotational work schedule proposed by the Proponent will help to alleviate some of these effects. For workers migrating from Pelly Crossing and Whitehorse, the four-day-on/four-day-off schedule, combined with a policy of flexible leave proposed by the Proponent, should provide adequate opportunity for these individuals to pursue traditional or recreational activities, general leisure or spend time off with their families.

The provision of training, substance abuse treatment and counselling services committed to by the Proponent will likely help to mitigate some of the potential adverse impacts associated with Project employment and increased income. The administrators of health and social services in Pelly Crossing should anticipate potential health and social impacts on the community and plan for sufficient resources to handle any increased demand.

8.2.2.4 Mine Closure

The inherent boom-and-bust nature of the mining industry can affect the social stability of communities. The proposed duration of the Project is relatively short. The Project will provide economic and other benefits to Carmacks in the short-term, but does not provide long-term economic stability for either individual workers or the community at large. It is anticipated that closure of the Project will have considerable effects on the Carmacks. The community will have to be prepared for these potential effects and able to adapt to the post-closure environment.

Mine employees will likely develop valuable skills and experience, which may be transferred to other work in the same or related fields. Particularly if further industrial development occurs in the region, practical mine experience may be an advantage. On the other hand, former mine employees may not be able to find work within Carmacks following closure of the mine. If skilled individuals stay in Carmacks, unemployment rates and dependence on unearned income may increase, potentially leading to family disruptions, increased substance abuse and crime rates. Alternatively, former mine employees may have to leave the community to find employment elsewhere, which could also have negative effects on individual and family well-being and ultimately, community stability.

The process established by the 'Yukon Mine Site Reclamation and Closure Policy' encourages the Proponent to seek the views of the community, the LSCFN and relevant YG departments on the development of the Carmacks Copper Project Closure and Reclamation Plan. As required by the Policy, a closure and reclamation plan will be prepared before mine operations begin. This inclusive process offers the dual advantage of allowing for input from the stakeholders and making stakeholders aware of the process and timing of mine closure, which will aid them in preparing for a post-closure environment. Communities can manage the impacts of mine closure by advanced planning, communicating with the mining company and government, understanding the process and providing input. Communities can work with the company to reduce the negative impacts of mine closure by (NRCan, 2006):

- Building community capacity to manage opportunities and impacts;
- Providing training and competency development; and
- Developing alternative and secondary industries (e.g., First Nations suppliers).

Premature or Temporary Mine Closure

Mines may be shut down temporarily due to low metal prices, resulting in employees being laid off (Sumi and Thomsen, 2001). Premature or temporary shut-down of the Project could result in significant adverse socio-economic effects on the community. The uncertainty and financial stress caused by a premature or temporary closure would adversely affect individual well-being, and family and community stability, potentially leading to depression, increased substance abuse, family break-ups, family violence, increased crime in the community, less participation in community events, and other indirect impacts.

Premature mine closures are always difficult, but particularly for small northern communities. The proposed financial management and planning training may encourage employees to establish savings, ultimately to prepare for planned closure of the mine, but also in the event of an unplanned permanent closure. Community involvement in the post-closure and reclamation planning process can also play a part in easing the effects of an unplanned closure. The Executive Committee suggests that the Proponent undertake to provide the Village of Carmacks and LSCFN with quarterly updates on its operation and provide a quarterly public forum to allow any community concerns to come forward.

8.2.3 REQUIRED MITIGATIVE MEASURES

108. The Proponent shall locate the single-status accommodation facility for transient mine workers at the mine site.
109. The Proponent shall implement management policies and procedures for the single-status accommodation facility. This will include:
    a. Alcohol and drug policies;
    b. Policies to encourage resident participation in recreational opportunities; and,

   c. Policies proving health promotion information and materials.

110. The Proponent shall make available counselling services to employees and their families.

111. The Proponent shall implement mandatory substance abuse and chemical dependency awareness training for all its employees, contractors and sub-contractors. Information about substance abuse shall consider the abuse of alcohol, illicit drugs and prescription medications.

112. The Proponent shall implement a substance control policy for mine employees. This policy may include mandatory pre-employment testing and random drug testing during employment for all mine employees. The substance control policy shall include protocols for how the employer will deal with the event of an employee being found consuming alcohol or drugs on site, or being under the influence of alcohol or drugs, or other otherwise failing a drug test. The Proponent shall document the rates of substance abuse instances, as well as success of the mine's substance abuse treatment resources (in terms of repeat offences), and shall, subject to privacy legislation, provide the information to YG-Health & Social Services, LSCFN and SFN if requested to do so.

113. As proposed by the Proponent, special consideration shall be given to granting leave requests to employees who intend to undertake traditional pursuits.

114. The Proponent shall engage with local communities, LSCFN and SFN to help maximize opportunities for employment and help to prepare the communities for the potential out-migration of skilled workers.

115. The Proponent, in cooperation with the Village of Carmacks, LSCFN, SFN and YG, shall plan for the eventual closure of the mine and the resulting effects on employees. This planning shall commence upon start-up of operations.

116. The Proponent shall develop the Mine Closure and Reclamation Plan in collaboration with the Village of Carmacks, LSCFN and YG.

8.2.4 EXECUTIVE COMMITTEE SUGGESTIONS

The Executive Committee suggests that the Proponent undertake to provide the Village of Carmacks, LSCFN and SFN with quarterly updates on its operation and will provide a quarterly public forum to allow any community concerns to come forward.

The Executive Committee suggests that the Proponent engage the Village of Carmacks and LSCFN to discuss the possibility of on-site mine infrastructure being re-located to Carmacks post mine closure.

8.2.5 CONCLUSION

The Executive Committee has determined that with the application of the above mitigative measures, significant adverse effects on the community structure and dynamics resulting from the Project are not anticipated.

The potential effects of the development of a mine near a small northern community that can destabilize community structure and dynamics are numerous, interrelated and difficult to predict with certainty. Many social effects are linked to each other and to existing conditions; therefore, the upset of one factor may have a cascading impact on other social dynamics. Because of the difficulty in assessing these effects, particularly in terms of likelihood, magnitude and extent, their significance is difficult to determine. For this reason, socio-economic effects monitoring and adaptive management strategies are critical steps in ensuring impacts are minimized.

The Executive Committee notes that there is generally a lack of baseline socio-economic data available at the community level in the Yukon. Given the well-documented range of potential socio-economic effects on small, rural northern communities resulting from industrial development, monitoring parameters such as, rates of substance abuse in the community, family violence incidents, incidences of violence against women, and others, would help to build sufficient baseline information, and to identify and ultimately address impacts of industrial development on affected communities. The Executive Committee is of the opinion that responsibility for the majority of such monitoring efforts falls to Yukon and First Nation governments.

8.3 ECONOMY AND EMPLOYMENT (COMMUNITY AND REGION)

8.3.1 OVERVIEW

The Project will affect the local and regional economy in terms of contributing to the Yukon GDP, generating government tax revenues and royalties, and providing employment and business opportunities. These effects are primarily beneficial in nature; however, the “boom-and-bust” cycle, often characteristic of mining developments, may have significant adverse effects to the local and regional economy and employment levels. The regional scope for the effects assessment for economy and employment is the Yukon Territory; the local scope is Carmacks.

The Carmacks economy is relatively limited in range (Government of Canada et al., 2004). More than half of Carmacks’ residents are employed with the territorial government, including education and health care. Many residents participate in traditional activities that supplement earned and unearned income and periodically participate directly and indirectly in resource exploration and development activities. Due to the seasonal nature of tourism, the primary service industry and mining exploration/development, only a small proportion of employment in Carmacks is full-time, year round. As reported in the 2001 Census, full-time, year round employment in Carmacks accounted for only 29 percent of employed people.

The Yukon economy has been heavily influenced by the mining sector for more than a century. However, government employment is presently the dominant industry in the Yukon. Territorial, federal, municipal and First Nations governments generate employment for the territory. Whitehorse, Yukon’s capital, has a diversified business sector which serves the entire territory. Whitehorse’s economy still relies in part on the state of Yukon mining, and many of the businesses that provide goods and services to the mining industry are headquartered in the city.

YG-Economic Development conducted an internal analysis based on the Proponent’s economic projections at the stated price of $2.55/pound of copper, which demonstrated that the Project is expected to have a significant positive economic impact on Carmacks and the Yukon. YG-Economic Development concluded that the Project will provide many jobs to Yukoners, increase the Yukon GDP by five percent and provide significant tax revenue to Yukon and First Nation governments.

8.3.2 EFFECTS CHARACTERIZATION

8.3.2.1 GDP and Government Finances

The tax revenue generated from the Project includes personal income taxes, corporate taxes and mining royalties and will be shared amongst the federal, territorial and First Nation governments. As the Proponent described, tax revenues will vary for each government depending on the locations of the businesses contracted by the mine and the residencies of its employees. The federal government and YG may receive corporate income tax revenues from the Project. YG may receive mining royalties pursuant to devolution agreements and legislation and may share these royalties with

Yukon First Nations in accordance with Ch 23 of YFNFAs. Given its incorporation under the Yukon's Municipal Act, the Village of Carmacks stands to benefit from increased property tax revenues.

Naturally, the GDP will fluctuate with the price of copper and a reduction in the stated price would negatively impact the tax revenue generated on profits (including mining royalties) as forecasted by the Proponent. Depending on the degree of change in the estimated rate, effects could be significantly adverse to the Yukon economy. There are no mitigative measures to directly address the potential effects to the economy; however, the Executive Committee is satisfied with the determination of the Proponent and YG-Economic Development that the Project will have an overall positive effect on the economy of Carmacks and the Yukon.

YG has implemented a mine reclamation and closure policy (see Section 9.2.5 for further discussion). A fundamental tenet of the policy is the requirement for mine owners to financially secure their developments for the cost of liability at any point in the life of the mine. Financial security will be required for the Project as a means of ensuring temporary closure (e.g., maintenance, labour disputes or any other unforeseen circumstances), reclamation, maintenance, monitoring and adaptive management programs are successfully implemented. The financial security will help to mitigate adverse impacts to the GDP and tax revenues that would result from lower prices of copper leading to an unanticipated mine closure.

8.3.2.2 Employment

Overall, the Project is anticipated to employ approximately 408 people (including direct and indirect employment). The labour force required for the construction phase of the Project is approximately 300 people seasonally over two construction seasons. During the operations phase, employment will range from approximately 115 people for the initial years, then peak to approximately 181 people during years four through six. The average number of employees for the operations phase is estimated to be 150 people.

The Proponent has established that the demand for mine employees exceeds the known supply of qualified persons in Carmacks or Pelly Crossing. The Proponent has committed to maximizing local hire and intends to apply the adjacency principle to ensure that residents of Carmacks and Pelly Crossing have the first opportunity at jobs with the mine. Maximizing local hire has potential benefits for the Proponent, local prospective mine employees and communities, including:

- Increasing the capacity of community members from Carmacks and Pelly Crossing in terms of skills development and experience;
- Decreasing expenses to the Proponent associated with transporting non-local employees to and from the mine site and providing them with housing; and
- Decreasing the likelihood of potential effects on community structure and dynamics associated with an influx of mine employees to Carmacks (see Section 8.2.2.2).

While significant adverse effects pertaining to employment are not anticipated, the Executive Committee recognizes the importance of maximizing the opportunities for local hire. The Executive Committee is of the opinion that the Proponent's commitment to maximize local hire must be developed further toward realizing this goal. While there are some individuals in both Carmacks and Pelly Crossing who possess the appropriate skills, training and experience to work with the mine, many do not and it is imperative that these individuals are given the opportunity to develop their skills and knowledge to ensure the greatest number of local people possible benefit from the Project. Overcoming potential barriers to employment, as highlighted by the Proponent, is critical to ensuring that local people and First Nations have the opportunity to attain and sustain employment with the mine. Barriers related to education and training are addressed in Section 8.5 *Education and Training* and social barriers are addressed in Section 8.2 *Community Structure and Dynamics*. In addition to the Proponent's participation in efforts aimed at overcoming obstacles to employment, the Executive Committee suggests that recruitment strategies be developed in cooperation with the LSCFN, the Village of Carmacks and YG Economic Development to target First Nations and northern employees. The Proponent has indicated that a Participation Agreement (i.e., benefits agreement) would be negotiated with the LSCFN and the community; the Executive Committee is of the opinion that the Proponent should commit to a percentage of local and First Nations hire and should formalize this commitment in the Participation Agreement. Formalizing this commitment will encourage local prospective employees to obtain the skills and training necessary to obtain employment at the mine and encourage the Proponent to invest in training and recruitment of local prospective employees. Other related measures, such as recruitment and training strategies and commitments, should also be formalized into such an agreement. Furthermore, monitoring of parameters such as, number of Carmacks residents employed at the mine, number of local people (i.e., from elsewhere in the Yukon) employed at the mine, and the number of First Nations people employed at the mine, should also be undertaken by the Proponent. Results of this monitoring should be submitted annually to YG-Economic Development, LSCFN and the Village of Carmacks.

8.3.2.3 Local Business Opportunities

The Proponent estimates that, during construction, approximately ten percent of projected capital costs would be sourced locally in the Yukon. On that basis, the updated initial estimated capital cost of $124 million, as presented in the proposal, will yield approximately $12.4 million in Yukon-sourced procurement of goods and services during construction. The Proponent is further aiming to secure a minimum of ten percent of the value of goods and services required for operations locally.

While significant adverse effects pertaining to local business opportunities are not anticipated, the Executive Committee recognizes the importance of maximizing these opportunities toward contributing to the local economy and building the capacity of local businesses. The Proponent has committed to maximizing local/ regional procurement of goods and services (e.g., preferential hiring). Western Copper expects this will encourage both the expansion of existing business and establishment of new business ventures locally; thereby contributing to the diversification of Carmacks' economy. The Executive Committee is of the opinion that the measures put forward by the Proponent related to maximizing local procurement of goods and services will be effective toward realizing this goal.

Existing or prospective local or regional businesses may face barriers to securing contracts for goods and services with the Project, in terms of lacking the experience or the capacity to bid on these types of contracts. Additionally, local goods and services in the north can be more costly than in the south, which may deter prospective buyers. However, local and regional businesses offer benefits in terms of familiarity with protocols for doing business in the Yukon, experience administering goods and services in a northern environment, ready availability of goods and services and reduced transport costs.

The Proponent intends to follow an approach of cascading adjacency, whereby business opportunities will first be made available to businesses, to the extent that they are qualified and capable, located in closest proximity to the Project area. In order to obtain the required goods and services from local sources, the Proponent has indicated that they are prepared to:

- Limit the scope of supply to better suit the capability of local supplier;
- Provide flexible commercial terms where justified;
- Consider joint ventures or other appropriate business relations between a local provider and an outside third party to meet Western Copper’s needs;
- Support local enterprise development through non-monetary means and, on a selective basis, offer financial support;
- Consider build, own, and transfer arrangements or other innovative approaches that encourage local investment and capacity building;
- Provide financial guarantees, under certain circumstances, to enable local business to get established or expand, and;
- Include specific language in purchase orders, contracts and agreements which clearly states Western Copper’s expectations regarding participation of local residents and firms in the performance of any Project related work or services. Bidders will be advised that the extent of local participation will be significant weighting factor in selection of the successful bidder.

The Executive Committee is of the opinion that these strategies, developed in partnership with the Carmacks Development Corporation, Chambers of Commerce, LSCFN, SFN, the Village of Carmacks and YG-Economic Development, will help local and regional businesses capitalize on the business opportunities offered by the Project, and likewise promote the success of the Proponent’s commitment. Additionally, the education and training measures outlined in Section 8.5 will help local and regional businesses to overcome barriers to benefiting from the Project. The Executive Committee further recognizes that local businesses can only plan to efficiently and cost-effectively provide goods and services to the Proponent when they are aware of the goods and services needed and approximate timelines on which those goods and services will be required.

The Executive Committee suggests that the Proponent quantify its commitments related to local procurement of goods and services and formalize this commitment in a benefits agreement.

8.3.2.4 Boom-and-Bust Cycle

The mining industry often leads to a “boom and bust” economic cycle in affected communities, because it is based on exploiting a finite resource. When mining operations commence, a “boom” in economic activity may occur (i.e., decline in unemployment, increases in demand and an increase in income levels). Affected individuals and communities may prosper during this time. The industry is subject to circumstances which could lead to an economic "bust", however, such as a decrease in the global market value of the mineral/ore, an unexpected shortage of labour or goods and services, or the planned closure of the mine when the resource is maximally exploited. The "bust" resulting from temporary or permanent mine closure results in employee layoffs, cessation of project-related provision of goods and services, and discontinued government tax and royalty revenues. These effects can be considered significant and adverse.

Planned mine closure is an inevitable outcome of a mining project. Unplanned closure is a known risk associated with mining projects, and there are means of lessening these impacts. Mine closure can also provide economic opportunities to individuals and businesses in the reclamation/ remediation field.

The Executive Committee anticipates that by meaningfully involving stakeholders in comprehensive closure planning, the "bust" effects associated with mine closure will be less significant. On an individual level, the Executive Committee is of the opinion that the employee financial planning training committed to by the Proponent, as well as the skills and training acquired as a result of Project related work, will help individuals adapt to life beyond the mine. It is anticipated that local and regional businesses contracted by the Project will have built the capacity to adjust to a post-mine environment by offering their services to other industries. The Executive Committee accepts the Proponent's assertion that the Project holds potential to diversify the economic base of the Carmacks regional and that economic diversification will promote Carmacks' post-development economic stability. Provided sufficient security is in place, First Nation, territorial and federal governments are anticipated to be able to adapt to the economic changes resulting from mine closure and significant effects are not anticipated. The Executive Committee consequently does not offer any further mitigation measures to address the potentially adverse effects associated with mine closure.

The social effects of the planned and unplanned mine closure on individuals and communities is addressed in Section 8.2.2.4 *Mine Closure*.

Increase in Inflation and Cost of Living

The "boom" usually associated with a development Project is often accompanied by a rise in inflation and cost of living, potentially resulting from an increase in demand from direct spending by the Proponent on Project inputs and from the spending of employment income by Project employees. This indirect effect may impact Carmacks because of its relatively small and narrow economic base. Increased inflation/cost of living in Carmacks could create a situation in which it is more difficult for individuals/families with lower incomes to maintain an acceptable quality of life. This can be particularly problematic with respect to inflationary costs in housing or unavailability of units in a smaller community like Carmacks (see Section 8.4.2.4 for further discussion). There are no specific mitigative measures to effectively address this effect of the Project on the Carmacks' economy; rather, it is important that the community be aware that the cost of living in Carmacks may increase.

Whitehorse is not anticipated to be affected by a rise in inflation/cost of living, because of its larger and considerably more diversified economy. The likelihood of upward pressure on the cost of living Yukon-wide as a result of the Project is expected to be negligible.

8.3.3 EXECUTIVE COMMITTEE SUGGESTIONS

As discussed previously, the Executive Committee does not anticipate significant adverse effects with respect to employment and local business opportunities. However, in the interest of encouraging the Proponent’s commitments related to maximizing of local and First Nations hire and local and regional procurement of goods and services, the Executive Committee suggests the following measures and additionally suggests that they be formalized in some manner. This could include an Impact and Benefits Agreement or other form of agreement:

- The Proponent should quantify its commitment to maximize local and First Nations hire in collaboration with the LSCFN, the SFN, the Village of Carmacks and community of Pelly Crossing, the City of Whitehorse and YG. The Proponent should monitor the number of Carmacks residents employed at the mine, number of other Yukon residents employed at the mine, and the number of First Nations people employed at the mine. Results of this monitoring should be submitted annually to YG-Economic Development, LSCFN, SFN and the Village of Carmacks.
- The Proponent should quantify its commitment to maximize local procurement of goods and services in collaboration with the LSCFN, the SFN, the Village of Carmacks and community of Pelly Crossing, Carmacks Development Corporation, the City of Whitehorse and YG. The Proponent should monitor the level of local (Carmacks and Yukon-wide) procurement of goods and services and should submit the results to YG-Economic Development, the Village of Carmacks and the LSCFN.
- The Proponent should collaborate with the appropriate bodies (e.g., LSCFN, SFN, Yukon Chamber of Commerce, Carmacks Development Corporation and YG-Economic Development) to develop appropriate recruitment strategies to target First Nations and other local people.
- The Proponent should collaborate with the appropriate bodies (e.g., LSCFN, SFN, the Carmacks Development Corporation and the Yukon Chamber of Commerce) to identify opportunities for procurement of local goods and services.
- The Proponent should issue notices of opportunities to supply good and services locally that include:
  - Describe the details of the goods and services required
  - Provide sufficient time for response
  - Incorporates training and certification requirements and Western Copper’s corporate safety and environmental standards to which the service provider will have to comply.

- The Proponent should develop a sourcing schedule that outlines estimates of goods and services and approximate timelines for their acquisition for distribution to local businesses.
- The Proponent should increase the positive opportunities for participation by Yukon business in the supplying of goods and services to the mine through mechanisms such as having a resident business development manager to assist First Nation and other Yukon companies in bidding on contracts.
- The Proponent should consider the use of competitive bidding systems such as a two-envelope bidding system, combining technical and price points, where technical points for commitments to local and regional provision of goods and services are fairly included in the technical merit of any proposal.

8.3.4 CONCLUSION

The Executive Committee is of the opinion that with adequate planning and communication the Project is not expected to have significant adverse effects on either the local economy of Carmacks or the regional economy of the Yukon.

8.4 COMMUNITY SERVICES AND INFRASTRUCTURE (COMMUNITY AND REGION)

8.4.1 OVERVIEW

Community services and infrastructure has been chosen as a VESEC because of its importance in supporting the overall function of Village of Carmacks. For the purposes of this assessment, community services and infrastructure includes the following components that may be affected by the Project (segregated by responsible government/body):

Village of Carmacks

- Municipal roads, parks and buildings
- Sewage and wastewater infrastructure
- Landfill and recycling
- Carmacks Recreation Centre

Government of Yukon

- Highway/bridge maintenance
- Housing (Yukon Housing Corporation)
- Department of Health and Social Services (Carmacks Health Centre)
- Emergency Services (fire and ambulance)
- Tantalus School
- Yukon College

LSCFN Government

- Health and Social Programs
- Daycare

Federal Government

- RCMP services

Private

- Grocery stores
- Supply stores
- Service providers
- Restaurants

As previously discussed, an estimated 10 to 20 mine employees may relocate to Carmacks with their families. Additionally, the Proponent may construct and operate a single status accommodation facility (see Section 8.2.2.2 for details) for up to 60 rotational mine employees at any given time. The Project has the potential to adversely affect community services and infrastructure in the following ways:

- Transport of Project equipment, materials and personnel through the Carmacks may impact municipal road infrastructure.
- Influx of mine workers (and their families) to Carmacks may increase demand on existing housing infrastructure, and municipal, daycare, school, health, social and emergency services.
- Family/community social problems could result from individuals in the community pursuing employment at the mine (as discussed in Section 8.2.2.1 *Employment with the Mine and Increased Income*), which could put a strain on existing social services.

8.4.2 EFFECTS CHARACTERIZATION

8.4.2.1 Municipal Infrastructure

Project traffic through Carmacks may contribute to the degradation of municipal roads. The Proponent has proposed that the asphalt at the Klondike Highway/Freegold Road and Freegold Road/River Road intersections be upgraded to mitigate possible damage due to the high stress applied from heavy, slow-turning traffic. Additionally, the municipality will likely incur the expense of the installation of signage to warn community members of industrial traffic proposed by the Executive Committee to help mitigate risks to public safety. The Executive Committee is of the opinion that with the proposed upgrades and regular maintenance, impacts on municipal roads due to Project traffic are anticipated to be minimal.

An influx of mine personnel and their families will increase demand on municipal services, such as sewage and wastewater, waste management and recreational services. The Village of Carmacks, with support from YG, plans to build a new sewage and wastewater treatment plant with a 500-person capacity. Construction of the plant is set to begin as soon as funding is announced. Currently, Carmacks' sewage and wastewater treatment system serves approximately 200 people; thus, the population increase anticipated from the Project will not exceed the new system's capacity. If located in Carmacks, the scale of the single-status housing facility is not anticipated to result in excess demand on the local sewage and wastewater treatment system.

The landfill has a design capacity and operations budget to provide adequate service to the community, but does not have the capacity to meet the surge in demand the Project may induce (Kishchuk and Taggart, 2007). Planning for additional capital and operating expenses will be necessary to ensure the landfill has sufficient capacity to meet the demand increase. The Proponent has committed to enter into discussions with the Village of Carmacks regarding effects to landfill services and working with the Village to mitigate the impact. The Executive Committee is of the opinion that with adequate logistics and financial planning, significant impacts to landfill services are not anticipated.

It is assumed that Carmacks' municipal recreational services will be able to support additional use resulting from an influx of mine personnel and their families. Consequently, significant adverse effects to municipal recreational services are not anticipated.

The Executive Committee notes that the expected increase in property tax revenue from the influx of new residents to Carmacks should contribute to the municipality's ability to manage additional modest infrastructure expenses.

8.4.2.2 Health and Social Services

Both the YG- Health and Social Services and the LSCFN Health and Social Department provide a variety of services to Carmacks residents and LSCFN citizens. The influx of mine workers and their families to the community will increase demand on local health and social services. Potential social effects resulting from the Project, as discussed in Section 8.2, may also put strain on existing health and social services. YG-Health and Social Services indicated that additional doctor clinics may be required as a result of the Project, particularly in response to the need for employment medical examinations. The magnitude of any impact on health and social services is difficult to predict; however, the Executive Committee is of the opinion that potential adverse effects can be avoided with adequate planning on the part of YG-Health and Social Services and the LSCFN Health and Social Programs. Additionally, the transient workers being housed on-site rather than in the community will likely decrease the strain on local health and social services.

8.4.2.3 Emergency Services

The increased demand for emergency services (i.e., fire, police and ambulance services) is anticipated to be incremental and within current capacity. The mine will have established emergency protocols and its own on-site primary emergency care, including an ambulance, fire truck and emergency personnel. YG-Health and Social Services indicated that the Carmacks Health Centre would need to be apprised of mine health and safety protocols to delineate the responsibilities of all parties.

The Proponent has committed to working closely with the Carmacks Health Centre and Yukon Emergency Medical Services to ensure that mine health and safety protocols are understood by all parties. The Executive Committee is of the opinion that significant adverse effects are not likely to accrue to emergency services, provided the Proponent informs the Carmacks Health Centre, Yukon Emergency Medical Services, and Carmacks volunteer fire department of its health and safety protocols. The Executive Committee also notes that new Carmacks residents may increase the volunteer base available for the local fire department or ambulance services.

8.4.2.4 Housing

Currently, there is little activity in the housing market and rental units are limited. The Yukon Housing Corporation conducted a survey in 2001 and found houses in Carmacks are generally in poor condition (Yukon Housing Corporation, 2001). The official *Carmacks Integrated Community Sustainability* Plan states that lands available for future development are limited and would be difficult to service. Given these considerations, sufficient housing may not be available for the mine workers and their families who move to Carmacks. The Proponent and/or individual mine employees, therefore, may have to construct new residences.

Concern has been expressed among community members that real estate prices will drop following mine closure and that houses may remain empty and fall into disrepair. Community members also indicated that the demand for construction of new houses may take the few construction workers in the community away from attending to Carmacks' current housing issues.

It is difficult to predict the significance of these effects in terms of magnitude and extent. It will be important for the Proponent to make its employees who may relocate to Carmacks aware of the limited availability of housing. The Executive Committee suggests that the Proponent engage in discussions with the Village of Carmacks to ensure adequate land is available on which residences may be constructed to support the permanent mine workers. The Executive Committee notes that the influx of people to Carmacks has the potential to increase the tax base, which would contribute to the resources available to the Village of Carmacks and YG to deal with housing issues. With respect to potential impacts on the community after the mine closes, the Executive Committee is of the opinion that while 10 to 20 additional residences represents a considerable increase in housing units in Carmacks, given the current need for adequate housing, the houses will likely be purchased by Carmacks residents, by Yukon Housing Corporation as low-income housing units, or by the LSCFN.

8.4.2.5 Education Delivery

The Tantalus School offers classes from kindergarten through grade 12. In the 2004-2005 school year total enrolment was 103 for all grade levels. The school currently has 14 teachers plus two educational assistants and one remedial tutor. In September 2007, the Tantalus School opened a new building with larger capacity and updated facilities. Cully Robinson, Principal of the Tantalus School, indicated that an influx of children to the school resulting from the in-migration of mine workers to the community would contribute to the school's growth and development and would be generally positive for the school (C. Robinson, pers. comm. 2007). Some additional resources may be required to support the additional students (i.e., teachers, educational assistants, desks, etc.), but Mr. Robinson was confident that these requirements would be manageable.

As discussed in Section 8.5 *Education and Training*, demand for courses at Yukon College satellite campus in Carmacks may increase as a result of the Project. Yukon College is expected to be able to meet the demand at the Carmacks campus or at the main campus in Whitehorse.

The Executive Committee consequently concludes that significant adverse effects to educational services in Carmacks are not anticipated.

8.4.2.6 Daycare Services

Child care in the Yukon is regulated under the *Child Care Act* (Yukon) and associated regulations. The regulations set out required staff:child ratios, maximum group sizes and maximum centre sizes. The reduction of childcare services available to families in Carmacks is considered by the Executive Committee as a potentially significant adverse effect.

The Dune'na Zra Sunch'I Ku Daycare is the only daycare provider in Carmacks. The Daycare is funded by CYFN and receives support from YG through a direct operating grant to help with operating costs. Currently, the Daycare is operating at near-full capacity and recruitment and retention of staff – due primarily to relatively low wages – is an ongoing problem (K. Skookum, pers. comm., 2007). There are plans to construct a new facility in the spring, which would likely support the anticipated influx of children associated with the mine workers; however, inadequate staffing will likely remain an issue.

The Proponent has acknowledged that daycare services may require company support due to the potential influx of mine worker's children to the community. Kelly Skookum, Daycare Coordinator, is of the opinion that higher wages would attract and retain more daycare employees, and indicated that financial support is required to supplement staff wages. The Executive Committee acknowledges that inadequate staffing is an existing condition and as such, does not represent a direct effect of the Project. It is recognized, however, that the Project may exacerbate this effect by placing additional strain on daycare services in Carmacks. An increase in children enrolled at the local daycare will result in an accompanying increase of income to the daycare, which can be used toward managing the costs associated with the influx of children. However, increases in children may require the hiring of additional staff in order to meet regulated staff:child ratios. In order for the daycare to continue to provide existing services to the families in Carmacks, the Executive Committee recommends that the Proponent inform the local daycare providers of likely numbers and ages of children that their Carmacks-residing employees intend on enrolling in the daycare. At its discretion, the Proponent may consider supplementary financial support to the daycare in order to support this service for its employees. The Executive Committee believes some of the responsibility for providing adequate daycare in Carmacks lies with other parties who can integrate this information into their planning and funding programs (i.e., territorial and/or First Nation governments).

8.4.2.7 Private Businesses/Services

Adverse effects to private businesses (e.g., grocery stores, supply stores, restaurants, etc.) are not anticipated, because they are expected to have the capacity to deal with the predicted population increase. The Executive Committee notes that the mine workers and their families may increase the consumer base, which would be positive for local businesses.

8.4.3 REQUIRED MITIGATIVE MEASURES

117. The Proponent shall inform the local daycare providers of likely numbers and ages of children that their Carmacks-residing employees intend on enrolling in the daycare.

8.4.4 EXECUTIVE COMMITTEE SUGGESTIONS

The Executive Committee suggests the following measures to address potential effects of the Project on community services and infrastructure:

- The Proponent should advise local program and service providers of the expected population increase in Carmacks and the likely population mix of that increase (e.g. single adults, families with children).
- The Proponent should apprise the Carmacks Health Centre and Yukon Emergency Medical Services of its health and safety protocols prior to commencement of mine construction.
- The Proponent should engage in discussions with the Village of Carmacks and YG to ensure adequate land is available for residences to be constructed to support the permanent mine workers.
- The Proponent should discuss with the Village of Carmacks and YG how to respond and how to pay for any increases in required road maintenance within the community due to Project-related traffic.

8.4.5 CONCLUSION

The Executive Committee is of the opinion that with the application of the above-mentioned mitigative measures, as well as appropriate planning and communication between the Proponent, the Village of Carmacks, LSCFN and YG, significant adverse effects to community infrastructure are not anticipated

8.5 EDUCATION AND TRAINING (COMMUNITY AND REGION)

8.5.1 OVERVIEW

Education and training can be used to overcome barriers to employment, advance cultural understanding, raise awareness about substance abuse, improve personal and family financial management, improve employability post-Project and ultimately, to build individual and community capacity. Education and training is consequently considered a VESEC.

In general, the Executive Committee agrees with the Proponent’s assertion that the overall effect of the Project on education is expected to be positive. The mine will provide many people with the opportunity to gain valuable knowledge and skills that can be applied to other positions and may ultimately improve the well-being of individuals and their families in the long-term. No mitigation measures with respect to education and training are proposed since no adverse effects to this VESEC are anticipated. Education and training has been discussed, however, in the context of addressing effects to other socio-economic VESECs

The Executive Committee acknowledges the Proponent’s commitment to invest in human capital in terms of providing training and work experience; however, the Executive Committee is of the opinion that some of these commitments require additional consideration to increase the likelihood of their effectiveness. This section examines education and training required for the Project in terms of pre-employment training, job-specific training, training to improve employee well-being and the work environment, pre-closure training, and training for women.

In general, basic education requirements for employment with the Project will be a high school diploma. Trades qualifications will also be a requirement for a number of positions; other post-secondary education will be required for a limited number of positions. The Proponent has outlined some of the training and skills upgrading requirements for employment with the Project. With respect to socio-economic considerations, the Proponent committed to providing the following training for its employees:

- Substance abuse and chemical dependency awareness training;
- Financial and money management training sessions;
- Retirement planning training;
- Cultural awareness and diversity training;

The Proponent also committed to monitoring the level of training or education, and changes in that level, of employees.

8.5.1.1 Background

There are numerous resources available in the Yukon to support industrial development through capacity building. The Yukon Mine Training Association (YMTA), a partnership between the Yukon’s mining industry and First Nations, provides mining-related training to help maximize employment opportunities for northerners. The YMTA provides a variety of training, including safety training, Aboriginal/First Nations Liaison Officer training and Aboriginal/Cross-cultural Awareness Training. The YMTA's objectives include:

- Ensuring First Nations and other Yukoners receive skills needed to access jobs in the mining sector;
- Ensuring First Nations and other Yukoners are able to retain the jobs acquired; and
- Ensuring ongoing needs for a labour pool for mining projects are met.

The Industrial Benefits Preparedness Program is available to support the training requirements of the Project. Additionally, the Yukon Chamber of Mines offers courses that that may help to address Project training needs.

Yukon College operates a satellite community campus in Carmacks. The community campus provides academic upgrading courses including; General Education Diploma (GED), computer training and various occupation-related courses. Yukon College also offers numerous mining/ industry-related programs and courses. Courses/programs which may be relevant to the skills-building required for Project employment include:

- Adult Basic Education Program (includes courses such as Essential Skills for Living);
- General Educational Development (GED) Preparation and Testing;
- Business Administration/ Management courses;
- Career Planning/ Employability Skills courses;
- Cross-cultural Education courses;
- Trades & Technology Program (basic industrial training, workers health & safety);
- Women Exploring Trades & Technology Program (basic industrial training, workers health & safety).

The Carmacks Training and Employment Society is the community training fund that acts as a conduit for the Yukon Government's community training monies. Community training funds are designed to be community-based and community-driven means of ensuring that job-specific training happening in the community is designed to meet the needs of the local job market and the interests of community members.

8.5.2 PRE-EMPLOYMENT TRAINING

Pre-employment training involves training to assist people in overcoming potential social barriers to employment, as well as training to raise education levels to meet the requirement for working at the mine (e.g., standard worker health and safety training).

As highlighted by the Proponent, First Nations people and northerners in general, may experience barriers to employment with the mining sector, due to factors such as variances in education qualifications, lack of computer skills or career planning knowledge and skills, lack of experience in mining or related fields, and limited opportunity for gaining employment-related skills. Specific training and education that may help First Nations and northerners to overcome these barriers, includes:

- Life skills training, basic computer skills and career planning training;
- Small business management/ business administration, including specific training to assist Aboriginal and other northern companies in bidding on contracts;
- Basic industrial/ trades training;
- Health and safety training

Training programs to address these requirements should be developed in cooperation with appropriate agencies, including the LSCFN, the SFN, Yukon College, YG-Economic Development and the Village of Carmacks.

8.5.3 JOB SPECIFIC TRAINING

For specific positions, the Proponent will offer on-the-job training for employees (e.g., operating equipment or machinery). Concern has been expressed that First Nations and northerners are often employed in low-level, low-paying positions, and may not have satisfactory career advancement opportunities. To facilitate promotion to higher level jobs, it is anticipated that the Proponent will offer on-the-job training, and will support external training.

The Executive Committee notes that job specific training, often technical, requires more than a year of education. By communicating with Yukon College the positions it will be hiring and the education/training required, Yukon College can deliver appropriate training to prospective local employees

The Executive Committee is satisfied with the Proponent’s commitment to support employee skills development through building a training program specific to the requirements of the Project. The Executive Committee believes that such a program should be dynamic in nature and should be developed pre-construction to facilitate prospective employees building their skills through appropriate training, and re-assessed prior to operations, during operations and pre-closure to target the skills upgrading/ training requirements of current employees. The Proponent should develop the training program in collaboration with Yukon College, YG-Education, Carmacks Training and Employment Society, Yukon Learn Society and the LSCFN and SFN.

8.5.4 TRAINING TO IMPROVE EMPLOYEE WELL-BEING AND THE WORK ENVIRONMENT

As suggested by the Proponent, personal/family financial management training should be offered to all employees. The Executive Committee commends this commitment and believes it will improve employee well-being by helping employees maximize the financial benefits of working for the mine, including strategic planning for retirement, and will mitigate the potential for money mismanagement.

Mandatory substance abuse and chemical dependency awareness training for all mine employees will help to address existing or potential substance abuse issues among the mine workers, thereby improving individual well-being.

Literature and community concern suggests that some workers – especially First Nations – experience adverse working conditions at industrial sites due to cultural differences, segregation, discrimination or harassment. Mandatory cultural awareness training for mine employees, which focuses on the promotion of racial harmony, on First Nation history, culture and spirituality and on the adjustments necessary in making the transition from traditional to wage economy, would be helpful in lessening the potential for this effect.

Women have reported experiencing discrimination and/or harassment while on the job at mine sites (Status of Women Council of the NWT, 1999). The Executive Committee believes that gender awareness training, which addresses gender discrimination and harassment in the workplace, be implemented. This training could be delivered as a module of cultural awareness training. Section 8.5.6 further addresses training for women.

8.5.5 PRE-CLOSURE TRAINING

As the Proponent has outlined, mine closure will involve reclamation and closure activities which will employ an estimated six people during the first two years and two people during subsequent years. These positions will require training in reclamation and remediation work; it is anticipated that the Proponent will provide some of the training.

