PRELIMINARY MINE RC&R PLAN

PRELIMINARY MINE RECLAMATION, CLOSURE, AND REHABILITATION PLAN

Amulsar Gold Project

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Glossary of Acronyms

ADR	Adsorption, Desorption and Recovery
AIC	Amulsar Information Center
APW	Aerobic Polishing Wetland
ARD	Acid Rock Drainage
BCR	Biochemical Reactor
BRSF	Barren Rock Storage Facility
CDP	Community Development Plan
CLC	Community Liaison Committee
EBA	Endemic Bird Area
EBRD	European Bank for Reconstruction and Development
EHS	Environmental, Health, and Safety Guidelines
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ET	Evapo-transpirative
FS	Feasibility Study
GCL	geosynethetic clay liner
Golder	Golder Associates
GRE	Global Resource Engineering
ha	Hectare
HLF	Heap Leach Facility
IBA	Important Bird Area
ICMC	International Cyanide Management Code (Also “Cyanide Code”)
ICMI	International Cyanide Management Institute
ICMM	International Council on Mining and Metals
IFC PS	International Finance Corporation’s Performance Standards
IFC	International Finance Corporation
km	Kilometer
L/sec	Liter per second
LLDPE	linear low-density polyethylene
LOM	Life-of-Mine

LRP	Livelihood Restoration Plan
LUC	Land Use Consultants
Lydian	Lydian International Ltd
masl	Meter above sea level
MENR	Ministry of Energy and Natural Resources
MIW	Mine Influenced Water
m^3	Cubic meter
Mm^3	Million cubic meter
MNP	Ministry of Nature and Protection
MRG	Manganese removal beds
Mt	Million tonne
NAG	Non-acid-generating
NNL	No Net Loss
PAG	Potentially acid generating
PWTF	Passive Water Treatment Facility
RC&R	Reclamation, Closure, and Rehabilitation
RoA	Republic of Armenia
ROM	Run-of-Mine
SEP	Stakeholder Engagement Plan
ShMAG	Law on Environmental Impact Assessment Process (Also EIA)
Sovereign	Sovereign Consulting, Inc.
SPNA	Specially Protected Nature Areas
SRCE	Standardized Reclamation Cost Estimator
TEC	Treweek Environmental Consultants
WAI	Wardell Armstrong International Ltd.
WBG	World Bank Group

1.0 INTRODUCTION

Mining is a temporary land use—all mines eventually close. It is the ultimate purpose of a mine Reclamation, Closure and Rehabilitation (RC&R) plan, and its subsequent implementation, to mitigate the impacts of mine closure and post-mining residual impacts to the surrounding environment and the local and regional communities. Best practice dictates that mining companies should begin planning for closure at the earliest opportunity in the life of the mine to reduce the eventual impacts upon closure, to meet post-closure objectives and identify any opportunities for post-closure social and environmental enhancement.

Golder Associates Inc. coordinated the compilation of this preliminary Mine Reclamation, Closure, and Rehabilitation Plan (RC&R Plan) for the proposed Amulsar Gold Project (the Project) being developed by Lydian International Ltd. (Lydian). This updated RC&R Plan has been developed to support the October 2015 update to the prior Canadian National Instrument (NI) 43-101 Feasibility Study (SGS 2015) for the Project based on revisions made to the project as a result of recent value engineering. The updated 43-101 Feasibility Study (FS) is being compiled by Samuel Engineering (Samuel). Design input for individual facilities used in the development of this updated RC&R Plan has been provided by Samuel; Mine Development Associates (MDA); Praetorian Construction Management, Ltd. (Praetorian); Global Resource Engineering (GRE).; and Sovereign Consulting, Inc. (Sovereign). Wardell-Armstrong International Ltd (WAI); Treweek Environmental Consultants (TEC); and Land Use Consultants (LUC) have provided input to previous versions of this RC&R Plan, which were also compiled and coordinated by Golder.

The primary purpose of this RC&R Plan is to document and present the preliminary closure goals, objectives, strategies, and activities that will be completed prior to and after the cessation of mining operations to accommodate the post-closure land uses. A range of post-closure land use options remain under consideration by Lydian, and these will be included in future stakeholder engagement as part of the Stakeholder Engagement Plan (SEP) and the Community Development Plan (CDP).

The Project is located on the mountains between the villages of Gndevaz and Gorayk in central Armenia (Figure 01), an area where there is an epithermal gold deposit. Operations will include open pit mining with a heap leach facility (HLF) using dilute cyanide solution and an adsorption desorption recovery (ADR) process plant to extract gold and silver, as shown on Figure 02. The Project is owned by Lydian and is operated by its fully owned subsidiary company, Geoteam CJSC (Geoteam), in Armenia. The project area includes a project footprint of approximately 600 ha of disturbed land within a total restricted access zone of approximately 1690 ha and straddles the Vayots Dzor Marz and Syunik Marz province boundaries.

This RC&R Plan is the first step in developing a comprehensive and detailed plan for progressive rehabilitation leading to the eventual closure of Lydian's Amulsar mine. It outlines broad closure objectives and strategies that will be further refined during subsequent updates to this plan to eventually develop a refined and detailed RC&R plan. This preliminary RC&R Plan documents the closure objectives and

strategies that have been developed to mitigate the RC&R environmental and social issues anticipated and provides recommendations for future technical studies to reduce current RC&R uncertainties and/or to refine and advance this RC&R Plan. It is intended that this document be submitted as part of any updates to any regulatory approvals based on the revised mine plan, if required by the Republic of Armenia (RoA) authorities.

It should be emphasized that RC&R Plans are inherently dynamic, beginning as preliminary designs based on closure objectives and strategies developed early in the mine life cycle and evolving stepwise into plans with detailed executable designs to support concurrent and final rehabilitation. It is anticipated that future updates to this preliminary RC&R Plan will be developed to advance the closure strategies and will ultimately develop success criteria and finalize the RC&R design criteria for concurrent and final rehabilitation. Future updates will be integrated with the International Cyanide Management Code (ICMC) Implementation Guidance (ICMI 2014) decommissioning procedures and the environmental and social management system (ESMS) developed for the operational phase of the mine. It is also anticipated that future RC&R Plan updates will be integrated with the Life-of-Mine (LOM) plans to optimize progressive RC&R opportunities and to develop the specific RC&R procedures (e.g., soil salvaging and stockpiling, regrading, cover material specifications, drainage and erosion controls, general rehabilitation, revegetation, habitat restoration and land hand-back), which are not yet fully addressed in this RC&R Plan.

This preliminary RC&R Plan addresses progressive reclamation, closure, and post-closure of the proposed Project. Distinct concepts for the terms “closure” and “post-closure” are used, which imply different stages of the mine life cycle and therefore different processes of interaction between the mine and the environment. “Closure” refers to the period in which activities are carried out to achieve the final closure design specifications (e.g., construction of surface water conveyances, removal of select infrastructure, site grading, revegetation, etc.). These activities may extend beyond the end of mining and are required to meet the post-closure land use objectives and RC&R design objectives. “Post-closure” considers the period following completion of closure construction and water management activities when closure design criteria have been achieved. During this phase, activities will generally be limited to site monitoring, inspections, and maintenance activities to the extent necessary to meet applicable RC&R requirements.

