Mackenzie Valley Land and Water Board
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December 27, 2018 File: MV2018L8-0007

Pierric Lepert
Eiffage Canada
3455 Landmark Road
Burlington, ON L7M 1T4 Email: pierric.lepert@ic2i.ca

Dear Pierric Lepert:

Water Licence Application – Incomplete
Pine Point Bridge – Rehabilitation

The Mackenzie Valley Land and Water Board (MVLWB or the Board) received your application for a Water Licence on December 21, 2018. Your application has been reviewed and found to be lacking sufficient information to conduct a preliminary screening. For this application to be considered complete, the following information must be submitted to our office:

1. A copy of your current Certificate of Corporate Registration from the Government of the Northwest Territories (GNWT).

2. To demonstrate eligibility to conduct these activities, provide proof of access, and other applicable agreement(s), from the GNWT – Department of Infrastructure (INF).

3. Contact the GNWT-INF to discuss the development of a closure cost estimate. Applicants are strongly encouraged to use the attached template and supporting guidance document to calculate a closure cost estimate.

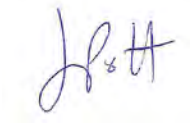
4. Sign and date the Application form.

5. Submit an Application fee, in the amount of $30.00, to the Board office. Please make all cheques payable to the Receiver General for Canada.

Upon receipt of this information, your application will be reviewed in accordance with the *Waters Act* and the *Mackenzie Valley Resource Management Act.* For further assistance, please refer to the *Guide for Completing Water Use Applications to the Mackenzie Valley Land and Water Board* available on our website at www.mvlwb.ca/mv under "Forms and Guides".

If you have any questions or concerns, please contact me at (867) 766-7468 or email jpotten@mvlwb.com.

Yours sincerely,



Jen Potten
Regulatory Coordinator

Copied to: Wendy Bidwell, GNWT-ENR Inspector
Stu Niven, GNWT-INF
Cameron Jackson, EDI Dynamics

Attached: Security Worksheet Template: RECLAIM 7.0 – March 26, 2014
Reclaim User Manual

RECLAIM 7.0

USER MANUAL

MINING VERSION

Revised November 2017

Government of
Northwest Territories

RECLAIM 7.0

USER MANUAL

MINING VERSION

Prepared for: Government of the Northwest Territories

Prepared by: Brodie Consulting Ltd.
Revised: November 2017

This manual supports the RECLAIM 7.0 Model for Closure and Reclamation Cost Estimates.

Table of Contents

1 Introduction

RECLAIM has been developed by Brodie Consulting Ltd. (BCL) on behalf of the Government of the Northwest Territories (GNWT) to assist the GNWT, the Land and/or Water Boards, and other stakeholders (typically proponents) to estimate closure and reclamation costs (the "closure cost estimate") at mines and advanced mineral explorations projects in the Northwest Territories (NWT). The model format is specifically designed to help these parties to better comprehend the multiple components of mine site closure cost estimates. These estimates are intended to cover government liabilities associated with authorized development projects in the NWT.

Until such time as the GNWT issues its own Policy for Closure and Reclamation Cost Estimates, GNWT adheres to Indigenous and Northern Affairs Canada's (INAC) *Mine Site Reclamation Policy for the Northwest Territories*, 2002.

Presently, the authority for setting security in the NWT rests with the Gwich'in, Sahtu, Wek'èezhìi, and Mackenzie Valley Land and Water Boards (in the Mackenzie Valley) and the Inuvialuit Water Board (in the Inuvialuit Settlement Region). The Minister determines the form of security.[1] The Land and/or Water Boards are also guided by INAC's *Mine Site Reclamation Policy for the Northwest Territories*, which states that: "The recognized methodology for calculating reclamation costs for the purposes of financial security, should be the RECLAIM or some other appropriate model." The Land and Water Boards rely on the GNWT to develop and maintain the RECLAIM Model and User Manual.

This User Manual includes descriptions of:

- Considerations for closure cost estimates in northern settings (Section 2);
- How different parties may approach the cost estimate for a given site (Section 3). An understanding of the perspectives may help resolve differences in the estimates prepared;
- The RECLAIM Model and guidance on how to use it (Section 4 and 5), which includes:
    - RECLAIM Model Worksheets (Section 4.1 to Section 4.5);
    - Data entry into spreadsheets (Section 4.6-4.8); and
    - Menu descriptions (Section 5).

2 Considerations for Northern Settings

It cannot be over-emphasized that in order to derive an accurate closure cost estimate it is imperative that the company have a Closure and Reclamation Plan that demonstrates a comprehensive understanding of the closure and reclamation requirements and objectives and scope of work to achieve those objectives. The first step to using the

[1] Waters Act, s 35(1); MVRMA s 60(1.1)

RECLAIM Model effectively is to prepare a comprehensive Closure and Reclamation Plan with sufficient detail to list and quantify the activities required.

Factors that should be recognized when developing a Closure and Reclamation Plan and closure cost estimate for a site in northern Canada are discussed below:

- Low Unit Costs typically apply to work that is conducted in large volumes using appropriate equipment. However, in northern Canada efforts to reduce mobilization costs to remote sites may result in some work being conducted with non-optimal equipment.
- Some activities are best conducted in summer, such as placement and compaction of soils, while others may require winter (i.e. frozen) conditions for trafficability reasons. As such, reclamation activities may need to be extended over several seasons at some northern sites.
- Productivity of people and equipment is reduced in winter conditions.
- Fuel costs can be high due to the cost of mobilizing fuel to site.

3 Proponent Operating Costs vs. Security Estimate

There are important differences in the types of cost estimates that may be prepared by a proponent or a regulator. These are described as follows:

3.1 Company Operating Costs – Internal Use

A proponent's estimate for internal use presents the costs the company expects to incur as part of the development project and is typically based on operating costs. The estimates may be derived to assess the viability of the mine or for corporate cash flow accounting. Typical factors which may affect this type of estimate are:

- Low Unit Costs are generally utilized as it is assumed that the work will be conducted under the direction of the mine manager utilizing existing staff and equipment.
- Equipment Unit Cost may exclude capital cost of the equipment as it may have been discounted to zero during operations.
- Equipment productivity may be assumed to be relatively high due to familiarity with working conditions on the site.
- Salvage and sale of equipment is typically included in a company's internal estimate to off-set costs.
- A low contingency may be applied based upon the assumption that the mine development and closure activities will proceed as planned without upsets or deviations.

3.2 Security Estimate

A security estimate is assumed to cover the government's costs for closure and reclamation should the company become insolvent and abandon the site. Costs are therefore inherently higher than a proponent's operating cost estimate described above.

Typical factors which may affect this type of estimate are:

- Unit Costs are based on third-party contractors conducting all of the work.
- Mobilization costs are included for every piece of equipment or machine required for the work (i.e. does not assume that existing mine equipment is available and in good working condition, see Section 4.3.2).
- There is no allowance for salvage or sale of equipment.
- The closure costs are not reduced for progressive reclamation work until after the work has been completed and it is demonstrated that it meets the approved closure objectives.
- A provision is included for interim site care and maintenance to address the period of time between the ceasing of operations and the commencement of closure work. Based on recent mine closure for which the company has become insolvent, this period of interim care and maintenance would be a minimum of 2-3 years. Additional time could be required if a final Closure and Reclamation Plan has not been approved and/or there are complex issues that still need to be addressed.
- A contingency is applied that reflects the degree of uncertainty in the Closure and Reclamation Plan (i.e. address key areas of uncertainty in closure options until such time as the preferred option is demonstrated or verified during the life of the project).

3.2.1 Salvage Considerations

GNWT does not recognize salvage value because of the problems associated with creditor's rights, sale of equipment, and uncertainty as to the actual value at the time of insolvency.

3.2.2 Progressive Reclamation Considerations

Mine reclamation cost estimates are prepared assuming that progressive reclamation is not conducted. Until this work is completed it is still an outstanding closure cost (i.e. government liability) just like any reclamation which is put off until final closure of the mine. Therefore, financial security should cover the costs to complete this work as proposed. If the company carries out progressive reclamation during operations as proposed, such as revegetation of disturbed areas during operations, then the closure cost estimate could be reduced by the associated costs for that component when the company demonstrates that the closure activity has been successfully completed and closure objectives and criteria have been met.

4 RECLAIM v.7.0

4.1 General Description

RECLAIM is a model developed in Microsoft EXCEL to aid in the calculation of costs associated with each activity required to meet the objectives of the Closure and Reclamation Plan. It provides line items for each reclamation activity which might be required at a given site. For each, the model presents the "quantity" of work multiplied by the appropriate "Unit Cost".

For example, a reclamation activity may involve using a dozer to contour overburden in a disturbed area. If the quantity of soil to be dozed is 500 m^3 and the Unit Cost is \$1.05/m^3, then the cost for that reclamation activity would be \$525. RECLAIM is designed to both assist the user in identifying each of the activities required by including a list of typical activities, as well as providing a range of Unit Costs.

RECLAIM lists many typical reclamation activities for each component. These default lists will likely cover the majority of reclamation activities required for decommissioning a given mine. The default lists do not attempt to include all possible reclamation activities as the spreadsheet would be too cumbersome. If a desired activity is missing from the default list the user may modify text within this area of the spreadsheet or insert rows within Excel. If rows are inserted, it should be checked that these rows have been included in the total for the worksheet.

There are eleven reclamation costing worksheets used to compute the overall closure cost estimate. These include **direct costs** associated with the following mine components:

- Open pit
- Underground mine
- Tailings impoundment
- Rock pile
- Buildings and equipment
- Chemicals, hazardous materials and contaminated soils
- Water treatment
- Water management
- Interim care and maintenance

As well as worksheets for each of the following **indirect costs**:

- Post-closure monitoring and maintenance
- Mobilization and demobilization

Additional cost factors such as contingency, engineering, project management and bonding are calculated in the Summary Worksheet.