The financial management training discussed in the previous section should also include specific training on financial planning for life following mine closure.

8.5.6 TRAINING FOR WOMEN

The Executive Committee is of the opinion training for women deserves particular consideration due to the issues that have been raised by women in other northern jurisdictions related to mining development Projects (Status of Women Council of the NWT, 1999; IORVL, 2006)). In general, women are a minority in the industrial trades. Particularly in small northern communities, women are often not qualified for, or do not have the opportunity to pursue “non-traditional” positions (i.e., positions traditionally held by men) in the mining industry. In small, rural, northern communities, women are in general less likely to have completed high school or further formal education, generally earn less and may be more likely to be the primary caregiver to their children. The Executive Committee is encouraged by the fact that a higher proportion of women in Carmacks hold a trades certificate or diploma when compared with Yukon women as a whole; however, many women in the community do not have these skills and may not even hold a high school diploma.

Additionally, concern has been expressed by women who are working in project-related industrial jobs that they often end up working in what are considered to be traditional, low-level, low-paying positions, for example, as housekeepers, dishwashers or cooks’ helpers, relative to their male counterparts (Status of Women Council of the NWT, 1999). Women in the mining industry have expressed interest in being advanced to higher-level, better-paying positions.

The Executive Committee believes that training provisions focused on building the capacity of women in the community would be beneficial in helping women to overcome barriers to employment and to build the skills necessary for them to advance to more challenging, rewarding and higher-paying positions at the mine. The skills and knowledge gained through this training and experience will also provide women with valuable tools for use after the mine. The Executive Committee encourages the Proponent to work with Yukon College, perhaps through the Women Exploring Trades & Technology Program, to develop specific training courses for women. The Executive Committee also suggests that the Proponent focus on developing the capacity of women employed with the mine through training toward promoting them to higher level, higher paying jobs.

8.5.7 EXECUTIVE COMMITTEE SUGGESTIONS

As discussed in the overview, the Executive Committee does not propose any mitigative measures for education and training, because no significant adverse effects are anticipated with respect to this VESEC. The Executive Committee does however, offer the following suggestions toward enhancing the Proponent's training commitments.

- The Proponent should engage YG, the Village of Carmacks, LSCFN and SFN to develop a strategic approach to the Proponent's support for education and training.
- The Proponent should develop detailed training requirements for the mine positions, as part of a strategic training plan for its employees over the life of the mine, in collaboration with Yukon College, YG-Education, Carmacks Training and Employment Society, Yukon Chamber of Mines, Yukon Learn Society and LSCFN and SFN. Education and training gaps in the community workforce should be identified and existing or adapted training courses that will specifically address those capacity limitations should be developed and made available to Carmacks residents.
- The Proponent should work with Yukon College and other agencies to develop training regimes that focus on building the capacity of women to join the mine workforce and promoting advancement. The Proponent should monitor the number of women employed at the mine, as well as their level of advancement over time. Results of the monitoring should be submitted annually to Yukon College, YG-Economic Development, the Village of Carmacks and LSCFN.
- Education and training strategies should be incorporated into a benefits agreement, such as the Participation Agreement proposed by the Proponent.

8.5.8 CONCLUSION

The Executive Committee has concluded that no significant adverse effects to education and training are anticipated from the Project. The Executive Committee is of the opinion that the suggestions put forth in the previous section will help First Nations and northerners overcome barriers to employment and will, in turn, help the Proponent to achieve its commitment of maximizing local hire.

8.6 CUMULATIVE EFFECTS ASSESSMENT – COMMUNITY AND REGION

The Project may result in residual adverse socio-economic effects, primarily associated with community social (i.e., health and wellness) problems. Some residual effects related to employment may also persist. Residual effects of other projects or activities may act cumulatively to exacerbate these issues.

The Minto Mine, located southeast of Pelly Crossing and northwest of Carmacks, commenced production on October 1, 2007. This mining project draws on the labour forces of Pelly Crossing, Carmacks and Whitehorse, among others. It is anticipated that the communities of Pelly Crossing and Carmacks will be most affected by the Minto Mine. Residual social effects from the Minto Mine and the Project could act cumulatively to exacerbate social problems in Carmacks and Pelly Crossing. The Executive Committee notes that the Project is a relatively small mine, requiring a relatively small labour force; as such, residual impacts are anticipated to be minimal. Education and training provisions and counselling and treatment support services have been made available to enhance the benefits and mitigate the potential adverse effects of the Minto Mine on Pelly Crossing, in particular. The Executive Committee is of the opinion that these measures, in combination with the socio-economic mitigative measures proposed for the Project, will effectively lessen the potential impacts on Carmacks and Pelly Crossing.

The labour requirements of the Project and the Minto Mine could considerably deplete the existing supply of skilled labourers in Carmacks and Pelly Crossing. This could result in a significant adverse affect on these communities in terms of making it difficult to retain local services – particularly trades services. The Executive Committee is of the opinion that adequate planning and education and training provisions can successfully mitigate this potential impact. The Executive Committee recommends that the Proponent provide a comprehensive list of its various types of labour requirements to the LSCFN and SFN, the Village of Carmacks and the community of Pelly Crossing, Yukon College, YG-Education, Carmacks Training and Employment Society, Yukon Chamber of Mines, and the Yukon Learn Society – to ensure these agencies can develop strategies to provide adequate training resources to community members to fill the required positions at the mine to the greatest extent possible and to fill the employment positions in the communities left vacant by those who choose to pursue work at the mine.

The recently permitted Wolverine Mine, proposed in the Finlayson area of southeast Yukon, is planned to be operational in 2009. The Wolverine Mine is expected to draw primarily on the labour force of the communities of Ross River, Watson Lake and Whitehorse. This draw is not anticipated to affect the labour requirements of the Project. The communities of Ross River and Watson Lake are expected to be the most affected by the Wolverine project; thus, there is limited opportunity for socio-economic effects of the Wolverine project to interact with the Project.

There is also active exploration in the Carmacks/ Freegold Road area. Due to the small scale and relatively short duration of the majority of these activities, however, the Executive Committee does not anticipate that these activities will result in residual effects.

Impacts on affected communities may persist long after a mine is gone. Adverse residual effects may compromise the social fabric of the communities, and the ability of the community to deal with other development Projects in the future. The Executive Committee notes that current and pending mining projects in the Yukon may also act cumulatively to increase the capacity of the communities of Carmacks and Pelly Crossing in terms of skills development and experience. These benefits will contribute to community wellness and may increase the ability of community members to participate in future development in the Territory.

9.0 CLOSURE AND RECLAMATION

9.1 OVERVIEW

Proper reclamation and closure of the Project is in the best interest of the Proponent, governments and Yukoners. There are examples in the Yukon where appropriate planning and security was not required or secured and territorial or federal governments have had to take on closure and reclamation costs. Inadequate closure and reclamation, in the past, has resulted in serious environmental damage. Examples include the Faro Mine, the United Keno Hill Mine, Clinton Creek Mine and the Mount Nansen Mine. In contrast, where mine properties have been fully secured, closure has resulted in more appropriate reclamation and minimal environmental impact. One such example is the Brewery Creek Mine.

Potential environmental effects related to mine closure and a discussion on appropriate closure security are examined in this section. Potential socio-economic effects of closure are examined in Section 8.2.2.4.

The mandate for regulating major mining projects on public lands in Yukon, including their closure and reclamation, has devolved from the federal to YG. YG has instituted the ‘Yukon Mine Site Reclamation and Closure Policy’ to foster responsible and progressive mine reclamation and closure in the Yukon, conducted in a manner that promotes sustainable development and a healthy environment. One of the principles of this policy is that security retained by YG equals site liability at all stages during the mine life. The Executive Committee notes the release of the ‘Yukon Mine Site Reclamation and Closure Policy - Financial and Technical Guidelines’ that are directly relevant to many aspects of the proposed Project. In particular, ‘Guideline #T-05’ regarding acid rock drainage potential (ARD/ML), ‘Guideline #T-09’ regarding mine rock piles and ‘Guideline #T-14’ regarding heap leach pads address key Project closure issues.

The Executive Committee acknowledges that YG must approve the Project Reclamation and Closure Plan before proceeding with mine development. This Plan must incorporate reporting requirements and monitoring plans and will be refined and updated on a regular basis, or as required by YG, throughout the life of the mine. An annual report must be submitted to regulators, which details all progressive and ongoing reclamation that occurred during the preceding year. Programs to monitor the effectiveness of reclamation measures must be developed and implemented subject to regulatory review and approval. The results of programs to monitor the effectiveness of progressive reclamation measures, as well as measures taken to address unexpected reclamation developments must also be detailed in annual reports.

The Proponent has prepared a Conceptual Reclamation and Closure Plan, which provides a description of the progressive reclamation during construction and operations and the anticipated closure and reclamation activities on cessation of mine operations. It describes the areas of disturbance that will require reclamation, summarizes the proposed strategy and schedule for closure and reclamation of each area and outlines the work to be carried out. Post-closure monitoring and maintenance are also outlined. The conceptual plan addresses both temporary shutdown and final closure scenarios. There are four overall closure objectives identified:

- Protect public health and safety;
- Minimize, mitigate or prevent adverse environmental impacts;
- Reclaim the site to a land use state consistent with surrounding conditions; and
- Ensure long-term stability of the heap leach and WRSA and site water quality.

Closure of the mine site involves issues related to water quality, geochemical stability, and physical stability, and those associated with land use, aesthetics and public health and safety. Chemical stability and water quality are the prominent closure issues for the Project.

The Proponent has indicated that the ideal goal at closure is to achieve the above objectives in a “walk-away” scenario; that is, one in which there is no further requirement for monitoring and maintenance. A period of post-closure “active care” will be required however, until it has been satisfactorily demonstrated from the results of site monitoring that reclamation measures have achieved the required outcomes and are self-sustaining – particularly with respect to the spent ore heap. An initial “active care” system is proposed to rinse and neutralize the heap until heap effluent quality is demonstrated (i.e., meets MMER standards), at which time a “passive care” system will be implemented. YG has stated that “Reliance on long-term active treatment is not considered acceptable for reclamation and closure planning” (YOR doc #2006-0050-093-1 and ‘Yukon Mine Site and Reclamation Closure Policy - Financial and Technical Guidelines’)

The Proponent proposed the following closure measures in the Conceptual Reclamation and Closure Plan:

- Mine Site Infrastructure
  - All mine site facilities, equipment and materials will be dismantled (as appropriate) and removed from the site. Above-ground foundations will be broken down to ground level, covered with local glacial tills and seeded. Water treatment facilities will remain intact until the heap leach pad has been successfully neutralized and water quality for release to the long-term infiltration gallery is ensured. Water diverting structures will be made permanent and the sediment control ponds will be decommissioned.
  - If it is determined through consultation with the LSCFN that the mine access road should be dismantled, all culverts, bridges and approaches will be removed, the road will be scarified and de-compacted, drainage patterns will be restored and the right-of-way will be re-seeded. To discourage travel, the road may be bermed and ditched.
  - The ground will be re-contoured to restore pre-mine drainage patterns and re-vegetated with a seed mixture of indigenous plant species. The sand and gravel borrow areas will be re-contoured and seeded.
- Open Pit

  - The open pit will be allowed to flood, requiring at least 300 years based on current estimates.
  - Access to the open pit will be restricted.
- Heap and Processing Facilities
  - The heap will be rinsed with treated, recycled water and neutralized with sodium carbonate (active care).
  - Rinse solutions will be treated to appropriate standards and released to the environment.
  - The top surface of the heap leach pad will be re-graded to promote controlled runoff of precipitation, and minimize ponding and seepage.
  - Sludge from the HDS treatment plant will be placed on the top of the heap.
  - The top surface of the heap will be covered with an evapotranspiration (i.e., store and release) soil cover system to reduce infiltration.
  - Long-term water management measures to address heap infiltration will be implemented (passive care).
  - Contingency treatment measures are planned for polishing long-term solution release from the heap, if required (passive care) (e.g., limestone gallery).
- WRSA
  - Sloped grading of bench surfaces will be implemented to minimize surface water infiltration and erosion of downstream slopes.
  - The top surface of the WRSA will be covered with an evaporative/transpiration (i.e., store and release) soil cover system to reduce infiltration rates.
  - Long-term water management measures to address runoff will be implemented.

During closure/post-closure, once the geochemical stability of the waste rock has been demonstrated and runoff has met long-term discharge criteria, WRSA runoff will be diverted directly to Williams Creek.

The Proponent has indicated that monitoring toward a “walk away” closure scenario will be conducted as appropriate. At mine closure, there will be no major water retaining structures, diversions or impoundments for which physical stability must be ensured in the long-term. The remaining structures for which physical stability must be addressed are the spent ore heap, WRSA and associated water management facilities.

9.2 EFFECTS CHARACTERIZATION

The primary closure issue for this Project is long-term protection of local water resources. Potential long-term sources of contamination include effluent from the heap, effluent from the WRSA, exposure of groundwater to the open pit walls and site runoff. If the effluent from the heap, WRSA and open pit do not meet water quality discharge standards, without treatment, then treatment costs represent an environmental liability to be borne by either the Proponent or the responsible government. Should the Project closure goals not be achieved and result in the long-term impairment of water quality, the Executive Committee would consider these adverse effects potentially significant.

9.2.1 HEAP

The Project will result in the construction of a 13 million tonne heap of ore that will be processed or leached in place to remove copper. Once the recovery of copper is no longer economically feasible, the Proponent has proposed to rinse the heap with pulses of fresh and recycled, treated water, neutralize the acidity in the ore with an alkaline solution (sodium carbonate), and then rinse further with pulses of recycled, treated water. Once the heap has been successfully detoxified, the Proponent proposes to re-contour and cover the heap with a soil cover. The design allows for the continuous infiltration of meteoric precipitation into the heap after the soil cover is in place. The rates of infiltration will depend on the slightly negative natural water balance that controls the amount of water available and the characteristics of the soil cover and the heap as well. It is expected that the drainage of water from the heap will mirror local precipitation patterns.

The water in the heap and natural infiltration will continue to move down to and flow along the liner beneath the heap. This water will be collected in ditches adjacent to the heap and will eventually be discharged to the environment if the concentrations of chemical constituents in the water are acceptable. The planned rinsing of the heap is intended to ensure that water quality is acceptable over the long-term after closure

The ultimate goal of heap closure is that in the long-term, effluent from the heap will meet acceptable discharge criteria for metals, metalloids, and pH so that the heap effluent is not likely to contaminate local ground or surface water. Consistent with the YG ‘Yukon Mine Site Reclamation and Closure Policy - Financial and Technical Guidelines’, the Executive Committee is of the opinion that decommissioned heaps must be physically and chemically stable and that long-term water treatment is not an acceptable closure goal.

9.2.1.1 Heap Detoxification and Rinsing

After leaching of the ore to remove economic quantities of copper, the water and spent ore within the heap will contain residual concentrations of several chemical constituents that will be elevated above levels that will be acceptable for the resulting effluent to be directly discharged to the environment. The overall goal of the detoxification program is to ensure that the drainage from the heap, that is expected to discharge to surface water, does not contain elevated concentrations of these potentially toxic constituents and cause adverse effects in the receiving environment. The ore and solution will be rinsed with large volumes of treated water over an extended period to lower the concentrations of these chemical constituents. The Proponent has committed to detoxify the heap so that the solution that drains from the heap after closure of the mining operation will not cause significant adverse effects in the receiving environment.

As described previously, the Proponent will use on-site fresh and treated water to rinse the leached ore as the primary method of detoxification. This rinse water will be mixed with sodium carbonate to raise the pH and neutralize the acidity of water within the ore.

The Proponent has conducted several laboratory studies to test various heap detoxification procedures. Specifically, the Proponent has conducted leach and detoxification test work on ore-filled columns in a laboratory setting. Laboratory column rinse testing is an acceptable and widely practiced approach to evaluating closure strategies for heap leach operations (Lorax 2006). The laboratory column testing conducted by Alexco (2006) indicate that the copper concentrations in the drainage from leached ore can be reduced to levels below that prescribed by the MMER of 0.3 mg/L. The rinsing of the heap required to achieve this limit involves the use of freshwater with sodium carbonate to assist in the neutralization of the water within the heap.

Column tests were completed to address rinsing and “detoxification” of the leached ore (Appendix A3, January 2006). The results of four columns (#3, #5, #8 and #9) were presented and discussed. Each column contained about 40 kg of ore material. All columns had elemental sulphur and sulphuric acid added to assist the leaching process, and were allowed to drain down after leaching and prior to rinsing. It was estimated that the gravimetric moisture content after drain down was about 15 percent (or 0.15 m^3 per tonne of ore). This volume can be referred to as the “pore volume” or “Normalized Volume” (NV) in a unit volume of ore, and is important because rinsing can depend on the number of pore volumes that must be flushed at different scales to remove soluble products such as copper and sulphuric acid. One pore volume in a column test noted above was equal to about 6 L and the total ore volume was 25 L.

The columns were rinsed with a combination of fresh water and solution (either of lime or sodium carbonate) over periods between 122 and 139 days. Column #9, which incorporated rinsing with a sodium carbonate solution, exhibited the most efficient rinsing of copper and was the only column to achieve a lower copper value than the MMER value of 0.3 mg/L at the end of the rinse test. The copper concentration decreased from about 930 mg/L after an initial rinse with about two pore volumes (13.7 L) of freshwater to 0.24 mg/L after 20 pore volumes (120 L) in about 270 days. The interpretation of the data by Alexco (2006) suggested that the copper values declined below the MMER value for copper of 0.3 mg/L after about 105 L (17.5 pore volumes) of rinsing over 200 days. Rinsing of the other columns involved rinse volumes between 75 and 190 L (12 and 32 pore volumes) with final copper concentrations between 0.48 and 2.5 mg/L. The Proponent found that sodium carbonate in the rinse solution was superior to the use of lime that causes the formation of solids in the pore spaces of the heap and reduces rinsing efficiency. The sodium carbonate remains in solution and moves with the rinse water to neutralize the pore water throughout the heap. If Column #9 is assumed to represent the preferred rinse method with a sodium carbonate treatment, then the results can be applied to scale up for field conditions. These column tests showed clearly that the leaching to extract copper and the rinsing to detoxify the leach solutions were effective chemically if the ore could be physically washed by the added solution. This is important because the results indicate that the efficiency of rinsing will be a function of the efficiency of the contact between solution and ore rather than the chemical reactions that release and transform the chemical constituents.

The time required to rinse the heap is also important for several reasons that include the need for ongoing treatment, the volumes of water required and the cost. The heap leach pad will have a total mass of 13.3 million tonnes. With a bulk density of about 1 600 kg/m^3, the total volume of rock will be 8.3 Mm^3. At a gravimetric moisture content of 15 percent (or a volumetric moisture content of 0.24 m^3 water per m^3 ore), one pore volume will represent 2 Mm^3 of leach solution. It is reasonable to assume that rinsing will require at least the same number of pore volumes in the field as in the laboratory columns. The 17.5 pore volumes in the lab will represent a total rinse volume of 35 Mm^3 for rinsing the entire heap in the field. Regardless of whether the leach pad is rinsed in cells with concurrent rinsing, each cell will require 17.5 pore volumes, and therefore the total heap will require 35 Mm^3 of rinse solution before the entire heap has been rinsed with the same efficiency as Column #9 in the laboratory tests. The Proponent has proposed a rinse water application flow rate of about 400 m^3/hr. At this application rate, about ten years of year-round rising will be required to neutralize the heap (EcoMetrix 2008).

It is expected that extended cold winter temperatures will not affect year-round rinsing. The heap will have a large thermal mass and the temperatures of the rinse water are expected to be the same as the heap. Some heat input is expected from the pumping. Importantly, Brewery Creek is a Yukon example of a heap leach and rinsing program being operated successfully throughout the year. Should rinse water temperatures approach freezing there are options for burying the drip emitters in the heap or under an insulating layer of snow. The Executive Committee concludes that year-round rinsing can be accomplished for the Project.

According to Alexco (2006), this rinse solution will only be acceptable for release to the environment after the copper concentrations decrease below 0.3 mg/L (MMER value). Therefore, by definition, all of this 35 Mm^3 of solution will require treatment prior to either release to the environment or for re-rinsing of the leach pad regardless of any initial rinsing of the pad.

The rinsing and treatment of the leached ore with sodium carbonate in the laboratory showed that copper concentrations could be reduced to low values. The concentrations of other constituents of potential concern, such as arsenic, cadmium, cobalt, lead, molybdenum, nickel, selenium and zinc, were also reduced to low values. The target values for the concentrations of these constituents after closure can be determined in a manner similar to that used by Lorax (2007) to determine the discharge criteria for treated effluent that will be released to Williams Creek. The concentrations observed in the column rinsing study (Column #9) were below levels that would cause concentrations in the receiving environment to exceed water quality guidelines.

The Proponent plans to leach and rinse portions of the heap referred to as cells that are relatively independent zones with dedicated drip emitters and drainage collection systems. This will allow the Proponent enough flexibility to monitor the quality of the drainage from the cell being rinsed and to determine when the concentrations of chemical constituents decrease to the target levels to indicate that rinsing is has been sufficient before initiating rinsing of the next cells. After the target concentrations in the drainage from a cell has been attained, the Proponent can also complete testing of the leached and rinsed ore to confirm that rinsing was effective.

Concern has been expressed that the rinsing process may not be effective and that concentrations of copper may remain above levels that are acceptable for release to the environment. A report by Catalan (February 2008) to the Yukon Conservation Society (YCS) provides a summary of a field investigation into the rinsing of a copper heap leach pad in Gaspé, QC. The pad contained about 4 000 tonnes of "oxide" ore and measured 23 m by 23 m in plan view, with a height of about 4.6 m. The pad was constructed in a concrete bin with final placement by bulldozer. The pad had been subjected to a sulphuric acid leach to remove copper, and was then subjected to a rinse sequence that included:

- fresh water: 1 NV
- lime (0.06 to 3 g/L): 0.1 NV
- fresh water: 3.44 NV
- soda ash (3 g/L): 0.81 NV
- draindown: 0.06 NV
- soda ash (3 g/L): 0.90 NV
- draindown: 0.04

TOTAL 6.35 NV*

* NV = normalized volume (cubic metres of water per tonne of ore).

The results showed that the rinsing achieved lower copper concentrations, with values of less than 1 mg/L after more than 6 NV of rinsing. However, when rinsing was halted and draindown was allowed, the copper concentrations and pH "rebounded" toward pre-rinse levels, with increases in copper and decreases in pH. The first rebound in copper resulted in a concentration of 240 mg/L from about 1 mg/L, and the second rebound (after the second application of soda ash) resulted in a copper concentration of 120 mg/L or one-half of the value during the first draindown event.

There are several aspects of the Gaspé rinse tests that differ from that of the proposed rinse method for the Project, as illustrated by Column #9 in the Alexco (2006) test program. These include the following:

- The Gaspé test applied lime at a rate of about 0.06 kg/t during the early stages of the rinse – no lime was used for the successful Project rinse (Column #9);
- Soda ash was applied at a rate of about 2.4 kg/t in the Gaspé test, whereas the rate of soda ash addition in the Project test was about 17 kg/t (Note that the rate was expressed as 0.97 kg/t in Catalan and Li (1998) but that was for the first soda ash rinse only. The load rate for the second rinse was calculated from data supplied in the Catalan (2008) report.);
- The permeabilities of the ore in the tests are expected to differ substantially with bulldozer placement and concommitment compaction of the Gaspé ore and conveyor placement of the Project material that has agglomeration of the fine particles;
- The Project plan includes the agglomeration of fine material in the ore, and this may increase the overall permeability in comparison to ore that is simply crushed and placed as the Gaspé material was handled;

- The distance between drip emitters for the Gaspé test was 60 cm and that planned for the Project is 40 cm; and,
- Except for two brief draindown periods, the Gaspé test was run continuously whereas the Project proposes pulsing of rinse solutions with longer non-rinse periods.

In spite of major differences between the ore and rinse conditions, there are some relevant points of comparison that are made by Catalan (2008) between the Gaspé and the Project rinse plans. Catalan (2008) concludes that incomplete rinsing after more than 6 NV of rinse solution occurs because there are unrinsed (brown) zones that (presumably) have a lower permeability than the well-rinsed (grey) zones. It is clear that the well-rinsed zones (below the drip emitters) are related to the location of the drip emitters, with the poorly-rinsed zones located between the drip emitters. These results show that the poor efficiency of rinsing is due to a physical process. The evidence that the efficiency is not affected by a chemical process (such as formation of secondary minerals or adsorption of acid) is given by the results of column tests by Alexco (2006) on the Project ore. The column results indicate that no rebound occurs when draindown is allowed after soda ash rinsing. Therefore, it is concluded that the rebound and poor efficiency of rinsing observed in the Gaspé test was the result of poor contact between the rinse solution and the solids rather than a chemical complexity.

This is a very important distinction because it implies that, if the physical rinsing coverage is increased so that there are no unrinsed zones (as observed in the Gaspé test), then there will be no rebound of copper concentrations or pH values. Indeed, in the most recent publication by Catalan and Li (2000), the authors recommend that "the spacing between drip emitters should be optimized to make solution application more uniform" (p. 191). The authors concluded that, "if low flow zones can be prevented, a combination of fresh-water and soda ash solution rinsing may allow meeting decommissioning goals ….." (p. 201).

Overall, the Catalan (2008) report provides an important cautionary note. The rinsing of the pad should be optimized to ensure that rinsing is "physically" efficient. It was noted by Catalan *et al.* (1998) that the acidity in the rinse water during rinsing of the Gaspé test pad decreased more rapidly for each NV than did the acidity in large columns containing the same material. This means that less acidity was being removed from the pad per volume of rinse solution than was removed from the column. This showed that physical efficiency of rinsing the column (with a diameter of 0.66 m) was higher than that for the test pad. The pad required about 0.5 NV more than the column test to achieve the same decrease in acidity in the first two NV for which the column data were available. This also implies that it is not the number of NVs used for rinsing that is critical but the efficiency of the rinsing by each NV. If the spacing of the emitters and the efficiency of rinsing of the Project ore is optimized then the predicted number of NVs needed to rinse the pad in the field should be based on the column test and not the less efficient and less relevant field test conditions at Gaspé.

Rinsing of the Project ore is expected to be effective as a result of high leach efficiency that is discussed in the following section. In addition, the Proponent plans to rinse the ore in a similar fashion to that complete on Column #9 in the laboratory test, that involved about 17 pore volumes of rinse solution. Furthermore, the rinsing efficiency will be improved by the pulsing of the rinse solution between periods with no rinsing that will allow better exchange between the rinse solution and the resident pore water between percolation events.

The Executive Committee notes that scaling up column test results to larger-scale field trials, and finally to the heap pad involves making assumptions about leach efficiency and percolation of process and rinsing solutions through the heap. Therefore the Executive Committee recommends that confirmation of the leaching effectiveness be determined by the Proponent and further refinement of the rinsing process will be required during the mining operation.

9.2.1.2 Leach Efficiency and Percolation of Leach/Rinse Solutions Through the Heap

Heap leaching is a known and tried technology that has been applied at other mining operations for copper and gold projects. Acidic solutions are used to leach copper from oxide ores because the acid conditions are able to dissolve high concentrations of copper that are then captured and processed to remove copper and to produce a copper product. Generally, the leach solutions can be reused, after copper removal, to further leach the ore in order to extract all of the economically available copper.

Ore leaching is the process whereby acidic leach solution is added to the heap in manner similar to drip irrigation in agriculture. The leach solution drains onto a synthetic liner and is captured for processing and extraction of copper before being recycled to leach more copper from the heap. After copper concentrations in the leach solution decrease to levels that are no longer economic to extract, leaching of that area of the heap will be terminated and will progress to an unleached area. A concurrent rinsing program is proposed where individual zones of the heap known as cells will be leaching and others will have begun the rinsing and detoxification process.

The effectiveness of the rinsing of the leached or spent ore is linked to the initial leaching efficiency of the ore. One study that addressed leaching and rinsing of copper oxide ore (Gaspé Copper Mine; Catalan and Li 2000, Catalan 2008) suggested that leaching efficiency was poor and that the low efficiency of leaching also reduced the efficiency of rinsing the ore. The efficiency of leaching is a measure of the amount of leach solution flow that is required and the relative mass or ore that has had the copper removed compared to the ore that may not have been leached. A successful leaching operation is the primary goal of such an operation because a greater leaching efficiency translates to both more metals being recovered (i.e., better mine economics) as well as lower amounts of metals left in the heap that could mobilize into effluent after closure. The efficiency of leaching in the Gaspé study was affected by the spacing of the drip emitters and the poorly leached zones tended to be located between the zones influenced by the emitters. The spacing between emitters in that study was about 0.6 m.

The leaching efficiency for the Project is expected to be high as a result of several conditions that the Proponent plans for the operation. First, the ore will be deposited on the leach pad by conveyor and is not anticipated to be compacted by heavy equipment as was the case in the Gaspé test. This will help prevent the development of low permeability zones and allow the leach solutions to more easily percolate through the ore. Second, the fines in the ore will be agglomerated into gravel size particles. This agglomeration reduces the amount of fines in the heap and will increase the permeability over that expected if the fines remained in the heap. Third, the Proponent plans to use an emitter spacing of 0.4 m with the intention that leaching efficiency will be high. This configuration will also be used for the rinsing phase after leaching is complete. The Executive Committee is of the opinion that decreasing the likelihood of poorly leached zones occurring will increase the effectiveness of rinsing and detoxification.

The laboratory investigations completed by the Proponent have shown that leaching and rinsing can be very efficient when the entire vertical column of ore is contacted by the leach and rinse solutions, respectively. The relatively small spacing intervals (0.4 m) proposed for the emitters will help to ensure good coverage of the ore by the solutions. However, the field application of those solutions may require refinement to ensure that unleached zones do not develop between emitters. Therefore, the Proponent must use the first planned cell of the heap to demonstrate and refine the leaching efficiency for the project. This refinement should include an investigative approach to clearly show what ore is being leached and if there are zones that are not leached with the emitter configuration that is used. The leaching procedure should then be modified if non-leached zones are identified. After modification, the investigation should confirm that leaching of the entire column of ore has occurred during the leaching phase of the operation. An adaptive management approach based on field-scale lessons learned from the leaching of Cell one is recommended.

The foundation drainage system has been designed in such a way that the effluent from specific cells, or portions, of the heap can be isolated. Therefore the Proponent will be able to test the rinse effluent coming from a specified portion of the heap to determine that it has been successfully detoxified.

9.2.1.3 Water Treatment

To reduce the potential impacts on the local groundwater supply, the Proponent has proposed to use treated, recycled water as rinse for the heap after an initial rinse with fresh water. During rinsing and after closure, excess rinse water will be treated to discharge standards and released to Williams Creek.

The use of treated rinse water will likely be as effective as freshwater for adjustment of pH and metals but not sulphate. Sulphate concentrations in the treated water will remain high but will be limited by the solubility of gypsum, a calcium sulphate solid that is a common component of the sludge from such treatment systems. The use of fresh water initially and treated water later to rinse the leached ore should not result in any material differences in the rinse results (i.e., efficiency).

The Proponent has proposed the use of an HDS treatment system to treat effluent to discharge quality standards. An HDS treatment system with lime added for pH control is a recognized best practice method of treatment for dissolved metals and other constituents. The Operational Treatment System submitted by the Proponent (May 2007) to the Executive Committee provides details of the proposed treatment system (Appendix F1; updated in YOR doc #2006-0050-118-1). The process involves the collection of the solution and pumping into mixing tanks where a slurry of hydrated lime is added. As the pH is raised, metals and other chemical constituents will form solids in the tank and the treated slurry flows to another tank for settling. Some of the solids will be recycled to the initial tank to aid in the treatment process. The solids will settle in a larger tank and the clear treated effluent will be removed from the top of the tank. The solids that will remain as a slurry or in near liquid from can then be pumped to the desired location for storage. The final solids slurry in HDS plants typically contain about 25 to 35 percent solids (Appendix F1).

Molybdenum and selenium are metalloids that may not be as effectively removed from water as metals when treated in a standard HDS treatment system. However, when iron is present in solution or added to the water prior to treatment, these metalloids can be removed. The treatment testing performed for the Proponent showed that molybdenum (Mo) and selenium (Se) were effectively treated in the presence of iron in the leach solutions. The iron concentrations in the treatment test solutions were close to 20 mg/L. Iron precipitation, as a ferric hydroxide solid, is the main mechanism for removing constituents such as Mo and Se. Without adequate iron concentrations in solution, it is unlikely that Mo or Se would be removed effectively in the HDS treatment system. The effect of iron on the removal of Mo and Se was demonstrated in the CEMI tests (YOR doc #2006-0050-168-1). In those tests, different concentrations of iron (from 0.7 to 4.0 g/L) were added to each of the test solutions to assess the effects on treatment. The Se results show an increased removal with increasing iron addition that lowered Se levels by as much as 90 percent compared to treatment without iron addition. The removal of Mo was also improved by adding iron but the results were less consistent than those for Se. Based on these observations, the treatability of Mo in solutions with concentrations up to 40 mg/L should be verified.

The iron concentrations in the column test rinsing tests were generally much lower than the 20 mg/L value in the treatment test. The column test rinse solutions typically exhibited iron concentrations that were about 2 mg/L with one high value of 5 mg/L (Alexco, 2006; Tables 3 to 6). If efficient removal of Mo and Se is required during rinsing of the heap leach pad, then the minimum concentration of iron needed for effective removal of Mo and Se should be determined prior to final design of the treatment system.

Additional information submitted by the Proponent indicates that the sludge derived from the HDS treatment will be geochemically stable and suitable for disposal on the detoxified heap. The Proponent has committed to further testwork to characterize the physiochemisty of such sludge to refine and test the heap disposal methodology to prevent any adverse effects associated with remobilization of contaminants contained in the sludge disposed of in the rinsed areas of the heap.

9.2.1.4 Site Specific Water Discharge Criteria

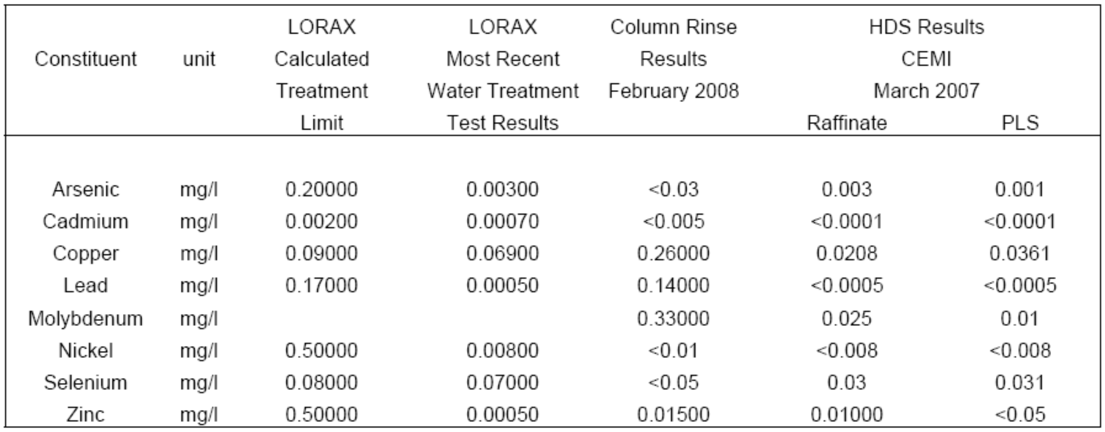
The Proponent will be required to meet federal and territorial discharge standards as established under their water licence. This means the water licence will be informed by the Metal Mining Effluent Regulations (*Fisheries Act* (Canada)) for end-of-pipe discharge standards and the CCME ‘Canadian Water Quality Guidelines for the Protection of Aquatic Life’ for compliance with water quality parameters in the receiving environment.

Water quality baseline data collected by the Proponent suggest that baseline concentrations of metals, in particular copper, have exceeded CCME levels (Appendix Q of the Project proposal, Environmental Monitoring Program Update and Data Summary-YOR doc #2006-0050-83-1, and summarised in Section 3.1.1.1). This suggests that site specific water discharge criteria for the receiving environment during rinsing and post-closure might be appropriate.

There are two types of discharge limits that need to be considered for the Project. The first relates to the discharge of treated effluent from the HDS treatment plant during active rinsing of the heap and without a soil cover. The second set of limits relate to the natural discharge that will occur from the heap after closure and construction of the proposed cover.

Lorax Environmental (2007, YOR doc #2006-0050-155-1), proposes site-specific effluent water quality limits for the discharge of treated effluent from the HDS treatment plant during active rinsing of the heap and without a soil cover. Lorax identified the upper limits of metal concentrations acceptable in the receiving environment then back-calculated acceptable concentrations of these metals in Project effluent. The The "Calculated Treatment Limit" incorporated the expected metal concentrations expected in the treated effluent, as well as the background concentrations of metals in Williams Creek and the assimilative capacity of the receiving environment. The calculated treatment limits for key chemical constituents are shown in Table 7. The water quality objectives utilized in these calculations were primarily CCME 'Canadian Water Quality Guidelines for the Protection of Aquatic Life'. The Executive Committee acknowledges that the establishment of discharge criteria will be completed for the water licence, but is of the opinion that this concept plays an important role in the assessment in terms of evaluating the likelihood of the Project being able to meet these objectives.

Table 7 Proposed Calculated Treatment Limits for Discharge Water (from Lorax (2007))



Constituent	unit	LORAX Calculated Treatment Limit	LORAX Most Recent Water Treatment Test Results	Column Rinse Results February 2008	HDS Results CEMI March 2007	
					Raffinate	PLS
Arsenic	mg/l	0.20000	0.00300	<0.03	0.003	0.001
Cadmium	mg/l	0.00200	0.00070	<0.005	<0.0001	<0.0001
Copper	mg/l	0.09000	0.06900	0.26000	0.0208	0.0361
Lead	mg/l	0.17000	0.00050	0.14000	<0.0005	<0.0005
Molybdenum	mg/l			0.33000	0.025	0.01
Nickel	mg/l	0.50000	0.00800	<0.01	<0.008	<0.008
Selenium	mg/l	0.08000	0.07000	<0.05	0.03	0.031
Zinc	mg/l	0.50000	0.00050	0.01500	0.01000	<0.05

The second set of discharge limits relate to the natural discharge that will occur from the heap after closure and construction of the proposed cover. There will be a natural flow that reflects the amount of meteoric precipitation can infiltrate the cover and heap after closure. This flow will contain some residual concentrations of metals and other chemical constituents. The discharge concentration limits for this drainage flow need to be calculated in a manner similar to that completed for the treated effluent by Lorax (2007) to determine acceptable values after closure when no treatment is anticipated. The calculated limits are directly dependent on the expected flow rates for the drainage discharge. The limits calculated by Lorax were based on high flow rates (as much as 50 000 m^3 per month). Because the flow after closure is expected to be lower than for drainage without a cover, the limits for discharge post closure will be higher than those reported by Lorax (2007). The calculated limits for closure conditions will then provide guidance for deciding when the rinsing and detoxification of the heap is complete.

