RECLAIM Version 8 (V8)

USER MANUAL

MINING VERSION

Developed by:
Government of the Northwest Territories and
Crown-Indigenous Relations and Northern Affairs Canada

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This User Manual supports the RECLAIM V8 tool for developing 100% Environmental Liability Cost Estimates. Each jurisdiction that chooses to utilize RECLAIM V8 does so pursuant to their own legislation, guidelines, and policies, and in consultation with proponents.

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Definitions and Acronyms

TERM	DEFINITION
AACE	Association for the Advancement of Cost Engineering
adaptive management	A management approach that describes a way of managing risks associated with uncertainty and provides a flexible framework for mitigation, monitoring and management measures to be implemented and actions to be taken, when specified thresholds are exceeded. Measures may include special studies, operational changes, revised or new water and waste management systems, structures or facilities or implementing mitigation activities to prevent, stabilize or reverse a change in environmental conditions or otherwise protect the receiving environment
AEMP	Aquatic Effects Monitoring Program
affected party(ies)	A party that is affected (or predicted to be affected) by a proposed or existing project, including an Indigenous government, an individual occupying land for traditional purposes, a private landowner, or a lease or interest holder (e.g., for a lodge).
Alberta Equipment Rental Guide	Alberta Roadbuilders and Heavy Construction Association (ARHCA) 2024 Equipment Rental Rates Guide
ARHCA	Alberta Roadbuilders and Heavy Construction Association[1]
Alberta Union Collective Agreement	Collective Agreement between PCL Builders Inc. Roadbuilding & Heavy Construction – Alberta and Construction Workers Union CLAC Local 63
The Blue Book 2024 BC	The Blue Book – 2024-2025 Equipment Rental Rate Guide BC Road Builders & Heavy Construction Association[2]
Boards	The Nunavut Water Board (NWB) and the Land and Water Boards of the Mackenzie Valley (LWB).
capital costs	See definition for DIRECT COSTS.
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada (formerly DIAND/INAC)
closure and reclamation	The processes and activities that facilitate the return of areas affected by a project to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and human activities.
contingency	An amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. Typically, contingency is estimated using statistical analysis or judgment based on past asset or project experience.[3] For RECLAIM, the determination of contingency percentage is a subjective and project-specific task that relies on the judgement of the estimator. The basis for that estimate typically correlates to the level of design (i.e. the more advanced the design, the fewer the project unknowns and cost uncertainties).
CPI	Consumer Price Index
CRP	Closure and Reclamation Plan.

[1] See https://www.arhca.ab.ca/

[2] See https://www.roadbuilders.bc.ca/blue-book/

[3] See AACE International Recommended Practice No. 10S-90 – Cost Engineering Terminology for Contingency

DIAND	Department of Indian Affairs and Northern Development (now CIRNAC)
direct costs	Direct costs are recognized as fixed, one-time expenditures to bring a project to an operable/final completed status. It includes the construction execution costs, and contrasts with operating/operational costs, which are the business operating costs, business overhead costs, equipment operating costs, etc. For RECLAIM, and in cost estimating practice, direct costs is used synonymously with CAPITAL COSTS.
escalation	A provision in costs or prices for uncertain changes in technical, economic, and market conditions over time. Inflation (or deflation) is a component of escalation.[4]
engagement	The communication and outreach activities a proponent undertakes with affected parties prior to and during the operation of a project.
environmental liability cost estimate	An estimate of the cost to ensure a third-party contractor can undertake the interim closure and maintenance, closure and reclamation, long-term monitoring and maintenance, and adaptive management activities of any abandoned sites. Also referred to as closure and reclamation cost estimate.
FCR	Final closure and reclamation includes dismantling infrastructure, reclaiming disturbed land, stabilizing tailings and waste facilities, restoring ecosystems, post-closure monitoring and maintenance activities, and adaptive management thresholds and corresponding activities.
GNWT	Government of the Northwest Territories
GN	Government of Nunavut
ICM	Interim care and maintenance is the period between the cessation of mining activities and when active remediation (a construction/demolition phase analogous to the implementation of closure activities) begins.
INAC	Indigenous and Northern Affairs Canada/Indian and Northern Affairs Canada (now CIRNAC)
Indigenous government/ organization	An government or organization representing a First Nation (as defined in section 2 of the MVRMA), Métis or Inuit organization, the Tłı̨chǫ First Nation, the Tłı̨chǫ Government, or the Dél̨ı̨nę Got'ine Government.
indirect costs	The indirect costs in RECLAIM include those for planning and designing, and that administratively and logistically support the reclamation and closure work.
inflation	A persistent increase in the level of consumer prices, or a persistent decline in the purchasing power of money, caused by an increase in available currency and credit beyond the proportion of available goods and services.[5]
inspector	An appointee or designated person representing a Regulator or Land owner who has the authority and designation to ensure compliance with authorizations with licence and/or permit conditions, such as verifies closure activities, reclamation, long-term monitoring and maintenance, and adaptive management plan activities have been adequately completed by a proponent.
land use permit	A regulatory authorization required for an activity set out in sections 4 and 5 of the Mackenzie Valley Land Use Regulations; or a land use permit (type C) required by Tłı̨chǫ law for use in Tłı̨chǫ lands or by a Dél̨ı̨nę law for a use of Dél̨ı̨nę lands, respectively, for which a type A or type B land use permit is not required. In Nunavut, a Land Use Permit means a Class A or Class B Permit. A Class A or Class B Permit means a permit issued pursuant to section 25 or section 27 Territorial Land Use Regulations, respectively.

[4] See AACE International Recommended Practice No. 10S-90 – Cost Engineering Terminology for Escalation

[5] See AACE International Recommended Practice No. 10S-90 – Cost Engineering Terminology for Inflation.

long-term monitoring and maintenance	The desired goals and outcomes of long-term monitoring and maintenance are jurisdictionally specific. Proponents are advised to seek guidance from their applicable land and water board / water board jurisdiction, such as Mackenzie Valley Land and Water Board or Nunavut Water Board, on the duration and thresholds and expectation for long-term monitoring and maintenance.
LWB	Land and Water Boards of the Mackenzie Valley
mob/demob	Mobilization/Demobilization
MVLWB	Mackenzie Valley Land and Water Board
NU	Nunavut
NWB	Nunavut Water Board
NWT	Northwest Territories
owner's rep	The Owner's Representative is an independent third-party entity acting on behalf of the landowner or regulator to ensure that closure and reclamation activities meet all technical, regulatory, and contractual requirements. The Owner's Representative provides independent oversight and advocacy for the landowner/regulator's interests throughout closure and post-closure phases.
progressive reclamation	Reclamation activities proactively conducted during the operating phase of a project.
project definition	The scope of work/ all activities, for a given project (e.g. closure and reclamation project), that will be used to calculate its cost
project management	Project Management is responsible for the planning, coordination, and execution of closure and reclamation activities. It is execution-focused, ensuring that closure plans are implemented effectively, on time, and within budget, while maintaining safety and environmental standards. Project Management is embedded within the delivery team and focuses on day-to-day operational control.
proponent	Applicant for, or holder of, a water licence and/or land use permit.
QA/QC	Quality Assurance/Quality Control
RECLAIM tool (or RECLAIM)	The preferred tool for calculating 100% environmental liability cost estimates for activities that require a water licence (including those that also require a land use permit).
reclamation	The process of returning a disturbed site to its natural state, or to a state which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
RIA	Regional Inuit Association (e.g. Kivalliq Inuit Association, Kitikmeot Inuit Association, and Qikiqtani Inuit Association)
remediation	The removal, reduction, or neutralization of substances, wastes, or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.
security deposit	Funds held by the appropriate authority (e.g. GNWT, CIRNAC, or landowner) that can be used in the case of abandonment of a project to reclaim the site, or carry out any ongoing measures that may remain to be taken after the abandonment of the project.
SNP	Surveillance Network Program
third-party contractor	A private company that is contracted by the Land owner or Regulator to undertake reclamation work on their behalf. It is noted that these contractors may utilize resources and equipment normally sized for construction or demolition / reclamation activities (i.e. not operational-sized mining equipment.)