Figure 01 Site Location Map

1.1 Rehabilitation and Closure Requirements

The IFC and the European Bank for Reconstruction and Development (EBRD) are shareholders in the Project and, as such, Geoteam will be expected to comply with the mine closure requirements of RoA obligations as well as these of the above-mentioned organizations.

Once Geoteam has met their completion requirements, they may relinquish interest in the sites. The responsible authority will need to confirm completion of the mine closure implementation plan. Records of the history of the closed site should be preserved to facilitate future land use planning.

1.1.1 Armenian Legal and Regulatory Requirements

1.1.1.1 Mining Code

The mining sector in the RoA is regulated by the Mining Code, adopted in January 2012. The Mining Code outlines the rights and responsibilities of government entities, mining and exploration companies. It is administered by the Ministry of Energy and Natural Resources (MENR), under which it reviews mining and exploration applications.

Closure provisions are included in the environmental requirements as stipulated by Chapter 2 (Article 15), Chapter 5 (Articles 48 to 60), Chapter 6 (Article 61), and Chapter 8 (Articles 64 to 71). In accordance with Article 49, the mine closure plan should include the following:

- Mine physical closure plan, which should include dismantling of infrastructure, machinery, equipment and buildings
- Reclamation of lands affected by mining activities, including reclamation during existence of mine
- Workforce social mitigation program in the manner prescribed by the legislation
- Program for monitoring disposal of industrial dumps developed during mine operations and for the purpose of protection of the security and health of the population of communities close to it. Development of final plan of mine closure two years prior to end of mine operation works
- Financial guarantees for implementation of mine closure program

Decree 22-N implemented on January 10, 2013, provides specific requirements for the procedures and estimation of costs required for monitoring of the mine operations during the active operating, closure, and post-closure periods inclusive of the communities affected to ensure the safety and health of the population.

Decree 1079-N implemented on August 23, 2012, provides the specific requirements for the calculation of the allocations to be made (i.e., the financial guarantee) to the nature and environmental protection fund as defined by Article 69 of the Mining Code, the basis of which can be determined from the cost estimates prepared from this preliminary RC&R Plan as discussed in Section 5.0.

1.1.1.2 Environmental Impact Assessment Law

The Law on Environmental Impact Assessment Process (EIA or ShMAG), 1995, regulates the legal, economic and institutional basis for the environmental impact assessment of intended activities and concepts. Chapter II, Article 4 (b) of ShMAG requires the assessment of environmental impacts in the mining sector and, in particular, the extraction and processing of minerals. It is not directly related to the mine closure procedure, but its requirements subject for consideration.

The procedure for issuance of EIA of intended activities is set forth under Chapter 2 of the ShMAG. It should be stated that according to Article 7 of ShMAG the documents and the list of information required for EIA of intended activities on "extraction and processing of ore" shall be established by the decision of the Government of the RoA. Nevertheless, at this day no decision has been issued by the Government.

Section 1 of Article 5 of ShMAG Law provides the scope of assessment of EIA of intended activities. It must at least cover the following:

- Forecasting, description and appraisal of possible direct and indirect impacts of intended activity related to:
  - Weather conditions, flora and fauna, individual elements of ecosystems, their inter-relations and stability, specially protected natural areas, landscapes, geomorphological structures, air, surface and ground waters, and soils
  - The health and well-being of the population
  - The environments of towns
  - Use of natural resources
  - Monuments of history and culture
- Alternative solutions, including zero option (rejection of the intended activity), their comparative analysis, and selection of the most acceptable options
- Measures for the elimination or minimization of the possible impact of the intended activity on the environment
- Detailed appraisal of consequences for economic and social development and the environment in case of zero option due to hazardous impact of the intended activities

1.1.1.3 Specific Rehabilitation Regulations

The estimation of the costs of rehabilitation is regulated by Decree N365-N by the Ministry of Nature Protection (MNP) "On laying down the procedure of cost estimation and indexing of reclamation works" dated 24 December 2012. Decree N365-N replaced Decree N 95-N of MNP dated 22 April 2004.

Decree N365-N regulates requirements regarding the cost estimates and assessment for rehabilitation activities by mining companies. It is based on paragraph 1 of Resolution N 1079-N dated 23 August 2012 to the Nature and Environment Preservation Fund as defined by Article 69 of the Mining Code. It deals with

"Approving the procedure of using the Nature and Environment preservation fund and calculating the amounts of allocations, as well as the composition of the professional committee."

Annex 3 of The Decree N 249-N dated 30 December 2011 from MENR on "Requirements for prior environmental impact assessment, environmental impact assessment, and mine closure plan enclosed to the application for mining right" provides the requirements, which shall be considered during approval of the mine closure plan.

1.1.1.4 Law on Environmental Control

The Law on "Environmental Control" i.e., monitoring and compliance regulates issues concerning organization and conduct of supervision over the implementation of the norms enacted by environmental legislation and defines legal and economic grounds for the specifics, regulatory requirements, and conditions of supervision over the implementation of these norms. The Environmental Inspection of the MNP carries out site inspections to ensure appropriate environmental controls are implemented. It is not directly related to the mine closure procedure, but its requirements are subject to consideration.

1.1.1.5 Law on Compensation Payments for Damages to Flora and Fauna Due to Environmental Offenses

This law sets forth the following environmental offenses:

- Use of fauna without licenses (permission) provided in accordance with procedure, concluded contracts and by violating conditions determined by the latter
- Unregulated use of fertilizers, other preparations, and poisonous substances that results in fauna damage
- Extermination of rare, endangered animals, as well as those recorded in the Red Book, their species, habitats (egg-laying areas, nesting) and/or implementation of the actions that result in reduction of number of these animals and deterioration of their habitats
- Offenses of regulations on hunting and fishing provided by the legislation
- Other offenses of legislation on the use and protection of fauna that result in fauna damage

This law also sets forth the scale of compensation payments for damages to fauna due to environmental offenses. Although not directly related to the mine closure, these requirements can be applied if issues arise during rehabilitation and closure activities.

1.1.2 Expectations of International Best Practice Relating to Mine Closure

The IFC Performance Standards (PS), the World Bank Group (WBG)/IFC Environmental, Health and Safety (EHS) Guidelines, and the EBRD Environmental and Social Policy and Performance Requirements contain little detail on mine closure, although the IFC/WBG Mining EHS Guidelines contain guidance and recommendations on the issue. The International Council on Mining and Metals (ICMM)—the international mining industry's CEO-led association for developing and disseminating sustainable development best

practice in the industry—has produced best practice guidance for closure planning and funding. The development of Amulsar mine's closure planning follows the general guidance of the ICMM document, Planning for Integrated Mine Closure, which contains a comprehensive tool-kit to ensure mine closure planning meets the expectations/requirements of international best practice (Table 1.1).

The WBG/IFC Mining EHS guidelines indicate that closure and post-closure activities should be considered as early in the planning and design stages as possible. The guidelines recommend that the mine closure plan incorporate both physical rehabilitation and socio-economic considerations as an integral part of the project life cycle. The plan should also address beneficial future land use, which should be determined using a multi-stakeholder process that includes regulatory agencies, local communities, traditional land users, adjacent leaseholders, civil society, and other impacted parties. The plan is required to be approved by the relevant national authorities, and should be the result of consultation and dialogue with local communities and their government representatives. The closure plan should be regularly updated and refined to reflect changes in mine development and operational planning, as well as the environmental and social conditions and circumstances. Records of the mine works should also be maintained as part of the post-closure plan. Closure and post closure plans should include appropriate aftercare and continued monitoring of the site, pollutant emissions, and related potential impacts. The duration of post-closure monitoring should be defined on a risk basis; however, site conditions typically require a minimum period of five years after closure.