4.2 Direct Costs

Closure costs for each of the typical mine components are estimated in worksheets of the same name. A percentage of direct costs may be applied to either "land costs" upon

which the land security is held, or "water costs" upon which the water licence security is held. Additional information regarding segregation of costs into either land or water is included in Section 4.5.

Most of the worksheets are self-explanatory based on the list of activities. However, the following worksheets warrant further description.

4.2.1 Chemicals, Hazardous Materials and Contaminated Soil

This worksheet is intended to itemize the costs for three aspects of this component of mine closure and reclamation:

- Inventory, collect, and contain chemicals, hazardous materials and contaminated soil for treatment or transport.
- Physically gather materials from various locations around the mine site and secure for on-site treatment or for transport off-site.
- Off-site disposal fees at a certified facility.

It is the GNWT's experience that even the best managed mines will have minor problems with hydrocarbon contamination associated with fuel handling and storage of waste oil, lubricants, coolants, and hydraulic fluid. In addition, many base-metal mines have soil contamination in the ore concentrate areas, especially if these are not protected from wind. It is common at older mines to encounter problems with asbestos and/or PCB's.

Management of any of these materials must be addressed on an individual basis. This typically involves off-site site disposal, though some hydrocarbon contaminated soil can be remediated on-site. Some mines produce a significant volume of hazardous waste, which may require a hazardous waste landfill to be developed on-site. This requires sophisticated design to ensure that the wastes remain encapsulated in the long term.

4.2.2 Buildings and Equipment

This worksheet outlines the demolition costs for buildings typically found at a mine site. It is assumed that inert debris (steel, concrete, wood, glass, plastic) will be disposed of on-site in an approved location such as a waste rock pile, landfill or other approved area specifically designated to accept these types of waste materials.

The area of each building is typically scaled by the ratio of the total height over an average 3m height. For example, the total area of a 6m high building would be the area of the footprint of the building multiplied by two (or 6m/3m). Unit Costs are then applied per m^2. The provision of demolition costs on a cost per area is such that the completion of demolition can be readily quantified and the security for this component refunded. This is opposed to providing the costs in terms of person days, which is more difficult to quantify for security refunds. Effort for disposal and burial of demolition waste needs to be included in this worksheet.

Users should be aware that the demolition Unit Costs included in RECLAIM are established at a point in time based on historically available information and as such may not represent all current costs. This is due to a number of factors that have increased demolition costs in recent years, as follows:

- Increased requirement for decontamination in advance of demolition to provide environmental protection. Where demolitions costs are expected to form a significant component of the closure cost estimate, users are encouraged to retain qualified persons to estimate costs.
- Increased health and safety workplace culture.
- Increased expectation for recycling, which then requires more careful demolition.

Proponents are encouraged to discuss demolition activities and requirements with the GNWT prior to finalizing the demolition costs, especially if decontamination is required for remediation purposes.

4.2.3 Water Treatment

Water treatment is generally considered for a site to be either short-term (≤20 years), or long-term. Examples of short-term water treatment could include: water treatment required to draw down the supernatant in a tailings storage facility pond; treatment of a sediment pond with flocculent prior to release of water; or treatment of water expected to reach acceptable quality for direct discharge within 20 years.

Long-term water treatment may be required for post-closure treatment of acid mine drainage or metal leaching. A more comprehensive list of what might be considered short-term versus long-term water treatment (i.e. post-closure) is described in Table 1. It is recognized that this definition of short-term versus long-term is somewhat arbitrary and the user is encouraged to use the worksheet as it best represents the expected situation and costs.

Given that water treatment may be considered short-term or long-term, the results of this worksheet do not appear directly within the summary sheet. Rather, the “Water Treatment” worksheet is used to calculate a cost that then feeds into either the “Water Management” worksheet when costs are for short-term water treatment or the “Post-closure Monitoring and Maintenance” worksheet when costs are for long-term water treatment. In the “Post-closure Monitoring and Maintenance” worksheet, there is a provision for the future costs to be calculated as a discounted Net Present Value.[2]

[2] Net Present Value discount rates need to be discussed with the GNWT. The provision of Net Present Value results in certain requirements for the form of this security.

Table 1. Examples of What Would Typically be Considered Short-Term Versus Long-Term Water Management and Treatment

		Short-term (≤ 20 years)	Long-term (> 20 years)
Open Pit	flood pit - install/operate pumping system	x	
	construct diversion ditches	x	
	treat 1st filling	x	
	install pump/decant system	x	
	passive/biological treatment	x	
	overflow treatment		x
Rock Pile/Heap Leach Facility	construct diversion ditches	x	
	install groundwater collection system	x	
	install toe seepage collection system	x	
	collect and treat groundwater		x
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
	detoxify heap leach pile (cyanide destruction)	x	
Tailings Storage Facility	construct diversion ditches	x	
	pump supernatant (to pit, underground)	x	
	treat supernatant	x	
	install toe seepage collection system	x	
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
Underground Mine	accelerate flooding	x	
	install seepage collection system	x	
	install dewatering/pumping system	x	
	operate seepage/dewatering system (ARD/ML)		x
Water Management	refill lakes		x
	redirect creeks/streams	x	
	stabilize water management ponds	x	
	stabilize/close sediment ponds	x	
	fresh water supply - breach embankment	x	
	fresh water supply - remove piping system	x	
	construct water treatment plant	x	
	construct sludge pond	x	
	water control in reclamation quarry	x	
	operate/maintain water treatment plant		x

4.2.4 Water Management (and Short-Term Water Treatment)

This worksheet provides a list of activities associated with water management; in essence the closure activities needed to collect, control, or restore surface or groundwater flows. Capital costs of water treatment systems are calculated within this worksheet, both for conventional active water treatment systems and passive water treatment systems.

As described above, there is a line included within this worksheet for short-term, or defined duration, water treatment calculated from the worksheet “Water Treatment”.

Alternatively, short-term water treatment costs may be included within a component worksheet. For example, pit flooding activities such as batch treatment are listed within the worksheet “Open Pit”; costs of detoxifying a heap leach facility are listed within the “Rock Pile” worksheet; and treatment of tailings supernatant where reagents such as cyanide or ammonia are expected to decay to non-toxic levels in a specified period of time are included in the worksheet “Tailings”.

4.2.5 Interim Care and Maintenance

Very few mines commence closure work soon after operations cease. Based on experience at abandoned sites in the NWT, it is assumed that a minimum period of time of 2-3 years is required to transfer ownership of the site to the GNWT, finalize a Closure and Reclamation Plan, retain a water licence for closure, mobilize equipment to the site, and conduct procurement activities to retain reclamation contractors. Care and maintenance costs should include personnel, camp, fuel, equipment and supplies. Water licence and land use permit requirements for environmental and geotechnical monitoring will have to be met during this period, and have been shown to be a significant driver in overall interim care and maintenance costs.

4.3 Indirect Costs

Worksheets for the indirect costs of Post-Closure Monitoring and Maintenance and Mobilization/Demobilization are described in more detail in the following sections.

4.3.1 Post-Closure Monitoring and Maintenance

Post-closure monitoring and maintenance costs are estimated in the "Post-Closure" Worksheet. These should reflect the monitoring and maintenance identified in the Closure and Reclamation Plan. Common monitoring programs are the Surveillance Network Program (SNP), Aquatic Effects Monitoring Program (AEMP), groundwater, geotechnical, vegetation, and seepage. Other monitoring programs may be included to reflect the approved closure objectives for a particular project. Commonly, monitoring is conducted on a declining frequency at progressively fewer sampling points after closure.

Post-closure maintenance is typically required for all mine sites with waste rock piles, tailings storage areas, etc. For example, spillways and diversions may require occasional

clearing of debris and ice, rip rap may need to be repaired, covers over mine waste may require management of vegetation or repair of erosion.

When post-closure costs extend into the long term (for example more than 20 years), a discount rate may be applied when calculating the Net Present Value of the future series of annual monitoring and maintenance cost. This is appropriate provided that the future costs are estimated on the basis of current (or end of mine life) as opposed to nominal (inflated) costs. Proponents must discuss discount rates and their use with the GNWT.

Note that determination of future costs must include all parameters, including: site access, monitoring, labour, fuel, power and all reagents and supplies. The calculation of the Net Present Value of a future series of costs may be complicated as costs, and the frequency in which these costs are incurred, may change in future years (e.g. a reduced monitoring program with a declining frequency). In these cases, supporting worksheets and/or calculations may be required.

4.3.2 Mobilization/Demobilization

Costs are estimated based on the assumption that a site has been abandoned after the owner becomes insolvent. Further, the assumption is made that the equipment and infrastructure has deteriorated to an advanced state of disrepair and has no material value (as has been the case for many abandoned sites in the north). Any equipment of value or that is salvageable is likely to be removed or sold to other local operators.

Mobilization/Demobilization of Equipment and Supplies
It is assumed that a contractor would have to mobilize all equipment and infrastructure to the site in order to carry out the closure and reclamation work. Mobilization of fuel (including the costs of the fuel and its transport) is assumed to be necessary for every site.

Personnel Movement and Accommodation
In the case of remote sites, mobilization of workers at the beginning/end of each work rotation is included. Modifications to an existing camp or mobilization of a workers camp may be required to allow for use by smaller numbers of support staff during closure and reclamation, or post-closure activities.

4.4 Indirect Costs as a Percentage of Direct Costs

In addition to the indirect costs of Monitoring and Maintenance, and Mobilization/Demobilization, there are a number of indirect costs that are calculated as a percentage of the direct costs in the RECLAIM Model.

4.4.1 Project Management

Project management covers general project coordination, accounting and project control, quality assurance/quality control and oversight, change orders and as-built reports. Project management is assumed to be at least 5% of direct project costs.

4.4.2 Engineering

In preparing a closure cost estimate, it is typical to assume that there is an existing, approved Closure and Reclamation Plan that can be converted to contract ready documents for closure activities (i.e. engineering is not required to develop a closure plan) and that there are no dramatic departures from the approved Closure and Reclamation Plan.

