



**Wolverine Project
Yukon Territory**

ENVIRONMENTAL ASSESSMENT REPORT

**Volume 1
Environmental Assessment Report Text**

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and
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Executive Summary

Project Overview

The proposed Wolverine Project is an underground mining project to produce copper, lead and zinc concentrates. The Wolverine Project is located within the Finlayson District in the southeastern Yukon, approximately 280 km east of Whitehorse, 190 km northwest of Watson Lake and 135 km southeast of Ross River, near the headwaters of the Wolverine Lake watershed. The Finlayson area is within the Kaska First Nation traditional territory; traditional use of the project area is within the territory of the Ross River Dena Council (RRDC).

Yukon Zinc Corporation (YZC) has a 100% interest in the mineral claims that comprise the Wolverine Project. YZC is committed to the development of an environmentally and socially responsible project, which optimizes benefits to the Yukon Territory and its people. In order to reduce project-related effects, the project has been designed to minimize the geographic extent of disturbance and for eventual permanent, passive closure. The site will be reclaimed in accordance with site-specific criteria in a planned and timely manner.

In late 2004, YZC submitted the project to regulators through filing a project description report. Both a Type A Water Use License, pursuant to the *Yukon Waters Act*, and a Yukon Quartz Mining License, pursuant to the *Quartz Mining Act*, are required for project development. Accordingly the project triggered an environmental assessment under the Yukon Environmental Assessment Act. YZC will comply with the requirements of all relevant territorial environmental acts and associated regulations during all project phases.

In July 2005, YZC signed a Socio-Economic Participation Agreement (SEPA) with the RRDC that provides a basis for participation by all Kaska in project exploration and development activities. YZC has entered into a Traditional Knowledge Protocol Agreement with the RRDC to ensure that traditional knowledge is not compromised in any way by project activities.

The property was originally staked in 1973 and over the past two decades extensive exploration has been conducted. Following receipt of a Class B Water License and Mining Land Use Permit, YZC commenced with a test mining program and detailed infill diamond drill program in June 2005. Existing infrastructure includes the portal and underground development as well as the existing airstrip, exploration camp, portal laydown areas, water treatment sumps, temporary waste rock pad, explosives storage areas, and the exploration trails and roads. The proposed project includes an underground mine with surface ramp access that produces 1250 t/d of mill feed ore.

The major components of the proposed Wolverine Project are as follows:

- A new 25.2 km long gravel access road between the Robert Campbell Highway and the mine site. The road starts at a new fenced staging yard, to be constructed adjacent to the highway, and then travels south, parallel to Light Creek, then diverges north west away from Money Creek Towards the mine site. Metal concentrates will be trucked via the Robert Campbell Highway to Watson Lake, and on for ultimate delivery to the existing Stewart Bulk Terminal at Stewart, BC. Concentrate transportation is via ocean freighters to smelters in Asia.
- Two main buildings within the industrial complex. The primary building will include the dense media separation plant, infrastructure for ore crushing and processing, the paste backfill plant, and the water treatment plant. The secondary building will include a heavy equipment maintenance shop, warehouse space, mine and administration offices, emergency response station and dry facilities.

- A 150 person capacity camp consisting of modular housing units, a dining hall, recreation facilities, a sewage treatment plant, utilidors and walkways, and parking facilities.
- Diesel, gasoline and propane fuel storage and dispensing facilities in the industrial complex in a contained area, with provision of secure space for short-term storage of hazardous materials pending offsite recycling or disposal.
- Power generation consisting of diesel gensets in the industrial complex and a distribution system of poles and lines throughout the property.
- Borrow areas to supply material for constructing the tailings dam. Borrow areas are located within the tailings impoundment and north of the airstrip.
- An incinerator to dispose of organic wastes, a non-hazardous waste landfill site and a landfarm, for the treatment of petroleum contaminated soils that may accrue during the mine's operation life.
- A tailings facility in the Go Creek watershed to enable the permanent storage of 1.25 Mt tailings and 1.68 Mt waste rock. The tailings impoundment will be formed with one L-shaped dam equipped with a seepage collection pond from which seepage will be pumped back into the tailings impoundment.
- Onsite haul roads between the camp, the industrial complex, the waste rock pad and the tailings facility.
- A temporary waste rock dump that will be decommissioned within the first two years of operation.
- Ancillary facilities including assay lab, freshwater wells for potable and process plant make up water, pumping facilities and pipelines for fresh, tailings, slurry and reclaim water, and explosives storage.