water licence	An authorization required as per the Nunavut Waters and Nunavut Surface Right Tribunal Act and Regulations (NU land), NWT Waters Regulations (NWT land outside of a federal area), and Mackenzie Valley Federal Areas Waters Regulations (federal area) that permits the for uses of water or deposits of waste into water.

1 Introduction

1.1 Overview

RECLAIM is the Land and Water Boards of the Mackenzie Valley (LWB), Nunavut Water Board (NWB), Government of Northwest Territories (GNWT), and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) accepted means to develop 100% environmental liability cost estimates. These estimates are intended to cover environmental liability costs associated with authorized development projects in the Northwest Territories (NWT) and Nunavut (NU). While RECLAIM is a tool to develop environmental liability cost estimates, establishing the security deposit amount[6] is jurisdictionally specific. Proponents are advised to seek guidance from their applicable land and water board / water board jurisdiction, such as the Mackenzie Valley Land and Water Board or the Nunavut Water Board, on the establishment of the security deposit amount.

The RECLAIM V8 tool and associated User Manual have been developed on behalf of the GNWT and CIRNAC. Since 1993, RECLAIM and its previous versions have assisted governments, the Boards, landowners (e.g. Indigenous Owned Lands) and stakeholders (typically proponents) in estimating environmental liability costs (the "closure cost estimate"). The RECLAIM tool format is specifically designed to help these parties to better comprehend the multiple components of mine site closure cost estimates and provide a transparent means of presenting the environmental liability cost estimate. RECLAIM V8 is geared towards mines and advanced mineral exploration projects in the NWT and NU, Canada, but can and has been used in other geographical regions and on other project types.

1.2 Background and Security

Mining, which includes all the phases of project development, plays an important role in the economy of Northern Canada. Unfortunately, there have been instances where mines were abandoned prior to full closure and reclamation. A consequence of this is that landowners (such as the Federal government) have become responsible for a large portfolio of “contaminated” sites, most of which are managed by CIRNAC’s Northern Contaminated Sites Program (NCSP). These sites range from relatively small advanced exploration properties to full scale former mines.

In response to these past events, the modern regulatory framework of the Northwest Territories and Nunavut were designed with the goal of ensuring that proponents close mines in an environmentally responsible way. As part of this framework, proponents are required to deposit an acceptable form of security with the landowner (e.g. GNWT,

[6] See Section 2.1 of *LWB/GNWT/CIRNAC Guidelines for Closure and Reclamation Cost Estimates for Mines* and the “Financial Security” sections of *A Mine Site Reclamation Policy for the Northwest Territories* and *Mine Site Reclamation Policy for Nunavut*, respectively.

CIRNAC, and/or Indigenous Government/Organization/Association) that in the event the proponent becomes insolvent, can be used to close and reclaim the site, or carry out any ongoing measures that may remain to be taken after the abandonment of the project. A key component of this process is the development of an environmental liability cost estimate that is based on the mine's Closure and Reclamation Plan (CRP). A proponent is required to develop a CRP and maintain a security deposit through the legally binding conditions set out in the regulatory authorizations issued to the proponent. Requirements of the CRP are jurisdictionally specific. Proponents are advised to seek guidance from their applicable land and water board / water board jurisdiction, such as the Mackenzie Valley Land and Water Board or the Nunavut Water Board[7].

1.3 Estimating 100% Environmental Liability Costs

Within the modern regulatory framework, proponents are responsible for calculating 100% of the environmental liability cost estimate to ensure a third-party contractor can undertake the interim care and maintenance, closure and reclamation, long-term monitoring and maintenance, and adaptive management activities of any abandoned site. The environmental liability cost estimate includes the activities as defined in a mine's CRP (the project definition). The cost estimate must include all direct and indirect costs that would be incurred from the time the site is abandoned, through interim care and maintenance, and completion of closure and reclamation activities. In addition to remedial works, environmental liability cost estimates are to account for post-closure monitoring costs (for example, water quality monitoring, geotechnical inspections, etc.), post-closure maintenance costs (for example, the costs of repairing eroded areas of a tailings cover that would be reasonably expected in the future), and Adaptive Management Plan activities. A third-party contractor is a private company that regularly conducts reclamation work utilizing resources and equipment normally sized for reclamation activities (i.e. not operational-sized mining equipment). The desired goals and outcomes of long-term monitoring and maintenance are jurisdictionally specific. Proponents are advised to seek guidance from their applicable land and water board / water board jurisdiction, such as the Mackenzie Valley Land and Water Board or the Nunavut Water Board[8], on the duration and thresholds to be met of long-term monitoring and maintenance.

This User Manual includes descriptions of:

- Considerations for environmental liability cost estimates in northern settings (Section 2);

[7] Mackenzie Valley Land and Water Board (https://mvlwb.com/resources/lwb-policies-and-guidelines) or Nunavut Water Board (https://www.nwb-oen.ca/).

[8] Mackenzie Valley Land and Water Board (https://mvlwb.com/resources/lwb-policies-and-guidelines) or Nunavut Water Board (https://www.nwb-oen.ca/).

- How different parties may approach the 100% environmental liability cost estimate for a given site (Section 3). An understanding of the perspectives may help resolve differences in the cost estimates prepared; and
- The RECLAIM tool and guidance on how to use it (Sections 4 and 5), which includes:
    - RECLAIM V8 Excel Worksheets (Section 4);
    - Using RECLAIM (Section 5).

2 Considerations for Northern Settings

To derive accurate environmental liability cost estimates, it is imperative that the proponent have an approved CRP which demonstrates a comprehensive understanding of closure and reclamation requirements, objectives, and the scope of work to achieve those objectives, monitor and maintain their performance, and adaptive measures to be implemented and actions to be taken, when specified thresholds are exceeded. The first step to using RECLAIM effectively is to prepare a CRP with sufficient detail to list and quantify the activities required.