1.2 Closure Goals and Objectives

The closure goals and objectives of this preliminary RC&R Plan include the following:

- Leave a positive contribution to the local community and region, including:
  - To maximize the reuse by the community and broader stakeholders of existing mine infrastructure where it is safe to do so and where sustainability can be achieved
  - To support local communities to diversify their income streams to minimize the impact caused by the loss of employment associated with mine closure
  - To provide retraining opportunities as necessary to help prepare the workforce to support their livelihoods post mine closure
  - To minimize the short-term social cost of closure while medium term social programs take effect
  - Maximize socio-economic opportunities and benefits
- Initiate a process of continuous and adaptive planning and management regarding RC&R of the Amulsar Mine, including:
  - On-going progressive rehabilitation during operation as practicable
  - Develop facility designs that are compatible with the RC&R objectives, strategy and design criteria
  - Develop a preliminary RC&R schedule

- Develop preliminary rehabilitated landform designs and rehabilitation plans, including removal of infrastructure and equipment, stabilization of disturbed areas and the treatment of leach facilities, barren rock storage areas, and pits
  - Design for closure to minimize slope instability, soil erosion, and sedimentation
  - Provide a safe and stable final structure in the pits to ensure long-term, physical, chemical, and environmental stability
  - Provide a safe and stable final structure for the Barren Rock Storage Facility (BRSF) and HLF to ensure long-term physical, chemical, and environmental stability that fits with the surrounding landscape and proposed post-closure land uses. Develop a management plan for execution of RC&R activities
  - Identify the skill sets and quantify skill resources needed for the execution of the RC&R Plan
  - Develop preliminary post-closure aftercare monitoring expectations
- Manage the retrenchment of employees in a manner consistent with EU Directive 98/59
- Provide for long term public health and safety
- Provide for post-closure use of the site that is beneficial and sustainable in the long term and meets the closure expectations of the local communities and the regulatory authorities
- Provide for minimal environmental, landscape, visual, and ecological impacts in the long-term, based on the understanding that there will be some impact from the mining operation
- Minimize, through progressive rehabilitation, any visual issues from the Jermuk area and along the road linking the national road to Jermuk through Gndevaz
- Protect surface waterways, water bodies, and groundwater from post-closure and mining-related impacts
- Minimize impacts on ecosystem services and restore benefits from priority ecosystem services
- Provide for no Net Loss (NNL) of biodiversity or a net gain as needed for residual impacts on natural and critical habitat, respectively
- Avoid and mitigate impacts on species listed in the RoA's Red Book during the mine closure process and restore habitats for these species post-closure to the extent possible
- Meet rehabilitation criteria established by the RoA to successively relinquish the site
- Describe closure objectives to blend back all disturbed areas into the landscape, through regrading so that the landform conforms to the adjacent natural landscapes
- Rehabilitate disturbed soil and vegetation within the mine and associated infrastructure footprint, including tracks and other areas disturbed by use of vehicles, to encourage restoration of pre-impact vegetation types and conditions, supplementing natural regeneration with seed, seedlings, or other transplants of locally occurring native species
- Inform stakeholders of the international best practice and the expectations of national regulations and to communicate to stakeholders how the Project RC&R objectives and strategies comply with these best practices and expectations
- Evaluate and consider potential alternative end uses for the Project. Such alternatives may consist of the following:
  - Other potential alternatives that can be envisaged for post-closure use of The Project include eco-tourism based on botanical and other biodiversity aspects of interest

- Restore, as much of the Project footprint as possible, to be consistent with the identified post-closure land uses, including pasture and agriculture

- Provide a preliminary RC&R design to support the permit application process underway with the RoA

The objectives described above will be met in part by developing and implementing design strategies and procedures that will be outlined in detail throughout the remainder of this report.

This preliminary RC&R Plan provides the Project "design-for-closure" concepts based upon rehabilitation experience gained at other successful international RC&R mining projects from similar environments that have been successfully closed. Most project details are fully understood at this stage of design; however, it is common for some details to remain dynamic. Therefore, this RC&R Plan has been prepared based on anticipated conditions at the end of the mine's operational life. This plan is intended as a foundation for regular review and development to enable increasing detail to be included and account for adaptation to changing conditions during the mine's life.

1.3 Assumptions

This section summarizes the assumptions used to develop the Amulsar RC&R Plan. These assumptions were developed to support this update to the FS level mine layouts and designs and impacts assessment and mitigation measures as provided by Samuel, MDA, GRE, Praetorian, Sovereign, and Golder.

- Geoteam will develop and operate the Project according to the expectations of good international industry practice: (International Council on Mining and Metals (ICMM), International Finance Corporation's Performance Standards (IFC PS)), EBRD's Performance Requirements (PRs), and be compliant with the International Cyanide Code (ICMI 2014) for the manufacture, transport, and use of cyanide, including its closure and decommissioning requirements.
- The description of the mine plan and schedule is dynamic and subject to minor changes, however, for the purposes of this preliminary RC&R plan, the mine plan and schedule included herein are considered to be accurate and representative of the expected mining operations.
- Other than cyanide, hydrochloric acid, and sodium hydroxide, no hazardous materials (excluding fuel, solvents, and reagents associated with maintenance facilities, water treatment plant, and fueling stations or chemicals for on-site assay tests) will be used on site that would create problematic conditions for closure or require specially designed facilities other than the currently planned HLF, BRSF, water treatment facilities, and mine landfill.
- A more detailed description of the mining operations for the LOM will be provided in subsequent updates of the LOM RC&R Plan, that will include the following:
  - Type and method of mining and number of hectares (ha) directly affected annually with impacts
  - Overburden and mineral removal plan and production by tonnage
  - Major equipment to be used

- Employee workforce updates

- Safe pit slopes will be developed during mining by standard engineering techniques.
- The mine planning will be further optimized and mining staged such that pit backfill will be placed in the pits above projected levels at which potential pit lakes would develop. This plan includes backfilling of the majority of the Tigranes and Artavazdes Pits and backfilling the Erato Pit to a depth of 30 meters above the pit bottom, to preclude formation of a seasonal pit lake.
- Perimeter berms and diversion channels will be regraded or removed during rehabilitation to reflect pre-mine topography to the extent practical, except where required for closure/post-closure water management.
- Vegetation will be salvaged from areas where disturbance is short-term in the form of turves, which will be stored in suitable conditions until they can be reinstated. The turves should be of depths that relate to the depth of the growth medium and/or rooting depth. The methods for removing and storing turves will be further developed during 2016.
- There will be sufficient topsoil to restore pre-impact vegetation types, creating stable substrates of a suitable type and depth for target vegetation to be restored, whether from turves, transplants, or seeds.
- There will be sufficient material available within the mining license area or stockpiled during mining operations to provide suitable and appropriate quantities of cover materials for all affected areas during closure and rehabilitation. Growth media which is to be retained for reuse in restoration will be carefully excavated and stored in such a way that it is easily accessible at the point and time of use.
- Placement of barren rock (i.e., rock which does not contain ore) and low-grade ore on the BRSF is scheduled to occur in phases, such that:
  - Low-grade ore will be re-mined near the end of the mine life for processing and mineral recovery.
  - Potentially acid generating (PAG) materials that can be segregated will be encapsulated by non-acid generating (NAG) barren rock to mitigate the production of acid rock drainage (ARD).
  - Progressive reclamation, including recontouring, regrading, and cover placement that can take place during mining will occur to the extent practicable.
  - Backfill of the Tigranes and Artavazdes, can occur during mining, with the Erato Pit backfill occurring during closure activities.
  - An evapo-transpirative (ET) cover will be constructed over the BRSF (following the removal of the low-grade ore and regrading and recontouring of the facility) to limit infiltration flux contributing to seepage and “contact water” runoff, from the BRSF. Progressive reclamation and construction of the cover system will occur during mining operations, as practical, based on the BRSF design and phasing schedule.
- Based on the results of the geochemistry baseline work completed by GRE (SGS, 2015), there are no predicted acid forming materials that will be placed on the HLF. Therefore, it is anticipated that, while the draindown effluent from the HLF may require passive treatment during the post-closure period to treat for residual cyanide and other mobile constituents that exceed RoA discharge standards, long-term water treatment required for metals leaching will not be required (SGS, 2015). This RC&R Plan assumes the following:
  - After placement of the last ore on the pad, residual leaching of the pad will continue for an estimated period of 60 days following placement of the final ore on the pad, to recover residual gold.