Off site activities with related facilities include air access to the mine from existing airstrips in Whitehorse, Ross River and Watson Lake; use of the Robert Campbell Highway, the Alaska Highway and the Stewart-Cassiar Highway by concentrate haul trucks, and use of the existing concentrate storage and ship-loading facilities at the Port of Stewart.

Initial construction activities are planned to commence in summer 2006 and will include the establishment of quarries for construction materials, construction of the access road, and site grading and construction of the industrial complex, camp, and tailings facility sites. Construction activities will be completed by the fall of 2007. The extraction and processing of ore will begin in fall 2007. Based on the assumed resource of 5 Mt, mining will occur until 2019 with closure decommissioning shortly after. The extent of the mineable reserves is not fully known and an extended mine life is possible.

Ore will be mined from the Wolverine and Lynx deposits via an adjusted drift and fill mining method in conjunction with uphole slashing. The total material movement over the mine life is estimated at 8.34 Mt. Over the 12 year operating period an estimated 6.40 Mt of ore and 1.94 Mt of waste rock will be extracted. A total of 2.93 Mt of tails, dense media separation (DMS) rejects and waste rock will be stored in the tailing facility. 4.01 Mt of backfill will be developed and placed, using the balance of the waste. Approximately 1.4 Mt of concentrate will be trucked to smelters. Ore processing will involve crushing, dense media separation, and two-stage grinding followed by differential flotation processes to produce zinc, copper and lead concentrates.

Process water will be reclaimed from the tailings facility and recycled for use in the process plant. The facility will operate in a water surplus requiring an annual release of effluent into the receiving environment. Treated effluent meeting MMER Guidelines will be pumped on a controlled basis to Go Creek below the confluence of Hawkowl Creek, and ultimately into Money Creek. A high-density sludge water treatment plant of proven technology will be used to treat underground mine water and the excess tailings water during the operations phase. Sludge from the water treatment plant will be placed into the tailings impoundment. During closure, the mine will be flooded and water treatment will be limited to the

tailings effluent. The water treatment plant will continue to operate until the tailings facility pond water reaches acceptable discharge water quality (predicted to be less than 10 years).

Due to the timing of the EA Report submission in relation to field data collection and analysis, and ongoing process and test work, additional supporting documentation will be prepared and submitted in an EA Report Addendum in early January 2005, or made available to interested reviewers, as requested. These supporting documents will include the results of benthic invertebrate and periphyton sample analysis from the summer 2005 sampling program, as well as geochemistry results. In addition, the RRDC Traditional Knowledge Oversight Committee will submit a companion document on Traditional Knowledge specific to the Wolverine Project.

This EA Report addresses the information requirements laid out in the Guidelines prepared by the Executive Council Office (2005).

Environmental Setting

The project location is in the Campbell Range, at the easternmost limit of the Pelly Mountains and abuts the broad Yukon Plateau to the north and east. The area consists of rolling, glacially scoured mountains with no significant peaks. Elevations on the property range between 1200 and 1300 m. The main valleys are wide and U-shaped. Glacial till covers the majority of the lower lying valleys and there is significant infilling by post-glacial sediments.

The minesite and industrial complex are located on a gentle sloping subalpine rider in the pass between the Go Creek/Money Creek watershed to the south and the Wolverine Creek watershed to the north. Money Creek flows east to Frances Lake, in the Liard River drainage. Wolverine Creek flows north to Wolverine Lake, which in turn drains, via Nougha Creek, to the Finlayson River.

The airstrip, proposed tailings facility and camp infrastructure are situated near the headwaters of Go Creek. The haul road route runs southeast from the mine area, traversing the upper Go and Hawkowl Creek watersheds, turning northeast through the Chip Creek and Bunker Creek basins of Money Creek. The northern third of the route parallels then crosses the Light Creek drainage, another tributary of the Finlayson River, before joining the Robert Campbell Highway. The only disturbances to the drainage basins in the project area occur as a result of mine activities at the project site and the Robert Campbell Highway (in lowermost reaches of basins).