The following are some factors that should be recognized when developing a CRP and environmental liability cost estimate for a site in northern Canada.

- 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, closure and 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. Environmental Liability Cost Estimates

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

3.1 Proponent Operating Costs – Internal Use

A proponent's estimate for internal use presents the costs the proponent 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. The following are some typical factors which may affect this type of cost estimate.

- Low unit costs are generally utilized by the proponent 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 the 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 proponent'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 Environmental Liability Cost Estimate

An environmental liability cost estimate is assumed to cover a third-party's costs should the proponent become insolvent and abandon the site. Costs are therefore inherently higher than a proponent's operating cost estimate described in Section 3.1.

The following are some typical factors which may affect this type of cost estimate:

- 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. RECLAIM does not assume that existing mine equipment is available and in good working condition, see Section 4.2.5).
- No allowance for salvage or sale of equipment.
- The environmental liability 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.
- Includes a provision for interim site care and maintenance to address the period of time between the ceasing of operations and the commencement of closure work. The duration of Interim Care and Maintenance has demonstrably been found to be at least five years for projects that return to a public government; more if a final closure plan has not been approved and/or there are complex issues to address.
- A contingency is applied that reflects the maturity level and degree of uncertainty in the closure 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).
- Salvage value is not recognized because of the problems associated with creditor's rights, sale of equipment, and uncertainty as to the actual value at the time of

insolvency. It is also accepted that the costs of mobilizing equipment off site may at times exceed the sale value of the equipment, thus making it not a viable option.

- The precautionary principle, which states that "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation[9]."

3.2.1 Progressive Reclamation

Environmental liability cost estimates are prepared assuming progressive reclamation has not yet occurred. Until this work is completed and its performance verified by the responsible inspector and/or regulatory board, it is still an outstanding environmental liability (i.e. closure and reclamation cost), just like any closure and reclamation activities that are put off until final closure of the project site.

Proponents are encouraged to carry-out progressive reclamation as early as possible (i.e. during operations). If the proponent carries out progressive reclamation such as revegetation of disturbed areas during operations, then the environmental liability cost estimate could be reduced by the associated costs for that component when the proponent demonstrates that the closure activity has been successfully completed and the responsible inspector and/or regulatory board has verified the closure and reclamation objectives and criteria have been met.

While RECLAIM is a tool to develop environmental liability cost estimates, the specifics for calculating work completed (i.e. progressive reclamation) for the purposes of reducing the environmental liability cost estimate are jurisdictionally specific. Proponents are advised to seek guidance from their applicable land and water board / water board jurisdiction, such as the Mackenzie Valley Land and Water Board or the Nunavut Water Board, on the reduction of the environmental liability cost estimate as a result of progressive reclamation.

4 RECLAIM V8

4.1 General Description

RECLAIM is a tool developed in Microsoft Excel to aid in the calculation of costs associated with each activity required to meet the objectives of the site-specific CRP. It is designed to both assist the user in identifying the activities required to close and reclaim each site component, as well as estimate the costs through providing a typical range for each unit cost. RECLAIM provides line items for numerous types of closure and reclamation activities which might be required at a given site. For each closure and reclamation activity, the model presents the “quantity” of work multiplied by the appropriate “Unit Cost”. For example, an activity may involve using a dozer to contour overburden in a

[9] See Chapter 3 of Guide to understanding the Canadian Environmental Protection Act: chapter 3 - Canada.ca

disturbed area. If the quantity of soil to be dozed is 500 m^3 and the unit cost is \$1.54/m^3, then the cost for that reclamation activity would be \$770.

The default lists provided in the RECLAIM tool will likely cover the majority of the activities required for closing and reclaiming a given mine. The default lists do not attempt to include all possible closure and reclamation activities as the worksheets would be too cumbersome. If a desired activity is missing from the default list the user may modify text within this area of the RECLAIM worksheet or insert rows within the worksheet. If rows are inserted, it should be checked that these rows have been included in the total calculations for the worksheet. The onus for this is on the User of the sheet.

In RECLAIM, there are eleven costing worksheets used to calculate the overall closure cost estimate. These include costs associated with the following mine components:

- Open pit(s)
- Underground mine
- Tailings impoundment(s)
- Rock pile(s)
- Buildings and equipment
- Chemicals, hazardous materials, and contaminated soils
- Water management
- Water treatment

In addition, RECLAIM includes worksheets for estimating the costs for:

- Interim Care and Maintenance (including preparation of the Final Closure and Reclamation Plan)
- Post-closure monitoring and maintenance
- Mobilization and demobilization

Direct costs[10] are those attributed to performing the work activities necessary for implementing the CRP. Closure costs for each of the typical mine components are estimated in worksheets of the same name.

Indirect cost such as engineering design, project management, monitoring & quality management, bonding/insurance, engagement and regulatory compliance, contingency and owner's representative are calculated as percentages of the direct costs in the Summary Worksheet.

4.2 RECLAIM Worksheets

Most of the RECLAIM worksheets are self-explanatory based on the list of activities. However, the following worksheets are considered to warrant further description. They are listed in the tab order that they appear in the RECLAIM V8 tool.

[10] In RECLAIM, direct costs are synonymous to 'capital costs'.

4.2.1 Interim Care and Maintenance

The Interim Care and Maintenance (ICM) worksheet captures the costs incurred during the period between the cessation of mining activities and when active remediation (a construction/demolition phase analogous to the implementation of closure activities) begins. The ICM activities include:

- Maintaining the overall physical and chemical stability of the site (on-site caretaker team carrying out site maintenance and water management as required).
- Finalizing the closure and reclamation plan.
- Retaining a water licence and any other applicable authorizations for closure.
- Conducting 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 of overall interim care and maintenance costs.

The scenario that typically forms the basis of the ICM costs is as follows:

- Operations have ceased with as much of the site facilities mothballed as possible. For example, the number of buildings that require usage and heat is reduced to the extent possible.
- Efforts have been made to minimize site presence with costs based on the minimum number of people on-site thought to be necessary to maintain site security and environmental compliance.
- The open pit or underground mine has been allowed to flood thus reducing (though likely not eliminating) the quantity of water to manage or treat.

The duration of Interim Care and Maintenance has demonstrably been found to be at least five years for large projects that return to a public government.

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.

RECLAIM V8 uses the volume space of each building to estimate the demolition costs. For example, the total footprint area of a building multiplied by its height. Unit Costs are applied per m^3. Effort for disposal and burial of demolition waste are also included in this worksheet and are to be included in the closure cost estimate.

Users should be aware that demolition cost estimates are to include:

- 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.
- Health and safety workplace culture.
- Expectation for recycling, which then requires more careful demolition.

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

4.2.3 Chemicals, Hazardous Materials & 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 material 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 has been observed that even the best managed mines will have incidents that result in 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 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.

4.2.4 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. Direct costs of water treatment systems are calculated within this worksheet, both for conventional active water treatment systems and passive water treatment systems.