In the RECLAIM Model, the engineering provision is for advancing the Closure and Reclamation Plan into a scope of work that can be provided to a contractor. Engineering includes preparation of Issued For Construction (IFC) drawings and specifications for the closure and reclamation work. Additional engineering may be required while the work is being carried out to address any unexpected issues.

Engineering is normally assumed to be at least 5% of direct project costs.

4.4.3 Health and Safety and Bonding/Insurance

The inclusion of costs for workers health and safety as well as insurance for work related injury are common in government contracting processes and as such are relevant to reclamation of mine sites. A provision of 1% of direct costs provides for preparation and administration of safety protocols, and relevant worker training.

4.4.4 Contingency

A contingency is added to cover both the uncertainty in the costing estimate (i.e. variability in quantity of work, Unit Costs and required scope of activities) and the possibility that some aspects of the closure and reclamation activities may be more difficult to perform. The determination of the contingency percentage is a subjective and project-specific task that relies on the judgement of the estimator. There is commonly considerable debate between proponents and regulators about the most appropriate contingency percentage. Table 2 provides some guidance.

Table 2. Guidelines for Contingency Percentage

Estimate Type	Description	Contingency
Detailed or Project Control	Based upon detailed engineering "take-offs" and written quotes	5%
Definitive or construction drawing phase	Engineering mostly complete, some written quotes	10%
Preliminary or budget level	Little detailed engineering and costs based upon verbal quotes	15%
Feasibility or advanced conceptual	Engineering may be 10% complete and costs based upon typical Unit Costs	20%
Pre-feasibility, conceptual or trade-off study	Very basic engineering only and costs based upon typical Unit Costs	25%

For mining, most Closure and Reclamation Plans and associated closure cost estimates are at the "feasibility or advanced conceptual" level until nearing the end of operations.

This is due to lack of detailed engineering and uncertainty in the quantities of work. During the life of the mine, reclamation research, operational experience (possibly from other mines), data from environmental monitoring programs, and engagement with affected parties may reduce uncertainty.

A low contingency would be indicative of a comprehensive database of site specific parameters, detailed engineering, and proven closure and reclamation measures. Proven measures are those that have been shown to be effective in conditions similar to those at the mine, and the effort and cost associated with that work is well understood.

To the extent possible, if there are major areas of uncertainty in a Closure and Reclamation Plan, these should be addressed in the appropriate mine component spreadsheet (e.g. thicker cover, different slope, liner, quarry, etc.). In some cases, it may be appropriate to consider a different level of contingency for different components of the closure cost estimate.

In RECLAIM v.7.0, contingencies are only applied to direct costs. However, for some liability estimates where there is a similar level of uncertainty, it may be appropriate to apply contingency costs to indirect costs as well.

4.4.5 Market Price Factor Adjustment

To account for times when economic activity is very high the RECLAIM Model includes a Market Price Factor Adjustment. It is recommended that companies contact the GNWT to determine if the Market Price Factor Adjustment would apply for their cost estimate.

4.5 Segregation of Costs into Land or Water Related Costs

For each activity, the user can assign a percentage of each cost to either be included as a land related cost or as a water related cost. Examples of each are as follows:

- An activity such as a building demolition would be 100% land liability.
- Treating supernatant prior to discharge would be 100% water liability.
- Placing a soil cover over a rock pile could be, for example, 50% land liability in promoting revegetation, and 50% water liability in reducing seepage loading. This could vary based on site-specific factors.

4.6 Unit Cost Table

After having developed a comprehensive Closure and Reclamation Plan from which the reclamation activities have been scoped and quantified, the selection of Unit Costs to apply to each of these activities is required to derive a security estimate.

The Unit Cost table contains a list of many of the common reclamation activities that may be carried out at a particular mine site and the associated Unit Costs for each activity. To the extent achievable, the Unit Costs in the table are independent third party costs that have been obtained from a review of northern reclamation projects

conducted by third party contractors. Unless specifically noted, all Unit Costs are inclusive of equipment, labour, maintenance, fuel, consumables, and contractor profit.

For each activity in the Unit Cost table, there is a brief description of the activity and a one to four-character acronym, called the cost code, for that activity. Additional activities, with user-defined cost codes and Unit Costs, may be added to the Unit Cost table.

Acronyms have been developed to reflect the activity it is intended to apply to. For example, if a reclamation activity such as covering a waste rock pile for re-vegetation involves the excavation of soil which is readily excavated, hauled a short distance and dumped, then the cost code SB1L would be appropriate. This acronym translates roughly as Soil, Bulk, 1 (for short haul), low. If the excavation involved careful or controlled work, such as in ditch or spillway construction, then the SC1L cost code for Soil, Controlled, 1 (for short haul), low may be more appropriate.

For each Unit Cost, a range is provided from low (L) to high (H), which is intended to capture the variability in level of effort that may be required. For the example provided above, SB1L, the suffix L in the acronym indicates that the cost for this particular activity is believed to be at the lower end of the range for soil movement. Factors such as an uphill haul, difficult excavation due to density, frozen zones or excessive boulders would require the use of the high cost suffix, H. In this way the selection of the cost code allows others to understand the assumptions of the estimator for the scope of work and intended effort. Users are encouraged to document the assumptions used to select the appropriate Unit Cost.

4.6.1 Inflation

Unit Costs are based on the Canadian dollar at the time of the RECLAIM Model update. Unit Costs in RECLAIM v.7.0 were updated March 2014, more than 3 years ago. Adjustments for inflation should occur using a function in the RECLAIM Model described in Section 7. Inflation rates can be obtained from Statistics Canada (http://www.statcan.gc.ca/daily-quotidien/170224/dq170224a-eng.htm) or Bank of Canada (http://www.bankofcanada.ca/rates/related/inflation-calculator/).

Proponents are encouraged to discuss whether to consider inflation with the GNWT prior to completing their security estimate. For example, inflation can be considered for reclamation estimates when there is a time lapse between the estimate date and the calendar year in which the RECLAIM was last updated.

4.7 Specified Costs and Estimator

In some cases, rather than selecting a Unit Cost from the Unit Cost Table provided in RECLAIM, it may be appropriate to derive a project specific Unit Cost. If a proponent is proposing a specified Unit Cost, it should provide sufficient detail and rationale to allow others to review and assess the adequacy of these specified costs. All supporting calculations and documentation should be provided.

When using a specified cost, the Unit Cost can be inserted in the Unit Cost Table. Where these specified costs are to be used in calculations, the suffix "S" would be used instead of "L" or "H". For example, SBTS = $\$15.50/m^3$ is specific to hauling and placing wet tailings as infill. Alternatively, the specified cost can be simply inserted directly into the applicable worksheet in the Unit Cost Column.

Specified costs are typically derived from one of the following three methods, which are further described below:

- Quotes from qualified 3rd party contractors,
- Information provided by equipment suppliers, or
- First principle cost estimating.

Quotes from Contractors

It is important to be very clear in obtaining costs from qualified contractors. The contractor's cost should include capital cost, fuel (consumption and mobilization unless mobilization is included elsewhere), tires, maintenance, support equipment, and an operators hourly rate. Ideally, the contractor should have knowledge of local conditions and how they may vary with seasons. The more information the contractor has regarding the scope of work and conditions, the more reliable the cost estimate to carry out the work will be.

Equipment Suppliers

Unit Cost data can be obtained from equipment suppliers. However, caution is warranted as a supplier is likely to provide only peak or optimal performance data. In all cases, adjustments will be required to reflect local cost factors such as labour rate and availability, or specific job site factors which affect productivity (cycle-times) such as weather and daylight hours.

First Principle Cost Estimating

First principle cost estimating means evaluating equipment productivity in terms of hourly production divided by hourly cost of operation. Productivity evaluation is a series of adjustments or corrections to the peak or optimal productivity rate for a given piece of equipment. For example, adjustment factors for an excavator would involve difficultly in digging (type and hardness of material), job geometry (side-hill or full bench), finish condition (ditch versus quarry operation), operator skill (fair, good, excellent), working time per hour and other appropriate site factors. The "Estimator" worksheet provides examples for productivity adjustments based on the Caterpillar Performance Handbook Edition 42. Another source of Unit Cost data is the RS Means Heavy Construction Costs.

4.8 Summary Sheet

The summary sheet presents the subtotals of capital and indirect costs to derive the total closure cost estimate.

It is within the summary sheet that the percentage of indirect costs that are to be assigned to "land liability" and "water liability" are calculated for determining the appropriate security. These percentages correspond directly to the direct costs that make up the total direct cost subtotal. The RECLAIM Model then applies these direct cost percentages to indirect costs. For example, if direct costs are calculated as being 20% land and 80% water, then the same percentages are applied to each indirect cost.

5 Using RECLAIM v.7.0

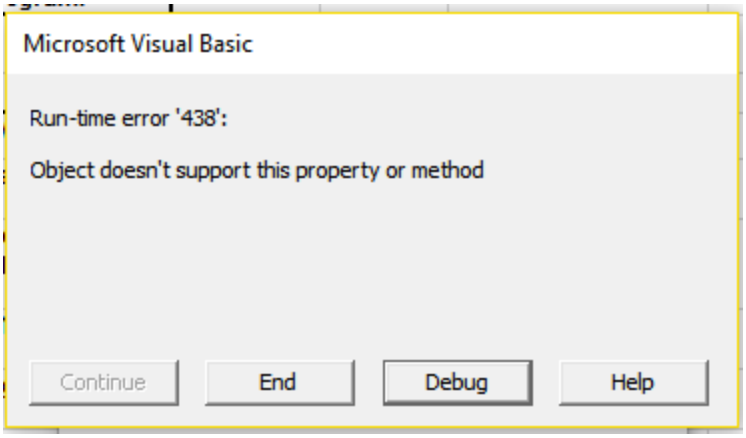
Upon opening RECLAIM v.7.0, depending on the user's computer security settings, the user may receive a SECURITY WARNING "macros have been disabled". Select the "Enable this content" within the options menu. A pop-up box will request the Project Name. Typically this is the mine name, which will be inserted at the top right of each worksheet. The program will then initialize, which should only take a few seconds.