- Once residual leaching is complete, the HLF will be rinsed. Rinsing involves the application of clean water to the HLF to remove cyanide, nitrate, salts, and other constituents of concern for water quality.
- Enhanced evaporation techniques (foggers, sprays, etc.) will be applied to dispose of rinse water. Once rinsing is complete, the water will be evaporated and the salt residual will be disposed of according to Armenian regulations.
- Once rinsing is complete, passive water treatment will begin in order to achieve permissible effluent discharge levels for heavy metals and sulfate.
- Finally, the HLF will be covered with an ET cover to limit infiltration flux contributing to seepage and "contact water" runoff from the HLF.

- Effluent monitoring from both the BRSF and HLF will continue for a period of five years following construction completion of the respective ET covers.
- Rehabilitation of the crushing facility, mine warehouse, truck shop, administration and warehouse facilities, and ADR plant site is assumed to include salvage and removal of major structures and buildings and/or demolition of smaller facilities, and regrading of the areas, including retaining walls around the crusher location, followed by revegetation of all disturbed areas.
- The closure process is assumed to include the removal and salvaging of mining equipment, materials, buildings and infrastructure (including rehabilitation of access roads and tracks) and revegetation, leaving only the access and/or facilities required for on-going monitoring or to satisfy yet to be determined post-closure uses. The main access road will remain for use by the local communities.
- The Amulsar Project will employ approximately 770 people during the operations period. This will reduce in stages during the closure period, with further detail on required roles to be developed closer to the date of closure.
- Geoteam will institute appropriate community engagement and socioeconomic development activities during the life of the mine that will assist in offsetting some of the socio-economic mine closure impacts. This will also include the provision of training opportunities and support to employees prior to retrenchment to assist them with this transition.

For a mining project to leave a positive contribution to the sustainable development of a community or region, closure objectives and impacts must be considered from the project's inception and throughout the LOM.

1.4 Closure Planning and Management

1.4.1 Risk/Opportunity Assessment and Management

All closure planning should consider the risks and opportunities presented and develop actions based on sound knowledge of these risks/opportunities. A conceptual/framework closure plan should identify the potential issues that could elevate the risk of undesirable closure outcomes and/or reduce the likelihood of beneficial opportunities being realized.

According to ICMM's Planning for Integrated Mine Closure Toolkit, a structured risk/opportunity assessment process should:

- Minimize the negative consequences of closure
- Maximize the positive benefits of closure
- Minimize the likelihood that closure goals are not met
- Maximize the likelihood that opportunities for lasting benefits are captured

Six types of risk are identified and are listed below in no particular order:

- Health and safety
- Natural environment, including biodiversity and ecological issues
- Social
- Reputational
- Legal
- Financial

The issues should be noted as risk factors that require control and monitoring in current and subsequent versions of the closure plan. The intent of this plan is to adequately evaluate the risks and opportunities as described above.

1.4.2 RC&R Planning

This preliminary RC&R Plan is considered as a starting point from which the ultimate RC&R Plan, final design criteria, and final closure design will ultimately be developed. This plan is intended to support Lydian and Geoteam during the on-going permit application process and provide a baseline closure document for permitting purposes. This RC&R Plan will periodically be revised to incorporate any significant changes to the mine plan and to advance the RC&R Plan, closure design criteria, closure design, and closure cost estimate. Relevant stakeholder input will be necessary throughout this period.

Such an approach of planning, review, and update during the mine life will enable the final RC&R Plan to incorporate the currently unforeseeable influences of the following:

- Improvements in technology enabling the reprocessing of mineral wastes or low-grade ores (which may assist the cost and/or process of rehabilitation)
- The potential for re-mining on the site under different economic circumstances
- The discovery of new ore bodies nearby resulting in the retention of the processing plant as a centralized operation
- Changes in mine closure legislation in Armenia
- Changes in regulation relating to environmental monitoring/natural resource usage standards (water, soils, air)
- Changing community expectations
- Changing stakeholder priorities

The Amulsar preliminary RC&R Plan will therefore be fully integrated with the LOM plan, especially with regard to environmental and socio-economic management issues. It will form part of the overarching ESMS, which will also include occupational health and safety management. Guidance may be required in carrying out periodic studies of closure options to reduce uncertainties, risks, and opportunities associated with RC&R.

The RC&R objectives, strategies and success criteria adopted for Amulsar need to be acceptable to all stakeholders and comply with the expectations of international best practice. Success criteria are intended to reflect the unique environmental, social, and economic circumstances of the Amulsar mine. RC&R design criteria and success criteria will be developed during the operational phase as a benchmark for successful (progressive and final) rehabilitation.

A range of post-closure land use options remain under consideration by Geoteam, and these will be included in on-going stakeholder engagement as part of the stakeholder engagement plan and the community development plan. Wherever possible, “walk away” closure solutions will be chosen. Where this is not possible, “passive after care” is preferable, which should be selected over “active after care.” Passive after care requires lower maintenance and sustaining capital to implement, thus is more likely to be successful in the long term.

1.5 Stakeholder Engagement

Stakeholder engagement for the Project was initiated in 2006 and has become more formalized as the Project has developed. Geoteam has established Community Liaison Committees (CLC) as a means of ensuring consistent on-going communication with the local communities. The CLCs have been structured to include representatives from different sectors of the community, such as education, health, and local government. In addition, each CLC includes both women and men, to provide for gender equity and ensure that everybody’s interests are represented. CLCs were first formed in early 2010 in the rural communities of Gndevaz, Gorayk, and Saravan, and later in February 2011, a CLC was established in the town of Jermuk.

A formal Stakeholder Engagement Plan (SEP) was developed in 2011. This was updated most recently in April 2015. It is available for public review on the Geoteam and Lydian website and is available in the Amulsar Information Center, (AIC) located in Gndevaz.

The company is using a stakeholder engagement log that keeps track of all meetings with stakeholders at all levels, such as:

- Information or Project meetings
- Formal Public Hearings (as required per the Law on Environmental Impact Assessment)

- Public disclosure meetings
- CLC meetings

This stakeholder management system allows recording of all meetings, demonstrating frequency of interaction with stakeholders and providing records of the participants and questions or issues raised by specific people.