As described below, there is a line included within this worksheet for short term 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 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 have deteriorated to an advanced state of disrepair and has no material value (as has been the case for many abandoned sites in the north).

The environmental liability cost estimate will include mob/demob for equipment, supplies and workers to perform the ICM activities, active remediation (closure activities), and post closure monitoring and maintenance.

Especially in remote locations, careful consideration is given to the logistics and associated costs that are expected to contribute to high mobilization and demobilization costs.

Mobilization/Demobilization of Equipment and Supplies

It is assumed that a third-party 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 of transporting the fuel) is assumed to be necessary for every site.

Many northern mine reclamation sites are not accessible by all-season road and require winter road or winter trail access, and/ or aircraft access, and/ or water access to mob/demob equipment and supplies. The Mobilization/Demobilization worksheet includes a “Winter Road for Mobilization” subsection with winter road construction and operation, limited winter use (winter trail), and winter road tariff as closure cost items. While the Unit Cost Table includes unit rates of mobilization for road access, sealift, and barging. Airlift mobilization is highly variable, dependant on the size of equipment and materials, location and condition of airstrip, size of aircraft required, and therefore requires a user defined unit cost in the Unit Cost Table; “Other (e.g. airlift)” rate.

Some remote sites, especially in Nunavut, require mobilization by sealift to a designated port; and may then also require winter road access to the site.

Personnel Movement & Accommodation

In the case of remote sites, mobilization of workers at the beginning/end of each work rotation is included. Aircraft transport of personnel is often used for worker mob to the

remote sites. Modifications to an existing camp or mobilization of a worker's camp may be required to allow for use by smaller numbers of support staff during closure and reclamation, or post-closure activities.

Ultimately, good knowledge of the mobilization and demobilization planned and actualized for the active mine operations is key in understanding the required post-mining access options and, therefore, provides more accurate reclamation costs.

4.2.6 Post-Closure Monitoring and Maintenance Activities, and Adaptive Management Plans

Post-closure monitoring and maintenance costs are estimated in the "Post-Closure" Worksheet. These should reflect the monitoring and maintenance plans and commitments identified in the CRP, as well as the Post-Closure Monitoring and Maintenance Plan[11]. Common monitoring programs are the Surveillance Network Program (SNP), Aquatics 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. If the trend for closure objectives is consistently being met, monitoring frequency may be decreased at progressively fewer sampling points after closure.

An important distinction regarding the calculated environmental liability cost estimate for the post-closure monitoring and maintenance, is that it reflects the monitoring and maintenance commitments in the CRP and not risk-based costs for potential future monitoring or maintenance events. If post-closure risk events are a concern for a closure component, the monitoring and maintenance plans should capture appropriate activities to be costed in conjunction with the Adaptive Management Plan.

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.

Note: determination of future costs must include all parameters such as site access, monitoring, labour, fuel, power and all reagents and supplies.

4.2.7 Water Treatment

Water treatment at a site is generally classified as either short term or long. Short-term water treatment may include continuing active water treatment during ICM or other activities during construction such as drawing down supernatant from a tailings storage facility pond, treating a sediment pond with flocculant prior to water release, or treating

[11] The LWBs' Standard Water Licence Conditions include Post-Closure Monitoring and Maintenance Plans, and it is typical for LWBs to require these for projects that require a water licence.

water that is expected to achieve acceptable quality for direct discharge during construction. Long-term water treatment includes activities which will occur post-closure such as managing neutral mine drainage or Acid Rock Drainage (ARD) and to ensure compliance with water quality objectives and regulatory requirements. Table 1 provides a more comprehensive comparison of activities typically considered short-term versus long-term water treatment. Because the distinction between short-term and long-term water treatment is somewhat arbitrary, users should complete the worksheets in a manner that best reflects anticipated site conditions and associated costs.

The “Water Treatment” worksheet does not directly populate values in the “Summary Sheet”. Instead, the worksheet calculates costs that transfer to the “Interim Care and Maintenance”, “Tailings, Water Management”, or “Post-Closure Monitoring and Maintenance” worksheets, where they are captured in the overall costs reported in the “Summary Sheet”. There are notes describing this on the worksheets.

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

		Short Term (Ops, ICM, Construction)	Long term (Post Closure)
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	x
	overflow treatment	x	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	x
	collect and treat seepage (ARD/ML)	x	x
	install passive treatment system	x	
	operate and maintain passive treatment system	x	x
	detoxify heap leach pile (cyanide destruction)	x	
Tailings Storage Facility	construct diversion ditches	x	
	pump supernatant (to pit, U/G)	x	x
	treat supernatant	x	x
	install toe seepage collection system	x	
	collect and treat seepage (ARD/ML)	x	x
	install passive treatment system	x	
	operate and maintain passive treatment system	x	x
U/G Mine	accelerate flooding	x	
	install seepage collection system	x	
	install dewatering/pumping system	x	
	operate seepage/dewatering system (ARD/ML)	x	x
Water Management	refill lakes	x	x
	redirect creeks/streams	x	
	stabilize water management ponds	x	x
	stabilize/close sediment ponds	x	
	fresh water supply - breach embankment	x	
	fresh water supply - remove piping system	x	
	water treatment plant	x	x
	sludge pond	x	x
	water control in reclamation quarry	x	
	operate/maintain water treatment plant	x	x

4.2.8 Additional RECLAIM descriptions

4.2.8.1 Engineering Design

In preparing a closure cost estimate, it is typical to assume that there is an existing, CRP that can be converted to contract ready documents for closure activities. The CRP will exist in various stages of progressive design as the project advances through its lifecycle. It typically requires years to get a fully approved CRP, and applicants/licensees are encouraged to advance closure planning as early as possible.

In the RECLAIM tool, the engineering provision is for advancing the CRP 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, and to provide quality assurance for the work.

4.2.8.2 Project Management

Project Management is responsible for the planning, coordination, and execution of closure and reclamation activities. Unlike the Owner's Representative, which provides independent oversight, Project Management is embedded within the delivery team and focuses on operational control. Key responsibilities include:

- Scheduling and Budget Control: Develops and maintains project timelines, monitors progress, and ensures adherence to budget constraints.
- Contract Administration: Manages contractor agreements, change orders, and procurement processes.
- Resource Coordination: Allocates personnel, equipment, and materials to meet project objectives efficiently.
- Risk Management: Identifies potential risks to schedule, cost, and safety, and implements mitigation strategies.
- Compliance and Reporting: Ensures activities meet regulatory requirements and prepares reports for regulators and stakeholders.
- Field Oversight: Supervises on-site activities to confirm work aligns with approved plans and specifications.
- Change Management: Handles scope adjustments and ensures proper documentation and approvals.
- Close-Out Activities: Prepares as-built documentation, final reports, and lessons learned for post-closure phases.

Project Management is execution-focused, ensuring that closure plans are implemented effectively, on time, and within budget, while maintaining safety and environmental standards.