Use of the calculated discharge limits to determine the completeness of detoxification relies on the assumption that the water quality in the drainage at the end of rinsing and detoxification will remain the same or will improve in the future. The column test results for Column #9 in the rinse test program shows that the chemistry of the leachate consistently improves with each additional rinse cycle and that “rebound” to more acidic pH values or increases in metal concentrations do not occur near the end on the rinsing program. Copper and most other constituents exhibit consistent declining concentrations over the last five rinse cycles. Sulphate was an exception to this trend and showed an increase on the last cycle after about three months between rinses. This is expected if there is some gypsum (calcium sulphate) that has accumulated in the rinsed ore and some dissolution occurs between rinses. Similar behaviour is not anticipated for metals that have much lower solubility limits at neutral to alkaline pH values. The pH is also expected to remain neutral to mildly alkaline in the rinsed ore. Studies by CANMET (2006) have shown that the rock contains only small amounts of sulphide minerals that are not expected to produce acid over the long-term. Other possible sources of acid were minor and were identified as the dissolved iron (either Fe^{2+} or Fe^{3+}) that can release some acid when the iron precipitates as a hydroxide and possibly jarosite (an iron hydroxyl-sulphate mineral that can form during the sulphuric acid leach process) that produce acid when it dissolves. Both of these sources of acid, however, are expected to be neutralized by the addition of the sodium carbonate during the rinsing stage. There was no evidence of these sources of acidity in the column tests even though there was adequate time for the acidity to appear between rinse cycles. Therefore, the leachate from the heap in the post closure period is expected to be stable or to improve with time and natural infiltration slowly rinses the heap over the long-term.

9.2.1.5 Sludge

Sludge will be generated by treating the rinse water from the heap. The sludge will be a mixture of gypsum, calcium carbonate, un-reacted lime, moisture and precipitated metals, primarily in hydroxide form. Specifically, the sludge created will be composed primarily of iron oxyhydroxide, calcium sulphate and calcium carbonate that form when iron, sulphate and sodium carbonate in the rinse water reacts with lime in the rinse water. When iron is an important component of the treated solution as expected with the Project sludge, the stability of metals in the solids are generally enhanced. Typical sludge from HDS treatment plants is chemically stable and controls the concentrations of metals to low levels so that leaching from the sludge is not problematic. The Proponent plans to perform further testing of the sludge produced from actual heap rinse solutions prior to finalizing the disposal plan.

The Proponent proposes placing the sludge on the heap prior to mechanical mixing into the top surface of the previously rinsed leached ore. The oxide ore will be chemically compatible with the sludge in that the sludge would be expected to remain stable when in contact with the leached ore. The Executive Committee agrees that placing the sludge on the heap is a reasonable approach for sludge disposal once the spent ore on the leach pad is confirmed to be successfully rinsed and detoxified.

Water treatment will produce an estimated total dry mass of sludge of about 220 000 t for the treatment of one pore volume of full strength rinse solution (added at a rate of 0.15 m^3/t) (Attachment A to Appendix F, March 2007). Although it is stated by the Proponent that this dry mass of sludge is a worst case estimate, it is almost certainly a realistic estimate for several reasons. First, all the rinse water will ultimately require treatment and any earlier rinsing will not eliminate the need to treat the initial dissolved mass in the heap. Second, the addition of lime and sodium carbonate to the rinse solution will produce more solids in the sludge (through the precipitation of calcium carbonate) than was found in the test work without the sodium carbonate). Third, the sludge volume will include the iron content of the rinse water (at 20 mg/L), and if a higher content of iron is present in the water, then the sludge mass and volume will increase proportionately. For example, the amount of sludge produced from sodium carbonate can be estimated as follows. The sodium carbonate solution will be 50 g/L or 50 kg/m^3 of rinse solution. Laboratory studies indicated that about two pore volumes of sodium carbonate were used in the rinse phase for the leached ore. Such rinsing will involve about 4 Mm^3 of water in the leach pad and will likely represent a total mass of 200 000 t of sodium carbonate. This sodium carbonate will be similar to the mass of calcium carbonate that will precipitate as treatment solids. In this scenario, the sludge may increase by about 200 000 to about 420 000 t after complete rinse treatment.

The volume of sludge represents an important consideration for the mine site because adequate storage volume is required on the pad. If the original sludge estimate of 220 000 t is considered at a dry bulk density of 1 100 kg/m^3, there will be a total volume of about 200 000 m^3. As noted by the Proponent, this represents an area of about ten hectares to a depth of 2 m. This area represents about one-third of the total surface area of the heap leach pad. However, if the additional sludge from sodium carbonate treatment is added, this will likely double the area required to cover 60 percent of the heap leach. Thus, the area needed for sludge disposal will range from 30 to 60 percent of the total surface of the leach pad.

Once placed on the heap, the sludge will substantially decrease the permeability of the heap and will likely inhibit any further rinsing of the underlying leached ore after placement on the pad. Therefore, the Project will require temporary sludge storage while it is determined that individual cells in the heap have been rinsed to an acceptable endpoint prior to being covered with sludge. The sludge generated by the treatment system will be temporarily stored within a lined, bermed area upslope of the heap (YOR doc #2006-0050-169-1). The Executive Committee believes this is an appropriate temporary storage solution for the sludge.

When it has been demonstrated that a cell/portion of the heap has been successfully detoxified, the sludge will be deposited on top of that cell. It is necessary to resolve the effectiveness of the rinse protocol and adequacy of rinsing in the field prior to sludge placement on the heap. The Proponent plans to leach and rinse individual cells on the pad that are relatively self-contained. If the first cell is used to test the leach and rinse efficiencies, it will identify the process details required to achieve the desired rinsing efficiency. Such a refined procedure for rinsing should be verified before sludge is deposited on each cell and thereby premature covering by sludge can be avoided.

The successful detoxification of an individual cell on the heap will be demonstrated by the quality of the drainage that will be collected and tested. Furthermore, the cell will be drilled and sampled to determine the effectiveness of the rinsing on the leached ore samples. These monitoring approaches will ensure that the heap is not used for storage of sludge until the rinsing and detoxification is complete.

9.2.1.6 Heap Cell Rinsing Endpoint

The site specific discharge criteria for heap drainage after closure will be used to establish the successful rinsing and detoxification of the heap. The method for developing the criteria is provided in Section 9.2.1.4. The concentrations of constituents in the drainage will be monitored by collecting samples of leachate regularly. Concentrations in the drainage can then be compared to the discharge criteria and the when the values decline below the criteria, the heap can be sampled by drilling. Samples of rinsed ore will be collected and tested. Testing should include short term leach tests to determine the extractable concentrations of constituents. The results will confirm that the heap has been adequately rinsed or will indicate if zones within the heap require additional leaching to comply with the discharge criteria after closure.

9.2.1.7 Heap Cover

Following heap detoxification, the Proponent will pump the sludge onto the heap, and construct a soil cover on the heap as part of the reclamation activities. The cover will provide a growth medium for vegetation and will also likely represent a partial barrier to water infiltration.

The discharge criteria for release of heap drainage to Williams Creek were shown previously to be at or below values expected for most key constituents after rinsing of the heap. When a high flow rate of drainage from the heap is assumed, copper was the only constituent in the column drainage to exceed the calculated criteria (by a factor of three). When a cover is in place, a lower flow rate than that used in the Lorax (2007) calculation would be expected for natural drainage so the criteria for copper and other constituents will be higher that those shown in Table 7 above. In addition to the soil cover, the placement of the treatment sludge will also decrease the permeability of the surface layer of the heap. The decreased infiltration will result in decreased drainage flow through the heap and therefore will allow higher discharge criteria for the key constituents. The degree of reduction of infiltration needed is quite small and any additional reduction will be beneficial but not necessarily required. Therefore, the cover design does not need to be stringent in terms of infiltration reduction and a simple design will be appropriate.

9.2.1.8 Long-term Passive Care

As part of long-term "passive care" measures, the Proponent has proposed the use of an alkaline trench to passively treat (i.e., "polish") the heap effluent prior to discharge during post-closure. The Tulsequah Chief mine employed a similar trench and found that aluminum hydroxide, produced as a result of aluminum in relatively low pH effluent reacted with the limestone, coated the limestone and thereby extinguished its neutralizing capacity (B. Godin, pers. comm. 2008). Test work conducted indicates that aluminum will be present in the Project heap effluent. The Executive Committee believes the likelihood of this passive treatment measure being effective is low. Consequently, it is imperative that the Proponent demonstrate that the heap effluent meets acceptable standards as set out in the water licence without the requirement for long-term passive treatment measures. It will be the responsibility of the regulator to ensure discharge standards are met in the long-term. If passive treatment is required to polish the effluent prior to discharge, an alternative option will have to be proposed by the Proponent and deemed appropriate by the regulator.

9.2.2 WASTE ROCK STORAGE AREA

The WRSA is proposed to be located immediately north of the open pit on a gentle, north-east facing slope. The WRSA covers an area of approximately 70 ha, and is designed to provide for permanent, secure storage and total confinement of the mine waste rock. The proposed design includes surface drainage ditches to drain the footprint of the waste dump. Specifically, surface runoff and seepage from the WRSA will be collected in perimeter collection ditches located at the toe of the facility and transported via the WRSA outlet channel to the sediment control pond. The Proponent has proposed that, where appropriate (and upon closure), portions of the WRSA will be recontoured, covered with stockpiled overburden material, and revegetated. During the pre-production pit stripping phase the following construction activities would be carried out across the WRSA footprint and sediment pond areas:

- General site development and site preparation removing all trees and stripping the area down to the mineral soil over the area to average depths of 30 to 50 cm;
- Stockpiling the material in a selected area north or west of the WRSA;
- Site grading with construction of the surface water perimeter ditch and the internal ditches and French basins;
- Excavation and construction of surface water sediment pond east of the WRSA;
- Installation of instrumentation;
- Construction of required section of main mine haul road in WRSA footprint; and,
- Stripping and grading of the west portion of the WRSA before the start of production of the mine operation.

The design of the WRSA is based upon a projected capacity of 60 million tonnes of waste rock. The waste rock is a durable granodiorite or biotite gneiss and would be placed by end-dumping starting near the center of the site and progressing to the east limit of the WRSA before progressing to the west side of the WRSA. Deposition will occur in lifts of up to 20 m thick.

Drilling undertaken by the Proponent is considered to have adequately sampled the waste rock (except for relatively small portions of the west and north parts of the pit - see Section 6.1.3.1). These waste rock samples have been adequately characterized for their acid generation potential by static test work performed by Golder in 2007 (YOR doc #2006-0050-167-1). The results of these tests concluded that the waste rock will not generate ARD or natural metal leaching. The neutralizing potential ratio of the waste rock well-exceeded 4:1, which according to the 'Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia' (Price and Errington 1998) demonstrates that there is no ARD potential and therefore further kinetic testing is not required. Runoff from the WRSA is not proposed to be treated. If this runoff contains contaminants, or is of acidity levels (due to ARD/ML other processes) to alter receiving waters, this would be considered a significant adverse effect by the Executive Committee.

As a result of the waste rock characterization, this assessment considers the goals of reclamation to include long-term geotechnical stability (primary importance), and the establishment of the conditions for a new landscape and to ensure that the trajectory of evolution for this landscape is correct, both in terms of the rate of evolution and end point (secondary importance).

9.2.2.1 Geotechnical Stability

The WRSA is located approximately 100 m from North Williams Creek, and 700 m from Williams Creek. The aquatic values associated with Williams Creek are described in Section6.1. These values may be significantly affected by unmitigated sedimentation as a result of the Project, since runoff from the WRSA reports to North Williams Creek, and subsequently to Williams Creek. Consequently, given the proximity of the WRSA to these watercourses, geotechnical stability is of primary interest and concern, with respect to the final WRSA cover.

Unplanned, rapid changes in the reclaimed landscape could result in unacceptably high sediment loading of streams (i.e., North Williams and Williams creeks), gully scarring, and landslides. The incorporation of natural slope features into the final landform and cover design for stockpiles not only improves aesthetics, but also emulates slopes that are in equilibrium with local conditions of rainfall, soil type, and vegetation cover.

The WRSA, as proposed, has been designed based upon the guidelines set out in the British Columbia Ministry of Energy, Mines, and Petroleum Resources document for the 'Investigation and Design of Mine Dumps, Interim Guidelines, May 1991'. The B.C. Interim Guidelines are considered appropriate to waste dumps in the Yukon, due to the fact that Yukon does not have its own guidelines in place. Consulting engineers and YG departments reference these guidelines as best practices within the industry, and they have been applied to many projects in the Yukon.

Design guidelines for covers on a macro-scale are largely governed by the same guidelines as for landform design (i.e., landform engineering), in terms of choosing appropriate soil layers to support vegetation, store and release meteoric water, restrict infiltration, as examples. The construction of this soil cover must consider the natural forces of nature as well as the implications of these forces over time – unarmoured slopes will flatten, planar slopes will gully, straight drainage courses will start to meander, and linear or convex slopes will become concave.

Concerning cover failures, surface slumping is the most common mechanism for failure in northern Canada, where winter freeze is deep and perched water tables develop in frozen layers in spring. Under moderate climatic conditions, the drainage capability in the surficial layers is the most important factor controlling failure (Jakubick, McKenna, and Robertson, 2003). The cover material is proposed to be organic, and no impermeable layer is proposed, which will allow drainage through the

WRSA. The grain size of the rock fill overlying the existing ground level is expected to be quite coarse, since this material will not be crushed, and will also facilitate drainage through the WRSA thereby minimizing the possibility of perched water tables, particularly with the installation of French drains as proposed.

The Proponent has however identified some uncertainties with respect to the long-term stability of the WRSA. As stated in the proposal:

> "…the sandy deposits which would thaw under the initial loading of waste rock will control the slope stability of the WRSA. The silt zones at depth, which are frozen will also influence the slope stability of the WRSA but it is anticipated that the silts are deep enough and should remain frozen" (Section 4.3). "In the event that the clayey silt thaws, it will not be thaw stable and would develop excess pore water pressures which will reduce the above factors of safety and local instability may occur"

The Proponent has not provided details related to the specific geotechnical data and assumptions made during the design process, though it is assumed that the design engineer has made their best interpretation of the available data to complete the design to meet the best practices of the industry. Given the underlying uncertainties however, it is important, in the opinion of the Executive Committee, that active monitoring occur so as to ensure that any precursors to instability can be uncovered and mitigated promptly. Of primary concern are the effects of multi-bench failures/global failures on the aquatic resources of Williams Creek, since it is anticipated that sedimentation associated with local instability and mobilization of sediment will be sufficiently managed and mitigated via water collection and management (i.e. proposed ditches and sedimentation pond), barring extreme events. As provided in the proposal:

> "For normal operations, it is proposed that the sediment pond will have a riser decant structure that will be used to slowly draw down the stored water allowing sufficient time for the settling of suspended sediment. For extreme events, a riprap lined spillway will convey the 1:200 year return flood event, plus snowmelt, with a minimum freeboard of 1 m to prevent overtopping of the embankment. The decant structure and spillway will discharge downstream into a plunge pool, then to North Williams Creek and finally to Williams Creek."

9.2.2.2 Aesthetics/ Landscape productivity

In the context of sustainable development, this assessment considers the establishment of the conditions for the re-establishment of a naturally-productive landscape to be the responsibility of the Proponent. If reclaimed appropriately, the legacy footprint of the WRSA will be minimized. Success, with respect to reclamation, is not necessarily measured in terms of the extent to which the previous landscape is restored. Rather, reclamation efforts expected to allow the landscape to redevelop towards an equivalent capability, compared to that which existed prior to mining. Insufficient reclamation of the WRSA is considered a significant socio-economic effect.

The Proponent has proposed to cover flat surfaces of the WRSA with organic material and reseed with native seed mixtures. This approach is considered appropriate for flat areas, however is insufficient for slopes. Currently, the entire landscape where the WRSA is proposed to be located is largely productive, and therefore this should guide the objectives for reclamation. This may require the stabilization of material on slopes prior to seeding, or reducing slope angles as part of the dumping plan. Neither of these measures are anticipated to adversely affect geotechnical stability, in fact it is likely they should result in a positive effect in this regard.

9.2.3 OPEN PIT

Following closure, the Proponent proposes to allow the pit to fill with water to a level determined by the local ground water table. Two potential significant effects are the generation of ARD/ML from the pit walls and floor and the potential for accidents associated with the open pit. The Executive Committee would consider these two effects potentially significant.

As discussed previously in Section 9.2.2, Golder (2007) confirmed that there is low ARD/ML potential for the majority of the rock that will be exposed as pit walls and floor. Previous mitigation recommends the Proponent conduct the appropriate drilling and materials testing on the remaining relatively small areas (west and north edges of the pit) to confirm that material is also not acid-generating.

It is known that rock with higher acid generating potential lies below the ore proposed to be mined (Golder 2007). The Proponent has committed to testing the rock as the pit excavation approaches the transition zone from oxide to sulphide ores and has committed to not mine within six metres of the sulphide ores.

Should errors or fissures lead to exposure of the sulphide ores, it is anticipated that the filling of the pit with water will isolate the acid generating rocks from the air and prevent acid generation. Disposing of acid generating rock underwater one method to decrease and control acid generation.

The Executive Committee is satisfied that proper closure of the open pit will not result in adverse effects to ground water quality. To ensure public safety, the Executive Committee recommends that appropriate efforts are made to restrict access to the pit and that signage be installed in the area around the open pit warning people of the danger.

9.2.4 MINE SITE INFRASTRUCTURE

The overall objective of decommissioning and reclamation is to physically and chemically stabilize and restore the mine area, including mine site and mine access road, to a functioning ecosystem that resembles pre-mine conditions to the greatest extent possible.

As discussed in Section 6.2, the Executive Committee has recommended that the mine access road be decommissioned following mine closure to limit hunter access to the area, due to potential impacts on moose. The Executive Committee notes however, that access to the mine site during closure and reclamation – particularly with respect to ensuring the heap is adequately detoxified – must be maintained while closure activities continue. The Executive Committee has concluded that the best way to mitigate potential adverse effects of increased hunter access to important wildlife habitat is to continue to manage the road as private controlled road, inhibiting vehicle access until the road is decommissioned.

The Executive Committee concludes that although the Project will include lasting physical changes to the local topography, the proposed reclamation and re-vegetation measures will minimize these effects. The Executive Committee is of the opinion that the eventual removal of all mine site facilities, equipment and materials will be effective in returning the mine site to an appropriate condition. The Executive Committee notes, however, that the Proponent has not provided criteria for determining whether reclamation goals have been met. The Executive Committee acknowledges that flexibility and adaptive management are important principles in the success of site reclamation; however, suggests that the Proponent develop measurable end-points for assessing reclamation success. Specific goals for re-vegetation should be established, for example, which are quantitative to allow future monitoring to determine a measure of success. Such criteria should be established in collaboration with YG and local land users.

9.2.5 CLOSURE COSTS AND SECURITY

The Executive Committee notes that financial security shall ultimately be determined by YG through the regulatory process and that the quartz mining licence shall stipulate the amounts, types and duration for security to be held. Security requirements are reviewed and revised at least every two years. It is the responsibility of YG to hold sufficient financial security from the Proponent such that unforeseen circumstances, such as early mine closure, do not result in Yukoners having to take on the financial burden of mine closure and reclamation. The Executive Committee notes the Proponent's closure philosophy which includes to: "Ensure that security provisions are adequate and available to fund closure activities at any time during the operation."

While some aspects of closure are addressed by the regulatory authorities, the Executive Committee is of the opinion that should closure and reclamation costs be required to be borne by this could result in a potentially significant adverse socio-economic effect. Current experience and cost estimates to properly close abandoned mines like Faro, United Keno Hill and Mount Nansen in the Yukon have made this a relevant and important issue.

This screening considers many of the factors that YG and its experts can consider when setting security costs and makes recommendations with respect to overall feasibility of closure/reclamation methods. These recommendations are made on the basis that YG intends to maintain 100 percent of the required security to remediate and close the site at any given point in the Project.

The prominent closure issue for the Project is the feasibility and likelihood of successful detoxification and long-term geochemical stability of the leach heap toward mitigating the risk of adverse impacts on water resources.

9.2.5.1 Closure Feasibility

The Executive Committee acknowledges that there is no example of a successfully detoxified heap elsewhere. For most sulphuric acid leach heaps, detoxification is not attempted, because of the dry environments in which these heaps are located (e.g., southwestern U.S.). In these regions, groundwater is often located very deep, thus the risk of groundwater contamination is low. The heaps may be allowed to dry out/ evaporate before they are capped. In some cases, the spent ore may be rinsed/neutralized to a minimal extent, but not with the intention of complete detoxification. The closure objective with these heaps is to isolate them from the surrounding environment; therefore, liners and impermeable covers/caps are appropriate.

The conditions in the Yukon are different (though precipitation/evaporation balance is slightly negative), thus an alternate approach to closing the heap is required. Western Copper is proposing to detoxify the heap – that is, to rinse and neutralize the spent ore so that in the long-term, the heap effluent is suitable for direct discharge to the environment without further treatment (polishing may be required). The detoxification of the spent oxide ores on the heap should result a very low risk of any effluent resulting in any long-term effects on surface/ground water quality so a store-and-release/ evapotranspiration heap is reasonable.

The Executive Committee is satisfied that the proposed method of heap detoxification is viable and appropriate, especially with the additional knowledge to be gained through the application of field-scale leaching tests, as discussed in Section 9.2.1.

9.2.5.2 Closure Timing

There remains uncertainty with respect to the amount of time required to detoxify the heap. Specifically, the Proponent has estimated it will require approximately 4.5 years to rinse and neutralized the heap, while the technical reviews commissioned by YG and the Executive Committee estimated nine to ten years.

Using water volumes required to detoxify the heap and proposed application rates, the amount of time required to detoxify the heap can be calculated. The Proponent proposed a rinse rate of 400 m^3/hr that would be applied to the heap. At this application rate, leaching will require ten years to apply the estimated volume of 35 Mm^3 of rinse water to the heap (EcoMetrix 2008). If the rinse flow rate is lower, then more time will be required and if the flow rate is higher then less time may be required. However, the total rinse volume likely will be the same. It is therefore likely that the rinse time for the heap will exceed the Proponent's initial estimate by a minimum of about five years. This conclusion has implications for the volume of water required as well as the cost related to the ongoing operation of the treatment plant. Lorax (2006) performed similar calculations based on the normalized volume of rinse water per tonne of ore with similar conclusions that the heap rinsing is anticipated to require about nine years for successful detoxification

9.2.5.3 Security

Following information requests by the Executive Committee the Proponent revised estimates for closure costs from $7.0 M in the proposal to $9.1 M (YOR doc #2006-0050-117-1) and $19.7 M (YOR doc# 2006-0050-0207-1). The Proponent has estimated a further $2.9 M of pumping and treatment costs would be incurred should rinsing take an additional five years.

The Executive Committee agrees with the Proponent that reagent costs for neutralizing the heap will form a substantial portion of the closure costs. The 2006 column studies indicated that the rinse process would use sodium carbonate at a rate of about 17.1 kg/t of ore to neutralize the solution within the heap. More recent estimates suggest that the sodium carbonate addition rate may be closer to 5.1 kg/t. At an estimated unit cost of $200/t for sodium carbonate, the reagent cost alone for rinsing would range from $45 M and $13 M.

Iron may be another reagent required to properly detoxify the heap. The iron concentrations in the column test rinsing tests were generally much lower than the 20 mg/L value in the treatment test. The column test rinse solutions typically exhibited iron concentrations that were about 2 mg/L with one high value of 5 mg/L (Alexco, 2006; Tables 3 to 6). If efficient removal of Mo and Se is required during rinsing of the heap, then iron addition to at least 20 mg/L in the rinse solution may be required prior to treatment. This additional iron could add another material cost to this detoxification process.

The Executive Committee recommends that YG take into account the following factors when determining appropriate security to be held for the Project:

- Potential variation in the detoxification methodology for the heap leach until confirmed by completed field-scale trials on the first heap leach cell;
- Estimates of ten years required to detoxify the heap;
- Costs of reagents required to detoxify the heap;
- The current trend of rising regional operational costs of all large projects including mining;
- Any progressive reclamation completed by the Proponent; and,
- Security requirements should be reviewed and revised on an annual basis rather than every two years.

9.3 SUMMARY

The results and reviews of the Proponent’s analyses and tests indicate that successful detoxification of the heap is feasible. The Executive Committee is of the opinion that while useful, scaling-up these tests provides a much higher degree of certainty with respect to predicting the chemical stability of the heap. Furthermore, the proposed heap leach pad liner and cover – while proven technologies – may not function optimally, as predicted. Continued heap and rinse water treatment, testing and monitoring, and adaptive management, as proposed by the Proponent, are therefore critical to minimizing the potential for adverse effects to surface/ground water quality, soil quality/stability, aesthetics and/or land use. The Executive Committee is satisfied that these measures will effectively reduce the potential adverse effects.

The Executive Committee is satisfied that if sulphide ores are not placed in the WRSA, there will not be any ARD/ML. Furthermore, erosion on the WRSA will be effectively controlled by the store and release cover. The Executive Committee is of the opinion that the proposed ongoing test work and monitoring of the WRSA runoff and seepage quality are appropriate measures for identifying potential water quality issues. Progressive reclamation of the WRSA will help to identify and address any water quality issues at an early stage and will ultimately expedite final closure of the WRSA.

Consistent with policy of YG and proposal of the Proponent, the Executive Committee is of the opinion that sufficient and available security should be held from the Proponent to properly close the site at any point during the Project.

9.4 REQUIRED MITIGATIVE MEASURES

To minimize the likelihood of incomplete leaching of the heap:

118. The Proponent shall design, build and manage the first cell of the heap as a field-scale trial of the heap leach process. This trial will be designed as an investigative approach to clearly show what ore is being leached and if there are zones that are not leached. If non-leached zones are identified, the Proponent shall make alterations or refinements to the leaching process to increase leaching efficiency and minimize the creation of non-leached zones in the heap. The Proponent shall provide the design and results of this leaching trial to regulators.

To minimize potential effects related to temporary sludge storage:

119. As proposed by the Proponent, sludge from the high-density sludge (HDS) treatment plant shall be temporarily stored in a bermed, lined area upslope of the heap.

To minimize the likelihood of reclamation objectives not being met:

120. As per the 'Yukon Mine Site Reclamation and Closure Policy', the Proponent shall submit a detailed closure and reclamation plan to the regulators. This plan shall be updated and submitted at regular intervals during the Project at the regulators' discretion. Updated plans shall include cost estimates for financial security, including a cost estimate for post-closure monitoring, inspections and maintenance.

121. As part of the detailed closure and reclamation plan, the Proponent shall develop site and activity-specific reclamation objectives. The Proponent shall develop target indicators to ensure reclamation targets have been met.

122. The Proponent shall provide to the appropriate regulators plans for long-term inspections and maintenance of engineered facilities.

123. The Proponent shall provide to the appropriate regulators detailed design and analysis of liners, store and release covers and/or evapotranspiration covers on mine installations.

124. The Proponent shall submit to the appropriate regulators plans for post-closure monitoring and maintenance.

To minimize the likelihood of insufficient closure security is held:

125. As per the 'Yukon Mine Site Reclamation and Closure Policy', outstanding liability associated with technical features and structures shall be determined by a professional engineer licensed to practice in Yukon.
126. Financial security requirements shall be reviewed and revised on an annual basis.
127. When determining the amount of security to be held the following should be considered:
    a. Potential variation in the detoxification methodology for the heap leach until confirmed by completed field-scale trials on the first heap leach cell;
    b. Estimates of ten years required to detoxify the heap;
    c. Costs of reagents required to detoxify the heap;
    d. The current trend of rising regional operational costs of all large projects including mining; and,
    e. Any progressive reclamation completed by the Proponent.

To minimize the likelihood and magnitude of any post-closure effects of runoff on surface water:

128. As proposed by the Proponent, further test work shall be conducted on the sludge produced by the high-density sludge (HDS) treatment plant to prevent any adverse effects associated with remobilization of contaminants in the sludge into the rinsed areas of the heap.
129. The Proponent shall not place sludge on a cell in the heap until it has been demonstrated that the cell has been properly rinsed and detoxified (i.e. drainage from the cell meets water quality discharge criteria without treatment).
130. As proposed by the Proponent, an evaporative/transpiration (i.e., store and release) soil cover system shall be placed over the heap after detoxification to reduce infiltration rates.
131. Water treatment facilities shall remain operational until it has been demonstrated that the heap has been detoxified (i.e., when it is demonstrated that heap effluent meets discharge standards without treatment in the long-term).
132. If it is determined that following heap detoxification, the heap effluent requires further "polishing" prior to discharge (as determined by regulatory authorities), the Proponent shall submit plans for alternative methods of long-term passive treatment to the regulators. The Proponent shall demonstrate the effectiveness of any proposed passive treatment measure.

To minimize the effects associated with increased access via the mine access road:

133. The Proponent shall maintain private control of the mine access road and deter public vehicle access, including by off-road vehicles, with either personnel or appropriate barriers until the road is decommissioned.
134. The Proponent shall decommission the mine access road following successful detoxification and closure of the heap and other required site closure and reclamation activities. All

culverts, bridges and approaches shall be removed, the road will be scarified and de-compacted, drainage patterns will be restored and the right-of-way will be re-seeded. To discourage travel, the road shall be bermed and ditched.

To minimize the likelihood of accidents post-closure involving the open pit:

135. As proposed by the Proponent, public access to the open pit shall be restricted by installing fencing or other appropriate infrastructure/earthworks.

136. The Proponent shall install appropriate signage around the open pit warning people of danger.

To minimize the likelihood of WRSA geotechnical failure:

137. As proposed by the Proponent, a detailed plan shall be developed and implemented to monitor and measure temperature, water and materials movement in and under the WRSA. The plan will include the installation and monitoring of survey hubs/monuments, wire line extensometers, piezometers and thermistors, or equivalent sensors under and around the WRSA.

138. As proposed by the Proponent, a detailed monitoring plan shall be developed to establish monitoring frequencies and reporting responsibilities. The plan shall set out trigger levels and action items if movement or the measurements approach 50 percent of the trigger level and then 80 percent of the trigger level. The plan shall identify staff that would be responsible to respond to the warnings provided through monitoring. This monitoring plan, in addition to the final layout of instrumentation shall be approved by the regulator prior to any development of the waste rock storage area (WRSA).

139. The Proponent shall submit a detailed dumping plan for the waste rock storage area (WRSA) to the regulator for approval.

To minimize long-term aesthetic effects at the mine site

140. As proposed by the Proponent, all mine site facilities, equipment and materials will be dismantled (as appropriate) and removed from the site.

141. As proposed by the Proponent, the ground will be re-contoured to restore pre-mine drainage patterns and re-vegetated with a seed mixture of indigenous plant species. The sand and gravel borrow areas will be re-contoured and seeded.

142. The Proponent shall reclaim all surfaces of the WRSA by providing appropriate soil properties (type, structure, depth, and stability) and re-seeding with indigenous seed sources as deemed appropriate by the regulator. Natural re-vegetation of disturbed areas will be promoted, where likely to be successful, as part of re-vegetation plans.

143. As proposed by the Proponent, and as required by the regulator, points of compliance for re-vegetation shall be established to determine that:
    a. Fertilizing and seeding is completed;
    b. Vegetation is established; and
    c. Vegetation composition is acceptable.

9.5 EXECUTIVE COMMITTEE SUGGESTIONS

- The Proponent should develop measurable goals/indicators for assessing reclamation success. These goals should be developed in collaboration with local land users.

9.6 CONCLUSION

The Executive Committee is of the opinion that the measures outlined in the Conceptual Reclamation and Closure Plan, in addition to the above-mentioned required mitigative measures, will mitigate potentially significant adverse environmental and socio-economic effects associated with Project closure and reclamation on water quality.

10.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

10.1 OVERVIEW

Changes to the environment, beyond those that are anticipated, could increase the risk of design failure or impact the implementation of various aspects of the Project. Design standards and the Project EMS incorporate a certain amount of environmental variability. The Proponent has identified structures, facilities, and processes upon which extreme fluctuations of the environment could have an effect:

- Process (leaching/rinsing) solutions and water collection, piping, and storage infrastructure (e.g., process plant, pipelines, pumps, sediment ponds, events pond);
- The heap, including berms and liners;
- The open pit; and,
- The waste rock storage area (WRSA).

The potential adverse effects of the environment on these mining activities largely involve extreme weather events (extreme precipitation or temperatures), local forest fires and earthquakes. Potential changes in climate are less likely to impact Project operations (i.e. 5-15 year horizon) but are relevant for the long-term stability of the site post-closure.

10.2 EFFECTS ASSESSMENT

The flowing environmental conditions or events were assessed with respect to their potential effects on the Project:

- Increases in soil temperature related to climate change may lead to local permafrost degradation and instability of infrastructure foundations;
- Changes in the weather and/or extreme weather events related to climate change;
- Extreme weather events damaging structures and/or disrupting activities and processes:
  - Extreme temperature (either hot or cold and the length of extreme temperatures)
  - Heavy precipitation/severe drought disrupting the Project water balance and processes
  - Severe high winds and storms damaging infrastructure;
- Forest fires may damage or destroy Project infrastructure; and,
- Seismic activity could damage infrastructure.

Should future natural environmental conditions or events change dramatically from established range of baseline conditions, they could affect the Project and, in the opinion of the Executive Committee, result in potentially significant environmental or socio-economic effects.

10.2.1 EXTREME WEATHER EVENTS

Extreme weather events may cause disruption of routine mining operations. It is likely that such events would result in the malfunctions or failures of structures (e.g., embankments), equipment (e.g., accidents, breakdowns) and process failures (e.g., water collection/transport). In addition extreme weather events may cause effects on remaining structures during and after reclamation and closure. The effects could cause disruption of geochemical and physical stability in the mining structures and disruption of mining processes.

10.2.1.1 Extreme Temperatures

Extended Higher Temperatures

Periods of high temperature increase the evaporation rates which are an important part of the Project water balance. During operations this may result in increased make-up water being required for the heap. Post-closure, increased evaporation is a benefit as it will decrease the amount of water that would potentially percolate through the heap or WRSA.

The proponent intends to either melt or excavate and replace any known areas of permafrost or thaw-unstable soils under the heap or WRSA. Extended periods of higher temperatures could result in more extended melting of local discontinuous permafrost, but it is not expected that this would adversely affect the Project.

Extended Lower Temperatures

Cold temperature extremes, such as extended severe winter cold, could disrupt the processes of water collection, conveyance, and storage infrastructure through freezing of solutions and equipment. For example, the drip emitters, depending on their placement, may be more prone to freezing. If the drip emitters were to freeze, leaching and rinsing rates would temporarily decrease (i.e. Project efficiency decreases) but no environmental effects would result.

10.2.1.2 Extreme Precipitation

Though the evaporation to precipitation ratio in the Project area is slightly negative and the Project is anticipated to run a water deficit (i.e. it will require makeup water from wells) it is conceivable that a series of extremely high precipitation events could result in volumes of meteoric precipitation that would need to be actively managed. The events pond and sediment ponds can both be used to control meteoric precipitation and have been designed to capture and control excess precipitation (i.e., 1 in 200 year event, plus snowmelt, with a minimum freeboard of 1 m). Should meteoric precipitation exceed the volumes being planned for, the HDS treatment plant will be in operation in the event that runoff will need to be treated and released.

Water management within the heap and WRSA is important during post-closure. Soil and vegetation covering the heap and WRSA are anticipated to decrease infiltration. The heap will only be closed, and the Project move into “post-closure” when water percolating through both heap and WRSA meet discharge standards set out in the water licence. During post-closure water percolating through the heap or WRSA is not expected to be high in acid or high or dissolved metals. However, increases in the flow of runoff can lead to increases in surface erosion or channelization within the heap or WRSA. While unlikely, this could potentially result in geotechnical instability. Project design and location are expected to minimize any potential effects of extreme precipitation events on the Project.

10.2.1.3 Severe High Winds and Storms

Storms and high winds, especially with blowing snow can reduce visibility and restrict access to or from the mine site so that workers may not be able to adequately carryout the required tasks. Tree blow down could hamper access to the mine site or affect power lines causing power failures and disruption of processes. High winds could cause wave action and potential erosion of the embankments of the events and sediment ponds. Armouring and lining of these ponds is expected to control any potential for wind-induced erosion.

10.2.2 FOREST FIRES

The number and size of forest fires in an area each year vary with annual weather (i.e., dry or wet years), and natural forest fire regime. Susceptibility of an area to fire depends on aspect, stand age, forest cover type and, for human caused fires, distance from facilities and processes that involve heat or sparks.

The Forest Fire History Map for the Project area shows that the 1995 fire came within approximately 10 km to the north of the site. The Canadian Forest Service estimates typical forest fire frequencies in the boreal forest at between 50-200 years, with fires being more frequent in western Canada.

The Project site will be largely cleared of vegetation during operations and it is expected that little or no woody material would be available on-site to burn. Infrastructure at particular risk to forest fire would be the diesel storage areas for both diesel generation and explosives manufacture.

A forest fire encroaching into the mine site area could result in a loss of infrastructure (i.e., SX/EW plant, HDS plant, mill, accommodations buildings) and/or a loss of operating time/work days. These losses could affect the functioning of the water collection, conveyance, and storage infrastructure (e.g., pipelines, pumps, HDS treatment plant). Should fire-related infrastructure damage coincide with conditions requiring water treatment and discharge, there is risk of contaminated water being released to the environment. The Proponent has proposed redundant pumping systems and considered forest fire response as part of their EMS.

10.2.3 SEISMIC ACTIVITY

The Project site is located in an area of historically low seismicity. Recent reports of earthquakes include 30 January, 2008 (magnitude 4.8) and 14 December, 2002 (magnitude 4.4). Historical earthquakes greater than 5.0 on the Richter scale have occurred along source bands over 150 km from the Project to the northeast and southwest (see Figure 5). The Project is located within the Northern B.C. source zone bounded to the west by the Denali-Shakwak source zone and to the east by the Mackenzie source zone. In addition, further southwest beyond the Denali-Shakwak source zone, lies the Fairweather-Yakutat source zone, a region which produces a higher rate of large earthquakes (magnitude 7 and greater).