The program should open to the instructions sheet, which is an overview description of the program and details of program limitations. There are some requirements that must be met for the program to work. The following instructions should be reviewed prior to modifying the worksheets:

- The names of the worksheets must not be changed.
- Certain cells have defined names, which must not be changed. Where the cell is named, the name will appear in the name box.
- The first line of data for any component worksheet starts on line 4. Do not change the first line of a component worksheet.
- Cell A1 of the component sheet must always contain the "count" of that component for the duplicate function to work.
- The user can add lines to component activities in each worksheet and the Unit Cost table. However, the user should check that the new Unit Cost does not fall outside the named ranges. You can check the size of the named range by selecting the name from the drop-down box at the top left of the sheet. For example, in RECLAIM v.7.0 the Unit Costs range is to line 172 of the Unit Cost worksheet.
- A component will only be printed if its sub-total is greater than zero. In addition, a component and the summary sheet cannot be printed if there is an error. Printing has been set to print 1 page per worksheet.

5.1 Start-up Error Message

A common error which arises when starting RECLAIM v.7.0 is to see the dialogue box shown below.



This message occurs when the RECLAIM Model is opened with another Microsoft Excel file already open on the computer. In this situation, the RECLAIM Model macros have not been enabled. However, all other functions of the RECLAIM Model are unaffected, and the calculation functions are not affected in any way.

If the user wants the macros to function, the RECLAIM Model must be the first Excel file to be opened.

5.2 Completing Worksheets

Complete each of the individual worksheets by selecting the type of activity required, estimating the quantity (i.e. volume, area, length etc.) in column E and assigning an appropriate Unit Cost code in column F.

Activity items can be added to component worksheets, either by changing the activity/material description in column B, adding the activity where the line item is purposely left as “other” or inserting a line and copying the content from an adjacent line.

As described in Section 4.5, activities are typically assigned a percentage as "land liability" which can be used to set land security and the remaining percentage as "water liability" which can be used to set water security.

5.3 Menu Descriptions

Functions specific to the RECLAIM Model are displayed in the tab “Add Ins” on the Excel menu bar. If this menu tab is not displayed, the functions are also found within the sheet titled “Tools”. A summary of the functions is provided in the Instructions worksheet and are described below:

Clear

This function deletes all input data, deletes any duplicated elements and blanks out the project name.

Another function within this menu is to hide or display segregation columns within the worksheets that ascribe the costs to either ‘water’ or ‘land” liability.

Note the Clear function does not affect the Unit Cost table.

Duplicate

This function duplicates components of the project. For example, if there is more than one Open Pit, complete the activities and quantities for one Open Pit then use duplicate to add a second Open Pit. Quantities for the new Open Pit are erased, but the Activities and Cost Codes are carried over from the original Open Pit. The new Open Pit subtotal is added to the Summary page. The duplicate function can be applied for the following worksheets: open pit, underground mine, tailings impoundment, rock piles, buildings and infrastructure, and estimator.

Unit Costs

By selecting the show/hide function within Unit Costs a window of Unit Costs is displayed to the right of the open worksheet to allow the user to view the table of Unit Costs for ease of reference. The Unit Cost table has a filter in the 'UNITS' column. You can select to only see a particular unit (e.g. km) or multiple units (km and m^3) or all units.

By selecting the inflate function, Unit Costs can be increased by a percentage to account for inflation from the date the Unit Costs were last updated (RECLAIM v.7.0 was updated in March 2014).

Print All

This option prints the Summary Worksheet, Unit Cost Worksheet, and individual component worksheets having non-zero balances. Individual worksheets can be printed directly using standard printing methods.

Project Name: **Reclaim Model - Overview of Program**

Blank **All users are urged to read the Reclaim Model User Manual - Scroll down for overview description of program.**

Important! Reclaim 7.0 works better with no other excel files open.
If other excel files are open ignore run time error and proceed

Reclaim Menu	The default Excel menu bar has an additional tab labelled "Add-Ins" that provides options specific to the Reclaim Model.
Clear	This option deletes all input data, deletes any duplicated elements and blanks out the project name. It also allows for segregation into land costs vs water costs if required.
Duplicate	This option Duplicates components of the project. E.g. if there is more than one Open Pit, use duplicate to add a second Open Pit. Quantities for the new Open Pit are erased, but the Activities and Cost Codes are carried over from the original Open Pit. The new Open Pit subtotal is added to the Summary page.
Unit Costs	This option opens a window of unit costs to provide easy reference. NOTE: the unit cost table has a filter in the 'UNITS' column. You can select to only see a particular unit (eg km) or multiple units (km and m3) or all units.
Print All	This option prints the Summary Worksheet, Unit Cost Worksheet, and the individual component worksheets having non-zero balances. Individual worksheets can be printed directly using standard printing methods, such as Ctl - P.
Quit	Select Quit to exit the program
Help	Redirects user to Instructions worksheet.

WorkSheets	
Summary	This worksheet contains a cumulative summary of costs for each component of the project. Associated costs such as engineering and project management are added as a percentage of the component costs.
Components	Costs are derived for individual closure and reclamation activities by multiplying a "quantity" of activity by a "unit cost". An activity can be edited, added, or deleted from worksheet. However, care should be taken not to modify cells that are defined and used elsewhere in the program. ***Do not change the content or column width of the first column of each component worksheet.***
Unit Costs	This worksheet contains a look up table with costs for typical work associated with each closure and reclamation activity

Limitations	***The Reclaim Program will NOT work if the worksheets are changed such that the following requirements are not met. Please review the following prior to modifiying worksheets.***
WorkSheet Names	*The names of the worksheets must not be changed.*
Defined Names	Certain cells have defined names, which must not be changed. Where the cell is named, the name will appear in the "Name Box" to the left of the formula bar.
First line of data	The first line of data for any component worksheet starts on line 4. ***Do not change the first line of a component worksheet, ie the component name.***
Cell A1	Cell A1 on the component sheet MUST always contain the count of that component for the duplicate function to operate. ***DO NOT CHANGE.***
Adding Lines	You can add lines to components and the unit cost table, as long as they are not the last lines. The last line might fall outside the named ranges. You can check the size of the named range by selecting the name from the drop down box at the top left of the sheet. Usually this box has a cell reference, or a name.
Printing	A component will only be printed if its sub-total is greater than zero. In addition, a component and the summary sheet cannot be printed if there is an error. Printing has been set to print 1 page per component.

Conditions of Use	The Reclamation Cost Estimating Model was prepared to serve as a guide for Government Agencies, mining companies, and others to estimate the cost of mine reclamation. This model is not intended to replace reclamation planning or to be used to determine the activities required to reclaim a site or to dictate how much should be spent on reclamation. Reclaim was prepared by Brodie Consulting Ltd. on behalf of AANDC. AANDC and Brodie Consulting Ltd. are not responsible for the completeness or accuracy of any reclamation estimate made using this model. The user agrees to check and take responsibility for all aspects of any cost estimate made using this model.

The following table provides guidance as to whether water management and treatment is considered short term or long term. Short term closure activities may be costed within a component (eg 'Open Pit' or 'Rock Pile') or 'Water Management'. Long term or post-closure water treatment is costed in 'Water Treatment'.

		Short Term/ Capital Ex.	Long term/ NPV
Open Pit	flood pit - install/operate pumping system	x	
	construct diversion ditches	x	
	treat 1st filling	x	
	install pump/decant system	x	
	passive/biological treatment	x	
	overflow treatment		x
Rock Pile/Heap Leach Facility	construct diversion ditches	x	
	install groundwater collection system	x	
	install toe seepage collection system	x	
	collect and treat groundwater		x
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
	operate pump and detoxify heap leach pile (cyanide destruction)	x	
Tailings Facility	construct diversion ditches	x	
	pump supernatant (to pit, U/G)	x	
	treat supernatant	x	
	install toe seepage collection system	x	
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
U/G Mine	accelerate flooding	x	
	install seepage collection system	x	
	install dewatering/pumping system	x	
	operate seepage/dewatering system (ARD/ML)		x
Water Management	refill lakes		
	redirect creeks/streams	x	
	stabilize water management ponds	x	
	stabilize/close sediment ponds	x	
	fresh water supply - breach embankment	x	
	fresh water supply - remove piping system	x	
	construct water treatment plant	x	
	construct sludge pond	x	
	water control in reclamation quarry	x	
	operate/maintain water treatment plant		x

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	LAND LIABILITY	WATER LIABILITY
OPEN PIT		$0	$0	$0
UNDERGROUND MINE		$0	$0	$0
TAILINGS FACILITY		$0	$0	$0
ROCK PILE		$0	$0	$0
BUILDINGS AND EQUIPMENT		$0	$0	$0
CHEMICALS AND CONTAMINATED SOIL MANAGEMEN		$0	$0	$0
SURFACE AND GROUNDWATER MANAGEMENT		$0	-	$0
INTERIM CARE AND MAINTENANCE		$0	-	$0
	SUBTOTAL: Capital Costs	**$0**	**$0**	**$0**
	PERCENT OF SUBTOTAL		**0%**	**0%**

INDIRECT COSTS		COST	LAND LIABILITY	WATER LIABILITY
MOBILIZATION/DEMOBILIZATION		$0	$0	$0
POST-CLOSURE MONITORING AND MAINTENANCE		$0	$0	$0
ENGINEERING	5%	$0	$0	$0
PROJECT MANAGEMENT	5%	$0	$0	$0
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$0	$0	$0
BONDING/INSURANCE	1%	$0	$0	$0
CONTINGENCY	20%	$0	$0	$0
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0	$0
	SUBTOTAL: Indirect Costs	**$0**	**$0**	**$0**