4.2.8.3 Monitoring and QA/QC

Monitoring and Quality Assurance/Quality Control (QA/QC) within the engineering team focuses on verifying that design intent and technical specifications are achieved during

closure and reclamation activities. This is an integral part of project delivery and ensures that work meets regulatory, contractual, and performance standards.

Key responsibilities include:

- Design Compliance: Confirm that construction and reclamation activities align with approved engineering drawings, specifications, and closure objectives.
- Material and Installation Verification: Inspect and test materials (e.g., soil, rock, geosynthetics) and installation methods to ensure they meet required standards.
- Field Testing and Documentation: Conduct geotechnical, environmental, and structural tests; maintain detailed records for traceability and reporting.
- Change Control: Validate any field modifications against engineering principles and update as-built documentation.
- Performance Monitoring: Implement instrumentation and monitoring programs to assess stability, water management, and cover system performance during and after construction.
- Continuous Improvement: Identify deviations early, recommend corrective actions, and integrate lessons learned into future phases.

This scope is execution-focused, embedded in the project delivery process, and accountable for technical integrity and compliance.

4.2.8.4 Bonding/Insurance

Costs to secure performance and payment bonds and liability insurance are calculated as 3% of direct costs in RECLAIM.

4.2.8.5 Engagement and Regulatory Compliance

Engagement and consultation are required components of the regulatory process for applicants and holders of land use permits and water licences. For example, in the NWT, the LWB have developed an engagement and consultation policy and engagement guidelines for applicants and holders of water licences and land use permits[12]. The Policy describes expectations for communication and outreach with affected parties (including the LWB and Crown) from the initial project planning and pre-application (of permits and licences) stages through the life of the project. Engagement Record(s) and an Engagement Plan(s) are required submissions of the policy and guidelines.

Engagement activities should also consider risk communication in order to restore confidence in the mine site area so that closure objectives related to cultural use can be met. For example, these activities may include campaigns over various media (social media, radio, etc.), development of visual and graphical tools, risk communication specialists, and costs of developing risk communication plans.

Regulatory compliance costs may include but are not limited to: transfer or renewal of authorizations e.g. submission of application, participation in technical sessions and

[12] Further information can be found on the LWB website.

public hearings); preparing required submissions (e.g. annual reports required by the water licence, responses to information requests); reporting (e.g. monitoring reports, reclamation completion reports); and responding to reviewer comments during public reviews.

4.2.8.6 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 (design developments and changes within the scope, and variations in market and environmental condition). Contingency usually excludes[13]:

- Major scope changes;
- Extraordinary events such as major strikes and natural disasters;
- Management reserves; and
- Escalation and currency effects.

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	Typical CRP Phase	Contingency
Pre-feasibility, conceptual or trade-off study	Very basic engineering only and costs based upon typical unit costs (typical level of detail in Closure and Reclamation Plans)	Initial CRP/ Interim CRP (ICMP)	25 %
Feasibility or advanced conceptual	Engineering may be 10% complete and costs based upon typical unit costs	ICMP/ Final CRP (FCRP) with substantive-level engineering design	20 %
Preliminary or budget level	Little detailed engineering and costs based upon verbal quotes	FCRP with substantive design complete	15 %
Definitive or construction drawing phase	Engineering mostly complete, some written quotes	FCRP with detailed design complete	10 %
Detailed or Project Control	Based upon detailed engineering "take-offs" and written quotes	FCRP with Issued for Tender (IFT) engineering complete	5 %

[13] See AACE International Recommended Practice No. 10S-90 – Cost Engineering Terminology for Contingency

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 worksheet (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 V8, contingencies are applied to the direct costs.

4.2.8.7 Owner's Representative

The Owner's Representative (Owner's Rep) is an independent third-party entity acting on behalf of the landowner or regulator to ensure that closure and reclamation activities meet all technical, regulatory, and contractual requirements. This role is distinct from Project Management and provides oversight rather than execution. Key responsibilities include:

- Regulatory Compliance Oversight: Verifies that all closure activities adhere to applicable laws, permits, and guidelines.
- Technical Assurance: Confirms that engineering designs and construction practices meet approved standards and closure objectives.
- Risk Management: Identifies and mitigates risks related to environmental performance, safety, and schedule.
- Stakeholder Liaison: Acts as the primary interface between regulators, Indigenous governments, and other affected parties.
- Contract Administration Support: Reviews contractor performance, change orders, and ensures contractual obligations are met.
- Reporting and Documentation: Provides transparent reporting to the landowner/regulator on progress, compliance, and emerging issues.
- Health and Safety Oversight: Ensures adherence to safety standards and monitors implementation of safety programs.

Unlike Project Management, which focuses on day-to-day coordination and execution, the Owner's Representative provides independent oversight and advocacy for the landowner/regulator's interests throughout closure and post-closure phases.

4.3 Indirect Costs as a Percentage of Direct Costs

4.3.1 Overview

Indirect costs are costs that are not directly attributable to the completion of an activity. They are typically allocated or spread across all activities on a predetermined basis (i.e., RECLAIM assigns a default percentage for the different indirect cost item).

The indirect costs in RECLAIM include those for planning and designing, and that administratively and logistically support the reclamation and closure work. They are calculated as specified percentages of the direct costs based on best professional judgement (i.e. the default indirect percentages in RECLAIM are based on best professional judgement).

Detailed descriptions and percentage allocations are provided by phase of the mine lifecycle and task in Table 3 and the sections below. In general, the percentages decrease across the lifecycle because:

- Complexity and Integration: Early phases such as Construction and Early Production requires the most engineering, project management and oversight due to multidisciplinary design and coordination, and the often conceptual level of closure planning. During later phases engineered designs will approach finalization and a significant amount of stakeholder and regulatory engagement should have already occurred.
- Risk and Uncertainty: Early phases have higher risk and uncertainty, requiring more oversight and compliance engagement. Later phases become predictable and compliance-driven, requiring less design but ongoing management and stakeholder engagement.
- Closure & Post-Closure: Activities become predictable and compliance-driven, requiring less design but ongoing monitoring and stakeholder engagement.
- Owner's Representative: High during construction and operations for oversight, then stabilizes as operations mature and closure activities become routine.

Table 3. Summary of Recommended Percentage Allocations by Phase

Phase	Engineering	Project Management	Engagement & Regulatory	Owner's Rep
Exploration	N/A	N/A	N/A	N/A
Construction	3–4%	5–6%	2%	4%
Early Production	4–5%	7–8%	3%	4–5%
Late Production	2-4%	6-8%	2-3%	4%
ICM & Closure	2–3%	3–4%	1%	4%
Post-Closure	1–2%	2–3%	1%	3%

4.3.2 Mine Life Cycle Phases and Percent Allocations

4.3.2.1 Exploration

Exploration is the initial phase of the mine lifecycle, focused on identifying and evaluating mineral resources to determine economic viability. This stage involves high uncertainty and requires extensive data collection and analysis. Activities include geological mapping, geophysical and geochemical surveys, core drilling, and resource modeling, supported by preliminary environmental baseline studies. Conceptual mine planning and early engineering input for feasibility may occur, but the phase does not include advanced engineering design for production or closure-related infrastructure such as open pits, waste rock facilities, tailings storage areas, or permanent buildings.