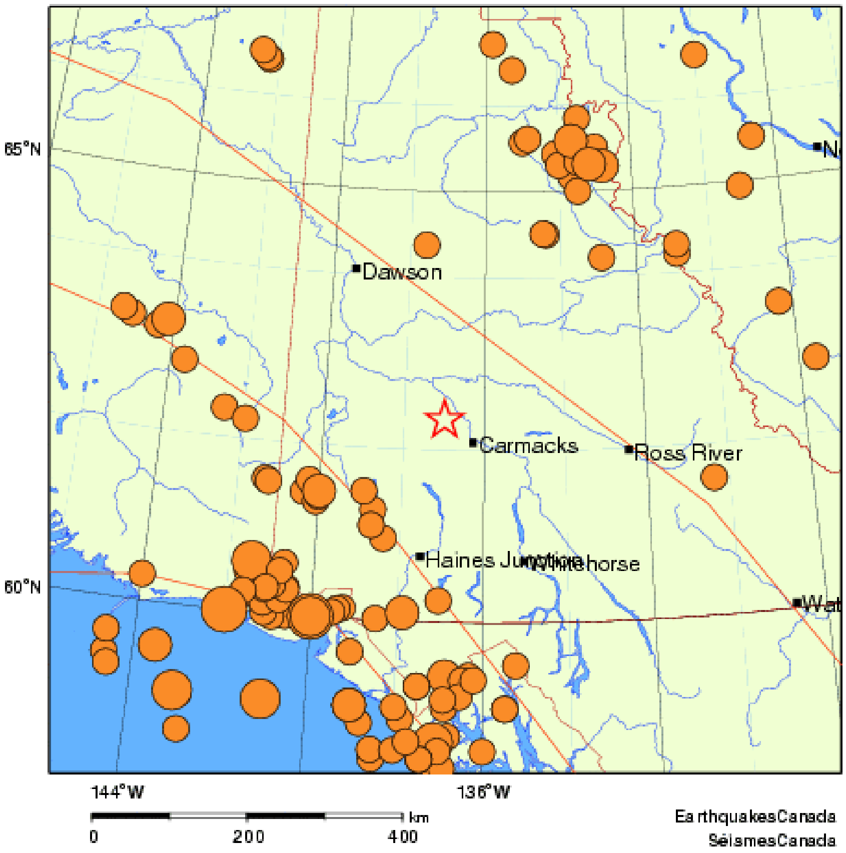


Figure 5 Historical Earthquakes Magnitude 5.0 and Larger (from Earthquakes Canada, NRCan)

Seismic activity can lead to foundation and infrastructure instability and failure. Secondary effects of earthquakes can be the triggering of landslides, slope failures, structural deformation and sediment liquefaction. These effects could be significant if the heap and retaining dam, pit walls, WRSA and event/sediment ponds and related embankments were subjected to a powerful enough earthquake. Failure of water control features (i.e. dams and ponds) could lead to a release of untreated water or process solution. Seismic-related slumping or failure of the WRSA or heap could lead to down slope movement of material towards Williams or North Williams creeks.

The proponent has proposed structures that meet applicable building codes/standards, seismicity design standards and mining regulatory standards for terrain/soil and slope stability. The preliminary design of the WRSA explicitly takes into account seismic activity and includes the installation of monitoring equipment to measure if any regional seismic activity has resulted in small scale changes to WRSA stability. The Executive Committee is of the opinion that seismic activity related effects on infrastructure are highly unlikely.

10.2.4 CLIMATE CHANGE

The warming of the global climate is “unequivocal” and most pronounced at higher northern latitudes (IPCC 2007). Global climate change models can be difficult to apply at the scale of an individual Project but the assessment can address additional risk to the Project related to increased climatic/weather uncertainty. Climate modeling in Canada, including Western Canada, has indicated a general overall trend towards warmer annual mean temperatures and increased annual precipitation. The magnitude and frequency of extreme storm events are also expected to increase.

Current infrastructure design criteria (i.e., to withstand one in 100 or 200 year events) are thought to be able to handle the minor changes in mean weather conditions as a result of climate change over the life of the Project. Of greater concern are the potential effects of climate variability and increased frequency and magnitude of extreme events, especially in post-closure. More, or more extreme, weather events including heavy precipitation events, severe hot or cold temperatures and storms with high winds is a possible scenario.

Though the Project will operate for approximately 15 years, inclusive of decommissioning, some installations like the heap, WRSA, open pit, and spillways, will remain, in some state, in perpetuity. Both the heap and the WRSA will be reclaimed through contouring, soil covers and re-seeding. Over the course of time, it is anticipated that the open pit will fill to the height of the surrounding water table level.

The Meteorological Service of Canada provided advice on assessing potential impacts of future climate change on possible maximum flood and possible maximum precipitation in Yukon. The modeling scenario developed for 2010 to 2030 suggests that a slight increase in flood likelihood is anticipated (approximately 3 to 5 percent) in this area. Increased meteoric precipitation in post-closure increases the potential volumes water percolating through the heap and WRSA. Additional runoff due to increased meteoric precipitation is not expected to be high in acid or dissolved metals but surface erosion and internal channelling to the heap and WRSA may need to be monitored and controlled.

With increases in meteoric precipitation, the open pit may fill more rapidly. Changes to the pit filling rate will not result in any changes in to environmental effects as long as non-acid generating rock forms the sides and floor of the pit. Should acid generating rock be exposed on the pit floor, water filling in the bottom of the pit will isolate it from the oxygen in the air that is needed to generate ARD.

Long-term increases in temperature could increase evaporation in the Project area which may decrease the amount of meteoric precipitation that percolates through the heap and WRSA post-closure.

During the Project, local and regional weather will be monitored. Any impacts of climate change on local weather conditions, and in particular the water management regime, will be observed. Adaptive management of Project operations and processes will allow appropriate response to changing weather patterns. This monitoring will provide additional information to better predict weather through post-closure. Additionally, climate change predictions will continue to improve as climate change research grows and builds on existing knowledge, data and technology.

10.3 REQUIRED MITIGATIVE MEASURES

In addition to the applicable mitigative measures outlined in Section 6.1.6 *Water Resources*, the Executive Committee recommends the following mitigative measures:

144. As proposed by the Proponent, appropriate soil testing shall be carried out to determine permafrost sites in the locations planned for mining infrastructure (i.e., heap, waste rock storage area (WRSA), events and sediment ponds).
145. All organic soils, weak mineral soils, ice-rich soils and any other soils deemed to be unsuitable shall be removed, down to competent mineral soils or fractured bedrock or other approved mitigations will be undertaken so that structures would be constructed on a prepared foundation.
146. A proposed by the Proponent, redundant systems shall be in place to ensure process water pumping and power systems are operational during extreme temperature, precipitation and wind events.
147. The Proponent shall include in the Environmental Management System, fire safety and contingency response planning which will outline and describe appropriate procedures and protocols to effectively deal with a forest fire.
148. The Proponent shall ensure that the embankments for the heap, waste rock storage area (WSRA) and events and sediment ponds are designed and constructed to the approved design criteria included within the Project description.

10.4 CONCLUSION

The Executive Committee concludes that with the application of the above mitigative measures, no significant adverse effects are anticipated to occur as a result of effects of the environment on the Project.

PART III – ASSESSMENT RECOMMENDATION

11.0 RECOMMENDATION

Pursuant to paragraph 58(1)(b) of YESAA, the Executive Committee recommends to the Decision Bodies that the Western Copper Corporation's Carmacks Copper Project be allowed to proceed without a review, subject to the terms and conditions of the mitigative measures specified below, as the Executive Committee has determined that this Project will have significant adverse environmental and socio-economic effects in Yukon that can be mitigated by these terms and conditions.

Ken McKinnon		Sm-Wood
Ken McKinnon	Stephen J. Mills	Simon Mason-Wood
Executive Committee Chair	Executive Committee Member	Executive Committee Member

12.0 TERMS AND CONDITIONS OF MITIGATIVE MEASURES

12.1 MINE SITE AND ACCESS ROAD

WATER RESOURCES

To minimize any effects due to water discharge:

1. Prior to any release to the environment, the Proponent shall ensure that water is tested and treated to Yukon and federal release standards and meets downstream water quality objectives as set out in the water licence.
2. Prior to any water discharge, the Proponent shall monitor receiving waters to determine downstream water volume and quality to confirm that Yukon and federal release standards will be met (i.e., CCME).
3. An assimilative capacity assessment shall be conducted to determine site-specific discharge criteria at the point of compliance.
4. Total suspended solids of any discharged water shall be controlled so as not to exceed regulated levels. If required, settling aids shall be used.

To decrease potential for ARD/ML in waste rock/pit walls:

5. The Proponent shall conduct appropriate sampling and materials testing to determine the acid rock drainage (ARD) potential of rock in the extreme western and northern portions of the proposed pit and report the results to the regulators prior to excavating those areas of the pit.
6. The Proponent shall, if required by the regulator, confirm the characterization of the waste rock through additional testing to confirm that the waste rock storage area (WRSA) has no acid rock drainage potential and that the potential to release metal contaminants via metal leaching mechanisms is negligible before placing material in the WRSA.
7. Sampling and monitoring measures shall be in place with the objective of minimizing the placement of acid generating rock in the waste rock storage area (WRSA) and exposing sulphide ores in the pit. The Proponent shall maintain a 6 m buffer of oxide ore above the sulphide ore in the pit.
8. All aggregate and building material sources and potential rock 'cuts' related to road or infrastructure development shall be characterized for acid potential by the Proponent prior to development. Only non-reactive aggregate materials may be used for infrastructure development and construction. Where acid generating materials are disturbed, appropriate management actions shall be identified, implemented and approved by regulators.

To decrease likelihood and magnitude of process solution leaks:

9. Detailed design of the heap liner system, including site specific liner leakage rates and allowable limits, as well as a response plan and contingency measures, shall be submitted to the regulators for review and approval.

To temporarily store HDS treatment plant generated sludge:

10. The Proponent shall have adequate storage facilities available on-site to temporarily store sludge generated from the high-density sludge (HDS) treatment system in the event that water is treated for discharge during operations. Sludge shall not be disposed of on the heap until those cells of the heap have been shown to be effectively detoxified.

To minimize sedimentation of surface waters:

11. The Proponent shall control erosion and the introduction of sediment into receiving waters, in particular during construction. Options available to the Proponent include best construction management practices like sedimentation ponds, silt fencing, drainage ditches.
12. Discharge location, volume and flow rates of released water will be controlled to prevent erosion damage to banks, stream beds or disturbance to fish.
13. Any road or bridge construction and maintenance at the Merrice and Williams Creek crossings shall be performed to standards established by the regulators to ensure minimal riparian and aquatic disturbance.
14. Disturbance on or near banks of watercourses or waterbodies will be minimized. Bank clearing will be conducted in accordance with Fisheries and Oceans Canada (DFO) Operational Statements (i.e., no bank cutting).

To ensure effectiveness of process solution seepage detection and collection:

15. The Proponent shall install groundwater monitoring wells, or other complementary approaches, down gradient of mine features, including the heap pad, waste rock storage area (WRSA), events and sediment control ponds. Location, elevation, borehole logs, screening depth, lithologies, installation methods, monitoring schedules and permeability analysis of these measures shall be submitted to the appropriate regulator.
16. Sediment from the events and sediment control ponds shall be tested prior to removal and disposed of in accordance with the appropriate regulation.

WILDLIFE

To decrease habitat alteration or loss

17. The Proponent shall use existing trails and disturbed areas, where suitable, to minimize the addition of new linear corridors.
18. The Proponent shall take every precaution to ensure disturbance of wildlife habitat, including but not limited to denning or nesting sites, is avoided.

19. As proposed by the Proponent, a minimum 30 m avoidance and vegetative buffer zone shall be maintained between stream riparian areas and facilities to minimize wildlife disturbance and protect wildlife corridors.

20. The Proponent shall hand cut vegetation near access road stream crossings to reduce disturbance to riparian areas.

21. The Proponent shall ensure personnel movement will be restricted to the Project area and access routes.

To decrease potential increases in wildlife mortality due to hunting

22. The Proponent shall operate the mine access road as a "private controlled access road". At the junction of the mine access road and the Freegold Road the Proponent shall install and maintain appropriate infrastructure and/or personnel to control vehicular access until the mine access road is de-commissioned.

23. As proposed by the Proponent, firearms shall be restricted on-site. The Proponent shall implement policies and procedures which will identify employee, management and contractor restrictions pertaining to fishing and hunting. These policies and procedures shall be in effect throughout the life of the Project.

24. The Proponent shall provide employees with instruction and education regarding the Project's "Wildlife Harassment" policy, which will encompass the avoidance of contact, attraction (i.e. feeding) and harassment of wildlife by Project personnel.

To decrease wildlife mortality due to vehicle collisions

25. The Proponent shall post speed limits and signage at wildlife crossings along the mine access road to minimize direct road mortalities.

26. The Proponent shall provide transportation to the mine site and encourage its use to minimize hunting opportunities and direct road mortalities.

To decrease attractants and control mine site access by wildlife, which could result in increased wildlife mortality:

27. The Proponent shall undertake routine garbage patrols to remove materials, (e.g., metals, plastics, grease) which may be potentially harmful to wildlife.

28. The Proponent shall regularly incinerate solid waste in a manner which minimizes odours and eliminates the attraction of bears and other wildlife to the mine site. As proposed by the Proponent, an approved petroleum-fired incinerator with high efficiency burner for camp facilities in accordance with the appropriate regulations will be used.

29. As per the Waste Management Plan, the Proponent shall regularly collect garbage and debris destined for disposal, and prior to incineration, shall store it in wildlife-proof containers in a manner that does not attract wildlife to the mine site.

30. The Proponent shall implement a progressive re-vegetation program for disturbed sites where native vegetation has been removed or destroyed. If any additional seeding is required, the seeding mix shall be reviewed by the regulator prior to application. Natural re-vegetation of disturbed areas will be promoted, where likely to be successful, as part of re-vegetation plans.

31. The Wildlife Management Plan shall identify measures to deter wildlife access to mine site and facilities, including but not limited to, the kitchen/camp facilities, heap leach pad, events pond and processing areas. These measures may include fencing, electric fencing and/or netting of specific facilities as required. Specifically, the Proponent shall enclose the heap leach pad, events pond, and processing areas with fencing. As proposed by the Proponent netting over the events pond shall be erected to exclude birds and waterfowl. Monitoring of wildlife interactions will inform further adaptive management strategies to ensure deterrence.

To minimize any barriers to wildlife movement:

32. The Proponent shall construct the span bridge over Merrice Creek in a manner that does not restrict moose passage.

33. The Proponent shall implement measures to reduce the impediment of wildlife movements, including specifically the ploughing back of snow banks, and ensuring sufficient breaks in the snow banks to provide adequate sightlines for drivers and wildlife escape.

34. The Proponent shall not create windrows that would restrict wildlife movements or create fire hazards.

35. The Proponent shall use traffic restrictions during peak times of movement for most wildlife species (i.e., in the evening and early morning) to minimize effects of Project traffic on wildlife.

36. The Proponent shall report all encounters with wildlife, and/or mortalities to a YG Conservation Officer.

CURRENT LAND USE

To avoid effects to, and compensate for residual effects to the holder of Trapping Concession #147:

37. The Proponent shall discuss with the concession holder #147 appropriate crossing locations along the mine access road for use while trapping. When ploughing snow off the mine access road, the Proponent shall leave breaks in the snow banks at these crossing points to provide adequate sightlines for drivers and safe passage by snowmobile.

38. The Proponent, in agreement with the concession holder #147, shall be responsible for the relocation and/or re-establishment of the two trapline trails, that are in proximity to the mine site.

39. As committed to in a letter from the Proponent (YOR doc #2006-0050-138-1), concession holder #147 shall be compensated for the residual effects to trapping activities caused by the Project..
40. The Proponent shall make every reasonable effort to avoid interference with trapline trails. The Proponent shall restore any trails used or crossed, by slashing any and all trees that may fall across these trails in the course of construction and operation. The Proponent shall remove all debris and snow piles that may be pushed across the trails.
41. Project personnel shall be instructed not to interfere with trapping equipment, or trapped animals.

AIR QUALITY

To control and avoid air emissions:

42. The Proponent shall develop the detailed design of the Sulphuric Acid Plant and SX/EW Processing Facility in consultation with YG-Environment to ensure that the design minimizes emissions.
43. The Proponent shall monitor the emissions from the Sulphuric Acid Plant and the SX/EW Processing Facility. If concentrations are found to be of a level that may be harmful to humans, vegetation or wildlife, then scrubbers, filters or other such measures shall be employed to reduce these levels.
44. During periods of high activity and/or dry conditions, the Proponent shall apply dust suppressants, such as water or calcium chloride, to dust prone areas (e.g., unconsolidated working surfaces, development rock and ore stockpiles). When using water as a dust control measure, the Proponent shall ensure water quality standards identified for release into the receiving waters are met.
45. The Proponent shall use low sulphur diesel fuel with a sulphur content <15 ppm and propane with negligible sulphur content and where appropriate, the Proponent shall employ waste heat recovery and energy efficient techniques to decrease diesel use.

SOIL STABILITY

To decrease and minimize disturbance due to new construction:

46. The Proponent shall use existing trails and disturbed areas, where suitable, to minimize soil disturbance.
47. During the construction and maintenance of mine site access and haul roads, the Proponent shall minimize cut and fill slopes to reduce road footprint.
48. The Proponent shall minimize riparian removal and ensure drainage channels are maintained and debris free.

49. The Proponent shall incorporate erosion protection measures (e.g., rip rap, cross ditches, breaks) along roads and facilities.

To decrease the likelihood of infrastructure instability/failure due to permafrost melt and subsidence:

50. Where permafrost is encountered, the Proponent shall ensure that roads and infrastructure pads are appropriately designed and constructed.
51. The Proponent shall engineer and construct roads to avoid permafrost exposure to the greatest extent possible and maintain permafrost condition. When disturbance does occur, appropriate engineering techniques shall be used to address the disturbance.
52. As proposed by the Proponent, additional geotechnical drilling shall be conducted to confirm permafrost existence under the heap and waste rock storage area (WRSA). Design and contingency adjustments, particularly of the subgrade and foundation, shall be submitted to the regulator for review and approval. As part of detailed design planning, foundation stabilization options shall be considered. Contingency stabilization methods may include removal of any thaw-unstable soils at both the heap and WRSA and construction of a toe berm at the WRSA.

To decrease effects of heavy equipment use:

53. The Proponent shall not move any equipment or vehicles unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging and shall suspend overland travel of equipment or vehicles if rutting occurs.

To increase the likelihood of reclamation/re-vegetation efforts:

54. Prior to reclamation, the Proponent shall test soil for quality and quantity and determine if the soils have sufficient content, nutrients and organic matter to support plant growth for the purposes of progressive reclamation.
55. The Proponent shall retain and stockpile organic material stripped from the site in such a manner as to ensure it will provide for its effective re-use for reclamation and re-vegetation.

HERITAGE RESOURCES

To identify and protect heritage/historic resources:

56. The Proponent shall retain a qualified professional to conduct a heritage/historic resources assessment of the proposed mine access road routing prior to commencement of construction. The assessment results must be submitted to the appropriate authorities for review and approval before any land disturbance is conducted. The scope of the assessment shall be commensurate with the requirements of the *Historic Resources Act* (Yukon).
57. If areas identified as having a high or medium potential for heritage sites are proposed to be disturbed by Project activities, a heritage/historic resources assessment of those areas

must be conducted by a qualified professional. The assessment results must be submitted to the appropriate authorities for review and approval before any land disturbance is conducted. The scope of the assessment shall be commensurate with the requirements of the *Historic Resources Act* (Yukon).

58. All known heritage/historic resources must be appropriately marked in the field, before commencing any Project activities which may disturb them. Markings may be removed after construction, or as stipulated by the appropriate authority.
59. The Proponent shall not carry out activities in the vicinity of known heritage/historic resources unless the appropriate authorities indicate, in writing, that such activities may be carried out.
60. The Proponent shall immediately mark and protect from further disturbance any sites containing heritage/historic resources discovered in the course of carrying out an operation. As soon as practical, the Proponent shall report the discovery to the appropriate authority in accordance with any relevant legislation. The Proponent shall not carry out any activities in the vicinity of any sites containing heritage/historic resources until the appropriate authorities indicate, in writing, that the activities may be resumed.
61. The Proponent shall, as part of general employee training, include instructions on the identification of heritage/historic resources.

PUBLIC HEALTH AND SAFETY

To minimize the likelihood and magnitude of effects on worker health:

62. The Proponent shall implement the proposed Environmental Management System (EMS) including the Hazardous Materials Management Plan, the Spill Contingency Plan and the Emergency Response Plan (as per Appendix L of the Project proposal) to both minimize health and safety risks and provide effective and efficient response to accidents or emergency situations. Employees shall be trained in appropriate emergency/spill response protocols.
63. The Proponent shall develop mine health and safety protocols and procedures to guide how it will provide on-site emergency response and first aid measures, and how it will provide emergency medical transportation from the mine site to Carmacks or another appropriate health facility, for emergency response. This will include the identification of key contacts, and the identification of specific high risk situations and chemicals that will be present at the mine along with associated treatment protocols. The Proponent will provide these protocols and procedures to YG-Health and Social Services (Community Nursing) and to YG-Community Services (Emergency Medical Services) before mine construction begins and will work with YG-Health and Social Services and YG-Community Services to ensure that the responsibilities for all parties for emergency medical response are clearly understood and agreed to.

64. The Proponent shall ensure Project personnel are adequately trained in emergency response and first aid measures. A designated health and safety officer and safety manager shall be on-site at all times.
65. The Proponent shall monitor environmental components such as water and air quality to ensure compliance with the terms and conditions of the water use licence and air emissions permit, respectively and to ensure that if levels of hazardous/dangerous substances rise above safe levels the appropriate emergency response can be deployed.

EFFECTS OF ACCIDENTS AND MALFUNCTIONS

To decrease likelihood and severity of exposure to dangerous materials:

66. The Proponent shall immediately implement the Spill Contingency Plan and/or Emergency Response Plan, as appropriate, should an accidental spill or release of dangerous/hazardous materials occur.
67. The Proponent shall ensure that all employees involved in handling dangerous/hazardous materials receive the appropriate training.
68. The Proponent shall ensure that all dangerous/hazardous materials storage and containment areas are protected, signed, and monitored as part of the Environmental Management System.
69. The Proponent shall ensure that all dangerous/hazardous materials are segregated and stored to ensure the integrity of product containers, avoidance of accidental mixing and their safety from weather effects.
70. The Proponent shall ensure that secondary containment measures for dangerous/hazardous materials shall be in place, as appropriate, to ensure worker health and safety and environmental protection.
71. The Proponent shall ensure that dangerous/hazardous materials handling facilities and fuelling stations are equipped with secondary containment.
72. In the event of a spill or release, the Proponent shall immediately implement the Project Spill Contingency Plan and/or Emergency Response Plan, as appropriate.

To minimize potential effects of forest fires:

73. As proposed by the Proponent, a Fire Water System shall be installed at appropriate places at the mine site and redundant pumping equipment and power sources shall be made available.
74. As proposed by the Proponent, emergency response personnel shall be trained in fire fighting.

To minimize risks associated with explosives:

75. The Proponent shall develop an Explosives Management Plan as part of the Environmental Management System for the safe manufacturing, handling, storage and use of explosives at the mine site.

76. Ammonium nitrate, and other explosive materials as appropriate, shall be transported and delivered to the mine site in licensed bulk container vehicles; the transport vehicles shall be equipped with spill kits.

77. As part of the Explosives Management Plan, the Proponent shall identify and implement appropriate signage, containment and safety measures for explosive storage and management; this may include but is not limited to fencing, gates, berms, dispensing vehicle management. As proposed by the Proponent, the explosives storage magazines shall be located in a bermed area.

78. As proposed by the Proponent, security measures shall be in place to limit access to the explosives storage magazines. Only authorized personnel shall have access to the magazines.

79. The Bulk Explosives Facility shall meet Bulk Guidelines published by the Explosives Regulatory Division of NRCan and local and federal regulations (e.g., Ammonium Nitrate Storage Facilities Regulations).

80. As proposed by the Proponent, un-detonated explosive in blastholes shall be washed out prior to pit excavation.

81. As proposed by the Proponent, fuel oil shall be stored in the Mine Fuel Storage facility located in a bermed, lined containment area.

To decrease likelihood of infrastructure failure:

82. The Proponent shall meet design/engineering, construction performance and best practices standards for the water collection and storage structures and equipment.

83. The Proponent shall meet design/engineering, construction performance and best practices standards for the heap structures and equipment.

84. The Proponent shall implement preventative engineering and design measures including:
    a. Stand-by emergency power generation;
    b. Redundant systems where appropriate and in line with standard engineering practices (pumping, piping, equipment and power); and,
    c. Construction of a high density sludge (HDS) treatment plant prior to placing ore onto the heap.

85. The Proponent shall design and construct the events pond, with a capacity to store solution volumes resulting from a combination of extreme events. Specifically, the events pond will have the capacity to store at a minimum:
    a. The operating solution volume, plus;
    b. Meteoric precipitation inflow from the 1 in 100 year event occurring at the most critical point in time, plus;
    c. An allowance for heap draindown as follows:
        - During the first year of operation, 100 percent of the total potential heap draindown volume, or
        - During subsequent years of operation, 48 hours of draindown (predicted 10 days of actual draindown) at the full rate of solution application.
86. The Proponent shall ensure that qualified personnel are on-site at all times during operations to implement redundant control and treatment systems as necessary.
87. The Proponent shall implement the leak detection and recovery system (LDRS) as proposed.
88. The Proponent shall develop and implement a pit wall monitoring program to provide an early warning system for pit wall failure to minimize worker injuries. The details of the pit wall monitoring program will be provided in the Proponent's mining license application.
89. The Proponent shall conduct geotechnical testing between the heap and the pit to ensure that heap loading will not contribute to pit wall failure.

12.2 FREEGOLD ROAD AND BRIDGES

PUBLIC AND WORKER HEALTH AND SAFETY

To ensure input from those potentially affected by traffic and decrease effects of project traffic on other users of Freegold Road:

90. The Proponent shall finalize its Traffic Management Plan in consultation with YG, the Village of Carmacks and the LSCFN, incorporating the route improvement and safety measures, and traffic monitoring and control measures outlined in the Preliminary Traffic Management Plan. The following additional measures shall be included in the finalized Traffic Management Plan:
    a. Appropriate convoy sizing shall be identified by the regulator;
    b. Convoys shall be accompanied by an escort/pilot vehicle;
    c. Overdimensional vehicles requiring an escort/pilot vehicle shall be identified;
    d. Vehicle wider than 2.6 m shall be accompanied by an escort/pilot vehicle;

   e. Escort/pilot vehicles shall inform oncoming traffic of convoys and advise them to stay in the pullout until the Project traffic passes; an additional escort/pilot vehicle may be required to accomplish this task;

   f. To facilitate public vehicle passing of Project convoys, every third pullout shall be large enough to accommodate the largest anticipated Project convoy;

   g. Vegetation alongside the road which obstructs sightlines of users on or approaching the road from adjoining trails or access roads shall be cleared;

   h. Employee private vehicle use to and from the mine site shall be restricted; and,

   i. Kilometre posts shall be oversized and spaced at 1 km intervals.

91. The route improvement safety measures shall be implemented as per the finalized Traffic Management Plan and in consultation with YG-Highways and Public Works to ensure access and safety for users of the Freegold Road. The appropriate measures for the Freegold Road shall be in place prior to construction activities to ensure safety along the route.

To maintain safe passage of project traffic along the Freegold road:

92. The Road shall be graded as required during the summer and any damaged locations along the roadway (e.g., formation of ruts, softening of the road surface) shall be repaired, as required.

93. During the winter months, all Project truck traffic shall apply tire chains as required.

To minimize the likelihood of project traffic resulting in bridge closure or failure:

94. Inspections of the Nordenskiold River Bridge and the Crossing Creek Bridge shall continue and repairs shall be made as required, at the discretion of YG-Highways and Public Works.

WILDLIFE

To decrease the likelihood of collisions between Project traffic and wildlife:

95. Snow on the Freegold Road shall be ploughed and breaks shall be left in the snow banks, where appropriate, to ensure adequate sightlines for drivers and wildlife escape.

96. Collisions between wildlife and Project vehicles along the Freegold Road will result in the consideration of changes to the Traffic Management Plan to minimize these effects. Wildlife mortalities shall also be reported to a YG Conservation Officer.

To better adaptively manage, and decrease any potential adverse Project effects on moose:

97. The Proponent shall conduct November post-rut moose surveys, including gender/age composition, annually for the first three years of Project construction/operations. The Proponent shall provide the result of these studies to the CRRC, LSCFN and YG-Environment.

98. The Proponent shall conduct post-rut moose surveys, including gender/age composition, every three years after construction. The Proponent shall provide the result of these studies to the CRRC, LSCFN and YG-Environment.

CURRENT LAND USE

To decrease effects of project traffic and winter road maintenance on the Yukon Quest:

99. Due to the opening of the Freegold Road during the winter months, safe routing for the Yukon Quest shall be established. The route shall follow existing linear disturbances (e.g., Freegold Road right-of-way, trails and cutlines) where possible, or result in the cutting of new trail less than 1.5 metres in width.

To identify and decrease any project traffic effects on local users of the Freegold Road:

100. Increased usage and traffic patterns caused by project traffic shall be reviewed at the Mile 8 and Mile 9 lakes location. If increased usage and traffic patterns cause adverse effects, YG-Highways and Public Works shall take appropriate measures to ensure public safety. Consideration shall be given to establishing one of the pullouts at this location if it decreases conflict between vehicles traveling on the Freegold Road and parked vehicles.
101. Access to trails and cabins along the Freegold Road shall not be unreasonably impeded by winter maintenance activities. YG-Highways and Public Works shall speak with local land users to determine where access points are located and determine an appropriate solution. Consideration shall be given to widening the ploughed portion of the road at these points to allow users to remove their vehicles from the travelled portion of the road.
102. Dust control measures shall be implemented for the Freegold Road and shall be in effect for the duration of active fishing and fish preparation at fish camps along the road. Discussions and subsequent follow-up with the fish camp operators/owners is required upon first implementation to ensure the appropriateness and effectiveness of the mitigation measure.

SURFACE WATER QUALITY

103. Riparian vegetation removal shall be minimized and drainage channels are to be maintained and debris free.
104. Erosion protection measures (riprap, cross-ditches, and breaks) along roads are to be applied as required.
105. The Proponent shall ensure that each truck carrying bulk loads of dangerous/hazardous materials is equipped with a spill kit and that all personnel responsible for the transport of such material are be trained and fully understand spill response measures.

HERITAGE RESOURCES

106. Any new construction activities (e.g. pullouts, land clearing, excavation or placement of earthen materials) along the Freegold Road shall be reviewed by YG-Tourism and Culture to determine if a heritage resources assessment is required. If required, a heritage resource assessment shall be undertaken pursuant to the *Historic Resources Act* (Yukon).

12.3 COMMUNITY AND REGION

PUBLIC HEALTH AND SAFETY

To decrease the likelihood of Project traffic effects in Carmacks:

107. The Proponent shall finalize its Traffic Management Plan in consultation with YG-Highways and Public Works, the Village of Carmacks and the LSCFN, incorporating the route improvement and safety measures, and traffic monitoring and control measures outlined in the Preliminary Traffic Management Plan, as well as the following measures should Project traffic pass through Carmacks:
    a. Signage shall be installed along the Project traffic route through Carmacks informing the community of the increased industrial traffic;
    b. Signage shall be installed informing drivers of high-probability/high-volume pedestrian crossing locations;
    c. Consideration shall be given to further increasing the visibility of high-probability/high-volume pedestrian crossing locations using beacons, signage or other appropriate devices to increase the awareness of both drivers and pedestrians;
    d. Consideration should be given to setting timing windows and special speed limits for larger project vehicles; and,
    e. The use of engine brakes within Carmacks shall be restricted.

COMMUNITY STRUCTURE AND DYNAMICS

108. The Proponent shall locate the single-status accommodation facility for transient mine workers at the mine site.
109. The Proponent shall implement management policies and procedures for the single-status accommodation facility. This will include:
    a. Alcohol and drug policies;
    b. Policies to encourage resident participation in recreational opportunities; and,
    c. Policies proving health promotion information and materials.

110. The Proponent shall make available counselling services to employees and their families.

111. The Proponent shall implement mandatory substance abuse and chemical dependency awareness training for all its employees, contractors and sub-contractors. Information about substance abuse shall consider the abuse of alcohol, illicit drugs and prescription medications.

112. The Proponent shall implement a substance control policy for mine employees. This policy may include mandatory pre-employment testing and random drug testing during employment for all mine employees. The substance control policy shall include protocols for how the employer will deal with the event of an employee being found consuming alcohol or drugs on site, or being under the influence of alcohol or drugs, or other otherwise failing a drug test. The Proponent shall document the rates of substance abuse instances, as well as success of the mine's substance abuse treatment resources (in terms of repeat offences), and shall, subject to privacy legislation, provide the information to YG-Health & Social Services, LSCFN and SFN if requested to do so.

113. As proposed by the Proponent, special consideration shall be given to granting leave requests to employees who intend to undertake traditional pursuits.

114. The Proponent shall engage with local communities, LSCFN and SFN to help maximize opportunities for employment and help to prepare the communities for the potential out-migration of skilled workers.

115. The Proponent, in cooperation with the Village of Carmacks, LSCFN, SFN and YG, shall plan for the eventual closure of the mine and the resulting effects on employees. This planning shall commence upon start-up of operations.

116. The Proponent shall develop the Mine Closure and Reclamation Plan in collaboration with the Village of Carmacks, LSCFN and YG.

COMMUNITY SERVICES AND INFRASTRUCTURE

117. The Proponent shall inform the local daycare providers of likely numbers and ages of children that their Carmacks-residing employees intend on enrolling in the daycare.

12.4 CLOSURE AND RECLAMATION

To minimize the likelihood of incomplete leaching of the heap:

118. The Proponent shall design, build and manage the first cell of the heap as a field-scale trial of the heap leach process. This trial will be designed as an investigative approach to clearly show what ore is being leached and if there are zones that are not leached. If non-leached zones are identified, the Proponent shall make alterations or refinements to the leaching process to increase leaching efficiency and minimize the creation of non-leached zones in

the heap. The Proponent shall provide the design and results of this leaching trial to regulators.

To minimize potential effects related to temporary sludge storage:

119. As proposed by the Proponent, sludge from the high-density sludge (HDS) treatment plant shall be temporarily stored in a bermed, lined area upslope of the heap.

To minimize the likelihood of reclamation objectives not being met:

120. As per the 'Yukon Mine Site Reclamation and Closure Policy', the Proponent shall submit a detailed closure and reclamation plan to the regulators. This plan shall be updated and submitted at regular intervals during the Project at the regulators' discretion. Updated plans shall include cost estimates for financial security, including a cost estimate for post-closure monitoring, inspections and maintenance.

121. As part of the detailed closure and reclamation plan, the Proponent shall develop site and activity-specific reclamation objectives. The Proponent shall develop target indicators to ensure reclamation targets have been met.

122. The Proponent shall provide to the appropriate regulators plans for long-term inspections and maintenance of engineered facilities.

123. The Proponent shall provide to the appropriate regulators detailed design and analysis of liners, store and release covers and/or evapotranspiration covers on mine installations.

124. The Proponent shall submit to the appropriate regulators plans for post-closure monitoring and maintenance.

To minimize the likelihood of insufficient closure security is held:

125. As per the 'Yukon Mine Site Reclamation and Closure Policy', outstanding liability associated with technical features and structures shall be determined by a professional engineer licensed to practice in Yukon.

126. Financial security requirements shall be reviewed and revised on an annual basis.

127. When determining the amount of security to be held the following should be considered:
    a. Potential variation in the detoxification methodology for the heap leach until confirmed by completed field-scale trials on the first heap leach cell;
    b. Estimates of ten years required to detoxify the heap;
    c. Costs of reagents required to detoxify the heap;
    d. The current trend of rising regional operational costs of all large projects including mining; and,
    e. Any progressive reclamation completed by the Proponent.

To minimize the likelihood and magnitude of any post-closure effects of runoff on surface water:

128. As proposed by the Proponent, further test work shall be conducted on the sludge produced by the high-density sludge (HDS) treatment plant to prevent any adverse effects associated with remobilization of contaminants in the sludge into the rinsed areas of the heap.

129. The Proponent shall not place sludge on a cell in the heap until it has been demonstrated that the cell has been properly rinsed and detoxified (i.e. drainage from the cell meets water quality discharge criteria without treatment).

130. As proposed by the Proponent, an evaporative/transpiration (i.e., store and release) soil cover system shall be placed over the heap after detoxification to reduce infiltration rates.

131. Water treatment facilities shall remain operational until it has been demonstrated that the heap has been detoxified (i.e., when it is demonstrated that heap effluent meets discharge standards without treatment in the long-term).

132. If it is determined that following heap detoxification, the heap effluent requires further "polishing" prior to discharge (as determined by regulatory authorities), the Proponent shall submit plans for alternative methods of long-term passive treatment to the regulators. The Proponent shall demonstrate the effectiveness of any proposed passive treatment measure.

To minimize the effects associated with increased access via the mine access road:

133. The Proponent shall maintain private control of the mine access road and deter public vehicle access, including by off-road vehicles, with either personnel or appropriate barriers until the road is decommissioned.

134. The Proponent shall decommission the mine access road following successful detoxification and closure of the heap and other required site closure and reclamation activities. All culverts, bridges and approaches shall be removed, the road will be scarified and de-compacted, drainage patterns will be restored and the right-of-way will be re-seeded. To discourage travel, the road shall be bermed and ditched.

To minimize the likelihood of accidents post-closure involving the open pit:

135. As proposed by the Proponent, public access to the open pit shall be restricted by installing fencing or other appropriate infrastructure/earthworks.

136. The Proponent shall install appropriate signage around the open pit warning people of danger.

To minimize the likelihood of WRSA geotechnical failure:

137. As proposed by the Proponent, a detailed plan shall be developed and implemented to monitor and measure temperature, water and materials movement in and under the WRSA. The plan will include the installation and monitoring of survey hubs/monuments, wire line extensometers, piezometers and thermistors, or equivalent sensors under and around the WRSA.

138. As proposed by the Proponent, a detailed monitoring plan shall be developed to establish monitoring frequencies and reporting responsibilities. The plan shall set out trigger levels and action items if movement or the measurements approach 50 percent of the trigger level and then 80 percent of the trigger level. The plan shall identify staff that would be responsible to respond to the warnings provided through monitoring. This monitoring plan, in addition to the final layout of instrumentation shall be approved by the regulator prior to any development of the waste rock storage area (WRSA).

139. The Proponent shall submit a detailed dumping plan for the waste rock storage area (WRSA) to the regulator for approval.

To minimize long-term aesthetic effects at the mine site

140. As proposed by the Proponent, all mine site facilities, equipment and materials will be dismantled (as appropriate) and removed from the site.

141. As proposed by the Proponent, the ground will be re-contoured to restore pre-mine drainage patterns and re-vegetated with a seed mixture of indigenous plant species. The sand and gravel borrow areas will be re-contoured and seeded.

142. The Proponent shall reclaim all surfaces of the WRSA by providing appropriate soil properties (type, structure, depth, and stability) and re-seeding with indigenous seed sources as deemed appropriate by the regulator. Natural re-vegetation of disturbed areas will be promoted, where likely to be successful, as part of re-vegetation plans.