In March 2013, Geoteam established the AIC to provide support and relevant information to stakeholders. The AIC is based in Gndevaz, and the purpose is to have an Information Center that will provide a variety of information including, videos, posters, electronic and other hard copy data and free internet access that will be available for stakeholder residents in nearby communities. The AIC is staffed permanently in order to familiarize stakeholders and guests with the Project information. While staff may not have knowledge of all technical aspects of the Project, they will document all questions and concerns to make sure stakeholders receive responses to all issues, concerns, and questions. Each month, a Geoteam Community Newsletter is distributed throughout the nearest four communities and a Media Newsletter is regularly published.

During formal scheduled events outlined in the SEP and the CLC meetings, communities are able to discuss the ShMAGs and permitting process, the Environmental and Social Impacts Assessment (ESIA) and FS progress, rehabilitation and closure planning and activities, and any other social, environmental, and labor issues arising.

2.0 PROJECT DESCRIPTION

The Project is a new gold and silver discovery made by Lydian in 2006. It is located in central Armenia in two separate provinces, or “Marzer,” namely Vayots Dzor Marz and Syunik Marz. The Amulsar deposits are located on the ridge peaks in the region of Mount Amulsar, in the Northern Zangezur mountain chain. The mining process will be open pit and the extraction of the gold and silver will be carried out using heap leaching technology.

The Project comprises three gold deposits, namely Erato, Tigranes, and Artavazdes. The three deposits are subject to additional exploration leading potentially to larger pits. The Tigranes and Artavazdes deposits will ultimately be mined within the same pit. The Project involves mining the Tigranes, Artavazdes, and Erato deposit in subsequent and separate phases. Other components of the Project’s Mine Plan include ore processing facilities (HLF and ADR), a BRSF, partial backfilling of the Tigranes, Artavazdes, and Erato Pits with barren rock, and supporting mine related infrastructure.

2.1 Project Location

The RoA covers an area of 29,800 km² in the Caucasus region of Eurasia and is a land-locked, mountainous country. The Project area coordinates are 39°47”08’ to 39°40”40’ North and 45°45”04’ to 45°39”13’ East and its position within Armenia is shown in Figure 01.

The study area includes the rural communities of Gorayk, Gndevaz, Saravan, and Jermuk. Saravan rural community comprises three small villages (Saravan, Saranlanj, and Ughedzor) and Jermuk includes both Jermuk city and its associated village of Kechut. The study area is predominantly rural, with Jermuk being the only urban center. Saravan and Gndevaz villages are situated in Vayots Dzor Marz, respectively approximately 5 km southwest and 7 km west of the deposit. Gorayk village is located in Syunik Marz, approximately 5 km southeast of the deposit. Jermuk city, which is situated in Vayots Dzor Marz, is situated approximately 10 km northwest from the deposit and 7 km from the closest piece of project infrastructure. The small community of Kechut, a part of the city of Jermuk, is located approximately 7 km north of the deposit.

2.2 General Features

The following sections provide an overview of the general features in the Project area including:

- Landscape, Climate and Topography
- Land-Use and Scenic Quality
- Biodiversity and Vegetation Cover
- Water Resources
- Geologic Setting
- Tectonics and Seismicity

- Communities and Livelihoods
- Infrastructure and Communications

2.2.1 Landscape, Climate, and Topography

Much of the country is mountainous with elevations of over 1,500 masl in most places, rising to a maximum of 4,090 masl (Aragats Mountain). The regional landscape is characterized by mountains, hills, and river valleys with gently sloping plateaus at lower elevations. There are no forested areas within the Project boundaries. The region supports highland prairie landscapes in the foothills, temperate meadow and prairie areas in the highlands and low alpine vegetation types on its peaks.

The Armenian climate is typically continental with warm summers and cold winters. The winters are more severe at the altitude of the Project, with snow often remaining in some areas until June.

The gold-bearing deposit is located at an altitude of 2,500 to 2,988 masl located in the region of Mount Amulsar, in the northern Zangezur mountain chain. The landscape is characterized by rugged rock exposures and deep gorges, together with glacial landforms and valleys. The core of the Amulsar license area comprises mountainous terrain along an approximately 7 km northwest-southeast trending ridge incorporating Mount Amulsar. The ridge runs roughly parallel to the Vorotan River.

The main landscape types present across the Project area are as follows:

- Lower Farmed and Settled Foothills (2,000 to 2,300 masl)
- Forested Upper Gorge and Foothills (2,300 to 2,500 masl)
- High Steppe and Plateau Grassland (2,000 to 2,300 masl)
- Highland Hills and Grazing (2,300 to 2,700 masl)
- High Rocky Peaks (>2,700 masl)

2.2.2 Land-Use and Scenery

The area affected by the Project is used for grazing livestock (including traditional seasonal and daily herding), hay meadows, arable crops, and apricot orchards, with less utilization near the top of mountain. Cultivated areas are concentrated around the proposed HLF site, south of the village of Gndevaz. Medicinal and culinary herbs and mushrooms are collected throughout the Project Affected Area and there is some fishing and hunting.

The landscape and scenery is varied and valued for different reasons by tourists and visitors as well as by residents of Jermuk and villages in the vicinity, all of whom are potential receptors of visual effects. Jermuk has a small ski facility and attractions associated with a spa and waterfall, as well as a forest park. Many people visit Jermuk for health treatment. The landscape within the license area does not hold any national designations, but amenity use of the landscape by local communities is important. The State Strategy on

Developing Specially Protected Nature Areas (SPNA) and National Action Plan for Armenia (2003-2010) envisaged establishment of 11 new SPNAs, including a new national park centered on Jermuk.

2.2.3 Biodiversity and Vegetation Cover

Armenia is located within the Caucasus Biodiversity hotspot identified because of the international importance of the region's biodiversity and very high levels of endemism in several taxonomic groups, especially flora. The country is within an Endemic Bird Area (EBA), reflecting the importance of the Caucasus as a center of endemism for birds, and is also an important staging area for migratory bird species.

The Project is located between two Important Bird Areas (Jermuk and Gorayk IBAs) in an area of natural habitat consisting of sub-alpine and montane meadows and pastures. Some small areas of other vegetation occur, including juniper scrub.

The sub-alpine meadows occupy land at the higher altitudes (generally over 2,450 masl) and there are some elements of alpine vegetation at the southern end of the Amulsar massif around the peak Arshak. Sub-alpine meadows form a matrix for rocky habitats that support a plant species listed as Critically Endangered in the RoA's Red Book, *Potentilla porphyrantha*. Amulsar is critical habitat for this species. Mountain meadows and pastures occur from approximately 1,800 masl to the sub-alpine zone. Some Red Book animal species also occur within the Project Affected Area.