Not Applicable (N/A) may be applied to Engineering, Project Management, Engagement & Regulatory Compliance and Owner's Representative indirect costs when there is no physical development or complex infrastructure requiring design or governance. This phase should only have temporary infrastructure (e.g. trailers) and minor earth work such as trenches, test pits and core drilling.

4.3.2.2 Construction

Construction is the phase where mine infrastructure and facilities are built to enable extraction and processing (Production phase). It assumes the mine plan is finalized and conceptual closure engineering is largely complete, though ongoing design support is required. Activities include site preparation, earthworks, and construction of processing plants and tailings storage facilities, impoundment and drainages, water treatment facilitates and other capital infrastructure related to that specific activity. Supporting infrastructure such as roads, power supply, water systems, and communication networks are installed alongside environmental and safety systems. This phase is critical for establishing operational readiness and ensuring compliance with design and regulatory requirements.

Construction is a resource-intensive phase. If a site were to become abandoned in this phase there would still be significant engineering and project management effort to maintain, coordinate or decommission the complex site. The application of the sliding scale is as follows:

- **Engineering (3–4%)**: Supports the development of detailed design for closure but a significant amount of uncertainty exists around the future geochemical and physical conditions. Resulting in additional engineering investigation costs to close gaps and finalize designs.
- **Project Management (5–6%)**: Provides oversight for scheduling, budgeting, contractor coordination to implement the closure plan.
- **Engagement & Regulatory (2%)**: Ensures engagement with stakeholders and compliance with permitting conditions and environmental obligations during large-scale construction or in the event of a default demolition.

- **Owner's Rep (4%)**: Third-party engineering team acting on behalf of the government that provides significant oversight and alignment on closure objectives, and many closure plans are in the conceptual stage but less than early production as major mining has not started.

4.3.2.3 Early Production

Early Production is the initial operational phase where mining ramps up to planned production rates. This phase has the highest sliding scales for indirect costs because it often involves commissioning new systems, optimizing processes or field proofing management and engineered controls on environmental mitigation strategies. Key activities include drilling and blasting, ore extraction, hauling, crushing, milling, refining, waste management, and continuous optimization. The level of effort and time required to advance the mine to closure would be greater than any other phase of mine life. The application of the sliding scale is as follows:

- **Engineering (4–5%)**: Supports development of detailed design for closure but a significant amount of uncertainty exists around the future geochemical and physical conditions. Resulting in additional engineering investigation costs to close gaps and finalize designs. Higher than construction as mine waste features are now present.
- **Project Management (7–8%)**: Highest level of oversight for scheduling, budgeting, contractor coordination to implement the closure plan.
- **Engagement & Regulatory (3%)**: Increased stakeholder engagement and regulatory reporting to address uncertainty with the mine closing early.
- **Owner's Rep (4-5%)**: Third-party engineering team acting on behalf of the government provides significant oversight and alignment on closure objectives and many closure plans are in the conceptual stage. Increased oversight required during updating of the closure designs and implementation of closure activities.

4.3.2.4 Late Production

Late Production is the mature operational phase when the mine is stable and focused on efficiency, cost control, and maximizing resource recovery. The mine is approaching its end-of-life state, Finalization of the closure plan including closure designs are near completion and long-term closure costs are generally understood. Percentages decline as the geochemical and engineering understanding of the closure site increases, but additional finalization of closure planning is still required. The application of the sliding scale is as follows:

- **Engineering (2–4%)**: Finalization of plans as the mine approaches its end-of-life and closure designs are approved by regulators. Plans at this point will be based on actual conditions.
- **Project Management (6–8%)**: Second highest level of oversight for scheduling, budgeting, contractor coordination to implement the closure plan.
- **Engagement & Regulatory (2-3%)**: Decreased slightly as stakeholder engagement and regulatory compliance should be well underway as closure approaches. Still additional work done to have the final permit and approvals for closure in place.

- **Owner's Rep (4%)**: Third-party engineering team acting on behalf of the government. Increased oversight required during updating of the closure designs and implementation of closure activities. Decreased Owner's Rep costs as uncertainty has decreased, progressive reclamation has likely begun and engineering plans have begun to receive regulatory approvals.

4.3.2.5 Interim Care and Maintenance

The Interim Care and Maintenance phase occurs when mining operations are suspended but the site is not fully closed. Activities include maintaining site conditions, monitoring water quality, maintaining tailings and waste facilities, and ensuring site security. Regulatory compliance and stakeholder communication remain essential, while cost control is prioritized through scaled-down staffing and optimized maintenance programs.

During ICM, operations are suspended, but critical infrastructure and environmental systems must be maintained. Engineering and project management costs drop because there is no active production, but oversight remains essential to manage risks and maintain compliance. The application of the sliding scale is as follows:

- **Engineering (2–3%)**: Focused on monitoring, risk mitigation, and maintaining stability of tailings, water systems, and structural integrity. Finalization of plans may still be required or modifications to existing plans based on changing field conditions.
- **Project Management (3–4%)**: Required for coordinating scaled-down operations, maintaining water treatment (if required), engineered controls, regulatory reporting, cost control and preparing for closure.
- **Engagement & Regulatory (1%)**: Ensures ongoing compliance and stakeholder communication during interim care and maintenance and leading into closure.
- **Owner's Rep (4%)**: Ongoing preparation for and support during ICM activities and Closure.

4.3.2.6 Closure

The closure stage is the phase where mining operations have permanently ceased, and the site is transitioned to a stable, environmentally secure condition that meets regulatory and community expectations. This stage involves implementing the final closure plan, which includes dismantling infrastructure, reclaiming disturbed land, stabilizing tailings and waste facilities, and restoring ecosystems.

Engineering and project management costs are lower than construction but still significant due to complexity, regulatory requirements and changes in anticipated conditions during closure. The application of the sliding scale is as follows:

- **Engineering (2–3%)**: Required for refinement of closure designs, reclamation planning, and water management solutions. Updates to closure designs once construction begins due to changes in the anticipated conditions.
- **Project Management (3–4%)**: Manages construction team contractors, schedules, and compliance during closure execution.

- **Engagement & Regulatory (1%)**: Critical for approvals, reporting, and ongoing stakeholder engagement.
- **Owner's Rep (4%)**: Ongoing support by the third-party engineering team acting on behalf of the government ensures closure activities meet standards and contractual obligations.

4.3.2.7 Post-Closure Monitoring and Maintenance

Post-closure is the long-term phase that begins after all physical closure activities have been completed and the mine site has transitioned into a stable condition. The primary objective of this stage is to ensure that environmental performance remains acceptable and that the site meets the closure objectives, end land uses and poses no ongoing risks to human health or ecosystems.

