

# Mactung Mine Project

## Economic Impact

## Analysis Report

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### 1.0 Introduction

This report presents the results of a local economic impact analysis of the proposed Mactung mine project in Yukon Territory undertaken on behalf of Yukon Economic Development. North American Tungsten Corporation Ltd. (NAT) is the Mactung mine project proponent.

The analysis focused on two economic impacts resulting from the proposed development and operation of the mine:

- 1) The net change in expenditures on Yukon Territory labour, goods and services.
- 2) The net change in employment in Yukon Territory, expressed in person-years of employment created.

The scope of work of the analysis engagement included:

1. Adapting an Excel-based economic impact analysis model, developed by Informetrica Ltd., for use in analyzing mine development projects.
2. Gathering and analyzing data, interpreting results and reporting on the local (Yukon) economic impact of the proposed Mactung tungsten mine.
3. Presenting the analysis results and findings to Yukon Economic Development.

Section 2.0 of this report presents the economic impacts calculated by the economic impact analysis model and summarizes the data entered into the model.

Section 3.0 of this report provides the key elements and aspects of the proposed Mactung mine project scenario upon which the economic impact analysis is based. Section 4.0 presents our assumptions and findings from the analysis of this scenario and section 5.0 identifies potential limitations on the results of the impact analysis.

Section 6.0 describes our methodology for gathering and analyzing data used in the local impact model.

We wish to thank and acknowledge the cooperation and assistance we received from North American Tungsten Corporation Ltd. personnel in Vancouver and Whitehorse.

## 2.0 Analysis Summary

This section presents the economic impacts calculated by the model and summarizes the key data entered into the economic impact analysis model.

### Calculated Impacts<sup>[1]</sup>

	Direct Effect	Indirect Effect	Induced Effect	Total Impact
<b>Local Expenditure Impact</b>				
Net Contribution to YT Economy	\$116,251,814	\$195,905,033	\$87,403,917	\$399,560,765
<b>Local Employment Impact (Person-Yrs)</b>				
Net Contribution to YT Economy	1,922	3,933	1,755	7,611

[1] For the construction and operating phases of the Mactung mine

### Key Data

- 2,000 tonne per day mill feed rate.
- Capital expenditures of about \$289 million during the 2½ year mine and site construction phase.
- 20-year mine operating life.
- 294 people employed by the proponent organization and contractors during operation.
- Gross labour expenditures of about \$550 million over the life of the mine.
- Operating expenditures over the life of the mine:

	\$ millions
Materials (operating & maintenance supplies, freight and backfill)	323
Fuel oil, gas, diesel	370
Catering [excluding labour]	33
Airline service [excluding labour]	54
Maintenance (roads, airport, surface R & M supplies, misc.) [excluding labour]	57
Environmental and tailings management	42
Site services, general and administration	53
Concentrate sales and freight [excluding labour]	48
Vancouver/Whitehorse office operation	62
Total	\$1,046

### 3.0 Mactung Mine Project Scenario

This section presents the key elements and aspects of the proposed Mactung mine project scenario upon which the economic impact analysis is based.

- .1 The majority of information entered into the economic impact analysis model was taken directly from North American Tungsten Corporation's *Mactung Project Economic Update* document that was made available to us for review during our visit to the North American Tungsten Corporation office in Vancouver.
- .2 North American Tungsten Corporation currently operates the Cantung tungsten mine — located in the same region as the proposed Mactung mine site. Selected data from the Cantung operation was provided to us and used to guide assumptions about the Mactung operation.
- .3 Additional information was provided to us verbally by North American Tungsten Corporation personnel.
- .4 The local economic impact analysis is based on Case 3, as described in the *Mactung Project Economic Update* document. Case 3 has the following elements and aspects:
  - a) 2,000 tonne per day mill feed from the Mount Allan deposit.
  - b) Capital assets are established during a 2½ year mine and site construction phase.
  - c) 20-year mine operating life: 10-year underground mine life followed by a 10-year long hole plus cut and fill mining method.
  - d) Electrical power generation plant and distribution system.
  - e) Mill plant.
  - f) Water distribution system using local water supply.
  - g) Waste water treatment.
  - h) Tailings storage at mine site.
  - i) 160 person camp.
  - j) 21 days in, 21 days out rotation; 12 hours per day
  - k) Personnel and visitors will be flown to and from an airstrip near the mine site and transferred to and from the mine site by ground transport. Two existing airstrips are being considered: 1) MacPass, YT, and 2) Tischiu River, NWT.
  - l) Tungsten concentrate in 2-tonne bags will be transported by truck (approximately two per day) to a staging site (e.g., Watson Lake) for massed transport to a concentrate processing facility. Two road-access-to-site options are being considered: 1) via a proposed new road intersecting the North Canol Road near the MacPass airstrip, and 2) via an existing access road intersecting the North Canol Road about 2.5 km north of the YT-NWT border.
  - m) Regional infrastructure upgrades and maintenance will be provided by others.