There is high vegetation cover and a significant and varied pattern of hydrology that supports rich biodiversity. Notably for this part of Armenia, the Project area has many habitats that are wet or have above average moisture, both on the slopes and in the valleys, as well as a significant density of surface water features. The Project Area's rich biodiversity includes:

- Populations of several species included in the RoA's Red Book, including plant, bird, mammal and invertebrate species
- Critical habitat for *Potentilla porphyrantha*, which is listed in the RoA Red Book as Critically Endangered
- High quality (species rich and diverse) sub-alpine plant communities
- Habitat for Brown Bear, *Ursus arctos,* which is listed in the RoA Red Book as Vulnerable and maintains a breeding population on Amulsar
- A breeding colony of the Lesser Kestrel (*Falco naumanni*), which is located on the periphery of the Project Area and a pair of Egyptian vultures (*Neophron percnopterus*) breed in Jermuk Gorge, using the Project Area for foraging
- Large congregations of migratory birds that use the Project Area for feeding in spring and autumn, while on migration
- A high number of breeding bird species, including some rare alpine species and several others, which are included in the RoA Red Book

2.2.4 Water Resources

The slopes of the Project area contribute to the catchments of the Arpa, Darb, and Vorotan rivers. The Project area contains various surface water features comprising seasonal melt-water rivers and some permanent streams. The Vorotan flows through the license area to its outlet in the Spandaryan reservoir to the south. Two small lakes have been identified in the mining license area. A water supply pipe captures water from springs in the headwaters of the Vorotan catchment and provides a limited part of the water supply to Gndevaz village. During operation, the pipeline will be routed, where necessary, around any mine facilities and will remain operational through closure and into post-closure.

Groundwater is encountered at depth beneath the open pits and in the area of the BRSF and HLF. There are several groundwater springs within the Project area, the majority of which only flow in spring following snowmelt. The town of Jermuk, located approximately 7 km north of the deposit, uses groundwater from a geothermal spring source as a resource for spa tourism and bottled water production. This water is sourced from a different groundwater and surface water catchment than the catchments in which the mine is located. An environmental isotope study of water samples from the area supports the conclusion that there is no connection between the source of the Jermuk spring waters and the groundwater and surface water on Amulsar Mountain. The same study also supports the conclusion that water from the Spandaryan Reservoir does not flow to the Kechut outfall, and that water leaving the Kechut outfall is groundwater seepage that has penetrated the Spandaryan-Kechut tunnel (Golder 2013).

2.2.5 Geologic Setting

The oldest rocks in the Project area are located within the northwest of the Saravan License area and are Upper Palaeocene marine sediments, comprising coarsely bedded conglomerates. These are overlain by a thin (<20-meter) volcanic tuffaceous unit hosting carbonate vein-style base metal mineralization. These deposits are uncomfortably overlain by a volcano-sedimentary breccia, which contains numerous basaltic intrusions (<2 meters thick). The bedded units were later intruded by a large andesite dome, which dominates the lithology of the Amulsar Mountain. The andesite porphyry will constitute a significant portion of the barren rock removed from the Amulsar Ore deposits and is highly altered with variable clay association across the license area.

The Amulsar gold deposit is situated along the ridge of Amulsar Mountain in the volcanic andesite porphyry and volcaniclastic rocks, which overlie the previously described lithology. Local faulting has provided conduits for mineralizing fluids and host high-grade gold mineralization. The resulting deposit has localized high-grade gold mineralization in numerous sub-vertical structures. A larger tonnage of lower grade gold mineralization occurs in the breccia. The deposit area also contains silver, copper, and other base metals.

2.2.6 Tectonics and Seismicity

The Amulsar license area is located within a seismically active region of the Arabia-Eurasia plate boundary zone. Historical records show that there have been 107 documented, strongly felt earthquakes in Armenia that have occurred from 600 BC to 2003. Historical records suggest that in the last 900 years the site has experienced strong to very strong earthquakes on at least three occasions. Based on Golder's seismic assessment study (Golder 2014) a generally moderate level of seismic hazard has been assigned to the license area.

2.2.7 Communities and Livelihoods

As stated previously, there are three rural village communities present in the study area—Gndevaz, Saravan, and Gorayk—as well as the city of Jermuk. The Saravan rural community comprises three small villages (Saravan, Saranlanj, and Ughedzor) and Jermuk includes both Jermuk city and its associated village of Kechut. The study area is predominantly rural, with Jermuk being the only urban center. A detailed land use survey was carried out in April through June 2013 as part of the baseline studies. Because of the dynamic and mixed nature of land use, strong seasonality and the poor alignment between rental agreements and geographic constraints, it is difficult to define land use in the rural areas precisely, however key land uses are grazing for livestock (higher montane areas, but also lower slopes after harvest), hay-making (middle and lower mountain slopes), cultivation of arable crops (lower mountain slopes and valley bottoms) and gardens and fruit orchards (lower mountain slopes and valley bottoms).

Animal grazing is the most visible activity in the rural lands in the area during the summer months. Herding is undertaken by local herders as well as seasonal herders who originate from other areas in Armenia. Seasonal herders coming from other villages or areas constitute another community group who will need to be addressed in the mine closure process. Two studies on herders were carried out during the summer 2012 and additional data was collected through focus group discussions in July 2014. Local herders typically return to their homes in the rural communities at the end of each day, while seasonal herders (estimated at around 60) establish temporary residence in derelict buildings, caravans, tents, or buses in their grazing leases or areas. Approximately 20 herders are located within the mine license area, although not all will be affected by the Project. In addition to the temporary pastoral camps, a group of seasonal herders also uses the quasi- abandoned village of Ughedzor for the summer months and grazes their animals in close proximity to the village.

The mayors of the rural communities believe that pastureland in the area is currently under-utilized, with potential for increased density of animals. Animal grazing and garden cultivation are the dominant summertime land-uses in Gorayk, Gndevaz, and Saravan. In Gndevaz however, apricot cultivation is also undertaken.

Other land-based activities include:

- Foraging for mushrooms, berries, nuts and herbs throughout the area
- Collecting dry wood from forested areas, particularly in Saravan, as a replacement or supplement for gas and electric central heating, as well as for household fuel use
- Hunting and fishing are traditional recreational activities, practiced in the forested areas and the rivers and tributaries in the study area
- Walking trails in the forested areas of the study area are popular with tourists and visitors as well as residents

2.2.8 Infrastructure and Communications

The Amulsar area is located some 170 km from the capital city of Yerevan. Access is via the M2 and H42 highways, plus gravel tracks from Gndevaz to the HLF from Kechut to the open pits and BRSF.

In general, the area is well supplied with electricity from the national grid and, while some houses have access to gas central heating, animal dung, and dry wood are traditionally used as domestic energy sources.

Mobile phone coverage exists in all the permanent settlements within the surrounding area, as well as along most of the M2 highway. Schools within Jermuk and Gorayk were found to be using internet facilities of varying connection speeds.

2.3 Site Facilities Layout

The proposed site layout of all facilities is shown on Figure 02 and is representative of the Project at the End of Mine Life. The majority of the proposed facilities will be north and west of the two open pit locations. The main Project components comprise the following elements, as shown on Figure 02:

- Open pits
- Barren Rock Storage Facility (BRSF), including:
  - Sumps
  - Contact water pond
  - Passive water treatment facility (PWTF)
- A Low-Grade Stockpile
- Fine Ore Stockpile/Truck Loadout Platform
- Run-of-mine (ROM) ore stockpile
- Haul and access roads
- Crushing and screening plant
- Overland conveyor and stacking system
- Heap Leap Facility (HLF), including:
  - Heap leach pad
  - Solution pond and storm water event ponds

- Adsorption-Desorption-Recovery Plant
- Detention Pond and surface water diversion channel
- PWTF

- Maintenance workshop and offices
- Temporary construction camp (removed during closure)
- Contractor ore placement facilities
- Landfill of domestic and industrial wastes
- Explosives magazine
- Borrow Areas
- Quarries

Mining of the Amulsar deposit is planned to be accomplished with conventional open pit mining methods for a term of 11 years. The Artavazdes, Tigranes, and Erato deposits are sequenced to arrive at an ultimate pit geometry containing the Project's mineral reserves. The Artavazdes and Tigranes deposits will be mined prior to mining the Erato pit, which requires more rock stripping to expose the ore. Barren (non-ore) rock from the Tigranes and Artavazdes deposits will be deposited in the BRSF and the barren rock from the Erato area will be used to partially backfill the Tigranes and Artavazdes areas in the later part of the mining operation. The Low Grade Stockpile will be located in the upper reaches of the BRSF and is scheduled to be re-mined and processed near the end of the Life of Mine (LoM).