Water quality and landform stability are regularly assessed, and vegetation success is monitored to confirm reclamation effectiveness. Adaptive management strategies address residual risks, while drainage and treatment systems are maintained (if applicable) to prevent environmental impacts. Ongoing regulatory reporting and stakeholder communication reinforce compliance and trust, ensuring that closure objectives are sustained for decades.

Post-closure is primarily monitoring and maintenance, with minimal new design or construction. Costs are driven by compliance and long-term stewardship rather than active engineering. The application of the sliding scale is as follows:

- **Engineering (1–2%)**: Limited to troubleshooting and adaptive management for environmental systems.
- **Project Management (2–3%)**: Oversees monitoring programs and ensures regulatory compliance.
- **Engagement & Regulatory (1%)**: Maintains transparency and fulfills reporting obligations.
- **Owner's Rep (3%)**: Ongoing review of site conditions and engineered features to ensure the mine remains in a stable condition. Ensures that regulatory requirements are being met and any potentially hazardous conditions are identified early.

5 Using RECLAIM V8

Upon opening RECLAIM V8, 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 opens 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 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 Version 7.0 the unit costs range is to line 172 of the unit cost worksheet.

5.1 Completing Worksheets

Complete each of the individual worksheets by selecting the type of activity required, estimating the quantity (e.g., 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 1, activities are typically assigned a percentage as "land liability" which will be used to set land security and the remaining percentage as "water liability" which will be used to set water security.

5.2 Menu Descriptions

Functions specific to the Reclaim Model program 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 V8 was updated in Q1 2026).

5.3 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. The rates are based in Q1 2026[14], and the source references for development of the unit rates include:

- Published data sources:
    - Alberta General Construction Sectors Collective Agreement (for crafts)
    - RS means online data released Q1 2026 for location in Yellowknife, Northern Territory Canada
    - Richardson Cost Online Data for Construction Estimate, July 2024 Edition
    - Construction Labour Relations Alberta
    - Equipment Rental Rate Guide – 2024-2025 Blue Book – BC Road Builders and Heavy Construction Association
    - 2024 Equipment Rental Rates Guide and Member Roasters – Alberta Roadbuilders and Heavy Construction Association
    - Quebec Rental rates for Heavy Machinery 2024
- First Principle Cost Estimating

[14] The first quarter of 2026, January 1 to March 31

    - Civil unit rate tool
- Third-party reference costs
    - Recent awarded contractor for non-union indirect labour: site manager, supervisor, security/fist aid, administrative staff, registered engineer, environmental technologist
    - Historical data
    - Estimations
    - Budgetary quote for HDPE pipes

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 (load/haul/place), low (for short haul). If the excavation involved careful or controlled work, such as in ditch or spillway construction, then the SC1L cost code for Soil, Controlled, 1 (load/haul/place), low (for short haul) 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 based on a short (1 km) haul distance. The suffix H in the acronym indicates that the cost for this particular activity is based on a long (5 km) haul distance. 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.

To provide better transparency to the RECLAIM tool on the breakdown of Unit Costs and their references, the following are appended to this manual:

- Basis of Unit Rates Development
- RECLAIM V8 Price Sources, Basis and References

The price sources, basis and references are intended to allow review and consistent updates of the unit rates in future versions of the costing model.

5.3.1 Escalation

Construction escalation refers to the increase in costs (e.g. labour, equipment, materials) for a project over time. Inflation (the increase of the cost of living over time) is a component of escalation; as are uncertain changes in technical, other economic, and market conditions.

The RECLAIM V8 Unit Costs are presented as Canadian dollars in Q1 2026. The Unit Costs can be escalated in the RECLAIM tool to reflect a project in a future-current year, e.g. a closure cost estimate calculated in 2027 will have 3 years of increased Unit Costs compared to 2024. A data entry cell, below the "Year for Rate Escalation", in the Unit Cost worksheet allows the user to enter the current year to calculate an escalation rate from 2026. The rate is automatically calculated based on the Canadian Consumer Price Index (CPI) for the "Select Location", either Nunavut or NWT[15].

CPI is commonly used as the cost index for calculating the rate of inflation. The RECLAIM tool uses this as the rate of escalation for the Unit Costs (labour, equipment, materials and reclamation activities). Although different cost indices exist for construction projects, including additional ones within the Statistics Canada web portal[16] (e.g. Building Construction Price Indexes, Construction Buildings Materials Price Index) and the Engineering News-Record Cost indices[17] (Construction, Building Cost, Material Price, Skilled Labour, Common Labour), they are not accurately representative of mine reclamation projects, and census data not necessarily updated annually or publicly or appropriate for Northern Canada. The use of CPI/inflation as escalation provides a reliable metric for calculating the increase of costs for the near-term future (e.g. 3-5 years). For a more accurate determination of the increase of costs at a future time, it is recommended that the Unit Cost be updated/redeveloped. This would capture unexpected economic events, e.g. global supply chain shortage post pandemic. The Basis of Unit Rates Development will allow a consistent framework for the future updates of the Unit Costs.

5.4 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. Proponents are encouraged to use the unit rate cost estimator in RECLAIM.

When using a specified cost, the unit cost can be inserted in the Unit Cost Table. Where these specified costs are to be in used in calculations, the suffix "S" would be used instead of "L" or "H". 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:

[15] See Statistics Canada CPI

[16] See https://www150.statcan.gc.ca/n1/en/type/data?subject_levels=18#tables

[17] The Engineering News-Record is a reputable reference for Construction Cost Indexes in North America; however, those cost are based on cities in the United States and are not necessarily reflective of prices changes in Northern Canada.

- Quotes from qualified third-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 direct cost, fuel (consumption and mobilization unless mobilization is included elsewhere), tires, maintenance, support equipment, and an operator's 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.

RECLAIM V8 includes a unit cost estimator worksheet ("Estimator") that allows users to calculate site-specific load, haul, dump, spread, and compact rates using first-principles methodology. First-principles rates provided in RECLAIM were developed using this estimator, ensuring transparency and consistency in cost calculations.

5.5 Summary Sheet

The summary sheet presents the subtotals of direct and indirect costs to derive the total environmental liability cost estimate.

5.5.1 Segregation of Costs into Land or Water Related Costs

The RECLAIM tool calculates environmental liability costs in their entirety. However, 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. This is to assist landowners and/or proponents to segregate the environmental liability cost estimate into land or water related costs as applicable for specific authorities/jurisdictions.

It is generally accepted that land and water liability are two sides of the same coin and assigned equal values or a 50/50 split of the overall calculated environmental liability cost estimate. However, each jurisdiction may default to other percentages based on expected impacts from the component or activity on its end receiver (i.e land or water body).

Examples of each are as follows:

- An activity such as a building demolitions could be treated as a 100% land liability;
- Treating supernatant prior to discharge could be a 100% water liability;
- Placing a soil cover over a rock pile could be say 50% land liability in promoting revegetation, and 50% water liability in reducing seepage loading.

6 References

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Appendix A – Summary of Changes from RECLAIM V7 to RECLAIM V8

Items Removed

The discounted value calculation was removed from the Post Closure sheet. This was replaced by the addition of a future value calculation discussed below.