143. As proposed by the Proponent, and as required by the regulator, points of compliance for re-vegetation shall be established to determine that:
    a. Fertilizing and seeding is completed;
    b. Vegetation is established; and
    c. Vegetation composition is acceptable.

12.5 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

144. As proposed by the Proponent, appropriate soil testing shall be carried out to determine permafrost sites in the locations planned for mining infrastructure (i.e., heap, waste rock storage area (WRSA), events and sediment ponds).

145. All organic soils, weak mineral soils, ice-rich soils and any other soils deemed to be unsuitable shall be removed, down to competent mineral soils or fractured bedrock or other approved mitigations will be undertaken so that structures would be constructed on a prepared foundation.

146. A proposed by the Proponent, redundant systems shall be in place to ensure process water pumping and power systems are operational during extreme temperature, precipitation and wind events.

147. The Proponent shall include in the Environmental Management System, fire safety and contingency response planning which will outline and describe appropriate procedures and protocols to effectively deal with a forest fire.

148. The Proponent shall ensure that the embankments for the heap, waste rock storage area (WSRA) and events and sediment ponds are designed and constructed to the approved design criteria included within the Project description.

Appendices

APPENDIX A SUMMARY OF COMMENTS SUBMITTED TO THE ASSESSMENT

Table B-1 Comments on the Project proposal

Comment Summary	Consideration for Use
Mayo District Renewable Resource Council **Document Number: 2006-0050-082-1/ Date Received: March 7, 2007**	
The MDRRC had no concerns on the proposed Project.	N/A
Yukon Conservation Society **Document Numbers: 2006-0050-088-2 1 & 2/ Date Submitted: March 19, 2007**	
The YCS expressed serious concern regarding the Project: 1) The operation is perched on a spur that drains into both arms of Williams Creek, which in turn drains into the Yukon River. Williams Creek has been documented by the company and others as being a salmon rearing stream and it is well known that the Yukon River below Williams Creek has large populations of spawning Chum and Chinook Salmon. Therefore drainage from this operation has the potential of having significant detrimental effects on salmon populations. 2) The ability of the Proponent to carry out successful *long-term* detoxification of the heap has not been proven. We have been unable to find documentation of successful *permanent* detoxification of sulphuric acid leach heaps in climates like the Yukon's. The company's own studies were terminated before proving that long-term detoxification is possible. This leads to the possibility that perpetual water treatment may be necessary upon closure. The Yukon government's Reclamation and Closure Policy and Guidelines indicate that perpetual care is no longer an option for closure. Until documentation can be provided proving that successful long-term detoxification of the heap can be achieved, this operation should not be allowed to proceed. 3) The proposed method of storing waste rock on ground containing permafrost has the potential in the long-term to cause melting, with consequent deposit of high levels of silt into North Williams Creek. The company is proposing sediment control during the mine operation; however we are concerned about the long-term potential for sediment runoff after closure. Additionally, the company has not provided adequate information about the composition of the waste rock to determine whether there may be metals or other contaminants besides sediment. 4) The proposal to transport 40 tonnes of liquid elemental sulphur per day into the operation poses a substantial environmental risk. If large quantities of sulphur are exposed to air and water, the resulting acid contamination could be disastrous. It is hard to imagine an effective spill remediation plan for quantities of this size, especially considering that the	Information

Comment Summary	Consideration for Use
sulphur will be transported across the Nordenskiold River.	
If the Proponent were able to provide convincing mitigations for the above concerns, and there were to be a decision to allow the operation to proceed, financial security must be provided to the Yukon Government based on worst case scenario costs. Due to the serious potential environmental liability we strongly recommend that in this case the security evaluation should be reviewed by an independent expert, as opposed to just being based on the company's own closure plan and cost estimates.	Information
NRCan **Document Number: 2006-0050-089-1/ Date Submitted: March 19, 2007**	
NRCan is likely a Decision Body under YESAA through the issuance of an Explosives Factory Licence. NRCan determined its Decision Body status through the limited information pertaining to explosives manufacturing and use provided in the project documentation that we part of the Proponent's 2005 submission under YEAA. NRCan again requests additional information both in order to confirm its Decision Body status and to better inform the YESAA screening process: • In order to operate a truck-mounted ammonium nitrate/ fuel oil (ANFO) blasting agent supply and slurry mixing/ dispensing unit, one must have the support of an Explosives Factory Licence issued by the Explosives Regulatory Division of NRCan. It is possible that an existing licenced explosives factory may support this site if it is within a ten hour drive (800 km) of the site. This requires further clarification. • The proposal cites that there will be an Explosives Licence (obtained by the explosives supplier) and an Ammonium Nitrate Fuel Oil Order required. The ANFO certificate is not required when a factory licence is in place. • With respect to the location proposed for explosives storage, the service complex is 500 m away and the camp is approximately 600 m away. Only 10, 000 kg of explosives would be allowed at 500 m from a vulnerable feature like the service complex and this quantity would probably not be enough to serve this project.	Policy or position
Should the Proponent require an Explosives Factory Licence, NRCan's basic needs for assessing a factory in an environmental assessment are as follows: • Explosives to be manufactured. Note that if the Proponent initially specifies ANFO and decides to add emulsion, the potential environmental effects of the Project are not likely affected, as effluents and other aspects relevant to the assessment do not change. • Maximum quantity of explosives at each facility. • Specified location/ detailed site plan with distances to vulnerable features. Infrastructures should be identified and include: explosives and detonator magazines, fuel storage, ammonium nitrate storage, maintenance/wash area, process trucks and their parking area, any offices, warehouses, buildings, etc. The Proponent needs to demonstrate	Information

Comment Summary	Consideration for Use
that safety distances required by the Explosives Regulatory Division of NRCan have been considered and met. • Fuel and ammonium nitrate storage plans, in conformance with ERD Guidelines. • Liquid effluent disposal plans. • Evaluation of worst case scenario. • Spill contingency plans • Details on temporary explosives facilities to be used for starting the Project. The temporary installations are often required before the other facilities can be put in place, and as such are often more problematic for location, containment, etc. Based on the documentation reviewed to date on the YOR, much of the information outline above has not been provided.	
Village Carmacks **Document Number: 2006-0050-090-1/ Date Submitted: April 3, 2007**	
The Village of Carmacks is writing to comment on the Carmacks Copper Project that has been submitted to YESAB for review. We have had an opportunity to discuss some information relevant to the Village of Carmacks regarding this project and offer the following comments. 1. The proposed routes through town and volume and type of traffic pose some potential hazards and concern, including the degradation of local infrastructure, hauling of hazardous material and safety of the residents of Carmacks. a. Degradation of local infrastructure – the concern is with the volume and type of traffic on local roads and the one lane Bailey bridge that crosses the Nordenskiold River. It is expected that the proposed volume of traffic during the life of the Project, specifically the construction phase, will shorten the useable life of this infrastructure. b. Hauling of hazardous material through the community poses safety concerns as the proposed routes pass directly through both commercial and residential areas of the community. c. Safety of the residents of Carmacks – the concern is that proposed route one passes by the local nursing station that currently has limited parking and residents are required to park on the street, the proposed routes one and two both pass through the school zone in the community, and route threepasses through urban residential, and that all three routes would pass through a playground zone along river road. Should a single status accommodation be constructed close to the Freegold road, effectively mitigating some concern of increased light traffic, the heavy traffic, including that which will be carrying hazardous material, that would be entering and leaving the site on a daily basis would still be required to travel through the community. Although a formal traffic management plan, proposed to be developed by the Proponent may mitigate some concerns about	Policy or position Information

Comment Summary	Consideration for Use
the type and volume of traffic moving through the community, it will not be able to address concerns of the infrastructure life span and concerns of increased traffic through residential areas. Revisiting the highway bypass planned for previous mining activity in this area would provide an alternative to help mitigate some of the current concerns of the proposed routes. This bypass road would exit the community on the Klondike Highway south of the industrial lots and re-connect with the Freegold Road north-west of the community, bypassing almost all developed areas in the community. The balance of having traffic pass through the community must be weighed with the potential loss of economic activity available to the community. An assessment on the lifespan of local infrastructure, including the Nordenskiold Bridge and the local roads chosen for the traffic route would also indicate whether the proposed routes are feasible for the volume and type of traffic expected through the lifespan of the Project. 2. The current Solid Waste Management Plan was developed with an expected continuance of usage that has been consistent in the community of Carmacks and did not account for a surge in demand, therefore without planning for additional capital and operating expenses, the facility will not be able to have the expected lifespan as anticipated in the plan that is used to manage the site. 3. The Village of Carmacks has recently completed exercises for both an Official Community Plan and an Integrated Sustainability Community Plan; both of these have a view to a healthy, vibrant and sustainable community. There is concern about the “boom and bust” effect of being a small mining town and about what will be left behind in the community when the Project is finished. Working closely with the community on lasting sustainable development in the community will be an important aspect keeping these sustainability principles alive. The Proponent has sought avenues of working with the community through the life of the Project on a very constant and continuous basis. This is important to our community as it allows issues, large and small, to be dealt with immediately and gives the stakeholders of the Project the ability to be proactive when concerns are raised. The Village of Carmacks is expecting to be involved for the life of the Project so that we are able to maximize the benefits available to the residents of Carmacks and minimize negative impacts that would surface if this type of process was not available.	
Environment Canada **Document Number: 2006-0050-091-1/ Date Submitted: April 3, 2007**	
Migratory Birds Environment Canada is provided a general notification of the potential impact of the Project on migratory birds populations, since no species surveys has been conducted on the property in regard to population of migratory birds. Canadian Wildlife Services (CWS), cannot, however, provide a written opinion that this project will not result in contravention of the Migratory	Information Policy or position Expert opinion

Comment Summary	Consideration for Use
Birds Regulation (MBR). Project planners and Proponents are encouraged to ensure that they practice due diligence to the MBR. A favorable decision under this environmental assessment review does not exempt the Proponent from the MBR. Heap Detoxification The evaluation of detoxification has been based on a different extraction process that what is currently being contemplated. The detoxification report provides in Appendix E3 uses elemental sulphur in all columns tested while the project proposal indicated that extraction of copper is better using H2SO4 only. We suggest that the nature of sulphuric acid in the concentration indicated may behave differently that s slower and constant release of sulphuric acid from the elemental sulphur through biological oxidation. Our calculations indicate that the sulpuric acid used for agglomeration will be initially at pH of -0.55 (350 g/l). This is extremely acidic and readily attacks the rock matrix. It will be neutralized with the minerals within the rock to produce clays and amorphous silicates. The material has the potential to affect the chemistry of the resulting detoxification solution. The company is undertaking a large column test to help with scaling the detoxification. In Appendix E4, the company indicated that a large column test is underway to estimate the time of detoxification which has a direct influence on the cost of decommissioning. In the same appendix, the company indicated that the experience with cyanide heap leach column testing versus the actually rinsing in the field is overestimated by 30 to 50%. We argue that the relationship may not be transferable since cyanide is an organic compound which benefits from degradation over time while the acidity and elements cannot be degraded over time and will remain stored if not neutralized or removed, actively or otherwise. HDPE Liner Lifespan We have some concerns based on a recent evaluation of HDPE liner system performance in that the liner may not behave as expected and longevity of the device may be shorter than expected (see attachment document on the YOR). We do not know id antioxidants form polymer resins that could create instability due to acidic pregnant leach solution. We do not know if the pregnant leach solution will degrade the liner quicker than with other type of solutions which the liner has been tested. We suggest that aging tests be performed on the liner to determine the lifespan of liners used at the mine under the condition of use, we suggest the use of EPA methods 9090 test for determining the compatibility of the geomembance with the sipper PLS, we suggest carrying out testing on heap leach liners to determine the temperature and solution degradation of liners as per ASTM D5322. Water Use We are concerned about the potential stream flow reduction due to mine area dewatering. The cone of depression for the mine due to put water pumping and groundwater well extraction may impact on base flow of surrounding streams. The pit also creates a higher evaporation sink and can impact water table off-site. We suggest that long- term predictions on	

Comment Summary	Consideration for Use
Williams Creek and utilization by aquatic resources as a consequence of use and withdrawal of groundwater for mining be evaluated. Closure Plan and security boning The Conceptual Closure and Reclamation Plan presents further information and details respecting closure issues, conceptual closure measures, remaining issues and investigations, and closure scheduling. Comments: Key points with the closure plan are that it needs to include the security cost as related to the various activities described in the plan. These activities need to be costed out separately as these details can vary substantially from the overall reclamation cost. The ability to carry the decommissioning and securing the cost of all liabilities as the mine proceeds is in our view part of the evaluation that the Project is doable and acceptable. The project economics are fluctuating over time but should the Project should become un-economic or the company faces bankruptcy, the government should not be left holding the liability. The procedures and final dollar values should be left to the regulatory agencies to decide but the EA process should be condiment that it is feasible (technically and economically). The Responsible authority can only do this in reviewing the figures associated with the activities that are identified in the conceptual closure and reclamation plan. The regulatory phase should include the trigger level for imitating the closure plan	
Yukon Government **Document Number: 2006-0050-093-1/ Date Submitted: April 3, 2007**	
Economics	
The Carmacks Copper YESAA application, the economic viewpoint estimates that overall, this project will be beneficial to the Yukon economy and the Carmacks Economy as a whole. In particular the Carmacks Copper Project will contribute to the mandate of the department in that: 1) It will potentially increase the participation of First Nations in economic development activities and 2) contribute to increase the department's ability to support the delivery of economic benefits to communities in the territory. Thus, the Department values First Nation economic development activities and the delivery of economic benefits to communities. Socio-economic Effects We expect the Carmacks Copper project to provide the following economic benefits: The Yukon has not seen this level of economic investment in the mining sector for years. At $124 million direct capital investment, the Project will require significant investment in direct and indirect industries that could benefit from increased capacity, logistic planning and labour experience.	Expert opinion Beneficial effect

Comment Summary	Consideration for Use
Carmacks Copper has indicated that it is open to engaging the local community in the development of business and labour opportunities. This commitment on behalf of the company will ensure that in a depressed labour and business environment, those participants will be able to be in a better position to participate in any future opportunities that may arise as the Yukon mining sector continues to see increased development. The Carmacks Development Corporation is undertaking a market sounding exercise in order to gauge interest in possible joint ventures. They have also engaged other development corporations, Little Salmon and Mayo, to increase regional awareness of business opportunities. The labour and skill requirements of the plant and mining operations will mean skill upgrading and development cooperation between the First Nation, Carmacks Copper and Yukon College. The participants will also become more employable outside the Yukon, as well as in the territory, as demand for qualified personnel increases. The revenue projections of the mine are adjusted to reflect current global demand and prices for copper. All the projections provided by Western Copper in the submission are at the stated price of $2.55/pound of copper for a total mine revenue of $91.6 million/yr. If that price was not to be realized during the life of mine it would have an important impact on the tax revenue generated on profits (including mining royalties) that could potentially be collected by the different level of governments. For example recent price fluctuations in copper have lowered this level to a projected $2.30 /pound, using these new projections, the mine would have revenue of $82.6 million, a decrease $8.9 million. This would have a negative impact on tax revenues for the Yukon and First Nations. *Maximizing Potential Benefit* In order to maximize those benefits for the community, the following resources are available to those interested: 1. The Yukon Mine Training Association program, a partnership between Industry, First Nations and YG, will offer training to Yukoners interested to work in the industry. It is expected that Carmacks Copper will utilize the fund to train workers. This would represent an unique opportunity to increase the employability and the wages of many Yukoners, allowing a much larger proportion if the immediate benefits from the mine to stay in the Yukon. 2. The Industrial Benefits Preparedness, the idea of which would be to identify opportunities, other than directly related opportunities, that can be brought to the communities affected by the Project. This program is currently in the pilot stage and the department is looking at several projects to do case studies. *Yukon based GDP* Capital cost and gross revenues GDP impact: During construction, with an estimated $124 million spent, total impact on Yukon GDP is estimated at $59 million over two years. The revenue projections of the mine are adjusted to reflect current global demand and prices for copper. Carmacks Copper's price is projected at $US2.55/pound (exchange rate 1.14) for a total mine revenue of $91.6 million/yr. At that price/exchange rate level, average Yukon GGP impact per year (direct and indirect) would total $65.5 million or would	

<table>
<tr><th>Comment Summary</th><th>Consideration for Use</th></tr>
<tr><td>increase Yukon GDP by approximately 5% over 2004 GDP. Naturally the GDP impact will fluctuate with the actual price of copper sold.

<i>Government taxation revenue</i>

As mentioned above, a reduction on the stated copper price would impact negatively the tax revenue generated on profit as forecasted in the submission. At the stated copper price and mine life, the mine will generate over $98 million in tax revenue of which $10.6 million will accrue on average for each operating year. That tax revenue is comprised of personal income taxes, corporate taxes and mining royalties and will be shared amongst the Federal, Territorial and First Nations governments. Depending on location choices made by businesses and individual the income taxes and corporate taxes revenues will vary for each government. Western Copper states that $210,000 to $630,000 of tax income will possibly accrue to Little Salmon Carmacks First nation every year from personal income taxes. In addition, Mining Royalties paid by Western Copper will be shared between Yukon and the First Nations as per their final agreements. Western Copper is projecting to pay $7 million per year on corporate and mining taxes to all levels of government.

<i>Conclusion</i>

Economic Development internal analysis of the Western Copper submission demonstrates that the Project will provides a significant positive economic impact to Carmacks and to the Yukon. The project once built will provide direct employment to 180 Yukoners, increase Yukon GDP by 5% and provide significant tax revenue to Yukon and First Nation Government. To help maximize the economic opportunities, the Economic Development Department can provide support to the communities and stakeholders including the business communities and the project promoter to identify, to plan for and to help develop the business capacity and economic infrastructure to leverage and access those economic opportunities.</td><td></td></tr>
<tr><td colspan="2"><i>Education</i></td></tr>
<tr><td>Education ‘s interest in this project include:

• Life-long learning opportunities to enable Yukoners to participate effectively in work and their communities.

Socio-economic Effect

Based on the information described in the project description, Education’s interest in the Project focus on providing educational programs and support to children who have moved to Carmacks and providing adult education programs and support to enable Yukoners to take advantage of the mining/construction field employment opportunities created as a result of the Project.

Based on the information provided in the project description, it is anticipated that their will be no likely significant effect on</td><td>Expert opinion
Information</td></tr>
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Comment Summary	Consideration for Use
education with the development of this project. Education is able to accommodate an increase of up to ten children in the Carmacks school and that any increase in adult training needs would not be a problem.	
Environment	
Valued Ecosystem Components 1. Wildlife 2. Aquatic Life: Fisheries, Benthic Invertebrates 3. Water Quality & Hydrology 4. Soils, Permafrost 5. Air Quality 6. Solid & Special Waste Management Effects and Suggested Mitigation 1. Wildlife Moose, mule deer, caribou, grizzly/black bears, golden eagle, bald eagle Effects: • Disturbance/displacement from range from noise and activity • Mortality from hunting, road collisions, events pond entrapment • Opening the Freegold road to year-round traffic will increase hunting pressure • Habitat loss – footprint of development • Camp attractant (bears and other problem wildlife) • Birds, waterfowl – landing in solution in ponds (netting required) • ATV, vehicle use by employees at camp when off shift expands disturbance effect to wildlife beyond mine site Mitigation • Gate and/or controlled access for company controlled portion of access No hunting by company personnel (company policy) • Speed limits • Escape methods from events pond, netting for birds • Electric fencing around camp Remove overburden and replace for reclamation	Used as VESEC Potential effect Possible mitigation Policy or position Expert opinion

Comment Summary	Consideration for Use
• Wildlife log, incident reporting 2. Fisheries & benthic invertebrates Effects: Fisheries and benthic invertebrates may potentially be affected by elevated metal concentrations in Williams Creek from leakage/spills of leach solution from the heap and plant site reporting to the creek. In addition, sediment deposition into Williams Creek due to erosion related to mine site facilities and effluent from sediment control ponds Mitigation: Mitigation measures identified in Volume I, 7.3.4 & Volume III, Appendix K Annual monitoring to includes fisheries and benthic invertebrate and sediment sampling at selected water sampling and control stations to compare with baseline. Adaptive Management Plan (AMP): Changes in species abundance or distribution or build-up of metals in sediment would be a trigger for specific actions to address those changes under an AMP to be developed by the Proponent. Must meet CCME criteria or defensible site specific criteria for individual metals proposed by Proponent in fish bearing waters (recommended location W4) 3. Water Quality & Hydrology Effects: Water quality may be contaminated from solution leakage at the leach pad, spills at the plant site, fuel storage site or metal leaching from the leach pad, open pit or WRSA. Weathering of ore on leach pad and waste rock once exposed to the atmosphere may result in additional metal leaching in surface and/or groundwater. Mitigation: Must meet MMER or defensible site specific criteria for discharge for individual metals for heap, WRSA and sediment pond effluent release at last point of control Site specific water quality parameters should be proposed by the company based on column testing to date for consideration by regulators. Ongoing column testing and observations of heap solution chemistry during operations are required to update predicted chemistry of effluent at closure and post-closure. Adaptive Management Plan: In the event that heap water chemistry during operations differs from that predicted during column testing to date mitigation measures from the Proponent are required. • Events Pond – Precipitate (sludge) volumes in the events pond may compromise the ability of the pond to perform as designed. As part of the AMP, a trigger (i.e. amount of precipitate) for action should be developed by the Proponent. Actions would include methods for precipitate removal and disposal. • Sediment Control Ponds – Water quality (including suspended solids and metals levels) need to be tested prior to any release of effluent into the environment from the sediment ponds. AMP: Effluent proposed for release into the environment that exceeds regulated water quality standards (MMER) is a trigger for action by the Proponent (ie. lime treatment). The AMP should include methods for removal and disposal of sediment and sludge from lime treatment to maintain efficiency of sediment ponds. • Pit water: Modeling of predicted pit water chemistry is required for closure and post-closure. This modeling can occur during mine operations.	

Comment Summary	Consideration for Use
- Waste Rock Storage Area (WRSA): Elevated metals in effluent draining the WRSA can have a negative effect on downstream water quality and aquatic life. Mitigation: A store and release soil cover is an effective way of keeping precipitation and other uncontaminated site water off of the WRSA. This will reduce the amount of water potentially contaminated by metal leaching that would require treatment from the WRSA potentially over the long-term. Should modeling or operational experience determine that metal leaching will occur from the WRSA over the long-term, a store and release cover should be considered as mitigation during closure and post-closure. As part of the Adaptive Management Plan, the trigger (predicted long-term metal leaching) would require an action (construction of a store and release soil cover) for the WRSA. - <u>Metal leaching</u> - Modeling of metal leaching from heap and WRSA should be continued during operations to determine long-term trends for closure. - <u>Groundwater</u> Effects: Groundwater contamination may occur from solution leakage on the leach pad, spills at the process facility, or metal leaching from the pit and WRSA <u>Mitigation</u> Table 7-9 Environmental Monitoring Program (Appendix H3) Environmental Management System (8.2.2, Volume I) Piezometers, wells - <u>Water withdrawals – heap rinsing phase</u> There is a requirement for large volumes of fresh water during the rinsing phase after the leaching of economic values of copper from the heap is completed. <u>Mitigation</u> Drilling of water wells at the site is required in order to determine that sufficient groundwater volumes are present to meet rinse volumes needed for effective detoxification of the heap. 4. Soils/Permafrost (WRSA) <u>Effects:</u> Thawing of permafrost and ice rich soils under the proposed WRSA site may lead to slope instability, slumping and deposition of material into the creek valley. A geotechnical investigation to determine foundation conditions was proposed	

Comment Summary	Consideration for Use
by EBA Engineering (G2 & G3 Appendix III) for the summer of 2006 but to date has not occurred. Mitigation: Complete geotechnical investigation as required by EBA Engineering prior to licensing in order to adequately determine project effects and prescribe appropriate mitigation measures. 5. Air Quality Effects: Emissions from sulphuric acid production and other plant site emissions are potentially harmful to human health, wildlife and vegetation. Mitigation: A permit under the Air Emissions Regulations, Environment Act is required. Monitoring and reporting will form part of permitting. Measures proposed under Volume III, Appendix K are applicable. 6. Solid & Special Waste Management Effects: Release of materials associated with mine infrastructure including the plant site, service complex, crusher, camp and other facilities into the environment may contaminate soils, vegetation, water and groundwater. This in turn can effect human health, wildlife, fisheries and vegetation. We do not support disposal of inert material into the waste rock dump because operationally it is very difficult to control Mitigation: A commercial dump permit for onsite disposal of solid waste under the Solid Waste Regulations, Environment Act is required. (batteries, solvents, chemicals) 7. Environmental Monitoring Program (Revision No. 2 received March 5, 2007) Effects: During operations, any changes in the water chemistry, fisheries & benthic distribution and abundance, and sediment characteristics of Williams Creek as well as wildlife populations in the area will be a result of Carmacks Copper operations. Mitigation: Monitoring is required to document changes or trends which may trigger actions/responses through the Adaptive Management Plan. The Proponent should propose a schedule for monitoring and reporting with much more detail than the current Revision two provides. 8. Decommissioning & Reclamation Effects: The Carmacks Copper Project, and in particular effluent from the spent heap, could result in long-term environmental risk to downstream waters if effluent from the heap is not adequately neutralized. Considerable progress has been made over the last year to demonstrate effective techniques to detoxify the spent heap and achieve an acceptable	

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non-toxic effluent. Mitigation: Performance objective for closure of the mine site must be a “walk away” solution to eliminate liability to Yukoners. Perpetual treatment is not acceptable (Yukon Government performance standard). A prediction of water quality from the heap, WRSA and open pit is required for the closure and post-closure phases of the Project after rinsing has occurred. 9. Financial Security Adequate financial security must be provided by the Proponent for the Carmacks Copper Project to cover the costs of reclamation, any temporary closure, closure and post-closure, related environmental monitoring and reasonable contingent liability. The amount of financial security should be reviewed periodically to ensure liabilities are equal to the security held. Section 3.3.5.2 of Volume I outlines reclamation security and costs. Assumptions for percentage increases for capital costs from 1995 for equipment and labour need to be verified as rationale for these assumptions is not provided.	
Health and Safety Services	
Operating under the *Yukon Public Health and Safety Act*, our branch is concerned with the prevention and suppression of disease and enforces legislation involving drinking water, sewage, food services, and other public nuisance issues. *Environmental Health Effects* The Proponent’s information provides an adequate overview of mine site development with regards to EHS concerns. No additional information or revision is required by our branch. EHS involvement as regulator in these areas will be necessary during the camp and mine site development. Sewage Disposal The Proponent must enter a permitting process with Environmental Health Services prior to the construction of any domestic sewage disposal system (*Sewage Disposal Systems Regulation*). Ensuring adequate sewage disposal prevents the exposure of persons to disease-causing organisms. Proper sewage disposal and solid waste disposal may also reduce the attraction of wildlife to the site. Mitigation involves the proper location and construction of a sewage disposal system sized appropriately for the estimated daily sewage flows. The Proponent has supplied basic information about sewage disposal that satisfies our branch that sewage disposal requirements have been considered in the development of the site. Drinking Water A drinking water supply will be developed at the site. Drinking water that is not chemically, radiologically, and micorbiologically safe for human consumption can result in a host of illnesses and disease- some acute, some chronic, and	Potential effect Possible mitigation Policy or position Expert opinion

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some fatal. Recommended Mitigation: Mitigation includes testing of the water source against the latest edition and amendments of the Canadian Drinking Water Quality Guideline, and obtaining EHS approval of any source before connection to a distribution system. Water sources must be protected from sources of contamination such as leachate from mine processing operations. The proposed measures put forward by the Proponent to control leachate would also mitigate the potential sources and routes of contamination to the drinking water aquifer.	
Energy Mines and Resources- Forestry Management	
Forest Management Branch interests in this project include: • Salvage of Timber: • Increased Forest Fire Risk: • Disposal of Un-Economical Timber: • Forest Sustainability: *Salvage of Timber:* The understanding of FMB is that the land clearing component of the new road and the majority of the pits has already been completed. We are not anticipating the Project produce a salvagable quantity of timber. If the new road, or other components of the Project change and require timber removal, we would ask the mine to contact the FMB and release this timber to allow the opportunity for local wood cutters to remove the timber. *Recommended Mitigation:* -The mine contact FMB if additional land clearing with timber will occur, so that opportunity for local wood cutters to salvage timber can be made. *Increased Forest Fire Risk:* The activities associated with this project could increase fire hazard and risk. Ignitions could occur from burn piles, equipment, humans, and increased fuel loads from slash and debris. *Recommended Mitigation:* The Proponent adheres to all permits and conditions required by Yukon Government Fire Management and Protection Services. *Disposal of Un-Economical Timber:* It is also accepted that all timber located within the Project may not be salvaged economically and that salvaging some timber would be an unnecessary burden to the Proponent. Other methods of disposal of this timber may be required (burning). *Recommended Mitigation:* Exemptions to dispose of timber will be determined on case by case bases and can be obtained	Potential effect Possible mitigation Information Expert opinion

Comment Summary	Consideration for Use
by the FMB. *Forest Sustainability* – (soil and vegetation): It is expected that the infrastructure required for the running of the mine will remove a portion of the land base from contributing to forest sustainability. Negative effects to the forest land base are from the direct loss of forest land, compaction/removal and erosion of forest soils. *Recommended Mitigation:* The FMB recommends that soils be retained for the decommissioning of the mine, and upon completion of the mine these soils be placed over the disturbed area in a manner which would see forest species re-establish over time.	
YG Tourism: Heritage Resources Branch	
Heritage Resources interests in the Project include: • Protection of archaeological and historic resources *Socio-economic Effect* The Carmacks Copper Project proposal has been reviewed by the Heritage Resources Unit. The Proponent carried out an archaeological impact assessment which identified several archaeological and historic resource concerns and proposed mitigations. No archaeological sites were identified within the areas proposed for the mine. Two historic archaeological sites were identified within the vicinity of the development (115-I/07/005 and 115-I/07/001) and these sites will not be disturbed by development. Three locations near the proposed mine access road were identified as having “medium” archaeological potential and further investigation was recommended prior to disturbance. The Proponent commits to carry out further archaeological investigations near Williams Creek and Merrice Creek. This proposed mitigation is deemed adequate. *Recommended Mitigation* The third identified area of medium potential, on both sides of Crossing Creek, should also be investigated by a qualified archaeologist prior to any disturbance in this area. Mitigation of any historic/archaeological resources identified in this assessment will be reviewed and approved by Yukon Heritage Resources.	Possible mitigation Information
Highways and Public Works	

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Transportation Division of Highways and Public Works interests in this project include: • Usage of the Freegold Road • Intersection of the mine access road and the Freegold Road • Delivery and maintenance of safe and efficient transportation infrastructure Usage of the Freegold Road The Transportation Division of Highways and Public Works has identified effects with the increase in heavy traffic and proposed year round use of the Freegold Road. With the exception of five kilometres upgraded in 1995, the existing Freegold Road is currently a seasonal use road that was never constructed to any particular standard but has evolved to its existing level over years of use. At present traffic volumes, the Freegold Road does hold up fairly well over the course of the summer months when it is maintained. There are several narrow, single lane portions, with limited visibility that will be a safety issue with the increased volume and size of truck traffic proposed by Western Copper. This road is at capacity for the current standard from a public safety perspective. The additional traffic loads proposed by Western Copper will substantially increase summer maintenance costs. *Recommended Mitigation:* • Transportation will have to subject all traffic to severe load restrictions and speed limitations. Current signage will have to be upgraded to reflect higher road usage and possible traffic conflicts. • Maintenance activities will have to be increased to keep the road surface in a usable condition and increased bridge inspection and evaluation will be required. Some maintenance activities may require short term road closures. • As the Freegold Road is not publicly maintained during the winter, maintenance will have to be initiated. • During spring thaw traffic will be subjected to further restrictions to avoid road degradation. Intersection of the mine access road and the Freegold Road A new access road to the mine site is identified and will require a new intersection with the Freegold Road, public safety at this intersection should be maintained. *Recommended Mitigation:* • To ensure public safety, the Proponent shall construct the new access to the standards and guidelines supplied by Highways and Public Works, removal of the existing access will be required. **Please note that there is a discrepancy in the project description materials that indicates that 'The route selected for upgrading will follow the existing exploration road as much as possible and will only depart from the existing right of way to comply with grade or road curvature requirements'. This statement is not supported by the figures found in 100-13-06/06	Possible mitigation Information

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and 100-13-46. Delivery and maintenance of safe and efficient transportation infrastructure The Freegold Road cannot be economically maintained under the increased traffic frequency and loading proposed due to its current very poor road structure, geometry and drainage conditions. There are several locations that have glaciation problems that will require a large manpower/machinery effort just to stay passable over the winter months. In addition, the road does not have the structural strength necessary to support fully loaded trucks through the spring thaw period, and perhaps not at other times of the year either. The existing single lane Bailey bridge, that crosses the Nordenskiold River, was at the time of its construction (1959), intended to be a temporary structure. The bridge is long past any reasonable expectation for service life. The additional traffic loads proposed by Western Copper will contribute to the continued deterioration of the structure to the point of potentially requiring replacement or upgrades. *Recommended Mitigation:* Prior to a production decision being made, the Proponent shall provide HPW with a report detailing how public safety and the integrity of the existing public infrastructure can be maintained during mine operations.	
Tourism: Tourism Branch	
Tourism Branch interests in this Project Include: • Recognition of tourism as an industry with economic values; • Effects on Yukon River tourists; and • Effects on Yukon Quest Dog Sled Race. Yukon and Regional Tourism Tourism recommends that the project proposal identify and recognize tourism as an industry that contributes to the regional economy. Tourism includes recreational activities carried out by non-resident visitors who contribute new money to Yukon's economy. The tourism industry is an important component of Yukon's economy. It is estimated that $164 million dollars in revenue is directly attributable to non-resident tourism. Tourism is the largest private sector employer in the Yukon with approximately 80 percent of all Yukon employees working for businesses that report at least some level of tourism revenue. Approximately 1 900 jobs in the Yukon are directly dependent on tourism. (Yukon Business Survey, 2000). Many businesses –not just tourism ones - in Yukon communities feel the impact of tourism in the economy. Most Yukon tourism businesses are small and local who provide stability, diversification and job creation. Tourism businesses based	Information Potential effect

Comment Summary	Consideration for Use
outside rural regions often support local economies by bringing clients to regional communities, businesses and attractions. Note: the Tage Cho Hudan Cultural Centre should be identified as a community business. In the summer of 2004, 251 700 non-resident visitors came to the Yukon – an increase of 8% (18,900 visitors) since 1999. Visitors direct out-of-pocket expenditures totalled over $75 850 000 – up 12% from 1999. The highest expenditures came from visitors who traveled primarily by canoe, kayak or boat while in the Yukon. Over 56 000 visitors included an outdoor or wilderness activity as part of their trip. These visitors spent almost $34 000 000 during their Yukon trip – over 40% of all visitors spending. (2004 Yukon Visitor Exit Survey). Yukon attracts guided and self-guided visitors. Guided trips are provided by licensed tour operators who must carry insurance, comply with no-trace camping requirements and submit annual trip and rental reports. Self-guided visitors purchase supplies and other goods, transport and often rent equipment. Campbell Region Tourism The Carmacks Copper Project falls within the Campbell Tourism Region. In 1999, 30,830 visitors stopped in the Campbell Region, spending approximately $1 577 000. In 2004, the 50 892 visitors who stopped in the Region spent approximately $3 705 782 – more than double compared to 1999. (1999 and 2004 Yukon Visitor Exit Surveys). Visual and Water Quality Effects on Yukon River Tourists. The project has the potential to impact visual aesthetic values for Yukon River trips if the river bank is visibly altered or scarred during operation and decommissioning, or if water quality is negatively altered. Mitigation should include minimizing or avoiding industrial or recreation activity by employees that would be visible from the river by maintaining an adequate visual buffer. Water quality measures included in the proposal should be adequate for avoiding water quality impacts. Yukon's wilderness tourism sector is growing, its products are expanding and its season is becoming year round. Wilderness landscapes are the foundation of the wilderness tourism sector. The quality of Yukon's wilderness is an important factor when travelers are choosing a wilderness destination. Scenery is an important part of Yukon's wilderness appeal. The 2004 Yukon Visitor Exit Survey reports that scenery was the second most frequently mentioned motivator for coming to the Yukon; the most frequently mentioned image visitors thought of immediately after their Yukon trip (41%); and the most frequently mentioned image visitors thought would come to mind one year after their trip (43%). River corridors are one of the Yukon's most important wilderness tourism features and are vital to the wilderness tourism sector. These travel routes are used for day and multi-day trips by canoe, raft, kayak or boats. While on a river trip, travelers hike from camps, fish, watch and study wildlife and nature and enjoy the scenery and sense of solitude offered in Yukon's wilderness. River activity takes place from May through October depending on the location, with June to September being the busiest. On river trips, the wilderness tourism experience can be affected by water sedimentation and contamination,	

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noise, loss of fish and wildlife and visual scarring of the landscape or development visible from the river. Canoeing on the Yukon River is the most significant summer tourism activity near the proposed Project. (The project study area extends to the Yukon River in the vicinity of Williams Creek). The Yukon River's blend of scenery, wildlife, history, access and easy paddling make it the most popular canoe route in the Territory for guided and self guided trips. The river has many campsites, visible relics of Yukon's gold rush and evidence of ancient and current Yukon First Nation use of the River. Most canoe trips take place between Whitehorse and Dawson (~ 14 days), while shorter trips start or stop in Carmacks. Most Yukon River travelers stop in Carmacks. Between 1999 and 2004, 13-18 operators guided 225-300 clients on Yukon River trips. Over 25 companies market trips each summer and the majority of operators guiding trips are Yukon-based. In the summer of 1997, just over 1 300 self-guided Yukon River travelers rented canoes; in 2004, 1 245 clients rented canoes for self guided trips. Data is not available for self guided travelers who did not rent canoes. (Wilderness Tourism Licensing Act Trip and Rental Data.) The Yukon River Quest uses the river for its annual Whitehorse to Dawson City marathon. It is the longest marathon canoe/kayak event in the world, attracting competitors from five countries. The event generates valuable media exposure for tourism. Effects of Increased Use of Freegold Road on the Yukon Quest Dog Sled Race. The project may impact the Yukon Quest dog sled race if the race is disrupted by increased traffic using the Freegold Road during the running of the race. To mitigate potential impacts on the Yukon Quest dog sled race Tourism recommends that the Proponent contact the Yukon Quest in early January of each year to establish a process for safe crossing of the Freegold Road during the race. The Project study area includes a portion of the Yukon Quest trail along the Freegold road then north along the Yukon River bank, crossing Williams Creek approximately 150 m upstream of the Yukon River confluence. The Yukon Quest is a world class dog sledding race that attracts mushers and media from around the world. In 2006, the Yukon Quest led to an estimated increase in spending or $1.6 million in the Yukon and additional business activity resulting from the event contributed to 10 FTE jobs to the Yukon economy. (2006 Yukon Quest Economic Impact Analysis)	
YG Women's Directorate	
Women's Directorate interest in the project include: The Women's Directorate's objective is to support the Yukon Government in its commitment to the economic, legal, and	Information Possible

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social equality of women. To accomplish this, the directorate works closely with both government departments and community organizations on economic independence, women's health, leadership development, gender equity education, and anti-racism initiatives. The directorate takes a leadership role on emerging government policy issues, conducts gender-inclusive policy analysis, and strives to coordinate effective public awareness campaigns on violence against women. Our purpose is to serve the Yukon government and Yukon women by initiating and maintaining government structures which will respond to the needs of all Yukon women. The Women's Directorate envisions a world that values the diversity of women, addresses women's needs, and advocates for their full participation in society. <u>Socio-economic Effects:</u> The Women's Directorate expects that the community of Carmacks will be most directly affected by the Carmacks Copper mining project, with some potential impacts on Pelly Crossing and Whitehorse. The Women's Directorate expects that there will be both positive and negative impacts on the community, including the potential of increased need for family violence support, the potential in employment and training opportunities for women, and the need to continue to monitor and assess the impacts using gender disaggregated data. It is important to acknowledge both the potential positive and negative impacts of resource-based industry on a small community, so as to plan to mitigate the negative and maximize the benefits. <u>Family Violence</u>: In the *Carmacks Copper Project Socio-Economic Effects Agreement (Appendix P)* report, Section 2.6.3 Crime (p. 38) discusses the issues of crime in the community of Carmacks, but does not discuss family violence, sexual assault, or spousal assaults. There is no discussion of how the community currently copes with family violence. The Women's Directorate is concerned about issues around family violence because Yukon has very high rates of violence against women. Rates of sexual offences recorded by the police in 2004 were two to threetimes higher in Yukon than in any of the provinces. Spousal homicide rates in the territories are also much higher than the Canadian average. When calculated as a rate per 100,000 population, shelter use on a single day was more than fourtimes higher in the Yukon compared with the national average.[1]	mitigation

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[1] General Social Survey, Statistics Canada, 2004

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In research from other jurisdictions and similar projects, it has been shown that an increase in income in the community, in-migration, and shifts in family life are often linked to an increase in violence against women.[2][3] The development of a resource-based industry near a small community can cause disruptions to family life. Increased income in families and communities that are already experiencing stress, in conjunction with rotational employment, commuting, the stress of single parenting, integrating an absent parent back into the family, can lead to increased substance abuse, behaviour problems for children, and sometimes, family violence.[4] Some women who experience family violence, choose to use a shelter to escape their home situation. Most women need to use a shelter, on average, ten times before they leave an abusive situation. Women from small communities often do not want to use the women's shelter in their home community. They are concerned with issues of: • anonymity – in a small community, where everyone knows where the shelter is, everyone knows who is accessing the services; • fear – security issues, where shelters in small communities are often not secure; fear of retaliation upon herself or her children by her partner; and • lateral violence from community and family members (where others will blame the victim for leaving, not support her safety concerns, etc.). The Women's Directorate had a relationship with Carmacks former women's safe house. The Safe House, however, was shut down in 2004 due to employee burn-out, after having been staffed throughout the 1990's. Ross River has a safe-house that is occasionally opened. Whitehorse has a women's shelter, Kaushee's Place, which accepts women from other communities. Recommended mitigation: • In-camp support for family services counselling • Increased support for family recreational opportunities • Ensuring child-care support for parents who are single-parenting, while the partner is away at work	

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[2] Aggie Brockman and Marsha Argue, NWT Status of Women Council. *Review of NWT BHPDiamonds Project Environmental Impact Statement: Socio-Economic Impacts on Women*

[3] Review of Diavik Diamonds Project Socio-Economic Environmental Effects Report: Impacts on Women and Families. NWT Status of Women Council. March 1999.