Figure 1 Looking Northwest from the Mine Site Across the Broad Wolverine Lake Valley

Vegetation

The project area and surroundings are rich in wildlife habitat. Vegetation in the project area ranges from open forest on lower elevation areas to dwarf shrub, herb, grass and lichen ecosystems at high elevations in the alpine. The majority of the mine site is within the subalpine zone, and the proposed mine access road route is mainly in the boreal highland zone with some subalpine zone incursions. These zones are dominated by open forests of sub-alpine fir, black and white spruce, and lodgepole pine. Willow and scrub birch are common in riparian areas, areas with recent fire history, and steeper upland areas.

Aquatic Ecosystems

The aquatic ecosystems in the project area are generally typified by cold, clear and clean water. Wetlands abound and many small streams occur in the area. Waters in the upper drainage areas affected by the project, with the exception of Wolverine Lake, do not appear to support substantial fisheries. Wolverine Lake and Little Wolverine Lake, have been designated Conservation Waters and are regulated as a barbless hook fishery. Go Creek, Money Creek, Bunker Creek, Chip Creek and Light Creek all have limited to no fisheries potential.

Wildlife

A variety of wildlife species live in or pass through the project area. The project area lies at the outer edges of the range of the Finlayson Caribou herd. Moose abound, as do small furbearers, in the project area. Grizzly bears and to a lesser degree Thinhorn sheep are occasionally seen in the project area.

Environmental Protection Measures

Environment protection has guided project design in several ways:

- The underground mine has been designed to generate only limited temporary surface storage of waste rock in order to minimize the disturbance footprint.
- Planning and design of all facilities has been undertaken to minimize effects on the sensitive Wolverine Lake basin. No contaminated drainage or effluents will be discharged to surface waters in this drainage.
- In order to minimize discharge to surface waters and to reduce process make up water requirements, the site water balance employs re-circulation of process, mine water and site drainage waters.
- Water management and treatment design has been guided by existing surface water quality in the project area and CCME Guidelines for protection of aquatic life.
- The tailings facility has been designed with abundant storage capacity providing flexibility for seasonal discharges and minimizing potential environmental effects.
- Progressive backfilling of waste will neutralize acid rock drainage and monitoring of groundwater during operations and will allow for the assessment of mitigation effectiveness and refinement of mitigation measures prior to mine flooding and closure.
- Tailings and waste rock will be permanently stored under water ensuring effective management of ARD at closure. Testing and treatment of decant water, as required during project decommissioning will ensure protection of surface waters until stabilization is confirmed.
- The mine access road route has been selected with the objective of minimizing effects on the aquatic ecosystem. Much of the route is located in headwater basins with minimal habitat value, and is well removed from potential or confirmed fish bearing reaches.
- Access control and strict policies concerning wildlife protection during the life of the project will minimize the risk of access-induced wildlife disturbance, impediments to movement or mortality.

Assessment Findings

Aquatic Habitat

Project effects on instream flows will be limited to:

- Reduced baseflow in upper Wolverine Creek during mine operations due to mine dewatering.
- Increased flows in Go Creek due to treatment and diversion of minewater from the Wolverine drainage.
- One time flow reduction in upper Go Creek during construction to commission the tailings facility.

No significant adverse effect on instream fish habitat is expected.

Metals and nitrate levels will be elevated above baseline conditions for a short section of Go Creek between the effluent discharge downstream of Hawkowl Creek and Money Creek. Baseline metals levels in Go Creek at times exceed CCME guidelines for protection of aquatic life. Site-specific water quality criteria for protection of aquatic life will be established at the baseline monitoring site above the Money Creek confluence in consultation with the Yukon Water Board. Accordingly no toxic effects on aquatic biota or fisheries are expected. Environmental effects monitoring (EEM) will track trends in metals levels in waters and stream sediments. Increasing trends will trigger additional monitoring of fish and plant tissue to assess risk of bioaccumulation and to guide adaptive management (improved treatment), if necessary. No significant effects on water quality or fish in Go Creek are expected.

At closure, groundwater flows through the backfilled mine workings could potentially mobilize metals due to ARD and metal leaching. Potential effects will be mitigated by paste backfill employing cement to neutralize and precipitate metals and restore pre-mine conductivity. Progressive backfill during operations will allow monitoring to test effectiveness of mitigation measures and guide adaptive management, if necessary. Groundwater with elevated metals levels could potentially discharge to surface waters in Wolverine Creek or Little Wolverine Lake following closure. Potential effects could be reduced by dilution in the groundwater and surface waters. Metal concentrations in the Wolverine Lake drainage are naturally elevated due to the mineralization in the area. Based on existing conditions in Wolverine Creek, expected mitigation effectiveness, monitoring during operations and opportunities for adaptive management, no significant effects on water quality or fish are expected in lower Wolverine Creek or Little Wolverine Lake.