TOTAL COSTS	**$0**	**$0**	**$0**

1 **Open Pit Name:** **Pit # 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
CONTROL ACCESS									
Fence		m		#N/A	$0.00	$0		$0	$0
Signs		each		#N/A	$0.00	$0		$0	$0
Berm at crest		m3		#N/A	$0.00	$0		$0	$0
Block roads		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
STABILITY STUDY									
Conduct stability and setback study		allow		#N/A	$0.00	$0		$0	$0
STABILIZE SLOPES									
Off-load crest, soil A		m3		#N/A	$0.00	$0		$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0		$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0		$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0		$0	$0
Buttress slope		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
COVER/CONTOUR SLOPES									
Place fill, soil A		m3		#N/A	$0.00	$0		$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3		#N/A	$0.00	$0		$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0		$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONSTRUCT DIVERSION DITCHES									
Excavate ditches -soil		m3		#N/A	$0.00	$0		$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0		$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0		$0	$0
CONSTRUCT SPILLWAY									
Excavate channel		m3		#N/A	$0.00	$0		$0	$0
Concrete		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
RECLAIM QUARRIES									
Contour slopes		m3		#N/A	$0.00	$0		$0	$0
Place overburden		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m3		#N/A	$0.00	$0		$0	$0
FLOOD PIT-Captital									
Remove stationary equipment (sump pumps)		each		#N/A	$0.00	$0		$0	$0
Remove dewatering pipeline		m		#N/A	$0.00	$0		$0	$0
Remove power lines		each		#N/A	$0.00	$0		$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0		$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0		$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0		$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0		$0	$0
Supply/install pump station		each		#N/A	$0.00	$0		$0	$0
Supply/install piping system		m		#N/A	$0.00	$0		$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0		$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0		$0	$0
FLOOD PIT-Annual Cost									
Operate pumps (power)		m3		#N/A	$0.00	$0		$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0		$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0		$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0		$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0		$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0		$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
					Annual pumping costs	$0			
Number of years of pump flooding		years							
					Total pumping costs	$0		$0	$0
					Total	$0		$0	$0
					% of Total			0%	0%

1 **Underground Mine Name** **UG Mine # *1***

ACTIVITY/MATERIAL	Notes	Unit	Qty	Code	Unit Cost	Cost Land	Land Cost	Water Cost
CONTROL ACCESS								
Fence		m		#N/A	$0.00	$0	$0	$0
Signs		each		#N/A	$0.00	$0	$0	$0
Block roads		m3		#N/A	$0.00	$0	$0	$0
Berm		m3		#N/A	$0.00	$0	$0	$0
Concrete wall in portals		m3		#N/A	$0.00	$0	$0	$0
Backfill portal #1		m3		#N/A	$0.00	$0	$0	$0
Backfill portal #2		m3		#N/A	$0.00	$0	$0	$0
Cap raise # 1		m3		#N/A	$0.00	$0	$0	$0
Cap raise #2		m3		#N/A	$0.00	$0	$0	$0
Cap shaft #1		m3		#N/A	$0.00	$0	$0	$0
Cap shaft #2		m3		#N/A	$0.00	$0	$0	$0
Backfill adits		m3		#N/A	$0.00	$0	$0	$0
Backfill open stope		m3		#N/A	$0.00	$0	$0	$0
Concrete cap over open stope		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
REMOVE HAZARDOUS MATERIALS								
Remove hazardous materials, U/G labor		mandays		#N/A	$0.00	$0	$0	$0
Remove/decontam. stationary & elect. equip		mandays		#N/A	$0.00	$0	$0	$0
Remove/decontam. mobile equipment		each		#N/A	$0.00	$0	$0	$0
Remove misc. haz. mat & explosives		kg		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
INSTALL BULKHEADS								
Bulkheads to control water flow		each		#N/A	$0.00	$0	$0	$0
Grout bulkhead		m3		#N/A	$0.00	$0	$0	$0
FLOOD MINE								
Supply/install pump		each		#N/A	$0.00	$0	$0	$0
Supply/install piping system		each		#N/A	$0.00	$0	$0	$0
Operate pumps to flood workings		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM								
Excavate/install sumps		m2		#N/A	$0.00	$0	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0	$0	$0
SPECIALIZED ITEMS								
Install water quality monitoring pipes		each		#N/A	$0.00	$0	$0	$0
Install permanent pumping system		each		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
					Total	$0	$0	$0
					% of Total		0%	0%

1 **Tailings Impoundment Name:** **Pond # *1***

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
CONTROL ACCESS									
Fence		m		#N/A	$0.00	$0		$0	$0
Signs		each		#N/A	$0.00	$0		$0	$0
Berm		m3		#N/A	$0.00	$0		$0	$0
Block roads		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
STABILIZE EMBANKMENT(S)									
Toe buttress, drainage layer		m3		#N/A	$0.00	$0		$0	$0
Toe buttress, bulk fill		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Raise crest		m3		#N/A	$0.00	$0		$0	$0
Flatten slopes		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
COVER TAILINGS									
Grade/shape tailings surface		m3		#N/A	$0.00	$0		$0	$0
Liner bedding		m3		#N/A	$0.00	$0		$0	$0
Subgrade preparation - compact		m2		#N/A	$0.00	$0		$0	$0
Supply geotextile/geosynthetic		m2		#N/A	$0.00	$0		$0	$0
Install geotextile/geosynthetic		m2		#N/A	$0.00	$0		$0	$0
Soil cover		m3		#N/A	$0.00	$0		$0	$0
Rock cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
BURY PAG ROCK									
Relocate PAG rock		m3		#N/A	$0.00	$0		$0	$0
Place cover over PAG rock		m3		#N/A	$0.00	$0		$0	$0
Raise crest of dam		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
STABILIZE DECANT SYSTEM									
Excavate and replace		m3		#N/A	$0.00	$0		$0	$0
Plug/backfill with concrete or clay		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
REMOVE TAILINGS DISCHARGE									
Cyclones		m3		#N/A	$0.00	$0		$0	$0
Pipe		m3		#N/A	$0.00	$0		$0	$0
Remove reclaim barge		allow		#N/A	$0.00	$0		$0	$0
CONSTRUCT DIVERSION DITCHES									
Excavate ditches -soil		m3		#N/A	$0.00	$0		$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0		$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0		$0	$0
FLOOD TAILINGS									
Doze tailings to final contour		m3		#N/A	$0.00	$0		$0	$0
Raise crest of dam		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
UPGRADE SPILLWAY									
Excavate channel, rock		m3		#N/A	$0.00	$0		$0	$0
Excavate channel, soil		m3		#N/A	$0.00	$0		$0	$0
Concrete		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONSTRUCT SEEPAGE COLLECTION POND									
Excavate seepage collection pond		m3		#N/A	$0.00	$0		$0	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0		$0	$0
Vegetate spread material		ha		#N/A	$0.00	$0		$0	$0
Bedding layer		m3		#N/A	$0.00	$0		$0	$0
Supply geomembrane		m2		#N/A	$0.00	$0		$0	$0
Install geomembrane		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM									
Excavate/install sumps		m3		#N/A	$0.00	$0		$0	$0
Install pumping wells		m3		#N/A	$0.00	$0		$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Install permanent instrumentation, supply & technican		each		#N/A	$0.00	$0		$0	$0
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0			$0
TREAT SEEPAGE - see "Water Management" and "Water Treatment"									
TREAT SUPERNATANT									
Pump water (to pit, U/G)		m3		#N/A	$0.00	$0		$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0		$0	$0
Supply reagents		tonne		#N/A	$0.00	$0		$0	$0
					Annual treatment costs	$0			
Number of years of treatment		years							
					Total treatment costs	$0			$0
					Total	$0		$0	$0
					% of Total			0%	0%

* for construction of passive treatment system refer to "Water Management"

1 **Rock Pile Name:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	% Cost Land	Land Cost	Water Cost	
STABILIZE SLOPES									
Flatten slopes with dozer		m3		#N/A	$0.00	$0		$0	$0
Flatten "bubble dump" areas		m3		#N/A	$0.00	$0		$0	$0
Divert runon, ditch mat'l A		m3		#N/A	$0.00	$0		$0	$0
Divert runon, ditch mat'l B		m3		#N/A	$0.00	$0		$0	$0
Toe buttress, drain mat'l		m3		#N/A	$0.00	$0		$0	$0
Toe buttress, fill mat'l A		m3		#N/A	$0.00	$0		$0	$0
Toe buttress, fill mat'l B		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
COVER ROCK PILE									
Subgrade preparation - doze surface		m3		#N/A	$0.00	$0		$0	$0
Soil cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0		$0	$0
Rock cover - excavate,haul & spread		m3		#N/A	$0.00	$0		$0	$0
Excavate downslope drainage channel & chute		m3		#N/A	$0.00	$0		$0	$0
Rip rap drainage channel and chute		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
VERY LOW PERMEABILITY COVER (in addition to above)									
Liner subgrade preparation - compact		m2		#N/A	$0.00	$0		$0	$0
Supply geomembrame		m2		#N/A	$0.00	$0		$0	$0
Install geomembrane		m2		#N/A	$0.00	$0		$0	$0
Protective cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0
CONSTRUCT DIVERSION DITCHES									
Excavate ditches -soil		m3		#N/A	$0.00	$0		$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0		$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0		$0	$0
CONSTRUCT SEEPAGE COLLECTION POND									
Excavate seepage collection pond		m3		#N/A	$0.00	$0		$0	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0		$0	$0
Vegetate spread material		ha		#N/A	$0.00	$0		$0	$0
Bedding layer		m3		#N/A	$0.00	$0		$0	$0
Supply geomembrane		m2		#N/A	$0.00	$0		$0	$0
Install geomembrane		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM									
Excavate/install sumps		m3		#N/A	$0.00	$0		$0	$0
Install pumping wells		m3		#N/A	$0.00	$0		$0	$0
Install pumps/pipelines/power supply		allow		#N/A	$0.00	$0		$0	$0
RELOCATE DUMPS									
Load, haul, dump or doze		m3		#N/A	$0.00	$0		$0	$0
Add lime		tonne		#N/A	$0.00	$0		$0	$0
Contour reclaimed area		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Install permanent instrumentation		each		#N/A	$0.00	$0		$0	$0
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0		$0	$0
TREAT ROCK PILE SEEPAGE - see "Water Management"									
HEAP LEACH SEEPAGE TREATMENT - Cyanide Detox									
Cyanide destruction water treatment pumping		m3		#N/A	$0.00	$0		$0	$0
Reagents		tonnes		#N/A	$0.00	$0		$0	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0		$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0		$0	$0
				Annual treatment costs		$0			
Number of years of treatment		years							
				Total treatment costs		$0			$0
HEAP LEACH SEEPAGE TREATMENT - ARD/ML**									
Upgrade/modify pumping system - report to WTP		allow		#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			0%	0%