Items Modified or Added

The largest changes made to RECLAIM include updating of indirect percentages, updating of unit rates, and the addition of future value calculations.

Indirect Percentage Changes

The table below presents the changes in Indirects Cost based on Direct Costs. The Table 4 below also includes the addition of indirect percentages for Engagement and Regulatory, and Owner's Representative. Sliding scale percentages are appropriate for Engineering Design, Project Management, Engagement & Regulatory Compliance, and Owner's Representative. Monitoring & QA/QC and Bonding / Insurance are a fix percentage of the Direct / Capital Cost for mine closure and reclamation. The purpose of the sliding scales is to support accurate cost estimation of environmental liabilities and risk management by aligning engineering and management efforts with the complexity and requirements of each phase in the event of abandonment.

Table 4: Summary of Changes to Percentage Increases for Indirect Costs based on Direct Costs

RECLAIM Version	Phase	Engineering	Project Management	Monitoring & QA/QC	Bonding/ Insurance	Engagement & Regulatory	Contingency	Owners Rep
V7	All	5%	5%	1%	1%	N/A	20%	N/A
V8	Exploration	N/A	N/A	1%	3%	N/A	25%	N/A
	Construction	3–4%	5–6%			2%		4%
	Early Production	4–5%	7–8%			3%		4–5%
	Late Production	2-4%	6-8%			2-3%		4%
	ICM & Closure	2–3%	3–4%			1%		4%
	Post-Closure	1–2%	2–3%			1%		3%

In general, the percentages decrease across the lifecycle because:

- Complexity and Integration: Early phases such as Construction and Early Production requires the most engineering, project management and oversight due to multidisciplinary design and coordination, and often conceptual level of closure planning. During later phases engineered designs will approach finalization and significant amounts of stakeholder and regulatory engagement should be occurring.
- Risk and Uncertainty: Early phases have higher risk and uncertainty, requiring more oversight and compliance engagement. Later phases become predictable and compliance-driven, requiring less design but ongoing management and stakeholder engagement.

RECLAIM 7.0 did not include indirect percentages for Engagement & Regulatory Compliance and Owner's Representative, both of which are an important aspect during closure of abandoned mines. Engagement and Regulatory Compliance are required components of the closure process to keep stakeholders engaged for the duration and ensure that regulatory requirements are met. Regulatory compliance costs may include but are not limited to transfer or renewal of authorizations; participation in technical sessions and public hearings; preparing required submissions; reporting; and responding to reviewer comments during public reviews. The Owner's Representative plays a critical role in ensuring the project objectives are met while adhering to all technical, regulatory and contractual requirements. The Owner's Representative is a third-party engineering firm that supports Government and assumes responsibilities such as acting as a liaison between stakeholders; regulatory compliance oversight; scope definition and project planning; contract administration; risk management; monitoring and quality assurance; budget and schedule oversight; supporting environmental and community engagement; reporting and documentation; and health and safety oversight. Complex sites with contaminant migration concerns or offsite impacts to human or ecological receptors can result in additional efforts by the Owner Representative and can be very time consuming and costly.

Unit Rate Updates

Unit rates were updated based on published data sources, civil unit rate tools, recent awarded contracts, historical data, estimations and budgetary quotes. Additional backup and rationale were added to the unit cost sheet for greater transparency of where the costs were developed from.

Published databases include information rates sources such as Construction Labour Relations Alberta, 2024 Nunavut, Qulliq Energy Corporation, Alberta union collective agreement, etc. Historical databases include recent quotes from detailed design projects. Estimated unit rates can include typical costs for a task based on actual costs incurred at projects across Canada. Such as Phase 2/3 Environmental Site Assessments, which are backed up with assumptions of hours per worker and expenses which include drilling costs, laboratory expenses, equipment cost, etc. In some cases, unit rates were escalated

in 2024 or were obtained from web searches. Online resources used to update RECLAIM are linked in the table below.

First principles were used to develop unit rates for load, haul, place and spread, and compact. To do this a civil estimating tool was used which factors in site specific information such as fuel costs, northern work, remoteness, unionized workforces, shift duration and schedule, number of workers, types of and capacity of machinery such as rock trucks and excavators, material properties and bulk density, etc. A summary of data sources used in the updating of RECLAIM are presented in Table 5 below.

Table 5: Published databases used to Update Rates in RECLAIM

Data source – Data Type	Website Link
Construction Labour Relations Alberta – Labour Costs & Subsistence Rates	https://clra.org/2019/08/industrial-subsistence-rates/
RS Means data – Construction Costs	https://www.rsmeans.com/resources/unit-cost-databases-construction-guide
Statistics Canada Data – Fuel Costs	https://www150.statcan.gc.ca/n1/en/type/data
Qulliq Energy Corporation – Energy Costs	https://www.qec.nu.ca/
NEAS Sealift Rates	https://neas.ca/rates/
Alberta Equipment Rental Rates	https://www.arhca.ab.ca/product-page/2024equipment-rental-rates-guide-and-member-rosters
Richardson Costonline – Construction Costs	https://www.costdataonline.com/
Chemanalyst – treatment chemical costs	https://www.chemanalyst.com/Pricing/Pricingoverview

Future Value

Future value was added to the Summary Worksheet which is to be used for the security amount. These amounts were added in the columns to the right of the baseline values. The calculation uses input values to be entered by the use above the table for inflation, and years for when closure activities and post-closure activities are anticipated to occur. The inflation value was set to a default value of 3% as this has been the upper limit of the Bank of Canada's target inflation rate since 1992. The future value calculation was included to ensure that Sites are not under secured for activities anticipated to occur in the future.

Additional Changes

In addition to the items above which have the largest impact on security amounts the changes below were made to improve the overall functionality of the tool. Changes are presented by sheet below.

ICM Sheets

- Added in rows for various water management activities.
- Added in line item for Finalize Closure and Reclamation Plan which is calculated as a percentage of construction costs. These costs were previously not included and can represent a significant cost in the event a mine becomes abandoned.

Tailings Sheet

- Updated water treatment description from Treat Seepage to Treat Seepage and Contact Water.
- Added description to other items for the “includes cultural use restoration”.

Rock Piles

- Added description to other items for the “includes cultural use restoration”.

BLDGS & Equip

- Added description to other items for the “includes cultural use restoration”.

Chemicals

- Added in row to contaminated soil removal for Excavate and transport remediated soil onsite.

Water Management

Added in a group of activities under a new section for “Sediment Control Features”.

Mobilization

- Added clarity for mobilization vs demobilization costs.
- Created separate inputs for mobilization costs associated with Interim Care and Maintenance, Closure Activities, and Post Closure for further clarity.

Water Treatment

- Added in line item under treatment plant – construction for existing plant refurbishment.

Unit Costs

- Added in a method to escalate the unit rates from 2024 values to present using CPI values provided by Statistics Canada Nunavut, the Northwest Territories, or user specified values.