The proposed HLF is located on the western side of Amulsar Mountain, approximately 1.2 km south of Gndevaz at its closest point, and approximately 6 km in a direct line from the open pits (Figure 2). The HLF will be located in a valley fill area and is anticipated to have a nominal capacity of 104 Mt. The HLF site is located within the Arpa River catchment and downstream of Kechut Reservoir. It includes collection ponds and the ADR gold recovery plant adjacent to the pad. All process facilities are designed for zero discharge.

Access to the mine, crushing facilities, and BRSF will be via a 10-km partially paved road that leads from the outskirts of Gndevaz that links to the main road connecting Gndevaz and Jermuk. Since the HLF is close to the existing main paved road leading from Gndevaz to Jermuk, a 100-meter access road will be constructed for the construction, operation, and maintenance of the HLF and ADR gold recovery plant. The existing power lines, which run along the western edge of the mine site, will be used to provide site power and a new 110-kV substation will be built.

Located approximately 3 to 5 km north of the Erato Pit will be the crushing and screening facility, overland conveyor, maintenance workshops, mine office building, and other smaller facilities to assist in the operation of the Project. The proposed HLF site is located approximately 6 km (12 km by road) to the west of the crushing plant. The conveyor route is located from the crusher down a west-trending ridgeline to the truck load-out facility near the eastern limits of the HLF.

Crushed ore will be transported on a covered overland conveyor. Ore will be loaded into haul trucks at the western end of the conveyor for distribution and stacking in the HLF. The ore will be stacked in 8-meter lifts up to a maximum height of approximately 120 meters above the liner.

An access road/utility corridor will be constructed near the proposed conveyor route for maintenance/ monitoring of the conveyor as well as access to the crusher and production infrastructure at the top of the mountain. Fiber optic lines, water and power lines will also be located in this corridor to minimize land disturbance and provide easy access for maintenance.

The BRSF is proposed to be located on the northeast side of Amulsar Mountain, approximately 2.5 km north of Erato. The BRSF will consist of a barren rock storage pad and a contact water pond located down gradient of the barren rock storage pad. The Low Grade Stockpile is located near the upper limits of the BRSF. The BRSF will be constructed with a low-permeability compacted clay liner consisting of re-compacted subsoil. NAG barren rock will be placed over the compacted soil liner. Any water emanating through the foundation of the BRSF (from potential seeps and springs) will travel through this layer towards the toe of the facility to an underdrain sump (toe sump), where it will be collected for storage in the PD-7 pond. From the PD-7 pond, seepage will be conveyed to the PD-8 pond near the HLF, where it will be consumed in the process or treated for discharge. The seepage will be monitored prior to discharge. Some of the barren rock at Amulsar has the potential to produce ARD if managed improperly. Potentially acid generating rocks will be segregated and encapsulated within the BRSF to mitigate the potential formation of ARD and runoff.

The proposed passive water treatment facility will be located near the HLF, has been designed by Sovereign, and is the preferred option to mitigate the potential formation of ARD from the BRSF and excess water from other contact water sources (e.g., the pits and HLF). The PWTF will be constructed during operations and used to treat excess water during the operations, closure and post-closure periods. After the BRSF outflow water has passed through the PWTF, the water will be collected and monitored prior to discharge into the natural environment. During operations, the outflow water from the BRSF may be directed to the HLF where it will be used as make-up water in the ADR gold recovery plant. The PWTF output will comply with RoA and European Union water discharge standards.

2.4 Mine Rehabilitation and Closure Context

2.4.1 Closure Design Strategies

2.4.1.1 Environmental

In order to achieve the Amulsar closure objectives, the following rehabilitation strategies and activities will be necessary:

- Haulage, stockpiling and monitoring of growth media and subsoil layers, to serve as a visual screen during construction, and a seed bank and to use for revegetation at closure
- Provision for collection of species, storage, and reinstatement of vegetation communities from and to areas during the entire length of the Project
- Progressive rehabilitation of affected areas, where possible, throughout the mine life
- Removal or redistribution of temporary buildings and structures once their purpose has been fulfilled
- Re-profiling and regrading of the BRSF, HLF, access roads, haul roads and the open pit areas, when no longer required as part of operations
- Storage and removal of hazardous and domestic wastes
- Engineering and revegetating slopes to provide erosion resistant and sustainable landforms
- Revegetating disturbed areas for compatibility with the selected post-mining land use, prioritizing native species and vegetation types that existed before the mining operation began and species which are culturally relevant

RC&R objectives also include assistance for biodiversity recovery. Strategies to meet this objective around the immediate Project area will be presented in updates to the RC&R Plan to maintain or enhance ecosystems and biodiversity, such as the provision of bird nesting sites for raptors, potentially artificial supplementation of food supply for carrion-eaters, restoration of diverse plant communities or rare species, and restoration of ecosystem functions and services.

With the nearby mining at Erato, the Tigranes/Artavazdes Pit will be partially back-filled with Erato barren rock. Areas on the pit boundaries may be left as rocky crags to provide raptor nesting sites and habitat for the critically endangered plant species *Potentilla porphyrantha* population for which a net gain must be demonstrated. Geoteam is working with specialist consultants to assess further post-closure options. During the final stages of mining, the Erato Pit will be backfilled to an elevation that precludes formation of a pit lake.

2.4.1.2 Labor, Socio-Economics, and Community

In order to achieve the labor, socio-economic and community closure objectives, the following general strategies will be implemented:

- Training and capacity-building of the workforce during the mine life with specific programs targeting retraining rolled out prior to mine closure
- Identification of potential social/cultural uses for mine infrastructure which could be safely and sustainably transferred to community administrations
- Provision for retrenchment at closure including effective and timely consultation and management
- Review of public services and the development of measures to address a possible reduction in public services due to mine closure
- Early and on-going community participation in the closure planning process and CDP throughout the life of the mine, including engagement over the hand-back of land and its anticipated condition at time of hand-back
- Monitor changes to demographics and integrate findings in social mine closure plans
- Identification of potential social impacts which will be likely to be generated by closure and mitigation measures which can be put in place to minimize these impacts
- The monitoring of housing demand and supply to anticipate and mitigate the impacts of closure as the Project progresses
- Assisting economic diversification during the mine life

Several opportunities have been identified/discussed during the ESIA/FS process that would enhance the closure outcomes and will be considered during the development and operational phase of the mine and implemented as part of Geoteam's community development and livelihood restoration work. The focus is currently on establishing sustainable community development projects, which will support and diversify the existing local economy beyond the mine life.