* For construction of passive treatment system refer to "Water Management". ARD/ML seepage treatment becomes post-closure water treatment cost

**Heap leach ARD/ML seepage treatment becomes post-closure water treatment cost

1 **Building / Equip Name:** **Bldg / Equip #: 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
DISPOSE MOBILE EQUIPMENT									
Decontaminate and ship off-site		allow		#N/A	$0.00	$0		$0	$0
Decontaminate and dispose on-site		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
REMOVE BUILDINGS - see note below									
Accomodation Complex		m2		#N/A	$0.00	$0		$0	$0
Process Facilities		m2		#N/A	$0.00	$0		$0	$0
Offices, Repair, Lab, Warehouse		m2		#N/A	$0.00	$0		$0	$0
Storage Facilites		m2		#N/A	$0.00	$0		$0	$0
Water and Wastewater Treatment Facilities		m2		#N/A	$0.00	$0		$0	$0
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0
AN Storage Facility		m2		#N/A	$0.00	$0		$0	$0
Warehouse, Shops and Other		m2		#N/A	$0.00	$0		$0	$0
Storage Facility at Laydown/Airstrip		m2		#N/A	$0.00	$0		$0	$0
Fuel tanks		m2		#N/A	$0.00	$0		$0	$0
Fuel Tanks		m2		#N/A	$0.00	$0		$0	$0
Freshwater intake		m2		#N/A	$0.00	$0		$0	$0
Reclaim pumps		m2		#N/A	$0.00	$0		$0	$0
Outfall & Diffuser		m2		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, electrician		mandays		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, mechanical		mandays		#N/A	$0.00	$0		$0	$0
Break foundation slabs	total of all buildings	m2		#N/A	$0.00	$0		$0	$0
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
LANDFILL FOR DEMOLITION WASTE									
Place rock cover		m3		#N/A	$0.00	$0		$0	$0
Place soil cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
GRADE AND CONTOUR PADS									
Accomodation Complex		ha		#N/A	$0.00	$0		$0	$0
Process Facilities		ha		#N/A	$0.00	$0		$0	$0
Offices, Repair, Lab, Warehouse		ha		#N/A	$0.00	$0		$0	$0
Storage Facilites		ha		#N/A	$0.00	$0		$0	$0
Water and Wastewater Treatment Facilities		ha		#N/A	$0.00	$0		$0	$0
U/G Heating Plant		ha		#N/A	$0.00	$0		$0	$0
Emulsion Plant		ha		#N/A	$0.00	$0		$0	$0
Warehouse, Shops and Other		ha		#N/A	$0.00	$0		$0	$0
Place rock cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
PUNCTURE LINED SUMPS									
Puncture liner and place soil cover		m3		#N/A	$0.00	$0		$0	$0
RECLAIM ROADS									
Remove culverts		each		#N/A	$0.00	$0		$0	$0
Remove bridges		each		#N/A	$0.00	$0		$0	$0
Scarify and install water breaks		ha		#N/A	$0.00	$0		$0	$0
Scarify airstriip		ha		#N/A	$0.00	$0		$0	$0
Scarify laydown areas		ha		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Dispose of misc. debris and laydown area refuse				#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			0%	0%

Note: Unit costs are based on 3m high, single storey building. Scale larger building areas accordingly. E.g. 10m high building multiply area by 3.3 (10/3)

1 **Chemicals/Soil Area Name:**

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
HAZARDOUS MATERIALS AUDIT									
Hazardous materials audit		mandays		#N/A	$0.00	$0		$0	$0
BUILDING DECONTAMINATION & CONSOLIDATION OF HAZARDOUS MATERIALS									
Environmental technician/coordinator		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate: oil, fuel		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate maintenance shop		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate power plant		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate bulk fuel storage		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate ANFO plant		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate offices/warehouse/accom		mandays		#N/A	$0.00	$0		$0	$0
Removal of asbestos siding on buildings		m2		#N/A	$0.00	$0		$0	$0
Removal of friable asbestos on equipment		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
HAZARDOUS MATERIALS REMOVAL									
Waste oils		litre		#N/A	$0.00	$0		$0	$0
Waste fuel		litre		#N/A	$0.00	$0		$0	$0
Waste batteries		kg		#N/A	$0.00	$0		$0	$0
Assay & environmental lab reagents		kg		#N/A	$0.00	$0		$0	$0
Machine shop paints, solvents etc		litre		#N/A	$0.00	$0		$0	$0
Glycol		litre		#N/A	$0.00	$0		$0	$0
Process reagents		kg		#N/A	$0.00	$0		$0	$0
Nuclear sources		allow		#N/A	$0.00	$0		$0	$0
Other hazardous materials		allow		#N/A	$0.00	$0		$0	$0
HAZARDOUS MATERIALS									
Transportation to disposal facility		allow		#N/A	$0.00	$0		$0	$0
Disposal fees		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONTAMINATED SOILS									
Contam. soil investigation - Phase 1		each		#N/A	$0.00	$0		$0	$0
Contam. soil investigation - Phase 2		each		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL REMOVAL									
Excavate and transport to onsite facility		m3		#N/A	$0.00	$0		$0	$0
Manage hydrocarbon remediation at facility		m3		#N/A	$0.00	$0		$0	$0
Reagents/stabilizing agent		m2		#N/A	$0.00	$0		$0	$0
Excavate and transport to offsite facility		m3		#N/A	$0.00	$0		$0	$0
Contour decontaminated area		m3		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER									
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Upper and lower bedding layers		m3		#N/A	$0.00	$0		$0	$0
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OTHER									
				#N/A	$0.00	$0		$0	$0
					Total	$0		$0	$0
					% of Total			0%	0%

1 **Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
BREACH DYKE EMBANKMENT						
Remove fill		m3		#N/A	$0.00	$0
Contour water intake area		m3		#N/A	$0.00	$0
STABILIZE SEDIMENT PONDS/WATER MANAGEMENT PONDS						
Place soil cover		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Rip rap in channel base		each		#N/A	$0.00	$0
REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES						
Excavate ditches -soil		m3		#N/A	$0.00	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0
Stabilize side slopes		m3		#N/A	$0.00	$0
Rip rap in channel base		m3		#N/A	$0.00	$0
BREACH DITCHES						
Excavate breaches		m3		#N/A	$0.00	$0
Backfill/recontour		m3		#N/A	$0.00	$0
Install flow dissipation		m3		#N/A	$0.00	$0
Vegetate remainder of ditch		m2		#N/A	$0.00	$0
DECOMISSION FRESH WATER SUPPLY						
Breach embankment		m		#N/A	$0.00	$0
Remove pump		LS		#N/A	$0.00	$0
Remove pipeline		m		#N/A	$0.00	$0
WATER CONTROL IN RECLAMATION QUARRY						
Install pumping system		LS		#N/A	$0.00	$0
Remove pumping system		LS		#N/A	$0.00	$0
REMOVE PIPELINES						
Remove pipes		m		#N/A	$0.00	$0
Concrete plug deep pipes		m3		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
GROUNDWATER COLLECTION SYSTEM						
Excavate/install sumps		m3		#N/A	$0.00	$0
Install pumping wells		m3		#N/A	$0.00	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0
CONSTRUCT CONTAMINATED WATER STORAGE POND						
Excavate pond		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Bedding layer		m3		#N/A	$0.00	$0
Supply geomembrane		m2		#N/A	$0.00	$0
Install geomembrane		m2		#N/A	$0.00	$0
Erosion protection layer		m3		#N/A	$0.00	$0
CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland)						
Construct access roads		km		#N/A	$0.00	$0
Install HDPE piping system from collection pond		m		#N/A	$0.00	$0
Inter-cell flow structures		allow		#N/A	$0.00	$0
Install liners		m2		#N/A	$0.00	$0
Install growth media		m3		#N/A	$0.00	$0
Wetland vegetation		ha		#N/A	$0.00	$0
CONSTRUCT WATER TREATMENT PLANT						
Build treatment plant		LS		#N/A	$0.00	$0
Build sludge containment facility		LS		#N/A	$0.00	$0
					Total	$0

For cost of long-term/post-closure water treatment see "WATER TREATMENT" Worksheet"

1 **Post Closure Water Treatment - Identified as long term/post-closure in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
ADDITION OF REAGENTS TO WTP						
H2O2		kg		#N/A	$0.00	$0
lime		kg		#N/A	$0.00	$0
ferric sulphate		kg		#N/A	$0.00	$0
ferrous sulphate		kg		#N/A	$0.00	$0
flocculents		kg		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
LABOUR AND SUPPLIES						
Annual fuel		litres		#N/A	$0.00	$0
Annual power		kW-h		#N/A	$0.00	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0
Misc. supplies, hoses, tools		allow		#N/A	$0.00	$0
Communications		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
WTP WATER SAMPLING AND ANALYSES						
Sampling equipment		allow		#N/A	$0.00	$0
Analyses		allow		#N/A	$0.00	$0
Shipping to laboratory		allow		#N/A	$0.00	$0
Reporting		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SITE ACCESS						
Road maintenance (incl. snow removal)		allow		#N/A	$0.00	$0
Winter road tariff		allow		#N/A	$0.00	$0
Truck rental		allow		#N/A	$0.00	$0
Air support		allow		#N/A	$0.00	$0
					Annual water treatment costs	$0
Number of years of water treatment		years				
					Total	$0