[4]. Review of Diavik Diamonds Project Socio-Economic Environmental Effects Report: Impacts on Women and Families. NWT Status of Women Council. March 1999.

[5] Statistics Canada, Aboriginal Population Profile, 2001

[6] Statistics Canada Catalog 15-001-XIE

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• Increased counselling in the village of Carmacks • Funding of the Carmacks Safe House – operations and maintenance that respects anonymity, OR □□ Funding of transport services to Kaushee's Place in Whitehorse Employment and Training Opportunities for Women Women in the Yukon are looking for opportunities to be trained and to work in the trades. The Government of Yukon is taking steps to increase the numbers of women in the trades, by running the second "Women Exploring Trades and Technology course in spring 2007. The course, a collaboration of the Yukon Government, Yukon College, and Yukon Women in Trades and Technology (YWITT), a non-profit organization, was extremely successful last year. YWITT, run by Betty Irwin, has been running sold-out workshops and courses for five years in a diversity of trades (plumbing, welding, carpentry, electrical, etc). These courses encourage women to pursue jobs in these fields. Interestingly, according to Statistics Canada's 2001 Aboriginal Population Profile, Aboriginal women in the Yukon make up 9% of all Aboriginal people in occupations in trades, transport and equipment operators. Aboriginal women make up about 38% of all Yukon women employed in this area, even though Aboriginal people comprise approximately 20% of the Yukon population. Aboriginal women make up 8% of all Aboriginal people in occupations unique to primary industry, and 18% of all Yukon women in these occupations.[5] The years covered by this update saw a downturn in the Yukon's resource sector economy. Mining and oil and gas dropped from 12.4% of the Yukon economy in 1997 to less than 3% in 2003[6]. Closure of mines led to a loss of jobs and a drop in population in some communities. Currently, the population has resumed growth, and there is renewed interest in mining and oil and gas, and strength in the construction sector. Yukon has demonstrated its investment in training women in the trades. There are a significant percentage of women, particularly Aboriginal women, in trades in Yukon. Carmacks Copper mining project has a perfect opportunity to expand women's skills and training to non-traditional trades, particularly mining and resource sector work. *Recommended mitigation:* • Offer hiring opportunities, with on-site job mentoring and skills development, to women leaving the "Women Exploring Trades and Technology" course; • Establish a recruiting and retention strategy to ensure a diverse workforce with a target of 30% women and Aboriginals people. On-going monitoring of social impact data, including gender disaggregated data Gender disaggregated data helps the government, private sector, and public understand the changing roles of men and women, including health, employment, legal status, and family structure. This data is therefore crucial to understanding a	

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very basic socio-economic picture of the territory. In relation to economic and community development, gender disaggregated data helps us to understand our workforce strengths. It allows us the opportunity for recruiting skilled individuals from unidentified labour pools. The Women's Directorate encourages the Proponent to continue to monitor the socio-economic impact of the Carmacks Copper project on the community of Carmacks, particularly keeping gender disaggregated data in mind.	
Energy Mines and Resources: Minerals Branch	
Energy, Mines and Resources interests in this project includes: • Safe, effective and efficient construction, operation and decommissioning of the mine; • Reliance on long-term active treatment is not considered acceptable for reclamation and closure planning; • Physical and chemical stability of mine works, facilities and structures; and • Responsible and progressive mine reclamation and closure conducted in a manner that fosters sustainable development and a healthy environment. The Proponent's project proposal identifies a number of mitigative terms and conditions in response to the proposed project effects. The mitigative terms and conditions suggested in these comments are generally above and beyond those identified in the project proposal. As the project proceeds and further monitoring occurs, adaptive management approaches will allow for adaptation of the project and the department recognizes that mitigative measures should be sensitive these types of adjustments. *Environmental Effect* <u>Reclamation, closure and temporary closure</u> The practice of progressive reclamation for components of the workings that are exhausted over the course of the project or are otherwise no longer required to accommodate continued mining or associated activities are encouraged. *Recommended mitigation:* • Detailed annual reports that identify all progressive and ongoing reclamation measures shall be provided to the regulators, inclusive of monitoring programs and results to evaluate the effectiveness of reclamation measures; • Conceptual closure and reclamation plans, inclusive of temporary closure plans will be filed with the appropriate regulator ensuring the physical and chemical stability of the mine. These plans will be updated and submitted based on a scheduled determined by the regulator; • Plans for temporary closure of the site must be submitted to the regulator(s) for approval which assures the physical	Potential effect Possible mitigation Expert opinion Information

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and chemical integrity of the mine components and assets; • In review of the options for mine access, utilization of the current footprint of the existing exploration road should be examined. <u>Security</u> Yukon government has recently undertaken the development of a mine reclamation and closure policy. A fundamental tenet of the policy is the requirement for mine owners to financially secure their developments for the cost of liability at any point in the life of the project. Financial security will be required for this project as a means of ensuring reclamation, maintenance, and monitoring and adaptive management programs are successfully implemented. Recommended mitigation: • As per the Yukon government's mine reclamation and closure policy, security held must reflect the cost of liability, including contingent liabilities, at any point in time, and any monitoring and maintenance and/or follow-up requirements in the post-closure phase of the project. Provision of financial assurance should also be included for care and maintenance purposes. *Acid rock drainage and metal leaching:* To prevent effects to downstream terrestrial and aquatic resources, the acid rock drainage and metal leaching potential of any mine site needs to explored and mitigated. Recommended mitigation: • All aggregate and building material sources and potential 'cuts' related to road or infrastructure development must be characterized for acid generation and metal leaching prior to development; • All efforts must be taken to ensure that sulphide bearing ground workings are not exposed to oxidation; • Monitoring and reporting schedules ensuring the geochemical and physical stability of all structures, works and installations associated with the mine shall be filed for regulatory approval; • Additional testing is to be completed to confirm the characterization of the waste rock and to confirm its acid rock drainage and metal leaching potential for long-term closure implications. Mitigative measures will be identified by the Proponent and shall be filed for regulatory approval; and • As the processes and practices of the mine are developed over time and the further test work optimizing the performance of these operations, updated and detailed water treatment plans for an emergency event, temporary closure, and final closure will be developed and shall be filed for regulatory approval. The Department of Environment has identified mitigative measures that address these points further. <u>Mine works and operations</u>	

Comment Summary	Consideration for Use
To prevent effects to the environment and ensure safe, effective and efficient practices during construction, operation and decommissioning of the mine, this department must be confident in the practices identified by the Proponent. Recommended mitigation: • Inclusive of the hydrological information, detailed design information for all of the sediment control ponds, inlet/ spillway channels and diversion/ perimeter ditches and embankment or impoundment structures shall be filed for regulatory approval; and • Justification for any heap leach pad materials being used and analysis of the long-term stability of any materials being used for the heap leach pad shall be filed for regulatory approval. Heap detoxification Reliance on long-term active treatment is not considered acceptable for reclamation and closure planning. Recommended mitigation: Upon the completion of further optimization, testing and analysis, detailed detoxification plans, including rinse volumes, pulse rates, timelines and schedules of neutralization processes shall be filed for regulatory approval.	
Health and Social Services	
In the Yukon, delivery of various health and social programs and services is spread among a number of governments and organizations. The Department of Health and Social Services has overall responsibility for the provision of health and social services and programs to the residents of the Yukon in accordance with the Yukon Health Act (1990). The purpose and mission of Health and Social Services (H&SS) is: to help individuals acquire the skills to live responsible, healthy and independent lives; and • to design and provide a range of accessible and sustainable programs and services that assist individuals, families, and communities to reach their full potential and protect, promote, and restore the wellbeing of individuals, families, and communities. Thus the Department of Health and Social Services values healthy, safe communities with skilled and adaptable people.	Information Beneficial effect Expert opinion Potential effect Possible mitigation

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[7] Imperial Oil Resources Ventures Ltd, *Environmental Impact Statement for the Mackenzie Gas Project*. Volume 6, Section 6.6.1, pg. 6-19. August 2004.

[8] Imperial Oil Resources Ventures Ltd, *Environmental Impact Statement for the Mackenzie Gas Project*. Volume 6, Section 6.6.1, pg. 6-22. August 2004

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Health and Social Effects of the Carmacks Copper Project H&SS expects that the community of Carmacks will be most directly impacted by the proposed Carmacks Copper Project due to its proximity to the community and that impacts may also occur in other Yukon communities, including Pelly Crossing and Whitehorse. These impacts will be both positive and negative and appropriate mitigation measures are necessary to minimize harm to individuals, families, and communities while maximizing the potential positive outcomes. The aspects of the proposed Carmacks Copper Project that are of greatest interest to Health & Social Services are: substance abuse prevention and treatment for employees; accommodations provided for the workforce; the provision of medical care and other health care for workers, on and off-site; potential Project support for local community services; promotion of healthy lifestyle options; and the potential influx of new income into Yukon communities. H&SS believes that suitable preparations in advance as well as the implementation of appropriate mitigation measures will assist in ensuring the positive benefits from the Project are maximized while the negative impacts are minimized. The identified aspects of the Carmacks Copper Project are of importance to H&SS as these elements of the Project have the greatest potential to affect the health and safety of Yukon communities, particularly Carmacks. Substance Abuse Tackling drug and alcohol abuse is a priority of the Government of Yukon as it recognizes the serious nature of substance abuse and its effects on our communities. H&SS offers numerous programs and services aimed at preventing substance abuse and offering encouragement and support to end substance abuse among current users. Potential Positive Effects As acknowledged by community members in Western Copper's Socio-Economic Effects Assessment (SEEA - Appendix P), there are pre-existing substance abuse issues in Carmacks. The Carmacks Copper Project may help to reduce issues related to substance abuse in the community. If the company implements the alcohol and drug policy described in their SEEA, those currently abusing alcohol and drugs may be motivated to quit in order to secure employment on the Project. Potential Negative Effects Studies of previous development projects have shown that "increased income from project employment might add substantially to substance-abuse related problems, and to the burdens of the social services that must deal with these problems."[7] Substance abuse prevention and treatment for employees of the Carmacks Copper Project is central to ensuring that the Project has beneficial effects upon the local communities. Recommended Mitigation While the company is not expected to address pre-existing community issues, it is important that the pre-existing issues are not exacerbated by the Project due to increased access to alcohol and drugs for workers and community members. The alcohol and drug policy proposed by Western Copper is an appropriate mitigative measure that could aid in reducing the	

Comment Summary	Consideration for Use
likelihood of increased substance abuse related to the Project. Additional information regarding the scope of the drug testing as well as the plans for collection of the samples would be useful in fully evaluating the Project alcohol and drug policy. As well, H&SS would be willing to work with the Project and other governments to assist any employee wishing to access substance abuse treatment as part of the company's graduated response to employee substance abuse. Western Copper may wish to develop an employee assistance program to support their workers who are addressing substance abuse as well as to provide counselling and assistance to those experiencing other issues. <u>Workforce Accommodations</u> Carmacks is a small community (pop. 408) that has limited housing availability, either for rent or for purchase. New arrivals are generally small in number and occur over an extended period of time, allowing the community to absorb the new residents into the community and preventing any social upheaval. Potential Positive Effects An influx of new, community-minded residents could bring fresh energy into Carmacks, particularly if the Project hires workers with families who would relocate to the community. As residents of Carmacks, the employees and their families could bring positive social benefits such as increasing the number of volunteers to support recreational and other activities of importance to the community. Potential Negative Effects Due to the relatively short lifespan of the Carmacks Copper Project and the transient nature of mine employment, the Project may lead to the arrival of a large group of mostly rotational shift mine workers who will be single or living without their families during their shift. These mine employees are unlikely to settle in the community yet could have significant effects upon the community. A significant influx of single, transient workers in a community is often accompanied by increased use of alcohol and illicit drugs, increased violence, and other behaviours which affect the quality of life of town residents and in turn result in increased community disruption. Appropriate mitigation measures would be required in order to try to achieve the greatest possible benefits and reduce the likelihood of negative social and health impacts on the community. Recommended Mitigation The Western Copper Company SEEA proposes housing single operation phase employees during their shift rotations in single employee "hotel style" accommodation located either in Carmacks or on the mine site. Locating the single employee accommodations in Carmacks is the Proponents' stated preference. If the single employee accommodations are located in Carmacks, H&SS would recommend that the company put appropriate measures in place to help mitigate the potential negative impacts. For instance, the company could promote healthy lifestyle options for their employees through the provision of positive physical recreation opportunities in the accommodations and at existing community facilities, healthy	

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food options and cooking facilities in the building, TV and internet access, and appropriate health promotion materials, such as condoms. In addition, the company could provide transportation between the mine site and the community to help minimize traffic on the Freegold Road thus reducing the potential negative effects of increased traffic including the increased risk of motor vehicle accidents and related injuries. Similar mitigative measures would be appropriate if the single employee accommodations are located at the mine site. From the perspective of preventing potential negative social and health impacts, housing the majority of employees on the mine site during all phases of the mine life, including construction and operation, could help to minimize potential negative effects on the community. However, H&SS would suggest that further consultations with Carmacks residents take place to determine which option and mitigative measures would result in the greatest positive benefits and least negative effects for the community. Medical Care and Health Services The Department of Health & Social Services is committed to providing quality health services to all Yukon residents in order to assist individuals, families, and communities in reaching their full potential. Potential Positive Effects The potential increase in individual and family income associated with the Carmacks Copper Project could lead to overall improved health and quality of life in the community. Increased incomes can be used to purchase a healthier diet for the household, new or improved living accommodations, and other consumer goods that ease the burden of daily life.[8] Potential Negative Effects An increase in community population due to the Carmacks Copper Project, as well as the work involved in mining could lead to an increased demand for medical care and other health services in the Carmacks area. H&SS provided Western Copper with a detailed list of potential effects of the Carmacks Copper Project on H&SS programs in the community of Carmacks and this information was utilized by the company in the preparation of its SEEA. Recommended Mitigation Mitigating the potential negative effects on health services due to a possible increase in demand would help to prevent the Project from compromising the health and safety of the community and its residents. Mitigative measures that could be implemented include: basic emergency medical care on-site; provision of appropriate emergency transportation to Carmacks for further treatment or medevac; establishing communication and information sharing with Carmacks Health Centre regarding potential dangerous or poisonous substances in use at the mine; and controlling traffic and mine traffic speed on the Freegold Road to reduce the likelihood of motor vehicle accidents.	

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Local Community Services Community services offered in Carmacks would be affected in a manner similar to health services as a result of the increased population related to the Carmacks Copper Project. Potential Positive Effects As mentioned previously, the in-migration of mine employees and their families due to the Project could help to bolster support for community services in Carmacks. More usage of community recreation facilities could increase revenues, while a greater number of possible volunteers could also assist in expanding and renewing community services in Carmacks. Potential Negative Effects While the increase in population and working population may help to bolster support for community services, it could also lead to increased demand for child care, youth activities, and recreational activities. Due to budgetary and personnel constraints, it may not be possible to meet the increased demand with existing resources. Recommended Mitigation H&SS would support the proposal made by Western Copper to contribute to existing community resources to ensure that they can meet the needs of the community and its residents. Healthy Lifestyle Options The Health Promotion Branch of H&SS provides health promotion and illness prevention services. This includes public awareness campaigns, school and community workshops, and supporting development of environments which promote health. H&SS encourages all residents of the Yukon to make healthy lifestyle options and supports employers in promoting these options to their workforce. Potential Positive Effects The Carmacks Copper Project may offer the opportunity for community members and employees of the project to integrate healthier lifestyle choices due to increased income and accessibility. To ensure positive benefits for the community and employees, healthy lifestyle options offered by the company ought to include: providing a variety of healthy food choices at the worksite; offering active recreation opportunities for employees, such as sports activities; support smoking cessation programs for workers; and share public education campaigns on lifestyle issues, such as infectious disease prevention. Recommended Measures If the healthy lifestyle options described above are offered by Western Copper as part of the Project, they will help to minimize potential negative effects of the mine and to maximize possible social and health benefits for individuals, families,	

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and the community. Influx of New Income into Communities Although the overall Yukon unemployment rate is currently low, people living in the communities experience higher rates of unemployment and often have fewer employment options. H&SS anticipates that Yukon communities, particularly Carmacks, will experience an influx of new income as a result of the Carmacks Copper Project and its local hire policies. Potential Positive Effects Increased individual and family incomes in Yukon communities could lead to improved health outcomes and a general increase in community well-being. Individual Yukoners and their families could potentially benefit from any employment provided directly and indirectly by the Project, particularly if they have the financial management skills and interest to allocate funds effectively. Potential Negative Effects The influx of new income into communities in which rates of unemployment have been high can cause negative social effects. These potential effects include: increased substance abuse; social, family, and community disruption; and a decline in health status for those making unhealthy lifestyle choices. Recommended Mitigation The money management training for employees proposed by the Carmacks Copper Project would be an appropriate mitigation to minimize any negative effects of increased income in Yukon communities due to the Project. Financial management workshops or training should be offered as part of initial employment training and access to ongoing financial counselling while employed by the Project could also assist in maximizing positive financial outcomes for mine employees, their families, and communities.	
Justice	
Value The Department of Justice values healthy and safe communities that are part of a just and peaceful society. It also values collaboration and co-operation with all stakeholders to find proactive and preventive solutions to the problem of crime. *Socio-economic Effect* The Department of Justice welcomes the measures proposed in the Project's Socio-Economic Effects Assessment to minimise an increase in crime during the period of the mine project. There remains some concern with managing the effects	Information Beneficial effect Expert opinion Potential effect Possible mitigation

Comment Summary	Consideration for Use
of locating the single-status employee accommodation in the town of Carmacks. Positive effect Since crime is lower in areas where there is higher social capital (social networking, volunteering and participation in community events) the company's plans to establish initiatives which raise social capital, such as recreational programs for local youth, are particularly gratifying to the Department of Justice. Having single employees housed in the town should maximize the potential pool of volunteers for these programs and other community events. Negative effect Since single males aged 15-24 have the highest crime rate there is some concern that single-status employees housed in the town will indulge in activities detrimental to the safety of the community, including but not limited to the potential for substance abuse and alcohol abuse. Another potentially negative effect of having single employees housed in the town with plenty of money to spend is that this may inflate prices in local stores. This would put essential goods, such as food, beyond the reach of local residents not working for the mine. This creates a differential in the buying power of residents compared with mine-workers. Such a differential has been shown to be associated with high rates of property crime. Recommended Mitigation Although the Department of Justice believes that locating the single accommodation at the mine-site would be the simplest way to deal with concern over a possible increase in crime, managing the effects of the town site location can achieve the same end and in addition maximize the potential benefits to the town of Carmacks. We recommend that the company talk with the town of Carmacks to devise recreational programming which will not only serve to promote the health of employees but would also afford them the opportunity to spend their recreational time in a positive manner volunteering as coaches to the young people of Carmacks and contributing to community events. We can see no way that the company can mitigate the negative effect of ready money inflating local prices and we can only alert the people of Carmacks to this problem.	
Little Salmon Carmacks First Nation **Document Number 2006-0050- 094-1/ Date Submitted April 3, 2007**	
Bridge Crossings: The first bridge is located in town and crosses the Nordenskiold River. We are concerned about the Bailey bridge and its ability to withstand the heavy loads and increased traffic during the life of the mine. A mitigation measure to upgrade the	Information Beneficial effect

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bridge would not be recommended. The community had considered this in the past but couldn't get around the concerns of heritage sites in close proximity to the proposed upgrade. There is the Roadhouse, the Hazel Cabin, the old Barn (on private property) and a micro-blade site which sit near each corner of the existing bridge. The second bridge is located on the Freegold road and crosses Crossing Creek. We are also concerned about its ability to withstand the heavy loads. This bridge is old and in poor shape. It's hard for us to imagine that a bridge upgrade would not be needed here. *In Town Routes:* The proposed routes through town all have their disadvantages, and our recommendation would be that the bypass road that was started in the late nineties be looked at as the only option. This measure would mitigate our concern with the Bailey bridge and also our concerns with the routes through town. Whose responsibility it would be to complete the bypass is another issue. Route one goes through an urban residential zone and it would be difficult for larger trucks to safely turn left from the highway onto Rowlinson Drive. Route two passes right in front of the new school. Route three passes in front of the nursing station. The sight of large trucks going through town might be a symbol of local economic growth but it's not worth the safety of our community members relating to potential traffic accidents or spills from hazardous materials. Nor is it worth the distraction from the noise, especially to the students in their new school, or the nurses with sick patients at the nursing station. *Mine Accommodation Alternatives:* LSCFN and the community have not explored in depth the advantages/disadvantages of housing the mine executives and workers in town or at the mine site. There are some people who would like to see the executive and miners housed in our community for economic reasons and others who fear the social ills that come with an increased population and increased wealth. Our community already has serious social issues and we need to discuss this and come to consensus. There are a number of options to look at and we feel the community will need to get together to discuss these alternatives. *Trapping:* As extensive as the project proposal was, we feel that this issue has yet to be addressed.	Expert opinion Possible mitigation Potential effect
Summary of Lindsey Staples' (Northwest Resources Consulting Group) Socio-economic Review	
1. The SEA does not provide a sufficient basis for reaching sound and defensible significance determinations related to potential socio-economic effects.	Expert opinion

Comment Summary	Consideration for Use
2. The SEA fails to provide a clear, explicit and systematic identification and treatment of socio-economic VCs.	Information
3. The VESECs have not been validated by the LSCFN.	Potential effect
4. The SEA baseline did not provide an adequate description of the socio-economic environmental that the people of the LSCFN and the Village of Carmacks recognize as characterizing the life of their community: their socio-economic and cultural similarities and differences, their respective aspiration and anxieties, strengths and weaknesses.	Possible mitigation
5. The SEA failed to document and explain the LSCFN traditional economy and its relationship to the local wage/cash economy. A substantial literature exists on the organization and function of subsistence or traditional economies in Yukon and Canadian aboriginal communities that could have been referenced to inform the SEA.	
6. The misapplication f assumptions about the meaning of national level data correlations in the SEA risks distorting and misrepresenting the meaning of the socio-economic baseline environment as it pertains to Carmacks – a small population of people, predominantly aboriginal, living in a remote wilderness setting, participating in traditional activities that supplement earned and unearned income, and periodically participating directly and indirectly in resource exploration and development activities – a sector that typically offers higher wages relative to education attainment and skills levels than many other economic sectors in the community and the region.	
7. A review of the relevant literature and comparative case studies could have provided a useful reference for better understanding the nature and scope of the socio-economic effects that may result from a project of this type and duration.	
8. Some of the effects identified in the SEA and that require greater clarity include the following: a. A Project-specific definition of direct, indirect and induced effects and Project-specific examples of direct, indirect and induced jobs and economic opportunities b. The estimated distribution of employment and business opportunities between Whitehorse, Carmacks and Pelly from the ten percent local sourcing provision c. The net economic effect on GDP and the net revenue (in taxes) to governments d. Linking the health and social impacts listed in Section four of the SEA to current community health and social concerns and problems, and whether these may be exacerbated e. Program, infrastructure and service adjustments specifically required of government and their associated costs f. Socio-economic effects specifically on youth and women g. Safety, usage and maintenance issues associated with the Freegold Road.	

Comment Summary	Consideration for Use
i. Location of a single status housing complex. A number of case studies and reports suggest that in-town location of camp housing may contribute to serious potential socio-economic effects that are not easily or effectively mitigated. 10. The SEA gives little attention to describing and evaluating the changes to health and to socio-economic conditions that may occur as a result of Project-related impacts to the biological and physical environments. This is particularly important with respect to the linkages between socio-cultural/ socio-economic systems and ecological systems, particularly as they relate to the traditional economy. The SEA provides no substantial assessment of the Project's effects on the traditional economy and the traditional way of life of the LSCFN. It gives no attention to how the LSCFN people, institutions and government could adapt to these changes and the consequences of these changes. 11. The assessment of cumulative effects that the SEA identifies is arbitrary and generally unsubstantiated. 12. The following information would have been helpful in attaching greater confidence to the mitigation measures that have been identified: a. A commitments table that document substantively the mitigation measures the Proponent is fully committed to undertaking b. Copies of the specific corporate policies and programs that the Proponent has referred to c. A list of those mitigation measures and corporate policies and programs that are under development by the Proponent and the time frame for their completion d. Any legally enforceable requirements for subcontractors to abide by the Proponents commitments and policies e. With respect to specific areas of shared responsibility between the Proponent and governments, such as policing, health care, community wellness, training, business support, infrastructure support, post-project adjustment measures, etc., a clear indication of which party is responsible for what specific action, program, service or support f. The status of discussions with various parties on mitigation and enhancement measures, the measures under discussion and the time frame for their completion, including participation agreements, impacts and benefits agreements, socioeconomic agreements and local service agreements g .Proposed mitigation and enhancements that are consistent with industry best practices. 13. In the absence of clearly established VESECs that have been confirmed by the LSCFN and others, the monitoring indicators identified in the SEA appear arbitrary. As outlined in the SEA, the monitoring program is only vaguely defined. There is a broad industry literature that could be referenced and that could inform the design of the Proponent's monitoring	

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program. It appears not to have been consulted. The following information would be helpful in evaluating the effectiveness of the program that the Proponent will undertake to monitor socio-economic effects: a. The program model and institutional structure (Proponent-based, community-based, independent, shared oversight, etc.) b. The adaptive management model employed by the Proponent and how monitoring results will be applied c. The process and criteria that will be used to establish indicators d. The data and information required to support these indicators e. The party(ies) responsible for the design and implementation of the program f. The role and participation of the LSCFN, other governments, communities in the monitoring program g The process for reporting and review of monitoring program results h. The length of the program (duration relative to mine start-up, closure and decommissioning i. Explanation of the confidentiality issues associated with the public release of aggregated data sets	
Summary of Nan Nena Dan Do Kanete Department's (Robbie Cashin) Comments	
In my opinion, there are several areas of the Project proposal that require further clarification. In addition, there are some project components for which there is significant uncertainty about whether their performance will be consistent with that described by WCC. For some of these components, the review of the Project proposal would benefit from participation experts with appropriate specific knowledge and experience. The Project proposal concludes that significant environmental effects will not occur from the Carmacks Copper Project. The outstanding questions about some aspects of the Project proposal and the uncertainties for some components raise questions about this overall conclusion. In my opinion, until these issues are resolved, it is not possible to accurately predict potential environmental effects of the project. Specific areas of concern identified during the review include: *Conceptual Closure Plan* In Cashin's opinion the closure plan remains a significant area of uncertainty, especially with respect to detoxification of the spent ore. Cashin states this means there is remaining uncertainty about one of LSCFN's primary concerns: the long- term	Information Potential effect

<table>
<tr><th>Comment Summary</th><th>Consideration for Use</th></tr>
<tr><td>condition of the land and water. Specific issues and concerns about the proposed closure plan include:
• Closure objectives
• Heap detoxification methodology and water balance
• Heap detoxification- Test work and scale-up
• Pit access control
• Sludge handling
• Waste Rock Reclamation
• Closure Cost Estimates
• Waste- Rock- Physical Stability
• Waste Rock- geotechnical
• Heap leach pad- Liner design and construction
• Heap leach facility- Emergency storage
• Air quality
• Wildlife use
• Assessment methodology- Significance Assessment
• Assessment methodology- Description of mitigation
• Cumulative effects assessment
Details of Cashin’s report may be found at www.yesab.ca/registry , quote Project 2006-050, Document Number 2007-09401.</td><td></td></tr>
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Table B-2 Responses to Executive Committee Inquiries

Comment Summary	Consideration for Use
Little Salmon Carmacks First Nation **Document Number: 2006-0050-109-1/ Date Submitted: July 26, 2007**	
Freegold Road – One of the most controversial issue Chief and council has had to deal with in the past and now again is the issue of the management of traffic on the Freegold road and through the community of Carmacks. We understand that there are mitigation plans for the traffic on the free gold road; however we do not feel those measures sufficiently unsure safety of other travelers on the road. We feel much stronger measures need to be taken to ensure the safety of other travelers. – There are many LSCFN citizens who have fish camps along the free gold road. There are concerns with ensuring that roadways/approaches down fish camp roads are updated as the Freegold road is upgraded. – Some fish camps are located close to the Freegold road and there are concerns with dust from the heavy traffic. Measures must be taken to ensure that dust does not interfere with the drying of fish at the fish camps. – Concerns with the temporary Nordenskiold River Bridge that was put in over 30 years ago. It needs serious repairs or replacement. Traffic Management Through the Community – We do not support the route through the Village of Carmacks via. Rowlinson Drive, Nanson Drive or Freegold Road for the following reasons: – Rowlinson Drive – This roadway has a dangerously steep approach and a 90 degree angle at the interface of Rowlinson Drive and the Klondike Highway. More traffic through this area puts more people at risk. There are burial grounds directly across the Klondike highway and on both the left and right sides of the Rowlinson Drive and Klondike Highway intersection. These areas have been violated in the past by road development/construction and there is no possible mitigative measure to ensure that further violation will not occur. Will not allow any further violation of this area. We do not support this route due to safety issues. – Nansen Road – The new school is build very close to this road. Children frequent this area as they leave school and access other areas of the community. For about four months of the year children cross River Road to walk home across the frozen river. Tourists and residence frequently use the board walk along this route. We do not support this route as it compromises the safety of residence. – River Road – This is the longest route through the residential area and school. As noted above this route has many pedestrians which pose's a safety risk when you have big trucks hauling dangerous goods traveling through the area. This route also runs by the nursing station. There is no parking available at the nursing station so people park on the side of the street. During emergencies there are usually vehicles parked on both sides of the street. We do not support this route as it compromises the safety of residents. – Casino Way – A previous Chief and Council initiated a notion of a bypass route during the previous negotiations with Western	Information Potential effect Possible mitigation Beneficial effect Used as VESEC

Comment Summary	Consideration for Use
Copper. The Yukon Government started construction of this road, however Western Copper went down and the road was only completed to a certain point. This road is even more urgent today with the increase of exploration in the Freegold and Nansen areas. Given the safety concerns of the other routes, Little Salmon Carmacks First Nation supports this route.	
Project Transportation Matters Field Tour – Meeting Summary **Document Number:2006-0050-112-1/ Date Submitted: August 28, 2007**	
The Following is a summary of the Carmacks Copper Project Transportation Matters Field Tour that took place on august the 28, 2007. Comments are not verbatim and this summary is intended to convey the meeting of the discussion only. Current Land Use *Maintenance and Upgrades to the Freegold Road* – Highways and Public Works reiterated there will be no upgrades to the road; some widening may be necessary. Maintenance will involve year round Grading and clearing. – Discussed maintenance responsibilities with Highways and Public Works – Discussed the construction of pull-outs. Limited concern was raised by participants about this issue. Potential locations for pull-outs were pointed out by participants. – Discussed proposed traffic volumes. – Western copper explained that the existing exploration road leading to the proposed site will not be maintained, but will be left for people to use. – *Current Use of the Freegold Road and Surrounding Area* – Existing features, such as fish camps and access, trail access, fishing spots, traditional use sites, cabins, and environmental features were pointed out along the Freegold Road (summarized in Table 1). A number of people indicated that the area is “used a lot year-round” for recreational, subsistence First Nation hunting, trapping, recreational fishing, traditional fish camps, berry-picking and medicinal plant gathering, and general recreational activities such as picnicking, snowmobiling and ATVing and other purposes. ATVs and vehicles are used during the summer to access the area; snowmobiles are used in the winter. – It was noted generally that “a lot” of year-round subsistence moose hunting by First Nations in the area. – Concern was raised about potential impacts to May Roberts’ fish camp. It was highlighted that brush along the camp access hinders visibility and could pose a safety risk to those turning onto the Freegold Road. It was recommended that the brush be cleared to increase visibility. Potential impact of dust emissions on the drying of fish was also raised; no objection to the proposed mitigation measure of watering the road. – It was highlighted that numerous important First Nation traditional use sites were located along the Road. – It was commented that there has been an increase in use of the Road (both industrial and recreational) over the past few years as a result of exploration activities in the area.	Information Potential effect Possible mitigation Expert opinion Beneficial effect Used as VESEC

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<p>Table 1 Features along the Freegold Road</p>
<table>
<tr><th>Kilometre</th><th>Feature Description</th></tr>
<tr><td>4.7</td><td>Spring</td></tr>
<tr><td>4.9</td><td>Known glaciation location</td></tr>
<tr><td>7.1</td><td>May Roberts’ fish camp</td></tr>
<tr><td>9.1</td><td>Kathy Cochrane’s fish camp</td></tr>
<tr><td>9.3</td><td>Access to Murray Creek waterfall</td></tr>
<tr><td>9.9</td><td>Fish camp access</td></tr>
<tr><td>10</td><td>The Billy’s fish camp</td></tr>
<tr><td>10.8</td><td>Small lake noted for nesting waterfowl in the spring</td></tr>
<tr><td>11.8</td><td>“8 Mile Lake”; noted for being stocked with rainbow trout and for being heavily used; noted as possible pullout location</td></tr>
<tr><td>12.4</td><td>“9 Mile Lake”; noted for being stocked with Arctic Char and for being heavily used</td></tr>
<tr><td>20.3</td><td>Yukon Crossing access roadway veers off from Freegold Road</td></tr>
<tr><td>25.1</td><td>Crossing Creek Bridge</td></tr>
<tr><td>29</td><td>Larry Tricker’s cabin</td></tr>
<tr><td>33.7</td><td>Existing exploration road to proposed mine site</td></tr>
</table>
<p>– The potential issues around Yukon Quest’s use of the first 20 km of the Freegold Road were explained to participants. It was highlighted that recreational and other users who travel the Freegold Road during the winter may face similar hindrances with respect to use of the trail and that users could share an alternate trail in the same way they share the Freegold Road currently. There were many locations pointed out along the Road where it would be difficult or impossible to create an alternate trail adjacent to the Road; the Yukon Quest and Western Copper seemed to be amenable to working out a solution to this challenge. The alternative routing options considered included:</p>

Clearing a trail adjacent to the Road where possible and routing the trail through a feasible location nearby where necessary.
Developing access initially cleared adjacent to the first stretch of Freegold Road in the 1990’s (for the proposed Western Silver Carmacks Copper Project) for project use and the Yukon Quest and other users can use the Freegold Road. At the