### 4.0 Assumptions and Findings

- .1 The Local Impact Model (LIM) requires the analyst to define the boundaries of the "local" area of interest. For this analysis, Yukon Territory is defined as the local area.
- .2 The LIM Handbook notes that “the economic impact model is tailored mainly for assessing the impacts of a single organization for a single year”. For this analysis, the "period of interest" is defined as the estimated duration of the mine construction phase (2½ years) plus the estimated duration of the mine operating or production phase (20 years).
- .3 All operating revenues from the Mactung mine will be derived from the sale of two tungsten products: gravity concentrate and flotation concentrate. These sales represent non-local sources of revenue. For the period of interest, total revenue from concentrate sales is estimated to be about \$2.25 billion — about \$1.77 billion for the gravity concentrate and about \$484 million for the flotation concentrate.
- .4 North American Tungsten Corporation advised that they may also be able to generate non-local revenue by optioning out mineral claims to other companies. No revenue from this source was included in the analysis.
- .5 The net local expenditure impact over the period of interest was calculated to be about \$400 million. Of this, about \$116 million was calculated to be an expenditure on local labour (direct effect); about \$196 million was calculated to be a local non-labour expenditure (indirect effect); and about \$87 million was calculated to be an induced effect from the expenditures on local labour, goods and services.
- .6 The net local employment impact over the period of interest was calculated to be approximately 7,610 person-years of employment. Of this, about 1,920 person-years was calculated to be a direct effect; about 3,930 person-years was calculated to be an indirect effect; and about 1,750 person-years was calculated to be an induced effect.
- .7 The Local Impact Model requires that labour and non-labour expenditures be separately stated. The LIM Handbook notes that “non-labour expenditures include all payments to businesses for goods and services, and capital expenditures (i.e., construction and machinery and equipment)”. Anticipated capital expenditures by North American Tungsten during the construction phase of about \$289 million were included in the economic impact analysis.

- .8 A key assumption used to calculate net local impact is the percentage of local workers employed directly by the project proponent. The current percentage of Yukon Territory workers at North American Tungsten's Cantung mine site (about 27%) was assumed to reasonably represent the percentage of local workers that could be expected at the Mactung mine site for analysis purposes. A North American Tungsten representative advised that the percentage of Yukon Territory workers employed is often limited by the availability of qualified personnel.
- .9 The Local Impact Model requires that information about the number of contractors, the gross wages and salaries paid to contractors and the total number of paid hours worked by contractors be identified. However, the term "contractor" is not formally defined, or used consistently, in the LIM Handbook.

To differentiate between "contractor" labour expenditures and non-labour expenditures (which the LIM Handbook describes as all payments to businesses for goods and services and which may have a labour component) the following criteria were established:

- a) Contractors are directly involved in the proponent organization's ongoing operations.
- b) Contractors include persons engaged by the proponent organization under a business-to-person contractual arrangement.
- c) Contractors include persons who are owners or employees of a business that is engaged by the proponent organization under a business-to-business contractual arrangement.

Using this criteria, the following activities were considered to be performed by contractors:

- a) Mine development and mining, e.g., drilling, blasting, rock bolting.
- b) Camp catering, i.e., provision of food services.
- c) Trucking, i.e., transport of tungsten concentrate from the mine site to the staging location; transport of materials from Watson Lake or Whitehorse to the mine site.
- d) Heavy equipment services, e.g., road and site maintenance, hauling of ore from the mine to the mill, hauling of tailings.
- e) Airline services, e.g., flying personnel and visitors to and from an airstrip near the mine site.

The wage and salary component of the total expenditures on these contractors was estimated and included as contractor fees in the economic impact model. It was assumed, on average, that 65% of contractor wages and salaries would be earned by Yukon-based workers.

- .10 Businesses and individuals involved in capital projects or other infrequent activities were not considered to be contractors for purposes of this economic analysis. Thus, the total expenditure (labour and non-labour) on legal, engineering, consulting, audit or other professional services and on support services such as assaying and equipment or machinery replacement or repair were treated as non-labour expenditures.
- .11 The LIM Handbook notes that “Many construction projects likely generate additional infrastructure development, such as building and upgrading of roads and electricity and other utilities. If these additional infrastructure requirements are not paid for by the project, they are considered ancillary expenditures. These expenditures serve to make the local economic impact even greater.”