1 **Interim Care and Maintenance**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
INTERIM CARE & MAINTENANCE						
on-site caretaker		manmonths		#N/A	0	$0
extra personnel		manmonths		#N/A	0	$0
-electrician		manmonths		#N/A	0	$0
-mechanic		manmonths		#N/A	0	$0
annual fuel		litre		#N/A	0	$0
misc. supplies		allow		#N/A	0	$0
pick-up truck		each		#N/A	0	$0
small dozer		allow		#N/A	0	$0
small excavator		allow		#N/A	0	$0
snow machine		allow		#N/A	0	$0
communications		allow		#N/A	0	$0
SNP/AEMP water sampling & reporting		each		#N/A	0	$0
geotechnical assessment		each		#N/A	0	$0
interim water treatment				#N/A		$0
other		each		#N/A	0	$0
				Annual Interim C&M Cost		$0
Number of years of ICM		years			**Total**	$0

1 Mobilization/Demobilization:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT						
Excavators		each		#N/A	0	$0
Dump trucks		each		#N/A	0	$0
Dozers		each		#N/A	0	$0
Demolition shears		each		#N/A	0	$0
Crane		each		#N/A	0	$0
Loader		each		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		each		#N/A	0	$0
MOBILIZE MISC. EQUIPMENT						
Pump shipping		each		#N/A	0	$0
Pipe shipping		m		#N/A	0	$0
Minor tools and equipment		allow		#N/A	0	$0
Truck tires		allow		#N/A	0	$0
Other				#N/A	0	$0
MOBILIZE CAMP						
Reclamation activities		allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
MOBILIZE WORKERS						
Reclamation activities - transport		each		#N/A	0	$0
Reclamation activities - travel time		manhours		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - transport		each		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - travel time		each		#N/A	0	$0
Monitoring Airfare		each		#N/A	0	$0
WORKER ACCOMODATIONS						
Reclamation activities		manmonths		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		manmonths		#N/A	0	$0
MOBILIZE FUEL						
Fuel freight - reclamation activities		litre		#N/A	0	$0
Fuel freight - long term reclamation activities		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
DEMOBILIZE HEAVY EQUIPMENT						
Excavators		km		#N/A	0	$0
Dump trucks		km		#N/A	0	$0
Dozers		km		#N/A	0	$0
Demolition shears		km		#N/A	0	$0
Crane		km		#N/A	0	$0
Loader		km		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		km		#N/A	0	$0
Other		km		#N/A	0	$0
DEMOBILIZE CAMP						
		allow		#N/A	0	$0
DEMOBILIZE WORKERS						
crew travel time		mandays		#N/A	0	$0
crew transportation		each		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
					Total	**$0**

1 Post-Closure Monitoring & Maintenance:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MONITORING & INSPECTIONS						
Annual geotechnical inspection		each		#N/A	$0.00	$0
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs*		each		#N/A	$0.00	$0
Site water monitoring (AEMP and SNP)		each		#N/A	$0.00	$0
- Active closure and flooding		each		#N/A	$0.00	$0
- Post pit flooding		each		#N/A	$0.00	$0
Air Quality Monitoring Program (AQMP)		each		#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		each		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
COVER MAINTENANCE						
Repair erosion - infill gullies		allow		#N/A	$0.00	$0
Repair erosion - upgrade diversion ditches		allow		#N/A	$0.00	$0
Remove problem vegetation		allow		#N/A	$0.00	$0
Repair animal damage		allow		#N/A	$0.00	$0
Repair/upgrade access controls		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SPILLWAY MAINTENANCE						
Repair erosion		m3		#N/A	$0.00	$0
Clear spillway		each		#N/A	$0.00	$0
CWTS MAINTENANCE						
Maintain flow, restore vegetation		allow		#N/A	$0.00	$0
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"						$0
Subtotal, Annual post-closure costs						$0
Discount rate for calculation of net present value of post-closure cost, %				0.00%		
Number of years of post-closure activity					years	
Present Value of payment stream						$0

*Regulatory costs - annual reporting, management plans, progress reports etc.

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

ITEM	Detail	COST CODE	UNITS	LOW $	HIGH $	SPECIFIED $	COMMENTS
Accomodation							
		ACCM	manday	100.00	175.00		
Buildings - Decontaminate							
	Asbestos	BDA	m2	25.60	51.20		Low: removal of asbestos siding & flooring; High: removal of insulated pipes, friable asbestos
Buildings - Remove							Unit costs are based on 3m high, single storey building. Scale areas accordingly.
	Wood	BRW	m2	27.50	41.00		
	Concrete	BRC	m2	40.00	65.00	6.00	Specified: puncture concrete foundation slabs
	Steel - teardown	BRS1	m2	45.00	65.00		
	Steel - for salvage	BRS2	m2	67.00	100.00		
Concrete work							
	Small pour	CSF	m3	426.50	639.75		Low: YK; High=1.5xLow
	Large pour	CLF	m3	353.50	530.25	2,130.00	Specified: concrete crown pillar
Contaminated Soils							
	ESA Phase 1	CS1	each	7500.00			Low: small, "clean" site
	ESA Phase 1	CS2	each	50000.00			Low: small, "clean" site
	Remediate on site	CSR	m3	47.00	146.00		
Dozing							
	doze rock piles	DR	m3	1.05	2.40		Low cost: doze crest off dump
	doze overburden/soil piles	DS	m3	0.95	3.80		High cost: push up to 300 m
Excavate Rock; Low Spec's and QA/QC							
	drill/blast/load/short haul	RB1	m3	11.40	17.05		Low:quarry operations for bulk fill
	drill/blast/load/long haul	RB2	m3	12.05	17.80		
	RB1 + spread and compact	RB3	m3	12.05	17.80		
	RB2 + spread and compact	RB4	m3	12.50	30.75		
	Specified activity	RBS	m3				
Excavate Rock; High Spec's and QA/QC							(e.g. ditch/spillway excavation)
	drill/blast/load/short haul	RC1	m3	12.05	17.80		Low:foundation excavation;High:spillway excavation
	drill/blast/load/long haul	RC2	m3	12.70	18.40		
	RC1 + spread and compact	RC3	m3	12.70	18.40		e,g, cover construction
	RC2 + spread and compact	RC4	m3	13.50	19.20		e,g, cover construction
	Specified activity	RCS	m3			175.00	Specified-drift excavation
Excavate Rip Rap							
	drill/blast/load/short haul/place	RR1	m3	13.50	17.75		High: quarry & place rip rap in channel
	drill/blast/load/long haul/place	RR2	m3	14.20	20.65		
	source is waste dump/short haul	RR3	m3	7.00			cost includes sorting
	source is waste dump/long haul	RR4	m3	7.60			
	Specified activity	RRS	m3				
Excavate Soil; Low Spec's and QA/QC							
	clear & grub	SBC	m2	3.40	5.00		
	excavate/load/short haul	SB1	m3	4.30	5.90		
	excavate/load/long haul	SB2	m3	4.60	7.30		
	SB1 + spread and compact	SB3	m3	5.10	8.90		Low: non-engineered; High:engineered
	SB2 + spread and compact	SB4	m3	5.50	11.00		Low: non-engineered; High:engineered
	Specified activity	SBS	m3	3.20	6.30		Low: rehandle waste rock dump by dozing; High:rehandle waste rock by hauling
	Tailings	SBT	m3	1.35	3.70	15.50	High:contour surface - wet or frozen; Specified:haul/place wet infill
Excavate Soil, High Spec's and QA/QC							
	excavate/load/short haul	SC1	m3	6.80	9.30		
	excavate/load/long haul	SC2	m3	7.10	11.75		
	SC1 + spread and compact	SC3	m3	8.90	14.20		Low: non-engineered; High:engineered
	SC2 + spread and compact	SC4	m3	9.30	23.20		Low: non-engineered; High:engineered (e.g. complex covers, low volume dam construction)
	Specified activity	SCS	m3			18.80	Backfill adit with waste rock
Fence							
		FNC	m	13.55	203.00		
Fuel and Electricity							
	Fuel cost - gas	FCG	litre	1.05	1.40		
	Fuel cost - diesel	FCD	litre	0.99	1.39		
	Fuel mobilization	FCM	litre	0.22	0.42		High: winter road usage
	Electricity	FCE	kW-h	0.17	0.19	0.49	Low and High:Yellowknife; Specified:diesel generator
Geo-Synthetics							
	geotextile	GST	m2	3.44			Supply and install
	geogrid	GSG	m2	5.75			
	liner, HDPE	GSHDPE	m2	7.95			Supply and install; large quantity
	liner, ES3	GSES3	m2	20.20			FOB Yellowknife
	geosynthetic installation	GSI	m2	3.16	14.00		Low:geotextile; High:ES3 or HDPE
	bentonite soil ammendment	GSBA	tonne	308.30	348.50		FOB Edmonton, add shipping & mixing
Grouting (/m3 of rock grouted)							
		grout	m3	236.55	286.75		High: cement, FOB Yellowknife
Labour & Equipment Rates							
	Site manager	sman	$/hr	125.00	152.00		
	Supervisor	super	$/hr	52.00	91.84		
	Registered engineer	eng	$/hr	95.00	220.00		
	Environmental coordinator	envco	$/hr	74.16	130.00		
	Evironmental technologist	envtech	$/hr	36.00			
	Electrician	elec	$/hr	74.00	95.00		
	Journeyman - various	journey	$/hr	44.00	71.79		
	Labour - skilled	lab-s	$/hr	41.00	49.60		
	Labour - unskilled	lab-us	$/hr	31.00	43.98		
	Equipment operator	oper	$/hr	41.00	65.00		
	Heavy duty mechanic	mech	$/hr	49.00	72.85		