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Comment Summary	Consideration for Use
point where the roads converge, the alternate trail could cross the Freegold Road and continue adjacent to the Yukon River along the flats (if feasible). ▪ Using the Trans Canada Trail proposed to be built along the Dawson Overland Trail routing. – General concern expressed about year-round maintenance of the Freegold Road leading to increased access to the area. This could result in increased trail use, hunting pressure and risk of disturbance to cabins and traplines. This has been the experience with the Mount Nansen road. Bison hunters were cited as being a significant issue. Selena Cheater mentioned that signage is posted along some trapline trails, warning people that the trail is an active trapline, but many people do not heed these warnings. She stated it was very important that no hunting weapons be permitted onsite and no hunting be allowed in the project area. She noted further that it is important that these restrictions are extended to project contractors/subcontractors, as well as direct personnel. – Selena Cheater explained that there is limited Conservation Officer presence in and around Carmacks. There is no Conservation Officer stationed in Carmacks and there is only one Conservation Officer covering the Northern Tutchone and Ross River Regions. Selena feels that more Conservation Officer presence is required in the Carmacks area than currently, especially in light of increased development and consequent access to the area. Selena discussed the decreasing moose population in the area and explained that many members of the community feel the trend is in part due to increased access resulting from year-round maintenance of the Mount Nansen Road. She mentioned that a community-based moose monitoring program has been implemented in Carmacks; monitoring results are submitted to the Regional Biologist, Mark O'Donoghue. – Joe Bellmore discussed the Game Guardian Program, which was outlined in the *LSCFN Community-Based Fish and Wildlife Management Plan 2004-2009* and has been implemented through LSCFN funding. 1-2 Little Salmon Carmacks First Nation members spend time on the land – particularly on and around the Mt Nansen Road – and record observations of game numbers, numbers of hunters, traffic volumes and report their observations to the community. There was discussion of employing the Game Guardian Program for monitoring related to potential direct and indirect effects resulting from the Carmacks Copper Project. – Concern was expressed that snowmobiles will not be able to use the Freegold Road in the winter if it is graded; however, people seemed to generally agree that users could drive their vehicles with their snowmobiles in the back and unload them at access points along the Road. It was noted that those doing the Carmacks-Freegold-Mount Nansen-Carmacks loop would still be hindered, because they would need to ride their snowmobiles along the Freegold Road to meet their trucks at the point where they started. Users seemed to think however, that using an alternate right-of-way, as proposed to facilitate the Yukon Quest, would be feasible. Discussions at the Nordenskiold Bridge – Community members seemed to feel that the Nordenskiold Bridge will need to be replaced to support the project. – It was pointed out that there is an archaeological site adjacent to the northwest corner of the Bridge, below the cemetery. It was also pointed out that the Bellmore's residence would potentially be the most affected by such work. Traffic Routing Alternatives – It was explained that Western Copper narrowed down the traffic routing alternatives to two: via the Freegold Road and River Road through Carmacks or via the Casino Way bypass avoiding the community altogether. There seemed to be general agreement among	

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the participants representing Carmacks that the Casino Way bypass is the preferred alternative. Participants cited safety risks to the community, deterioration of municipal road infrastructure and impairment to community aesthetics as the primary reasons. It was expressed that municipal roads were “never built for industrial traffic to go through town”, and that most residents of Carmacks choose to live there because of the Village’s scenic setting and that the boardwalk and riverfront area are “the essence of the community”. It was also brought up that Casino Way should be built to support the traffic of likely future development. List of Participants Travis Ritchie, Senior Assessment Officer, YESAB Councillor Darlene Johnson, LSCFN Robert Moar, Lands and Resources, LSCFN Joe Bellmore, Lands and Resources, LSCFN Lauren Haney Assessment Officer, YESAB Selena Cheater, Carmacks Renewable Resource Council Stephen Mills, Executive Committee Member, YESAB George Skookum, LSCFN Ken Roberts, LSCFN Viola Mullet, LSCFN Shirley Bellmore, LSCFN Randy Clarkson, YG Doris Hansen, Village of Carmacks Elaine Wyatt, Mayor or Carmacks/ Housing Manager (Carmacks), Yukon Housing Corporation Jonathan Clegg, Project Manager, Western Copper Dan Cornett, VP/ Project Manager, Access Consulting Group Stephen Reynolds, Executive Director, Yukon Quest International Association (Canada) Dick Stillwell, Regional Program Manager, Design & Construction, Highways & Public Works YG Toos Omtzigt, Environmental Coordinator, Highways & Public Works YG Lindsay DeHart, DAP Manager, Development Assessment Branch YG Youth Councillor Shari Wrixon, LSCFN	

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Yukon Quest International Association (Canada) /YESAB Meeting Summary Document Number: 2006-0050-110-1/ Date Submitted: August 2, 2007	
– A meeting was held on August 2, 2007 to discuss the Yukon Quest's use of the Freegold Road in relation the Carmacks Copper Project proposed by Western Copper (the Project). The following is a summary of issues discussed during the meeting solicited by YESAB and attended by Stephen Reynolds, Executive Director of the Yukon Quest International Association (Canada), Travis Ritchie, Senior Assessment Officer (YESAB), and Lauren Haney, Assessment Officer (YESAB). Mr. Reynolds has reviewed this summary. – Primary interest of the Yukon Quest International Association (Canada) (the Association) is to promote and support the annual Yukon Quest International Sled Dog Race. The Association is interested in raising awareness about the Yukon Quest Trail as a year-round recreational trail and its historic importance to the Yukon. • The Freegold Road was built along the historic Dawson Overland Trail. • The Association would like to promote the recreational/tourist use of the trail during the winter (by snowmobilers, mushers, etc.) and possibly during the summer season (by cyclists, hikers, ATV-users, etc.). – The Yukon Quest Trail overlaps with the Freegold Road north of Carmacks, a Race Checkpoint, for approximately 15 miles, to the point where the Freegold Road veers westward and departs from the Dawson Overland Trail routing. Road maintenance of the Freegold Road to support the proposed Project is a serious concern for the Association because of the potential impacts on the Race. – The chief concern is that mushers would be unable to stop along a graded road, because brakes on the sleds require a solid layer of hard-packed snow to function. This poses a serious risk to safety of mushers and dogs. – Abrasion to sleds or dogs' feet is secondary concern. Measures such as additional and/or thicker booties would reduce impacts. – Another concern is that mushers often camp along this portion of the road for 3-6 hours during years when the race starts in Whitehorse (teams usually do not camp along this portion of the Road during the years when the Race starts in Fairbanks). Apart from these ad hoc temporary campsites, there are no staging/stopping points along this portion of the Road. – Race support snowmachines traveling that section of the road in advance of the dog teams would also experience difficulties running on a surface graded to gravel. – Trail breaking/clearing starts in the beginning of January (usually the first weekend) and is usually completed in three weeks. – The Race begins on the second Saturday in February, runs for two weeks, followed by roughly two weeks of follow-up/decommissioning work to permit adequate trail clearing (removal of trail markers, debris, etc.). – When the teams start from Whitehorse, it takes approximately 3-4 days following the race start to clear the Freegold Road. • Mr. Reynolds indicated that it is unlikely that the Project and the Race can share the Freegold Road safely, should the road be required to be graded to gravel, and should the road be required to support Project vehicular traffic during Race activities. He views the development of an alternate route for the Race as the only solution. The Association would prefer an alternate route to be adjacent to the Freegold Road to preserve the historical connection. The route should not cross the Freegold Road, due	Information Potential effect Possible mitigation Used as VESEC

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to the risk of vehicle accidents with the dog teams. • Mr. Ritchie suggested the possibility of the Proponent and/or YG Highways creating a snow-packed trail, and a campsite pull-out along the Road for the duration of the Race. Mr. Reynolds explained it would require a lot of work to prepare such a trail (1-2' of snow settled in specific cold conditions), and that sharing the road in this way would still pose a safety risk to the dogs and mushers from accidents with vehicular traffic. • There was general agreement that shutting down mine-related use of the Road for the duration of Race activities each year *or* coordinating mine-related traffic to avoid interference with dog teams or support snowmobiles on the Road would not be feasible given the duration of Race activities and the trail conditions required. – The Association indicated that it would like to receive confirmation that Western Copper is not proposing use of the winter road that may interfere with the 2008 Race activities. Trail-breaking is planned for January 4, 2008 and trail clearing should be completed by March 16, 2008. 2008 is the 25th running of the Race. – The Association asserted that it does not want to impede the mine's development, only that it wants to protect the interests of the Race and the potential for the expansion of the use of the Yukon Quest Trail. – The Association expressed interest in having one of their representatives attend the "*Routing Investigation"* tour planned for the end of August in Carmacks.	
Information Gathering Session – Summary Notes **Documentation Number: 2006-0050-107-1/ Date Submitted: June 8, 2007**	
Rachael Byers – Health & Social Department; Little Salmon/Carmacks First Nation – This summary is meant to present items which were discussed during an informal meeting between Rachael Byers of LSCFN and Travis Ritchie, Senior Assessment Officer and Patricia Randell, Assessment Officer. – Drug and alcohol abuse is currently a problem in the community which may become exacerbated by a large immigration associated with the mine. – Social Assistance dependence has a presence in the community and has left some families and individuals unable to pursue traditional lifestyles or to have difficulty participating in the wage economy in a productive and self-sufficient way. – Child and youth wellbeing are important to the community. There is concern that immigration of single workers to the community may negatively affect dynamics that foster such wellbeing, specifically to young girls and women. – The location of workforce accommodations and available housing were raised as topics which require clarity as effects on community will be caused by this component of the project. – If the project was to proceed it would be beneficial to see educational programs hosted in the community which offer both industry related courses as well as life skills course (e.g., budgeting / money management). Larry Tricker – Local Trapper – The following notes summarize a conversation held between Travis Ritchie, Senior Assessment Officer, Patricia Randell,	Information Potential effect Possible mitigation Used as VESEC

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Assessment Officer and Larry Tricker, local trapper and concession holder. – There are concerns with the increased usage of the Freegold Road during winter months due to overlap with the trapping season. – It was suggested that workers from the mine may interfere with traps and/or animals which have been trapped, as this has been experienced in the past. – Additional hunting in the area where road improvements and maintenance allow for better access year round, as has been experienced with the Mt. Nansen project. If this occurs lower moose and caribou populations may result in lowered hunting success. – Larry Tricker owns a cabin at Mile 18 of the Freegold Road and it has been used as a survival cabin for him and others. There are concerns with encroachment on the cabin due to road improvements or maintenance, as well as interference or use resulting from the increased traffic. A second cabin is located at Mile 30 of the Freegold Road. – Larry Tricker's trapping season typically runs from October until January including trail clearing and maintenance. His trapping activities do not include use of the Freegold Road; however the Freegold Road is used for accessing his lines. – The business and activity of trapping this concession was inherited from Larry Tricker's father and is intended to be passed on to his son's. – Winter recreationalists occasionally travel a loop from Carmacks to the end of the Freegold Road then overland to the Mount Nansen – BYG Mine and back to Carmacks. Winter travel to Haines Junction is also occasionally conducted. This winter travel is primarily by skidoos. Hikers were also identified to occasionally use the land in the area. In terms of summer activities he identified the use of the pothole lakes at Miles seven and 8, which he stated are stocked by the government and used for recreation. He stated that there is currently no site management and therefore the area is being affected by discarded garbage and further people utilize the Freegold Road for parking as there is no parking lot. It is anticipated that use of this area will increase if the area becomes more accessible through road improvements and year round maintenance. – There is concern that increased road traffic in the summer may result in a lowered presence of lynx and wolverine due to avoidance. – Concern that workers as well as the general public may begin to access the traplines for recreational purposes and therefore it may be necessary to create new trails. – The forestry tower in the area is an asset for lynx due to the habitat it created. – Sight lines and speed restrictions along the Freegold Road will be necessary for safety reasons. – The bridge at 16 mile is no longer stable. – Fish camps are located in the area and are owned and operated by May Roberts (Mile 4), the Billy family, and Bill Kawalchuck. – Johnny Sam utilizes the area that the Mine is currently using for trapping. – The road is used by the Yukon Quest for the purpose of the race. – Larry suggested that it would be useful to have a meeting with all of the resource users so there may be a discussion of effects as well as potential solutions. <u>Johnny Sam – Local Trapper</u> – An informal meeting was held with Johnny Sam, a local trapper and husband to the concession holder (Kathleen Sam) which overlaps the project area. The following points were discussed.	

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- The area currently used for exploration and proposed to be used for development has a direct overlap with a portion of the trapping concession.
- Johnny Sam identified two lines in the immediate vicinity of the mine; one overlapping the Mine's Tinto Hill Road as well as the lower trail which is accessed by the Yukon River towards McGregor Creek. There are two concessions; one owned by Johnny Sam which was inherited from his family who used the area for trapping while operating a rafting business which provided fuel wood to boats heading to Dawson. Kathleen Sam owns the second concession that directly overlaps the mine, she received the line because of the death of a family member. The family has used the land for a long time and running the line has allowed them to understand the land and the animals and provides for community cohesion. There desire is to pass the land onto grandchildren who have taken an interest in trapping.
- The Lynx pelt is currently the most desired pelt.
- A loss in ecosystem function would result in the breaking of First Nation Law; he indicated that he wishes no loss of ecosystem function.
- The area is used by families for the picking of berries, herbs and medicinal plants as well as picnics. These activities have decreased in the area due to mineral exploration activity.
- Trails in the area have been disturbed by exploration from activities such as trenching.
- The activity of trapping cannot coexist with mining activities and use of the area has been declining since the 1980 when exploration began.
- Other activities in the area have also been contributing to an encroachment on trapping activities such as forest fires, the proposed YEC transmission line north and east of the concessions, and staking of mineral claims to the west of the Carmacks Copper project.
- Traps have been set along the road as well as a tent for safety reasons.

Village of Carmacks

Discussions were held at the Municipal Office between YESAB staff and municipal representatives, including:

Travis Ritchie – Senior Assessment Officer; YESAB	Patricia Randell – Assessment Officer; YESAB
Cory Bellmore – Chief Administrative Officer, Village of Carmacks	Elaine Wyatt – Mayor; Village of Carmacks
Doris Hansen – Councillor; Village of Carmacks	Leo DesRoches – Works Superintendent; Village of Carmacks.

- The following is a summary of the discussion which took place during the meeting:
- The municipality is reviewing a file from the early 1990's which contains a petition that the community had put together regarding the project when it had previously been proposed.
- The municipality has concerns over who will assume responsibility for the maintenance of municipal roads, where frequency and load weights are increased as a result of mining traffic. Further it was stated that neither the municipal roads nor the Nordenskiold

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Bridge were built to maintain the heavy truck loads as proposed. – The municipality expressed interest in knowing whether the bypass (if pursued) would be built prior to the construction phase of the project as this phase will require the movement of heavy loads. – The municipality would like to see the options for transportation routes be expanded to include the bypass, versus alternative routes through the town. – It was stated that YESAB has requested traffic management plan from the Proponent and would pass this information on for review by the municipality. – The municipality requested an overview of what information was requested from the Proponent; the following points were discussed: use of an onsite commercial dump to handle mining and camp waste; accommodations; water treatment sludge disposal; recreational activities in the area; and energy supply.	
Little Salmon/Carmacks First Nation – Technical Review, Catalan **Documentation Number: 2006-0050-198-1/ Date Submitted: 8 May , 2008**	
- this submission is a review by Dr. Catalan, of the EcoMetrix Report commissioned by YESAB: Re: Review of the EcoMetrix Report to YESAB on the “detoxification” of the heap leach pad, March 31, 2008. As per your request, I am providing my comments on the above mentioned report. With regards to the rinsing of the heap, the EcoMetrix report justly points out the need to optimize the distribution of the solution on top of the heap to prevent the formation of preferential flow pathways. However, it is important to add that this optimization should take place before the leaching starts, and not just during the rinsing phase. Indeed, as described in my earlier report (Catalan, 2008), the low permeability zones that hindered the rinsing efficiency in the Gaspe field tests were created during the leaching phase and not during the rinsing attempts. Hence, optimizing the solution distribution only for rinsing would be of little value if low permeability zones had already been created during the leaching phase. In fact, the Gaspe field tests showed that the change of solution distribution system at the end of the first draindown, from drip emitters to sprinklers (which allow a more homogeneous distribution of the rinse solution), had little effect on the outcome of the second sodium carbonate rinse. The drop in pH and rise in copper concentration during draindown occurred after rinsing with sprinklers (Catalan, 2008; Catalan and Li, 2000). If the solution distribution is not optimized prior to leaching the Carmacks ore, then there is a significant risk that flow of the leaching solution will preferentially take place in routes directly beneath the drip emitters and that secondary minerals such as jarosite or gypsum may precipitate between these routes where higher-pH conditions may exist. This is what happened during the Gaspe field tests. These minerals then plug the pores in the ore, cause cementation, and reduce the permeability in the zones located between the main flow routes. Hence, poor leaching efficiency can result in a chemical modification of the ore (i.e., mineral precipitation) which later prevents efficient rinsing. This process of mineral precipitation can be self-reinforcing because the loss of permeability leads to a further reduction in the flow rate of acid solution through these zones, and therefore to a higher pH and to more precipitation. Pictures	Information Potential effect Mitigation Expert opinion

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of Gaspe ore taken during excavation of vats that were leached but not rinsed show the presence of cemented (brown) material between drip emitters, which demonstrates that the problem originated during leaching, not rinsing (Figure 1). (*Figure intentionally not shown)* Although the EcoMetrix report emphasizes the differences in ore placement methods and in emitter spacing between the Carmacks project and the Gaspe field tests, it is questionable whether these differences will be sufficient to prevent the formation of low permeability zones during leaching and to provide for efficient heap rinsing. Moreover, although agglomeration of the fines in the ore may reduce segregation of the Carmacks heap leach material, it will not completely eliminate it (O'Kane et al., 1999). Figure 2 shows a photograph of an excavation in an agglomerated heap leach pile deposited by a radial stacker (Kinard and Schweizer, 1987). Alternating zones of coarse and fine material are visible throughout the depth of the excavation. Segregation may also result in preferential flow pathways, depending on the solution application rate. (*Figure 2 intentionally not shown)* The EcoMetrix report does not provide recommendations on how to optimize the layout of the solution distribution system and the spacing between drip emitters. This optimization should be carried out in tests at a scale large enough to approach the flow conditions in the heap, using actual drip emitters. Unfortunately, laboratory columns are not representative of flow conditions in a full scale heap.	
Little Salmon/Carmacks First Nation – Technical Review, Slater **Documentation Number: 2006-0050-200-1/ Date Submitted: 8 May , 2008**	
- this letter is from Bill Slater to LS/C FN and refers to Slater's Feb 5 letter report to the First Nation and to the more recent Comment Submissions and EC Information Request -responses and includes the following main points for EC to consider: "As you know, I have also reviewed two recent draft reports prepared for LSCFN by Drs. Lionel Catalan and Kendra Zamzow. In my view, the additional information provided through the online registry does not fully address the issues raised in my February 5 letter report to LSCFN. In addition, the information raises some additional questions that warrant consideration. ● <u>Sludge Management</u>: The review comments provided by Dr. Nicholson and Dr. Zamzow confirm that sludge management for this project is an important consideration, especially with respect to potential long-term stability of metal contaminants within the sludge. These reviews suggest that the sludge management plans proposed by WCC are not adequate to ensure protection of the environment from harmful effects of metal contamination. ● <u>Closure Cost Estimates</u>: As requested by the Executive Committee (EC), WCC's response documentation provides an incremental	Information Potential effect Mitigation Expert opinion

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cost for heap detoxification if the process takes longer than expected. This update does not address the more general concern expressed in my earlier letter about the need for cost estimates that allow a clearer understanding of the company's financial commitments and the activities that will be undertaken as part of a closure plan to avoid long-term environmental effects. ● <u>Heap Rinsing Process</u>: My letter of February 5 raised questions about the differences between rinsing with fresh groundwater vs. rinsing with water treatment plant effluent. In his review of the detoxification proposal, Dr. Nicholson has discounted this concern, stating that it is not important for rinsing of pH and metals that are the main contaminants of concern at this site. While I am not an expert in the fields of water treatment and geochemistry, I remain concerned about this issue because it was identified by WCC's experts, Beattie Consulting and Alexco. In evaluating the ineffectiveness of rinsing for raising pH in its test program, Beattie reached the following conclusions. "Over the test period of 141 days the effluent pH just achieved a value of pH 4. … The initial rinse with pH 7 solution involved insufficient volume to rinse out the sulphate from the leached ore. The rinsing with pH 5 solution involved greater volumes of solution per day and the rate of rinsing of sulphate, aluminum and magnesium from the spent ore increased. However, the sulphate in the effluent over the first 22 days of the test period initially remained near 5 gpl. By day 111, the sulphate in the solution had decreased to about 1 gpl. The aluminum in the effluent decrease from over 4000 ppm at the start of the rinse to about 200 ppm after 22 days of rinsing. It would appear that rinsing with much greater volumes of pH 7 solution than used in the present test is warranted in order to rinse out sulphate and other impurities before any attempt is made to add sodium carbonate for neutralization purposes." (Beattie, 2001, p. 39) This rationale for fresh water rinsing was repeated by Alexco in Appendix E3 of the project proposal (p. 1). As noted in my earlier letter, rinsing with water treatment plant effluent cannot, according to the predictions provided by CEMI, achieve reductions in dissolved solids consistent with those suggested by Beattie. In the recent documentation, WCC has provided partial results of additional detoxification test work that includes rinsing with gypsum saturated water. The data don't provide any details about feed solution chemistry, though sulphate content would initially be much higher than for previous test work with fresh water. As noted by Dr. Catalan, the data that are provided for effluent solutions raise some concern about the adequacy of the rinse procedure. Because of the critical nature of heap detoxification for addressing long-term environmental effects of this project, additional rationale is warranted, in my view, for discounting the views expressed by the experts who conducted the initial detoxification test work. ● <u>Waste Rock Physical Stability</u>: WCC has now provided an updated design for the waste rock storage facility. The document confirms WCC's approach for addressing issues related to physical stability of the waste rock dump, relying on pre-clearing and stripping of the initial area to encourage permafrost degradation prior to placement of waste materials. Once waste rock dump construction is underway, WCC contends that the permafrost will disappear or stabilize under the dump (Golder 2008, p. 7). WCC acknowledges that thawing permafrost in the soil conditions present under the dump could affect dump slope stability (Golder 2008, p. 6), but proposes	

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The stability analyses for the waste rock consider foundation strength parameters for thawed and drained foundation soils. If the soils do not thaw and drain prior to waste placement these analyses will not be relevant. The design proposes that if monitoring identifies the presence of thawing permafrost, the dump slopes will be flattened to less than angle of repose. Thawed soil strengths for fine-grained soils with excess ice can be very low and may require significant changes in dump design to maintain stability.
The issue of thawing in fine-grained soils seems likely to affect the proposed dump design. As noted above, WCC's design is premised on the assumption that early stripping will allow permafrost to thaw and drain before waste placement. In contrast however, part of the design assumes that deep permafrost will remain stable in the eastern portion of the WRSA. The initial stability analysis results confirmed that thawing of foundation materials would result in overall slope failure (Golder 2008, p. 12)
With the proposed design, WCC hopes to thaw and drain permafrost in the upper layers prior to and during waste placement. Once this desirable thaw is complete, the design relies on stabilization of permafrost because further thawing could lead to slope failures. The achievement of the necessary balance seems challenging and complex. This complexity may be heightened by a warming climate in warm permafrost conditions.
Past geotechnical reviewers have expressed concern about the effectiveness of the proposed concept. It would be prudent to conduct an independent review of the new design to confirm whether it addresses past concerns.

* <u>Waste Rock Reclamation</u>: In the Draft Screening Report, the EC referenced a WCC commitment to cap the WRSA to decrease infiltration and the likelihood of metal leaching – a commitment not previously identified, and not reflected in closure cost estimates. As requested by the EC, WCC provided additional details about its proposed closure and reclamation plan for the WRSA. The current design proposes development of a waste rock dump with 20 m high angle of repose lifts, with bench setbacks to provide an overall slope of two – 2.25H:1V. WCC's reclamation proposal includes minimal placement of organic materials on the flat dump surfaces, followed by revegetation on these surfaces. The dump slopes are to be left as is, though WCC proposes to "encourage" lodgepole pine on south and east facing slopes and white spruce on north facing slopes. It is not clear what form this encouragement will take. The new documentation suggests that infiltration reduction is no longer considered necessary and is not a design parameter. In my view, leaving angle-of-repose waste rock slopes in place at closure with negligible effort at reclamation is not consistent with good reclamation practice for mining projects. The approach will result in long-term effects on land use in the area as well as various other ecological components.

● <u>Molybdenum Guidelines</u>: Dr. Nicholson's review raises concerns about molybdenum contamination from the proposed heap leach facility. To address this issue, WCC identifies a calculated treatment limit consistent with methodology previously applied to this project by Lorax. The development of this calculated treatment limit required identification of an appropriate receiving water guideline. While the CCME guideline for the projection of aquatic life is quite low (0.073 mg/L), WCC argues that the less restrictive BC guideline (1 mg/L) is more defensible for protection of aquatic life. In deciding to use this BC guideline, WCC disregards guidelines for wildlife, even though these guidelines are more restrictive (BC guideline 0.05 mg/L) because the wildlife guidelines consider the toxicity of</td><td></td></tr>
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molybdenum to ruminants. Moose and caribou are both present in this area and the wildlife guidelines are likely appropriate to apply for calculation of treatment limits for molybdenum, since they appear to address the most sensitive ecological component present in the area. This letter describes issues that arise from the review of additional information recently submitted in relation to the Carmacks Copper project. It does not address all of the issues raised in my previous correspondence on this project. Some of the issues identified in the earlier correspondence are still relevant to the conclusion of the YESAA assessment process, even though they are not further addressed in this letter.	
Little Salmon/Carmacks First Nation – Technical Review, Zamzow **Documentation Number: 2006-0050-201-1/ Date Submitted: 9 May, 2008**	
-this document is a letter report from The Center for Science in Public Participation (CSP2) – Drs. Kendra Zamzow and Glen Miller and includes the following points: “One of the most troubling issues for closure of this project is the potential for metal leaching from the heap over the long-term. We concur that the heap is unlikely to be acid generating, however, acid is not required for mobilization of metals. The concentration of metals and metalloids in effluent after closure is a function of the mass and speciation of metals remaining in the heap, the volume of water flowing through the heap, and the accessibility of infiltration water to sequestered metals. Copper is the primary metal of concern due to the high concentrations remaining after leaching, but other contaminants will also need to be addressed, based on the expected post-mining use of the area. Four important aspects of heap closure are addressed in this correspondence. 1. Copper concentrations The first aspect is the copper released over the long-term from heaps after closure. It is estimated that at least 15% of the copper in the ore will remain after leaching (WCC, 2008b; Beattie, 2001 pg 1, pg 24, Appendix 2). Although raising the pH of the leaching solution indeed reduces the effluent concentration of copper, it still remains unacceptably high, and the remaining copper in the heap presents a clear risk to aquatic resources. Lab column simulations demonstrated near 5000 mg/L copper remaining in effluent at the end of the leach period (Alexco, 2006); after further rinsing with raffinate, 100 mg/L remained(WCC, 2008b). Regardless of the concentration of copper in effluent after leaching is complete, a significant mass of copper can be expected to remain, and a portion of this will flush out of the heap over time. The proposed plan to reduce copper is a series of rinses and neutralization. If the heap can be maintained at greater than pH 10, low copper concentrations can be maintained in the discharge solution, and the copper sequestered in the heap, however, this pH will cause other contaminants to mobilize, particularly selenium, arsenic, molybdenum, and aluminum. *Column testing has not shown good draindown chemistry even under controlled conditions*	Information Potential effect Mitigation Expert opinion

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Column testing has not shown that material subjected to the proposed rinsing and neutralization methods will meet the Metal Mining Effluent Regulations (MMER) for copper. MMER and Canadian Council of Ministers of the Environment (CCME) provide guidance for setting effluent limits. Molybdenum, selenium, and cadmium do not have MMER guidelines, but effluent discharge limits will likely be set during the Water Use License Application process. • In testing by Alexco, 2006, the MMER for copper was not met in threeof the fourcolumns, despite being held at a pH of 9.5 or higher, which is unlikely to be sustained in a heap over the long-term (see subsection below). Concentrations just below MMER have been met with one column (#9) in Alexco's testing and in preliminary results of recent copper column rinse testing (WCC, 2008b). However, rebound to near the copper MMER was observed after draindown two out of three times in the 2007-2008 column test, and copper hovered near the MMER for the entire period of the last rinse; no data is available to determine if a rebound above MMER occurred during draindown after the final rinse (WCC, 2008b). • No effluent standards have been set for selenium, but the draindown chemistry provided is not encouraging. Some selenium guidelines are 2 ug/L (British Columbia) or 1 ug/L (CCME). Laboratory testing indicates that selenium levels can be expected to be elevated in heap effluent: "rested columns" were over 250 ug/L at the end of treatment, efficacy in "unrested" columns is difficult to ascertain with limits of detection varying from 20-200 ug/L (Alexco, 2006b). The most recent column testing set a limit of detection of 50 ug/L (WCC, 2008b), despite the recommendation for setting it at 0.5-1.0 ug/L (Lorax, 2006). • There are no MMER for molybdenum and cadmium. CCME for molybdenum for protection of freshwater aquatic life is 0.073 ug/L, with toxicity observed at 0.73 ug/L; British Columbia has a less stringent standard of 1 mg/L for a 30 day average. Effluent may not be able to reach even the British Columbia standard. In columns rinsed with raffinate and neutralized, molybdenum increased when pH decreased from alkaline to neutral, with rinsed samples generally ranging from 200-500 ug/L (WCC, 2008b). In columns which did not receive a long-time raffinate rinse, molybdenum was quite high, at 1742-5320 ppb in columns rinsed immediately after leaching, and 23,835-30490 ppb in columns rested between leaching and rinsing (Alexco, 2006b). Column testing does not indicate if protective levels for cadmium can be achieved; the data from the latest rinse testing does not include cadmium concentrations, and testing in 2006 used limits of detection that varied between 2-20 ug/L; the Lorax review recommended a limit of detection of 0.015 to 0.02 ug/L (Lorax, 2006). Discharge of neutralized process solution water was only able to reach 2 ug/L (the US criteria for freshwater) at pH 9.5 (CEMI, 2006 Tables 2.2 and 2.3; CEMI, 2007 Tables 2 and 3). CCME standards for protection of aquatic life are 0.017 ug/L. *The pH of the heap will decrease over time, causing copper to mobilize.* The solubility of copper is a function of pH, and solubility goes up as pH goes down; copper will leach appreciably below pH of 10.	

Comment Summary	Consideration for Use
Copper removal testing has been done on process solutions in simulated emergency water treatment, and in rinsed and neutralized columns. Testing of pregnant leach solution (PLS) neutralized to pH 7.5, 8.5, and 9.5 with hydrated lime demonstrated copper above or near the MMER (CEMI, 2006). The data presented is suspect. In treated effluent, copper will have been lowest at pH 9.5 and increase with decreasing pH; the results provided by CEMI (Table 2.2) indicate that a fast filtration method was utilized, and the slight variation in concentrations (0.24 to 0.66 mg/L) are likely essentially scatter of the same number due to particulates. Testing neutralized raffinate provide more consistent results, with copper increasing at decreasing pH , but still indicate copper near or above the MMER when pH is below 8.5 (Table 2.3, CEMI 2006; Table 2, CEMI 2007). High-density sludge (HDS) treatment of raffinate represents the best case scenario of copper removal. Metals flushed from the heap after closure will not have the benefit of lime treatment. It is clear from column tests that the effluent will contain copper either above or very close to the MMER of 0.3 mg/L (see subsection above). The current plan for long-term management of the heap does not include long-term active neutralization of heap effluent. Even though the heap can be neutralized or left basic, carbon dioxide from the atmosphere will ultimately reduce the discharge pH to at least 8.5, and it may go lower depending on the specific characteristics of the heap. Copper concentrations in effluent held at pH 9 or 10 will increase as the pH of the heap decreases over time with atmospheric influence; potential cadmium mobilization is also a concern. *The heap will be heterogeneous.* Heaps are heterogeneous, not homogenous. This is likely to be the case even if a conveyor system is utilized for stacking (EcoMetrix, 2008). Examination of leached material in both copper oxide and gold cyanide heap leaches has shown that preferential pathways develop during leaching (Catalan, 2008a,b; O'Kane et al., 1999); Dr. Catalan's report is provided as Attachment A. Development of low flow zones has been addressed at the Gold Quarry mine in Nevada by determining areas of high conductance and reapplying a leach to specific areas for more complete extraction (Bell, 2008). Channeling has also been observed in column tests related to the Carmacks Copper Project (Beattie, 2001). The issue of low flow zones has been addressed in the Conceptual Closure and Reclamation Plan (WCC, 2006a) and in EcoMetrix (2008). Suggestions have been made to improve flow through the heap, which will optimize both copper recovery and rinse solution contact with ore. These include adding additional collection piping on lifts, placing drip emitters at 40 cm apart, instead of 60 cm; stacking ore with a conveyor system rather than bulldozer; and rinsing for ten years, with rest periods in between to allow for sequestered solution to drain into main paths. However, none of these remedies is likely to provide a heap drainage system that is effectively modeled by a simple column study. Differential settling, preferential flow paths and ore type differences render every heap heterogeneous and complicate the rinsing beyond anything that can be accurately modeled or the drainage water quality predicted. Copper and some of the other contaminants will be draining from the heap for a very long time. It has not been demonstrated in a heap leach operation that copper can be completely removed from a heap by rinsing. As mentioned above, even controlled laboratory tests have rarely demonstrated good removal of copper. If copper remains, despite either 4.5 to 10	

Comment Summary	Consideration for Use
years of rinsing, the testing of "rested" columns (Alexco, 2006) becomes relevant. After closure is complete, the covered heap will "rest" from approximately October to March, when no precipitation is expected to infiltrate, and then be flushed with snowmelt. During the rest period, the main pathways will drain; entrained solution and dissolved copper will migrate from more sequestered areas into the main pathways over time, and can be expected to flush out with spring melt and precipitation. This rebound, detailed in Dr. Catalan's report of the Gaspe mines testing (Catalan, 2008b) has been observed in Carmacks column tests. Some examples of rebound in neutralized, rinsed columns include: *In WCC 2008b* • Copper increase from 0.01 mg/L to 0.38 mg/L after the 1st rinse and increase from <0.01 mg/L to 0.28 mg/L after the 3rd rinse (Dec 2007 and Feb 2008) • Selenium increase from <0.05 mg/L to 0.42 mg/L after the 3rd rinse (Feb 2008) • Aluminum increase from <0.05 mg/L to 1.86 mg/L after the 3rd rinse (Feb 2008) *In Alexco, 2006b:* • Copper increase from 18 mg/L to 502 mg/L after the 1st alkali rinse and draindown (Column 8) • Copper increase from 43 mg/L to 313 mg/L after the 1st alkali rinse and draindown (Column 5) • Copper increase from 4.2 mg/L to 7.1 mg/L after the 2nd alkali rinse and draindown (Column 5) • Increase in sulfate (236 to 884 mg/L), calcium (<11 to 34 mg/L) and sodium (231 to 574 mg/L) during freshwater pulsing (day 188 to day 272, column 9); no draindown information provided. Therefore there cannot be certainty that the heap, even after rinsing, will not experience frequent rebound. <u>2. Volume of water in heap</u> A second aspect to be considered is the volume of water that will move through the heap annually, in perpetuity. This can be estimated from the acreage covered by the heap (330,000 m2) accepting an average of 375 mm of precipitation a year (120 million liters) or by using the water balance developed by CCL of approximately 100,000 m3 (100 million liters) of water expected to flow annually through the heap, primarily in April and May (CCL, 2006). Using 100 to 120 million liters of water annually provides 190-235 liters per minute of average flow through the heap. A previous review estimated 120-240 liters per minute seepage during peak periods (Lorax, 2006). The assumption of 20,000 m3/yr as a long-term infiltration rate, yielding 38 liters per minute (WCC, 2006a pg 3-17), is highly optimistic. Heap cover is not intended to reduce infiltration (WCC, 2007c), despite a review that recommends exactly this (Lorax, 2006); it is unclear why it is assumed that only 25% of average precipitation is expected to infiltrate. Proposed cover estimates have ranged from 0.3 m to 1 m (WCC, 2007c). The pan evaporation is likely to be quite low during most months in the northern climate, therefore relying on evapotranspiration is optimistic (WCC, 2006a pgs 3-13, 3-16). It is critical to determine the expected monthly and annual flow	

Comment Summary	Consideration for Use
through the heap based on precipitation in order to size long-term treatment systems. The current long-term management plan is vague, but presumes passive treatment through utilization of some combination of limestone drains, a biocell, and/or an infiltration gallery (WCC, 2006a). There are no passive treatment systems that have demonstrated success over the long-term for volumes of water greater than 50 liters per minute, and certainly not passive biocells. Active treatment will be required during spring and summer due to the volume of water that will move through the heap. <u>3. Water quality standards</u> The third and last aspect to be considered for long-term water treatment is the discharge limits that will be required. Currently MMER standards have been proposed for arsenic, copper, lead, nickel and zinc; effluent limits have not yet been set for the Water Use License Application. Site specific discharge limits are currently being considered for copper; it is known that copper is toxic to fish at 10 ug/L. Removal of selenium and molybdenum in process solutions by HDS treatment has been discussed (WCC, 2008a), but potential mobilization after heap closure has not been addressed. If post-mining use requires a vibrant aquatic life community in Williams Creek or other parts of the watershed, stringent discharge limits should be considered for other contaminants toxic to aquatic life, particularly selenium, molybdenum, and cadmium. Removing these metals, in addition to copper, is problematic due to solubilities that vary with pH and alkalinity. Copper and cadmium are less soluble as pH increases, but selenium, molybdenum, and aluminum become more soluble; addition of alkaline material to the heap will result in sequestration of some metals and mobilization of others. As heap pH changes on exposure to meteoric water and atmosphere, metal mobilities will be altered. Issues with mobilization of arsenic and selenium, and toxicity of selenium, have been discussed in a previous review (Lorax, 2006). Selenium is toxic to fish and birds at very low concentrations. Criteria for protection of aquatic life range from 1 ug/L (CCME) to 2 ug/L (British Columbia) to 5 ug/L (US) (Ecometrix, 2007). Aquatic plants accumulate selenium, which re-mobilizes when plants decay. The fate and transport is complicated, and dependent on retention time, physical characteristics of a water body, the type of sediment, and interactions with other elements and organic material. Primary toxic impacts include deformities and reduced growth and survival in both fish and birds, weight loss in birds, and reduced hatching success in birds. Fish and birds have similar toxicity thresholds. Molybdenum and cadmium are also toxic to aquatic organisms. CCME criteria for molybdenum is 0.073 ug/L for protection of freshwater aquatic life; British Columbia uses 1 mg/L monthly average. Cadmium has a CCME freshwater protective standard of 0.017 ug/L and the US National Recommended Water Quality Criteria is 0.25 ug/L (CCC, chronic criteria) or 2 ug/L (CMC, maximum criteria) (EPA, 2004). This drainage system should be considered a direct discharge to the creek and then too the Yukon River. Despite the proposal too utilize an infiltration system, the distance to the creek is sufficiently short that the fluids infiltrating into the soil will discharge to the surface water in the near future, depending on thee type of soils present in thee area. Thus, the discharge limits should be those of a surface water discharge permit, rather than a soil application.	