North American Tungsten is seeking assistance for new and upgraded regional infrastructure. This includes upgrading the ferry crossing at Ross River, a new Pelly River bridge crossing, upgrading of about 250 km of the North Canol Road, year-round maintenance of the North Canol Road, lengthening of the MacPass air strip to 1300 meters and evaluation of alternative power sources. About \$1.2 million for Canol Road upgrades was included in the capital expenditure amount noted above. Costs for other infrastructure construction or upgrades were not available and their potential net impact are not reflected in the results of the economic impact analysis.

- .12 The Local Impact Model requires that the local percentage of non-labour expenditures be estimated using the criteria of: “If payment is made to an office located in the community, it counts as a local expenditure.” The percentages selected and used in the analysis were based on the type of expenditure and on assumptions about the potential expansion of existing local businesses (e.g., trucking, airline) and start-up of new local businesses (e.g., catering).
- .13 The following table presents the retained expenditure share factors developed for the analysis based on information provided by North American Tungsten Ltd. and industry practice. The expenditure share factors are listed by type of non-labour expenditure. Local expenditure shares represent the portion of spending transactions that occur within the Yukon. The import leakage factors account for the reality that even if project inputs are purchased within the Yukon, local suppliers have themselves imported the inputs into the territory for sale to the project proponent. Local expenditures shares are multiplied by the import leakage factors to arrive at the retained expenditure shares which indicate the portion of project expenditures that are ultimately retained in the Yukon economy.

<b>Non-Labour Expenditure Type</b>	<b>Local Expenditure Share (%)</b>	<b>Import Leakage Factor (%)</b>	<b>Retained Expenditure Share (%)</b>
Materials (operating & maintenance supplies, freight and backfill)	50	80	10
Fuel oil, gas, diesel	80	95	4
Catering**	95	60	38
Airline service**	80	60	32
Maintenance (roads, airport, surface R & M supplies, misc.)**	95	20	76
Environmental and tailings management	80	40	48
Site services, general and administration	60	80	12
Concentrate sales and freight**	85	60	34
Vancouver/Whitehorse office operation	20	80	4
Capital	50	80	10

Note: \*\* excludes labour expenditures

- .14 The Local Impact Model requires that an Income Multiplier be selected and applied to enable calculation of induced expenditures. The LIM Handbook includes a set of income multipliers that correspond to ranges of community populations. The Handbook, however, also cautions that “as the income multipliers provided with the model are designed to estimate economic impacts at the community level, the model is less well suited for applications involving larger geographic regions.”

An Income Multiplier of 1.28 was selected and used for the economic impact analysis. This multiplier corresponds to a community population range of 10,000 to 25,000. Although the population of the local analysis area, Yukon Territory, is somewhat greater than 25,000 it was reasoned that the population outside of Whitehorse is sufficiently dispersed to warrant using a more conservative income multiplier value.

### 5.0 Limitations

Readers of this report should note the following potential limitations or constraints on the results of the analysis:

- .1 The analysis was based on North American Tungsten Corporation's development and operational scenario that it currently considers most likely to occur. Additional technical and economic analysis by North American Tungsten Corporation may result in actual mine development based on a revised or alternative scenario.
- .2 Information provided by North American Tungsten Corporation is considered preliminary and is subject to revision.
- .3 Disclosure of information by North American Tungsten Corporation for this analysis is potentially constrained by National Instrument 43-101 disclosure requirements.
- .4 Cost information obtained from North American Tungsten Corporation was not adjusted for inflation, price escalations or other factors.

### 6.0 Analysis Methodology

Our methodology for gathering and analyzing data included:

- .1 Development of an Information Breakdown Structure that graphically shows the information required to be gathered from the proponent organization.
- .2 A teleconference with North American Tungsten Corporation representatives to explain the Local Impact Model, to review the Information Breakdown Structure, to determine the availability of the requested information and to establish an approach for gathering data.
- .3 Visiting the North American Tungsten Corporation office in Vancouver to review project documents and extract relevant information, to discuss project details and to enter data into the economic impact analysis model.
- .4 Completing and verifying entry of data into the economic impact analysis model.
- .5 Reviewing with North American Tungsten Corporation representatives the data entered into the economic impact analysis model and any assumptions made to determine if the information entered fairly represents the currently proposed project scope, operating scenario and costs.