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
Water treatment plant operator	oper-wt	$/hr	41.00	59.86		
Security / first aid	safety	$/hr	36.00	66.97		
Administative staff	admin	$/hr	38.00	57.89		
Equipment rates include operator and fuel						
Loader - 4 cu.yd (3.06m3)	load-s	$/hr	175.00			
Loader - 7 cu.yd (5.35m3)	load-l	$/hr	315.00			
Excavator - 26.76-30.84 tonnes	exc-s	$/hr	190.00			
Excavator - 68.95+tonnes	exc-l	$/hr	420.00			
Grader	grad	$/hr	190.00			
Dump truck off hwy 30-50 tonnes	truck-s	$/hr	225.00			
Dump truck off hwy 55-75 tonnes	truck-l	$/hr	300.00			
dozer, small	dozers	$/hr	205.00	260.00		
dozer, large	dozerl	$/hr	490.00	565.00		
smooth drum compactor	comp	$/hr	155.00			
scooptram, 6 yd3 bucket	scoop	$/hr	170.00			
flat bed truck with hiab	hiab	$/hr	155.00			
fuel truck	ftruck	$/hr	150.00			
water truck	wtruck	$/hr	58.00	150.00		
Mobilize Heavy Equipment						
Road access	MHER	kmtonne	3.40	10.25		
Air access	MHEA	kmtonne	12.00			cargo rate>500lb
Mobilize Camp						
Road access	MCR	each	50000.00			refurbish existing camp
Mobilize Workers						
flight	MW	each	4500.00	9100.00		Low:e.g. 8 passenger; High: Dash 7
Oil Removal						
oil removal	OR	litre	0.43	1.20		Low:waste oil heater; High: ship offsite
PCB Removal						
Remove from site	PCBR	litre	40.20	46.90		Low: shipping, handling & disposal from Yellowknife
Pipes, small (<6in dia.)						
remove/dispose on site	PSR	m	1.00	24.00		Low: remove/dispose on site; High: remove/re-use
supply	PSS	m	6.10	11.10		Low:supply; High:supply and ship
install	PSI	m	25.00			
Pipes, large (>6in dia.)						
remove/dispose on site	PLR	m	22.00	72.00		Low: remove/dispose on site; High: remove/re-use
supply	PLS	m	129.00	143.00		Low:supply; High:supply and ship
install	PLI	m	50.00			
Power Lines						
remove/dispose on site	POWR	m	25.50			
Process Chemicals						
Remove from site	PCR	kg	0.45	2.50		Low: shipping, handling & disposal from Yellowknife
Pumps						
Pump capital cost	PC	each	195000.00			
Pump shipping	PS	each	2500.00			
Pump operating cost	POC	m3	0.12			pump operating costs should be calculated based on pump capacity, fuel costs, etc.
Pump maintenance	PM	allow	25000.00			
Pump sand BackFill						
	PBF	m3	85.00	300.00		
Scarify - road/mine site						
	SCFY	ha	4300	6030	2150	
Shaft, Raise & Portal Closures						
Shaft & Raises	SR	m2	645.00	2132.00		Low:pre-cast concrete slabs, little site prep. Area=shaft+>1m all around
Portals	POR	m3	18.80	250.00	1200.00	Low:unit cost code SCS;High:excavate & backfill collapsed portal;Spec: installed pressure plug
Site Inspection Report						
	RPT	each	10000.00	20000.00		
SpillWay - Clear						
	SW	each	3000.00	7000.00		
Survey/Instrumentation						
	SI	each	1800.00	3600.00		2 person crew
Treatment Plant - Construct						
Small (< 1000 m3/d)	TPS	lump sum	9000000	15000000		
Large (> 1000 m3/d)	TPL	lump sum	15000000	46000000		
Constructed Wetland	CWTS	ha	200000	300000		
Treatment Plant - Operate						
	TPO	m3	0.35	2.00		
Treatment Chemicals						
ferric sulphate	ferric	kg	1.19			
ferrous sulphate	ferrous	kg	1.32			
lime	lime	kg	0.56			
hydrogen peroxide, 35%	hperox	kg	1.50			
Sodium Metabisulfate	Nametab	kg	1.18			
Caustic soda, 50%	caustic	kg	0.74			
Sulfuric acid, 93%	sulfuric	kg	0.31			
flocculant	flocc	kg	6.00			
copper sulphate	copper	kg				
shipping	shipping	kg	0.20			
Vegetation						
Hydroseed, Flat	VHF	ha	4000.00			
Hydroseed, Sloped	VHS	ha	4500.00			
Veg. blanket/erosion mat	VB	ha	13000.00			

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
Tree planting	VT	ha	2600.00	6000.00		
Wetland species	VW	ha			47.72	Specified= /m3, Wetland Growth Media Substrate mixed and installed (sand, biochar and fertilizer, woodchips)
Water Sampling/Analysis/Reporting						
	WS	each	7000.00	10000.00		
Winter Road						
Construction	WRC	km	2000.00	11500.00		
Usage	WRU	kmtonne	0.29			

Unit Cost Estimator

1 Equipment Productivity Figures and Graphs have been reproduced from Caterpillar Performance Handbook - Edition 42

EXCAVATION

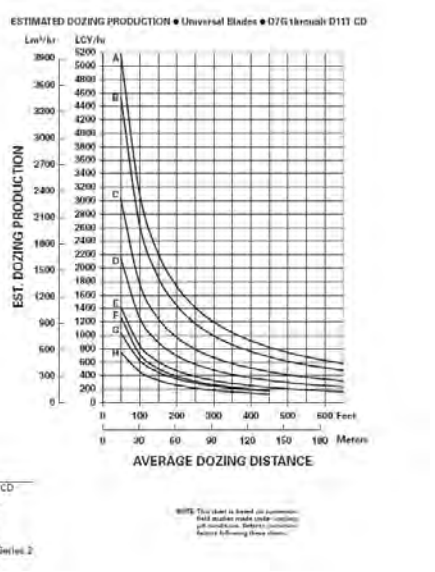
Productivity		
Machine Cat 336EL		
bucket capacity	3.16	m3
fill factor	75%	%
cycle time	45	seconds
operator skill	80%	%
machine availability	83%	%
altitude adjustment	100%	%
Hourly productivity	125.89	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$180.00	$/hr
Excavation cost - contractor rate	1.43	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Excavation cost - owner rate	$0.00	$/m3
Excavation cost - select contractor or owner rate (D22 or D31)		$/m3

HAUL AND DUMPING

Productivity		
Machine Cat 770		
truck capacity	25.1	m3
fill factor	80%	%
load time	6.0	min.
haul distance	1.5	km
average velocity	20.0	km/hr
haul time + return time	9.0	min.
wait time	0.5	min.
dump time	1.0	min.
cycle time	16.5	min.
machine availability	83%	%
altitude adjustment	100%	%
	13.7	ve. min/cycle
Hourly productivity	88.0	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$225.00	$/hr
Haul and Dump - contractor rate	2.56	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Haul/Dumping Cost - owner rate	$0.00	$/m3
Haul/Dumping Cost - select contractor or owner rate (I22 or I31		$/m3

SPREADING/DOZING

Productivity		
Machine Cat D8		
Estimate production using example curves provided or	600	m3/hr
equivalent from other supplier		
Correction factors (see table provided)		
operator skill	0.75	
material type, see table	0.80	
slot dozing	1.00	
side by side dozing	1.00	
visibility	1.00	
job efficiency	0.83	
altitude adjustment	1.00	
slope adjustment	1.00	
Hourly productivity	298.8	m3/hr
Operating Costs		
- Contractor		
Hourly rate - contractor supplied	$260.00	$/hr
Dozing - contractor rate	0.87	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	
Spreading/Dozing Cost - owner rate	$0.00	$/hr
Spreading/Dozing Cost - select contractor or owner rate (N22 or N31)		$/m3



Excavator

	Cat 320	Cat 325B	Cat 375
heaped bucket capacity, m3	1.5	2.2	5.4
	Typical Cycle Times (seconds)		
easy digging, shallow digging, small swing angle	16	18	20
med. to hard digging, rocky soil, swing angle to 90 deg.	23	23	25
tough digging, sandstone, caliche, at max. machine depth, swing angle > 120 deg.	27	29	35

Material	Fill Factor (% of heaped bucket capacity
Moist loam or sandy clay	100 - 110
sand and gravel (not till)	95 - 110
hard tough clay	80 - 90
rock - will blasted	60 - 75
rock - poorly blasted	40 -60

Operator Skill	poor	average	good
Correction factor	0.6	0.75	1

Machine availability	poor	average	good
Correction factor	0.9	0.95	1

Trucking

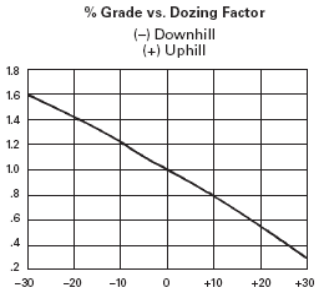
	Cat 771 D	Cat 777D	Cat 789C
Truck capacity - heaped, m3	27.5	60.5	137

Dozing

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR
OPERATOR —	
Excellent	1.00
Average	0.75
Poor	0.60
MATERIAL —	
Loose stockpile	1.20
Hard to cut; frozen —	
with tilt cylinder	0.80
without tilt cylinder	0.70
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80
Rock, ripped or blasted	0.60-0.80
SLOT DOZING	1.20
SIDE BY SIDE DOZING	1.15-1.25
VISIBILITY —	
Dust, rain, snow, fog or darkness	0.80
JOB EFFICIENCY —	
50 min/hr	0.83
40 min/hr	0.67
BULLDOZER*	
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.	
GRADES — See following graph.	

*NOTE: Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.



The functions in this worksheet serve as a back up in the event that the menu item "Add

Save file before clearing all data

Shows both active worksheet as well as table of Unit Costs in a sep

Prints all worksheets having non-zero sums

-Ins" is not

shown in E

xcel menu bar

These functions duplicate components within worksheet