Comment Summary	Consideration for Use
4. Sludge Briefly, the application of sludge on top of the rinsed heap is not recommended. As discussed, the pH of the heap will change over time, allowing some metals to mobilize. Infiltration of meteoric water through the heap while it maintains an alkali in pH will result in mobilization of selenium and molybdenum, while infiltration as heap pH decreases will result in mobilization of copper and cadmium. Implementation of one of the other alternative sludge storage options, such as mixing with cement, would ensure containment (WCC, 20006a pg 3-6). Conclusions To date, studies related to the Carmacks Copper project have examined efficacy of leaching protocols for best extraction of copper (Beattie, 22001), efficacy of fresh water and alkali-amended rinse water protocols (Beattie, 2001; Alex co, 2006a,b; WCC, 2007bb; WCC, 20008b), and contaminant concentrations after treating PPLS and raffinate process solution with lime or simulate HDS protocols (CEMI, 2006; CCEMI, 2007). Lorax (2007) concludes that treated process solution discharge is unlikely to meet proposed effluent limits at the compliance point in Williams Creek, except under the best scenario of HDS treatment of raffinate at pH 9.5. Recent testing of neutralized columns , in which repeated freshwater rinses were applied, has not indicated that contaminants will remain low when flushed out of thee heap over the long-term (WCC, 2008b). The issues that will remain after closure are primarily 1) the mass of copper and other contaminants remaining in the heap 2) the volume of water that will infiltrate the heap and flush remaining contaminants and 3) the concentration of contaminants that will reach Williams Creek at the compliance point. In my opinion, given the information provided thus far, the Carmacks Copper project does not ensure protection of the environment or flora and fauna within the nearby environs over the long-term after closure of the proposed copper heap leach. It has not been demonstrated that the heap will remain neutralized over the long-term, nor that neutralization will stabilize metals within the heap. Long-term management plans to constrain contaminants outside the heap remain vague, and depend on passive treatment systems, as yet un-designed, to handle in perpetuity seepage. This is the most troubling aspect of closure as presented to date. Passive treatment will not handle the quantity of water calculated too flow from the heap after closure, and copper and other contaminants can be expected to drain from the heap for many years to come. A sensitive location near the Yukon River, in a cold climate with moderate precipitation will not provide ideal conditions for an unproven experiment in heap neutralization as the basis for a long-term closure plan.	

Comment Summary	Consideration for Use
Yukon Conservation Society Documentation Number: 2006-0050-202-1/ Date Submitted: 9 May , 2008	
- this document is a letter summing up issues according to YCS and includes the following: “I wish to thank you and the Executive Committee for this opportunity to comment further on this project. As outlined to you in my phone call I was waiting for further technical analysis done by Dr Lionel Catalan on Heap Closure. This work is now available and has been forwarded to you as part of comments developed by the Little Salmon Carmacks First Nation (LSCFN). Additionally LSCFN has forwarded to you a review by Dr Kendra Zamzow of the Center for Science in Public Participation and Dr Glen Miller of the University of Nevada in which they examine the documents posted on the registry related to closure of the proposed leach heap. Without going into great detail one can sum up these analyses as follows: 1. To date no testing has been done at a scale large enough to indicate with confidence that the heap can be successfully leached to the point that the proposed plan for rinsing and neutralization provides any certainty of successful detoxification. 2. Without complete detoxification natural infiltration of the heap by normal precipitation will mobilize various heavy metals and other contaminants to a degree that the surrounding environment (in particular Williams Creek and the Yukon River) will be at risk of serious detrimental impact. 3. No specific plans or proposals to effectively deal with this risk have been proposed to date. Instead non-specific suggestions of “optimizing” certain factors or actions are proposed with no indication of how they will be “optimized”. 4. Without specific, proven methods of mitigation this risk will persist far into the future and will require significant long-term (probably perpetual) care to manage. No plans for financing of such long-term care have been proposed or even contemplated. After studying these analyses we are forced to return to our original position on this proposed heap leach operation. We find that all the documentation provided both by the Proponent and by Executive Committee commissioned experts only serves to reinforce our earlier position that the acid heap leach process may very well be completely inappropriate in a climate with a positive water balance. Research indicates that the record of financial failure of this type of operation world wide is very discouraging (*Citation Footnote left out intentionally*). There are still no examples of successful detoxification of this type of heap in the world. To recommend that this operation proceed when the odds indicate it has a high risk of financial failure and when it has not conclusively shown that it can clean up the heap and thereby avoid significant environmental impact, even if it does succeed financially, contradicts both the letter and the intent of the YESAA legislation.”	Information Potential effect Expert opinion

Comment Summary	Consideration for Use
-the YCS letter also provides background on Yukon River Chinook Salmon as a VESEC for this Project and a review of conservation efforts that are being expended on it: "This writer has been a commercial fisherman on the Yukon River since 1974. In 1985 I was appointed to the Canadian delegation negotiating a Yukon River Agreement under the Pacific Salmon Treaty. I worked in that delegation for 17 years until an Agreement was successfully concluded in 2002. In 1994 I was appointed to the Yukon Salmon Subcommittee formed under the authority of the UFA and FN Final Agreements. Since the conclusion of the international agreement I have served on the International Yukon River Panel. During this time I have gained considerable knowledge of the History, Biology, Politics, Management, and the Value of Yukon River Salmon. Yukon River Chinook are recognized world wide as probably the most unique of salmon stocks partially because they have the longest spawning migration of any salmon stock. They travel in excess of 2500 kilometres to reach their natal streams. During that migration they provide cultural, social and economic benefit to more than 2000 extended family subsistence households in Alaska, about 750 commercially licensed fishers in Alaska, numerous recreational users and non-native personal use fishers. Additionally almost every Yukon First Nation utilizes them for both sustenance and cultural purposes. Many First Nations actually define an important part of their cultural identity by their relationship with the river and the Salmon it produces. In some villages along the Yukon in Alaska, the word for "food" and the word for "fish" and the word for 'Salmon" are the same word. Some First Nations in Yukon name themselves as "People of the River" or "Big River People" and express much of this identification with the river by their interaction with, and use of, salmon. This cultural and subsistence relationship with salmon is a central part of their sense of themselves as unique peoples. There are also commercial, domestic and recreational fisheries in Yukon that derive significant social and economic benefit from access to these salmon stocks. Governments in both Canada and the US spend great amounts of tax money to manage both fisheries and fish habitat in order to maintain these stocks for the long-term. Canada and Yukon have just completed a five year long exercise to redesign and redevelop the management regime for placer mining in Yukon in order to better protect and maintain fish habitat. Each year the Yukon River Panel spends in excess of one million dollars US on projects designed to protect and maintain fish stocks and habitat. There are commitments undertaken by Canada in the Yukon River Annex to the Pacific Salmon Treaty to maintain habitat quality and quantity. Over the past decade, productivity of this stock has declined in response to climate change, changing cyclical ocean environmental conditions, and excessive by catches by other fisheries. The stock has two things going for it during this period of low productivity. First is an internationally coordinated management system that has been prepared to impose severe (in some cases draconian) restrictions on fisheries in both countries to maintain stocks. Fishers along the river have endured those restrictions knowing they are necessary.	

Comment Summary	Consideration for Use
The second thing this stock has going for it is a relatively pristine fresh water environment in the river that it spawns in. With the exception of the danger posed by the abandoned mine at Faro, for which clean-up plans are now being developed at great public expense, there are few major threats to habitat at this time. This proposed mining operation will take place only a short distance upstream of a major main stem spawning area on the Yukon River. This salmon stock is only one of many ecosystem components that could be impacted by the Carmacks Copper proposal. There are many others both aquatic and terrestrial. Nevertheless, its great cultural, social and economic values and the efforts being expended to maintain it provide enough reason to consider very seriously whether it should be put at risk by what is essentially a very large scale unproven experiment. Until specific mitigative procedures and actions are developed and tested at appropriate scales and are conclusively shown to have very high chances of success in preventing significant environmental impact, and until a credible plan for financing the required monitoring and active treatment that will be necessary for the long-term is found, a recommendation for this project to proceed cannot be justified.	

Table B-3 Comments on the Draft Screening Report Submitted During Comment Period

Comment Summary	Consideration for Use
Environment Canada **Document Number: 2006-0050-129-1/ Date Submitted: 11 January 2008**	
Environment Canada suggested the following modifications to term and condition # 1, 2 and 128: 1. Prior to any release to the environment, the Proponent shall ensure that water is tested and treated to Yukon and Federal release standards (i.e. CCME, MMER where appropriate). *Suggested wording:* Prior to any release to the environment, the Proponent shall ensure that water is tested and treated to Yukon and Federal release standards (i.e., CCME, water licence, MMER where appropriate). *Rationale:* Environment Canada considers that the recommendation should include the Yukon Water Board Licence, as the Board is one of the main regulators in this Project. 2. Total suspended solids of any discharged water shall be controlled at 15 mg/L during operations to meet federal Metal Mining Effluent Regulations for discharge. If required, a floating thickener shall be used to allow the use of settling aids (flocculants). *Suggested wording:* *Total suspended solids of any discharged water shall be controlled at 15 mg/L, until closure, to meet as a minimum, the federal Metal Mining Effluent Regulations for discharge, or the standards as prescribed by the regulator. If required, a floating thickener shall be used to allow the use of settling aids (flocculants).* *Rationale:* *The MMER is a national regulatory tool prescribing a minimum standard to achieve for metal mines in Canada. The regulations are valid until the mine owner/operator has conducted their final series or environmental effects monitoring and the Authorization Officer (Environment Canada) has accepted that the mine can be granted closed status, thereby no longer meeting the criteria for application of the regulations (defaulting as a*	Possible mitigation Expert opinion

Comment Summary	Consideration for Use
result to the general application of the Fisheries Act). The Yukon Water Board has the ability to require more stringent or other requirements not specified by the federal (minimum standard) regulations. 128. The Proponent shall implement preventative engineering and design measures including: – Contingency water treatment plant available during operations to treat effluent to meet MMER water quality and toxicity standards. *Suggested wording:* Contingency water treatment plant available during operations, and until closure, to treat effluent to meet MMER water quality and toxicity standards. *Rationale:* The MMER is a national regulation prescribing a minimum standard to achieve for metal mines in Canada. The regulations are not in effect until the mine has been accepted as closed by the Authorization Officer (Environment Canada). The Yukon Water Board has the ability to require more stringent or other requirements not specified by the federal regulations.	
Karen Gage **Document Number: 2006-0050-128-1/ Date Submitted: 10 January 2008**	
– Ms. Gage indicated that her main concern was with minimizing the negative social impacts that may be caused by the Carmacks Copper Project. Specifically, Ms. Gage expressed concern about the location of the single-status accommodation. She argued that for the following reasons, the Proponent should construct the single-status accommodation facility onsite, rather than in the Village: – Would cut down on approximately two hours of driving to and from the site from an already extended work day (12 hr shifts). – Would cut down traffic on the Freegold Road during fish camp season. – Would decrease the potential for effects such as: domestic problems, bar room brawls, supplying to minors, statutory rapes, medical emergencies, etc. – Easier for the employer to maintain control over activities within the facility; especially related to drugs and alcohol.	Information Potential effect Possible mitigation

Comment Summary	Consideration for Use
– Ms. Gage indicated that she supports permanent employees moving to Carmacks with their families and participating in the community, but that in her opinion, the transient workers which would stay in the single-status accommodation would not be as interested in becoming a part of the community.	
Little Salmon/ Carmacks First Nation **Document Number: 2006-0050-131-2/ Date Submitted: 15 January 2008**	
– Too many of the conditions referred to in the report are "nonbinding on the applicant"; where there are binding requirements in the report, they are lacking in the appropriate specificity. – Concerned that there is no Impact Benefit Agreement (IBA) between the Proponent and the LSCFN. The LSCFN "cannot and will not support the proposed project in the absence of an acceptable IBA". – This project has serious and numerous environmental issues that have yet to be addressed. It has the potential to result in catastrophic pollution of the Yukon River and the destruction of the salmon run for the LSCFN and other First Nations. "We are advised that there is a real risk of the runoff of sulphuric acid, copper, cadmium, selenium and other heavy metals into the river." – The long-term issues associated with the project are of significant concern. There will be ongoing issues of detoxification, reclamation and closure. The LSCFN has experience dealing with improper mine closure in the past.	Information Potential effect
Carmacks Development Corporation Inc. **Document Number: 2006-0050-132-1/ Date Submitted: 15 January 2008**	
– Recommendation # 84 is the only recommendation listed under the Economy and Employment section falls far short in meeting the required mitigations to allow the project to proceed. If the project proceeds, local businesses will need to undertake expansion to meet the growing project needs. The cost to the people and business community of Carmacks to recover their investment from this opportunity needs also to be considered in the context of closure, "or reticence on the part of the company to actually commit to doing business locally". The Carmacks business community is neither large nor robust and prior to facing closure or a downturn in the project, "we will require the type of 'suggestions' listed under 8.3.4 being upgraded to conditions of approval. It would be more expedient to simply require the Proponent to initiate an Impact and Benefits Agreement as outlined in the LSCFN Final	Information Potential effect Possible mitigation

Comment Summary	Consideration for Use
Agreement.” Discussions respecting business opportunities and employment have been cordial but not specific nor detailed in light of the regulatory and approval process. A benefits agreement should be in place.	
Yukon Conservation Society **Document Number: 2006-0050-133-1/ Date Submitted: 15 January 2008**	
- YCS points out that this project will be first attempt to use this mining process (acid heap leaching for Copper) in Yukon. - assert that natural conditions including permafrost, seasonal freeze-thaw cycles, and a precipitation- evaporation balance that is positive for precipitation must be accounted for, as must the fact that the project is located on a tributary that reports directly to some of the most important salmon spawning habitat in the Yukon River system. - we are prepared to acknowledge that these problems may possibly be adequately dealt with while active mining is going on. - greatest concerns are with the problems related to closure of the leach heap, with water quality after closure and with the proposed security estimates. Heap Closure: - agreed with Executive Committee that Proponent’s tests on heap detoxification do not provide certainty on heap chemical stability at closure and that planning for monitoring and water treatment is needed - research indicates that, to date, no successful long-term neutralization of a copper leach heap has been achieved as stated by a YCS consultant: “I have already performed a search after getting your message and I can’t find a single citation of where copper dump leach neutralization has been performed. So there is no evidence it can or can’t be done-one would have to rely on gold heap leach examples to make the argument either way and that’s not an apples to apples comparison and from a scientific perspective doesn’t accomplish anything.”(Jim Kuipers, P.E . Principal/Consulting Engineer, Kuipers and Associates LLD, Butte MT.) - information supplied by the Proponent is the result of small scale laboratory and pilot testing or refers to gold heap leach examples. It cannot be relied upon to address the problem of acid-copper leach heap neutralization on an operational scale. - to date the proposed technique (rinsing and addition of neutralizing materials) is unproven under any climatic conditions let alone those in the Yukon . . . Given that there is no assurance that heap neutralization will be achieved,	Information Potential effect Possible mitigation Expert opinion

Comment Summary	Consideration for Use
every means of isolating the heap at closure must be pursued - the precipitation –evaporation ratio is positive for precipitation in Yukon. - the literature indicates that there is a very high probability of some degree of liner failure . . .Current warranties for liner and cover materials are limited to from 30 to 50 years . . . Few, if any, liners survive the installation and mining operations undamaged.. . . there will eventually be leaching from the abandoned heap into ground water . . There is no way to estimate how long it may be necessary to collect and treat leachate once it appears. - . . . we cannot see that the Proponents "walk away" closure proposal is appropriate. - there must be contingency planning, monitoring, infrastructure, and financial security in place to deal with water quality problems in the long-term . . . - to minimize infiltration the Proponent should be required to provide a state of the art impermeable cover for the heap in addition to the natural cover. - access to the site for both personnel and equipment is going to be required for the long-term. Infrastructure for water treatment should be maintained on site. Security: - It is entirely possible that the Proponent company as a legal entity will have ceased to exist by the time these problems have to be dealt with. - . . . a method for providing long-term financial security to carry out monitoring and treatment must be found. Given the long time frame it must be free of dependence on the continuing existence of the company. - the Executive Committee has failed to comment in any way on the quality or adequacy of that submission. They have simply deferred to the regulator (EM&R Yukon) and the Reclamation and Closure Policy. This is extremely disappointing as the process between the Proponent and regulator is to a great extent a closed one with extremely limited opportunity for public input and little public exposure of the processes and negotiation used to arrive at final security requirements. The only opportunity to provide for the public an assessment of adequacy of closure cost estimates is the YESAB process. No such assessment has been done. - We have submitted the Proponent's estimates to Dr. David Chambers of the Centre for Science in Public Participation in Bozeman Montana. Dr Chambers is an acknowledged expert in the field and has extensive experience working in Yukon and Alaska developing and assessing the adequacy of security. His comments are as follows: "I can't tell how much work was put into developing this closure cost estimate. It appears they went into some level of	

Comment Summary	Consideration for Use
detail since some equipment costs and personnel rates are referenced. However the cover page implies they are relying on work done largely over ten years ago, which doesn't inspire a great deal of confidence in the level of effort they put into the estimate. I can offer a couple of specific comments: • Revegetation costs are low, but this is not a major cost factor. • It's not a good idea to assume significant cost recovery from salvaged process equipment. If the operation is in bankruptcy (which is when a bond would be called), low prices and low demand for used materials are the norm. • No contingency costs for water treatment. This could be a major cost. • No indirect costs - i.e. costs for Contingency; Mobilization / Demobilization; Engineering Redesign; Engineering, Procurement, Construction Management; Contractor Overhead; Contractor Profit; Agency Administration; Inflation. This should increase the total costs 40 - 65%. I hope that the Yukon Government is going to have its own consultant look at this in detail." <u>Possible Mitigations:</u> • Contingency planning for active monitoring and possible treatment of leachate from the heap must be an integral part of the proposal and be complete, detailed, and extend until a proven method of detoxifying the heap is found and carried out. This planning must deal with the need to maintain or rebuild necessary infrastructure long after mining ceases. • In support of the above, closure of the access road should not occur until all water quality problems are permanently dealt with. Mitigations to deal with unauthorized access provided by the road until then must be developed in detail as part of the proposal. • A method of providing financial security for the long-term must be developed. The draft guidelines under the Reclamation and Closure Policy state that "perpetual care should not be an acceptable option." In this case, until a method of ascertaining that the heap is permanently detoxified is found, perpetual care will be the only available option. With the possibility that the Proponent company could cease to exist before final solutions are found, innovative ways of providing for the necessary security over the required time frames must be developed and implemented. This may require changes to the current policy and regulation. The present proposal to offset some of the security costs by selling used equipment is not useful or realistic. Security must be up front and in a form that is available to the Government in sufficient amount immediately it is required. - The Executive Committee has not shown that significant long-term impacts to the environment can be mitigated and should recommend that this project not proceed in its present form.	

Comment Summary	Consideration for Use
Yukon Government, DB – ECO-DAP Branch **Document Number: 2006-0050-139-1/ Date Submitted: 28 January 2008**	
The Yukon Government is the main Decision Body for this project and has submitted a comprehensive set of comments in the form of an eleven page table as follows: . . . the comment table (forming part of the submitted YOR Document 2006-0050-139-1) identifies amendments to some of the proposed terms and conditions. The terms and conditions referenced in the table are sourced from Section 13 of the Draft Screening Report and Recommendation. Of the 142 terms and conditions within the Draft Screening Report and Recommendation, Yukon government suggests consideration be given to those specifically identified on the table. YTG states that those terms and conditions not referenced are agreeable to them. Included with the specified terms and conditions are suggested re-writes and rationales for the requested amendments. The table is divided into two parts: o Minor re-write: Improvement and clarity can be achieved through wording changes o Preferred rewrite: Some concern with current wording and changes are suggested The Executive Committee has carefully considered this submission and given the level of detail and length has decided not to repeat the document in this “Comment Summary”.	Information Mitigation Expert opinion
Yukon Conservation Society **Document Number: 2006-0050-144-1/ Date Submitted: 4 February 2008**	
- the letter introduces a report by Dr Lionel JJ Catalan, of Lakehead University submitted separately as Document 2006-0050-145-1 that was commissioned by the Yukon Conservation Society - letter outlines some of the findings of the report particularly about the operation and closure/neutralization of the heap and the financial security for reclamation and closure - the letter also criticizes the YESAB regarding the quality of the assessment and use of comments submitted	Information Potential effect Possible mitigation
Yukon Conservation Society – The Catalan Report (1 Feb. 08) **Document Number: 2006-0050-145-1/ Date Submitted: 4 February 2008**	

Comment Summary	Consideration for Use
L.J.J. Catalan wrote: "In the following, I will summarize the results of the rinsing/neutralization pilot tests carried out at Mines Gaspé and discuss their relevance to the Carmacks copper project. Next, I will provide specific comments on the test work that was done for the Carmacks copper project and the conceptual closure and reclamation plan proposed by Western Copper Corporation." - the report describes the Pilot Scale Rinsing/Neutralization Tests at Mines Gaspé and discusses the results which showed that both the leaching and the rinsing of the ore was incomplete and that a significant level of metals was left in the ore during both processes - Catalan concluded on the relevance of the Gaspe Pilot to the carmacks Copper leaching neutralization proposal as follows: "The above results are very relevant to the Carmacks heap leach project because they clearly show that the design of the solution application system (drip emitters) strongly affects the efficiency of both leaching and rinsing. Column tests carried out with the Carmacks ore samples were not able to simulate the flow heterogeneities that result from the use of drip emitters, which are the mode of solution application proposed for the full scale heap (Western Copper Corporation, February 2007). The lack of rebound for pH and copper concentrations in the column tests suggests that the ore was uniformly leached and rinsed in the columns, probably because the solutions were uniformly distributed on the top of the columns and solution channeling was minimal in the columns. However, the use of drip emitters on the full scale heap will likely result in flow heterogeneities similar to those evidenced in the Mines Gaspé pilot trials. This, in turn, will lower the rinsing efficiency and could very significantly increase the length of time required to achieve an effluent that meets regulatory limits. It is uncertain whether reducing the spacing between drip emitters could completely resolve this problem. It also remains uncertain whether improvements to the homogeneity of solution distribution would suffice in practice to prevent low flow zones, since other factors can also contribute to flow heterogeneities. For example, low permeability zones can arise during heap construction from compaction by heavy equipment, size segregation by stacking fines on top, compaction of lower lifts by upper lifts, and migration of fines." - the Catalan Report also comments on the Conceptual Closure and Reclamation Plan for Carmacks Copper saying: "The closure plan aims to achieve a "walk away" scenario that will require no further monitoring and maintenance. The Proponent claims that the long-term objective of a "walk-away" closure condition has been shown to be technically feasible (Western Copper Corporation, October 2006). When considering the technical information provided to sustain this claim, my opinion is that this claim is premature. I think that further testing is necessary, especially at a larger scale, to assess the effect of the solution distribution system on the rinsing efficiency. During these tests, the solution application system should be optimized to minimize channeling and the formation of low permeability zones. Also, the	Information Potential effect Possible mitigation Expert opinion

Comment Summary	Consideration for Use
composition of the draindown solutions should be analyzed to check for the possibility of rebound in copper concentrations once the flow of rinsing and neutralization solutions is shut-off." - the report provides an overview of the some of the specifics of the documents on leaching and rinsing that the Project Proponent submitted and/or referred to in the Project proposal and the Conceptual Closure and Reclamation Plan and Catalan expresses further concern with the rinsing and neutralization plan as follows: "In the eventuality that the heap effluent does not meet MMER standards after 4.5 years of rinsing and neutralization, the reclamation plan indicates that a contingency water treatment plant would be running for some time, although the closure date for this treatment plant is unclear. According to the closure and reclamation schedule Gantt chart (Table 7.1 in Western Copper Corporation, October 2006), the contingency treatment would end after 16 years, but Drawing ACG-S-01.001 in Western Copper Corporation (October 2006) shows that the contingency water treatment plant would close after ten years. In any case, it is questionable whether the effluent will meet MMER standards at that time. Once the water treatment plant is closed, "passive measures" such as a limestone trench, biological treatment cells, and an infiltration gallery will be used for long-term release of the heap effluent to the environment. This will last for another ten years according to Drawing ACG-WS-01.001, although I couldn't find this step in the Closure and Reclamation Schedule Gantt chart (Table 7.1 in Western Copper Corporation, October 2006). However, a limestone trench will not increase the pH at sufficiently high values to reduce the solubility of copper below the MMER standards. Moreover, the efficiency of biological treatment cells will be limited since bacteria may die off during the harsh winters. The reclamation plan provides no data to demonstrate that these "passive measures" would be successful at treating the effluent to MMER standards. On the other hand, the heap effluent volume, even if a cover is put in place, would be significant (20,000 m^3) and would be concentrated in the period of April to August. Therefore, the possibility of significant adverse environmental impacts exists if the water treatment plant is discontinued before the heap effluent meets MMER	
Natural Resources Canada **Document Number: 2006-0050-146-1/ Date Submitted: 6 February 2008**	
-NRCan submitted comments in the form of a letter which provides general comments related to their regulatory roll and are editorial in nature to accurately reflect the terminologies used in legislation and regulations	Information
Little Salmon/ Carmacks First Nation **Document Number: 2006-0050-147-1/ Date Submitted: 6 February 2008**	
- letter of transmittal for two reports one of which the Executive Committee received directly from the Yukon Conservation Society and the other by Bill Slater of Bill Slater Environmental Consulting the contracted Technical Advisor of LS/C FN - the letter is critical of the Executive Committee Draft Screening Report and requests that a Panel Review be required	Information Potential effect

Comment Summary	Consideration for Use
- LS/C FN is concerned with the long-term effects posed by the project saying: “that the two reports are clear evidence that our treaty rights and future well-being are jeopardized by the Carmacks Copper Project” - the Slater Report asserts that there were several “process” issues regarding to the development of the Draft Screening Report (DSR) mainly: “In my view, the DSR does not adequately consider and analyze many of the technical issues raised by reviewers of the project proposal including issues that LSCFN raised in its April 2007 submission to the EC. In some key areas, analysis and research to support the DSR would have benefited from additional input from qualified technical experts. Many of these areas were identified in LSCFN’s earlier submission. Instead, the DSR relies heavily on WC’s analyses and predictions and fails to demonstrate a comprehensive understanding of critical issues, concerns and uncertainties raised during the public review phase of the assessment. As a result, the conclusions reached by the EC lack a strong technical defense. In some cases, the EC’s conclusions are in part based upon information that was not available to LSCFN and discussions that did not involve LSCFN. The EC’s utilization of these additional inputs without providing opportunities for participation of other parties raises some process concerns which are described in Section 1.0 of this letter report.” - the Slater Report refers back to an April 2007 letter report stating: “My April 2, 2007 letter report to LSCFN identified several outstanding technical issues and concerns that warranted more detailed consideration by qualified experts. At the time, it was my expectation that such opportunities would be provided during the preparation of the DSR. As reflected in the introduction of my April 2007 letter report (p.1), YESAB staff had indicated that a detailed evaluation of issues was not required at that stage of the assessment process, and that YESAB would engage LSCFN and technical experts later in the process. It appears that the DSR has been prepared without involving LSCFN or its experts in any further discussion or review of these technical issues. Several areas where the EC appears to have relied on additional information that was not provided to LSCFN or additional discussions that did not involve LSCFN are discussed below.” - the Slater Report goes on to discuss sludge management, water treatment processes, a meeting on Heap Rinsing, the EAA Carmacks Copper Technical Committee and closure cost estimates and in general states that:	Possible mitigation Expert opinion

Comment Summary	Consideration for Use
“The EC conclusion about effects of . . . (he repeats this remark for several of the above topics) appears to have been made solely on the basis of input from WC, without any external review or discussion. As discussed below, I believe there are significant outstanding uncertainties with the proposed approach for . . . (he repeats this remark for sludge management, heap rinsing and closure costs estimates).” - the Report then discusses “Outstanding Technical Issues” as follows: “From a technical perspective, the DSR does not provide a rigorous analysis of possible environmental effects associated with the project and the significance of those effects. The proposed Carmacks Copper project is a large industrial development in a relatively pristine environment. As such, it warrants a comprehensive assessment of potential environmental and socio-economic effects. A comprehensive assessment for a project of this scale needs a systematic approach to independently and critically identify potential effects, understand the environment/project interactions and evaluate the significance of effects. The DSR does not demonstrate that such an assessment has been completed for this important project. In my view, the DSR does not provide sufficient rationale to support the conclusions and significant outstanding uncertainties remain about the performance of some mine components and the adequacy of some recommended mitigation measures. Some key areas that require further consideration are: Heap Rinsing Process *WC has now clarified that it plans to utilize water treatment plant effluent for the “fresh water” rinses. The range of test work completed by WC indicates that use of water treatment plant effluent is unlikely to provide the same rinsing success because of high total dissolved solids concentrations, especially sulphate. *While some test work has indicated that heap rinsing could be successful with very specific methodologies, the DSR accepts (p. 142) a heap rinsing proposal that is different from that described in the successful test program – one which previous test work has confirmed is unlikely to be successful. A failure of the heap rinsing proposal will lead to substantial changes in the duration of the project and its potential effects, including the possibility of very long-term water treatment requirements. *Overall, WC needs to propose a heap rinsing process that is supported by the results of test work that demonstrates effective rinsing outcomes. Only with this is it possible to understand the potential long-term effects, costs and management requirements for the proposed project. *Even if WC identifies a rinsing process that is consistent with its current test work, it is important to note that no test work to-date has demonstrated the long-term chemical stability of the heap even after successful rinsing. *This demonstrates that substantial additional, independent research and analysis are needed to support the EC’s	

Comment Summary	Consideration for Use
conclusions about potential effects of the Carmacks Copper project and the mitigation required. Heap Leach Water Discharge *The DSR treats the release of effluent from the heap leach facility during operations as an "accident or malfunction." As described in Section 2.2 of my September 12, 2005 report to LSCFN, the facility is NOT a zero discharge facility. The decision by the EC to consider effluent discharge during operations as a malfunction fails to recognize that the water balance estimates relied on average precipitation conditions. Over the mine life, there are likely to be years with above average precipitation. Depending on yearly water balance requirements, these could lead to discharges during mine operation. Such discharges are not malfunctions and need to be considered in detail in mine planning and impact assessment. Waste Rock Physical Stability *Appendix G3 in the Project proposal identified additional programs that WC's engineer recommended to confirm the adequacy of the waste rock storage proposal. No additional information has been provided on the YESAB online registry. In my view, significant uncertainty remains about the performance of this structure and failure could result in long-term water quality and soil stability effects. The DSR does not adequately address this issue and the comments provided in my April 2007 letter report remain relevant. DSR Recommended Effluent Limits – Lorax Report Review *In their report, Lorax concludes that application of discharge limits from the Metal Mining Effluent Regulations (MMER) under the Fisheries Act may not be sufficient to protect the aquatic ecosystem in Williams Creek. However, the DSR references the MMER as appropriate discharge limits and suggests that significant adverse effects can be mitigated by applying such discharge limits. *While it is appropriate for a water licence process to develop discharge standards, this does not reduce the EC's responsibility for consideration of potential environmental effects. This means that they need to understand how the project will affect water quality in the receiving environment – will the water quality in the downstream receiving environment, for example, exceed receiving water guidelines like the CCME guidelines. There is no evidence in the DSR that the EC has analyzed this issue. In fact, the results of the Lorax review suggest that with WC's proposal and standard water licencing practice (use of MMER), there could be effects on the aquatic environment. Because discharges at MMER may cause exceedences of CCME guidelines, they would usually not be considered acceptable in an environmental assessment. If this is indeed the case, it is imperative that the environmental assessment provide bounds on the regulatory flexibility for discharge limits. Metal Leaching from Waste Rock – SRK Report" *SRK concluded that the waste rock is not likely to be acid-generating, as long as transition and sulphide materials are	

Comment Summary	Consideration for Use
not placed in the waste rock dump. However, SRK also advised that the lab test program used for the evaluation "cannot provide a direct prediction of waste rock seepage chemistry" and that "leaching of copper can be expected to occur under non-acidic conditions and this should be incorporated into the predictions of water quality effects for the project." * The potential effects of metal leaching from the waste rock have not been addressed in the supplemental information provided by WC, or assessed in the DSR. In fact, the DSR states that metal leaching from the WRSA "is not expected to occur" (p. 38). * The DSR references a recent commitment to "capping the WRSA to decrease infiltration by precipitation and likelihood of metal leaching" (p. 41, p. 161) but there is no documentation available on the YESAB online registry confirming this commitment or describing a revised waste rock reclamation approach. In fact, the closure cost estimate submitted by WC as part of the supplementary information in October 2007 does not identify costs for covering of waste rock." - the Slater Report also discusses "Socio-Economic Assessment Considerations" as follows: "Costs to LSCFN Government * The DSR acknowledges that the project will likely lead to additional responsibilities for some LSCFN government agencies, especially in the areas of health and social services. These components of LSCFN's government are already under-resourced, but the DSR fails to make recommendations about resourcing requirements. Further responsibilities for LSCFN health and social programs could lead to significant effects in the community unless adequate resources are provided to increase capacity in these areas of government responsibility. Housing for LSCFN Citizens * The project could attract LSCFN citizens back to Carmacks for employment opportunities. If citizens return to Carmacks, they could seek housing from LSCFN. It is my understanding that LSCFN is already facing a shortage of suitable housing. Additional resources may be required by LSCFN to support housing development for citizens who return for employment. Effects of Housing Temporary Workers in Carmacks *The DSR recognizes some significant social issues that may arise for an in-town camp, but proposes that these can be addressed by mitigation measures that include curfews and alcohol bans. These mitigation measures are not likely to be fully effective and the DSR acknowledges opposing views in Carmacks about the camp options. *The EC recommends that WC engage in discussions with LSCFN and the Village of Carmacks to resolve this issue. With strongly opposing views, discussion and resolution of the issue could, on its own, lead to some substantial social effects in the community. Overall, it appears that the evaluation of significance of potential social effects likely depends on the perspectives of various community members. Resolution as suggested by the EC is likely not a workable solution.	

Comment Summary	Consideration for Use
*If the LSCFN is of the opinion that significant adverse effects associated with a transient worker camp in town cannot be mitigated, this view should be expressed to the EC. Compensation for Effects on Trapper * The EC has concluded that the effects on Mr. Sam and his family can be addressed by re-establishment of trap lines in other areas and by compensation. The DSR does not provide information about whether Mr. Sam considers this approach acceptable. It also does not identify mechanisms for ensuring a fair negotiation process between a First Nation elder and a well funded mining corporation. Both of these issues need to be addressed to support a conclusion that significant effects on Mr. Sam, his family and his descendants can be adequately mitigated.	
Selkirk First Nation **Document Number: 2006-0050-148-1/ Date Submitted: 6 February 2008**	
- this letter indicates that the Project lies in an area of overlapping Traditional Territories of Selkirk First Nation (SFN) and Little Salmon Carmacks First nations - states that no consultation was carried out by the Proponent with SFN - questions the environmental management and engineering proposed and SFN is concerned with the contaminants from Carmacks Copper reaching the Yukon River from the Williams Creek/Nancy Lee Creek drainage and downstream effects on salmon and salmon habitat - references the concerns from LSCFN on heap leach operation and closure and expresses the same concerns	Position Information
Selkirk Renewable Resources Council **Document Number: 2006-0050-149-2/ Date Submitted: 6 February 2008**	
- this letter states that the SRRC does not approve of this project suggesting that the risks of mine component failure are to great and that there are potential effects on fish and wildlife - the letter asserts that the Proponent has not provided adequate design and mitigation measures for the heap operation and closure and that ground water and surface water are potentially at risk - provides information that a magnitude 4.8 earthquake had occurred in early 2008 with the epicentre near the Project site and suggests EC revisit statements in the Draft Screening Report (DSR) about low seismicity - expresses concern with the lack of a detailed reclamation and closure plan which fully addresses neutralization/detoxification of the heap and sets out adequate security provisions and that these should have been required for the Screening - states that the EC should take a more critical look at the Project	Information Potential effect
Carmacks Renewable Resources Council **Document Number: 2006-0050-151-1/ Date Submitted: 6 February 2008**	

Comment Summary	Consideration for Use
- this letter expresses concern with the potential for increased hunting activity as the population of Carmacks increases, with the potential for spills from a vehicle accident along the Yukon River through the town and with the potential effects to ground and surface water from the heap – the WRSA – and from mining materials	Information Potential effect
Village of Carmacks **Document Number: 2006-0050-152-1/ Date Submitted: 6 February 2008**	
-this letter asserts that the EC/DSR has not adequately addressed traffic management through the Village of Carmacks in terms of: - the effects and logistics of bridge failure for the Village residents or any contingency plan for them - the costs of traffic management (road maintenance,) signage that would be borne by the Village - the effects on tourism use of the River Drive boardwalk -the letter had an attached Survey of residents views on the Traffic Management Plan which had a 59% response rate and which showed that most residents favoured the By-Pass Option and not the route through town - the letter states a concern that once the survey was submitted no further consultation was conducted in the community	Information Potential effect
Little Salmon/ Carmacks First Nation **Document Number: 2006-0050-159-1/ Date Submitted: 21 February 2008**	
- this letter commends the Executive Committee for addressing concerns around the heap detoxification and closure matters and for work to make the assessment better	Information
Karen Gage on behalf of Carmacks residents **Document Number: 2006-0050-161-3/ Date Submitted: 18 March 2008**	
Carmacks resident, Karen Gage, forwarded an updated petition to the Executive Committee indicating the preference of some community members that the single-status accommodation facility for the transient mine workers be located on site rather than in town. This document includes both the originally submitted petition (March 3, 2008) and the updated petition (March 17, 2008).	Information
Yukon Conservation Society **Document Number: 2006-0050-163-1/ Date Submitted: 5 March 2008**	
- this letter refers to the YESAB/EC commissioned “Technical Review of Heap Closure/Detoxification Issues” Document 162-2 - the key points in the letter are: -“The report claims that the type of ore used in the Catalan work was sulphide ore and therefore the Catalan findings “may not be meaningful” The claim is incorrect. A reading of the Catalan report clearly shows that the ore used was an oxide ore and even specifies that it contained only one tenth of one percent of sulphides. Available information provided by the Proponent indicates that there are some sulphides in the Williams Creek body but identifies it as oxide in the	Information Potential effect Possible mitigation

Comment Summary	Consideration for Use
main. The whole point of the Catalan report is that the work was carried out on a similar type of ore. If it had not been we would not have submitted it. That being so, the conclusions reached by Catalan are valid and “meaningful” and must be dealt with in detail if any conclusion on detoxification is to be reached. -Secondly the report states that although there are no examples of heaps that have been detoxified to date, none have had “active remediation such as sodium carbonate rinsing”. Catalan clearly states that the use of both lime and sodium carbonate were tested during the pilot study and that acid levels rebounded shortly after rinsing ceased. That was one of the main points of his work. -The questions of detoxification and rebounding of acid levels have not been satisfactorily addressed to date by anyone except Catalan. His work points out the problems that must be addressed at the operational scale and points in the direction of solutions. -Despite this report, it still remains completely uncertain that this heap can be successfully detoxified for the long-term. Until a definitive finding one way or the other is made, it will be extremely difficult to propose mitigations that will effectively prevent long-term significant environmental impact. It will also be impossible to recommend a level of required security. We submit that adequate security is the “ultimate mitigation” that assures environmental problems will be dealt with.”	

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