Wildlife

The project results in disturbance of a relatively small area within a region that is rich in wildlife habitat and very little existing disturbance, apart from the Robert Campbell Highway. Using conservative assumptions about the size of the project disturbance footprint, effects on habitat availability for all valued species assessed are expected to be low in magnitude and therefore not significant.

Barrier effects to wildlife movement are predicted to be low. The project is on the perimeter of the Finlayson Caribou Herd Range. Concentrate haul south to Watson Lake will avoid potential effects on intensely utilized caribou range to the north. The relatively narrow right-of-way for the access road and low level of traffic will allow wildlife to cross with little impediment. Accordingly effects on wildlife movement patterns are expected to be not significant.

Potential wildlife mortality due to wildlife collisions and hunting on the access road is a concern. Mitigation measures to manage hunting/collision mortality will be implemented as part of the Environmental Protection Plan:

- Access to the private mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning and closure phases of the project.
- Firearms will not be permitted.
- Hunting and fishing will be prohibited at all times on or in the vicinity of the project site.. This restriction will apply to all mine employees, managers and contractors. It will be in effect throughout the life of the project from construction through to closure and reclamation. Infringement of this policy is to be reported. This hunting and fishing prohibition has been in place successfully during the latter part of the exploration phase of the project.
- Fuel haul and concentrate haul volumes will not exceed 13 round trips per day on the proposed mine haul road. Incidental traffic will be kept minimal with air access to the mine predominating.
- Maximum speed limit on all access roads will be set at 60 km/hr.

- Any observed wildlife corridors will be signed to alert drivers to potential wildlife crossings.

Any mortality on the access road will be recorded and reported and any modifications to the mitigation measures will be considered in consultation with YTG, as required. Based on the effectiveness of these mitigation measures, effects of the access road on wildlife mortality during construction, operations and decommissioning are expected to be of low magnitude and not significant.

At closure, the access road will remain in place and it is assumed that responsibility and authority for the road will pass to the Ross River Dena Council. If public use of the mine access road is allowed post closure, there is a risk of increased mortality to the Wolverine-Fire Lake moose population from legal and illegal hunting. An increase in mortality in excess of the 2 to 3 percent (the allowable rate for sustainability of the population) could result in a significant adverse effect on the moose population. There are various mitigation options that could be employed at closure to mitigate this effect. These include:

- Close and decommission the access road
- Restrict road access onto the access road
- Limit hunter harvest for moose in the localized area surrounding the access road
- Establish no hunting zones for moose in the localized area surrounding the access road
- Conduct regular enforcement monitoring in the local area, including on and surrounding the road

If adequate mitigation measures to decrease mortality risk to moose are established following closure, this residual project effect of the access road is expected to remain not significant.

Socio-Economic

The Wolverine Project is located in a geographically isolated and sparsely populated area of the Yukon and within the Kaska First Nations Traditional Territory. The communities in the project area include Ross River, Faro, Watson Lake and Whitehorse. They are linked by key highways including the Robert Campbell Highway and Alaska Highway and are serviced by regularly scheduled and charter air services.

The Wolverine Project will be under construction between August 2006 and October 2007, at a capital cost of approximately \$127 million. Construction will require more than 284 person years of employment with a peak number of 150 workers housed in the camp, located near the mine. It is planned to source as many construction workers locally as possible. Construction activity will account for about 5.2% of Yukon's GDP and will yield almost \$11 million in taxes to governments in Yukon. The company will employ 191 workers to operate and maintain the project in addition to 39 contract truckers and related maintenance workers. In total the mine operations will annually account for about 2.3% of the Yukon GDP or about \$25 million increase in GDP annually and will result in 382 additional direct and indirect jobs.

Yukon Zinc Corporation is committed to sourcing workers and providers of goods and services for the Wolverine Project in the Yukon, wherever that is commercially feasible. In addition, the company is committed to ensuring the modest increase in road traffic resulting from concentrate haul and incidental travel has little or no effect on orderly traffic flow and traffic safety.

Lastly, although many Yukon residents will be employed at the mine, the company will work to ensure that First Nations employees in particular will have opportunities to balance traditional pursuit on the land with participation in the wage economy.

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