2.4.2 General Amulsar Mine Closure Activities

2.4.2.1 Rehabilitation of Disturbed Areas after Construction

Areas that will be disturbed during RC&R construction activities will be restricted to the extent possible to those areas that have previously been disturbed. For those areas of the site no longer required for operational use, the following strategies will be adopted:

- Dismantling and removal of all equipment and temporary installations, buildings, etc. not required for future operational use
- Removal of construction wastes and its appropriate disposal
- Filling and compacting of pits, hollows and excavation trenches with the appropriate stockpiled materials
- Slope regrading activities will occur to provide sustainable and erosion resistant landforms compatible with the post-closure land use and water management strategies

- Exposed soil and overburden slopes will be regraded so that they conform with adjacent landforms and to accommodate the RC&R design criteria
- Pit slopes located above the pit backfill will remain exposed as potential raptor nest sites

Any disturbance that occurs due to exploration activities will be rehabilitated in accordance with the progressive rehabilitation RC&R design criteria. These activities will be completed and funded as part of Amulsar operations.

2.4.2.2 Revegetation

Restoration of a range of vegetation types will be needed, including woodland and scrub on lower slopes, meadow and sub-alpine communities and wetlands. Vegetation restoration/reinstatement will use native species of local provenance, with the intention of restoring pre-impact vegetation types. One exception is the use of American poplar that is sometimes used locally for visual screening alongside existing roads and public highways near settlements and may be used to help reduce the visual impact of the mining operation in lower areas, where it is appropriate to its landscape context. American poplar will only be planted at lower altitudes in modified landscape contexts. It is anticipated that trees to be used for visual screening will be planted early in the mine life. Two tree nurseries have been established to grow saplings for this purpose, including native species, to ensure that sufficient stocks are available when needed. The nurseries are located in nearby villages both to help acclimatize the trees and provide some local employment. On-going specialist supervision is taking place to ensure the efficiency and effectiveness of the nurseries and some trees have already been transplanted to receptor locations.

Further planting of native, mixed woodland tree species and some Juniper is planned around the HLF on the north and west side of the site, particularly in locations where there are remnants of Caucasian mixed forest.

Restoration of montane meadow and sub-alpine vegetation is anticipated. A seed-harvesting program is underway to ensure that sufficient seed is available for the constituent species. For some vegetation types, methods based on translocation of “turves” or transplants may be needed. Initial tests will be supplemented by a program of field trials using a variety of techniques in advance of mine closure. Many of the plant communities on the mountain depend on vegetative reproduction rather than seed. Consequently, in addition to a tree nursery there will also be the need for a nursery to grow tussocky grass and herbaceous plants for revegetation.

The population of the critically endangered plant *Potentilla porphyrantha* must be returned to above its pre-mine size within a reasonable period. Experiments are planned in collaboration between the RoA Institute of Botany of the National Academy of Sciences, the University of Cambridge, and TEC to fully understand the environmental requirements and population parameters of this species so that new areas of the

appropriate rocky habitat can be created at mine closure. The research program will run from 2014 to at least 2018.

2.4.2.2.1 Supporting Research

Several experimental trials to research suitable revegetation techniques are proposed during the mine life. The results will be used to develop a program of successful, progressive restoration in the future. Trials will consider the following parameters:

- Determine the target vegetation communities for each area to be revegetated based on pre-mine communities and considering major changes in landform
- Species choice: local, native species will be used except in specific cases where a clear justification can be made for an alternative. Plants required will be produced at a local nursery established for the purposes of mine reinstatement. Lists of plant species required for each main vegetation community present in the Project area will be devised with input from several experts
- Detailed determination of the physical, chemical, climatic parameters needed to sustain these vegetation communities and intended end uses will be carried out and the results used to inform the species choice process and site preparation
- Surface preparation techniques including soil application, other cover materials, reduction of compaction and/or waterlogging, or use of stored growth media
- Techniques for ameliorating soil properties where required, such as the application of soil amendments to ensure suitable soil fertility, soil moisture retention, structure, or to reduce the availability of potentially toxic elements and mitigate excessive acidity or alkalinity
- Seeding/planting mixtures and techniques
- The aftercare requirements of established vegetation

The costs relating to revegetation research will be regarded as operational costs and will not be included in the estimate of mine closure costs.

Specialist research is also being carried out on propagation techniques for rare plants, including *Potentilla porphyrantha*. A partnership agreement with the RoA Institute of Botany and the University of Cambridge's Botanic Garden will guide much of this work.

2.4.2.3 Erosion Control, Water Diversion Systems, and Hydrology

A site-wide water management plan (Golder, 2015) has been developed by Golder for this FS. This plan will incorporate feasibility level engineering controls, erosion and sediment controls, and design criteria. This plan will be used as a basis to develop monitoring programs to evaluate the success criteria that will be used for progressive RC&R activities, as follows:

- Protect the soil surface with some form of cover
- Protect areas of exposed soil (or limit the time of exposure)
- Control runoff velocity

- Minimize channel erosion
- Trap sediment

The drainage structures used during operations will remain intact to the extent that they are required post-closure. Those elements removed during the closure process will be regraded, scarified, and revegetated.

Surface water channels and ponds are operated and maintained during mine operations according to the site-wide water balance and surface water management plan (Golder 2015). Upon closure of the mine, water management features will be modified to maintain flow similar to pre-development conditions in the major watersheds of the development area and to continue to provide water management for roads and facilities that exist in the closure plan. The objective of the closure drainage plan is to provide a drainage system for the closure landscape that is sustainable over the long term.

Surface water channels are generally located adjacent to haul roads and access roads. Channels associated with roads that will remain post operations, including RD-1, RD-2, RD-3, and RD-6, will be maintained. These conveyance channels are described further below.

Runoff contributing to RD-3 will continue to be conveyed in Channel C-1 and C-4, located adjacent to the RD-3 road and upgradient of the cut slopes, respectively. These channels will remain in place upon closure. The confluence of C-1 and C-4 is in a stilling basin, PD-15. PD-15 is lined with riprap and dissipates energy from C-1 and C-4. The outflow of PD-15 is via overflow back into C-1, conveying water to 2 x 1.2 m culverts, crossing RD-3 and to Sediment Pond, PD-14. The side slopes and depth of PD-14 will be reduced (average depth less than 2 m), but a low volume, shallow depth pond will remain in place to provide energy dissipation and attenuation. The outlet will be modified to a long overflow weir, allowing shallow depths of water to overflow the pond and be conveyed utilizing the natural topography. The outlet channel and pipeline from PD-14 will be removed and the area reclaimed. If required, additional revetment will be constructed to protect the surface water features to provide a low maintenance, robust system.

During operations, runoff contributing to RD-1, RD-2, and RD-6 is generally conveyed under the roads using culverts located in topographic low points along the road and the water is allowed to continue to flow using pre-development drainage courses. The roadside channel conveys localized runoff to the culverts and then under the road to stormwater Best Management Practices (BMPs) which allows the water to spread back out from concentrated flow and then utilize the existing topography for conveyance. The roadside channels, and BMPs will remain in the closure drainage system to continue to allow water from natural, upgradient drainage areas to flow downstream of the road. Culverts will be removed and replaced with dip crossings.

The surface water channels from roads that will be removed and reclaimed in the closure plan, including RD-4, RD-7, RD-9, and RD-10, will be regraded to provide drainage to existing drainage areas. Any culverts and stormwater revetment will be removed. The regraded area will be vegetated to minimize erosion.

PD-12 is an operational sediment pond and water storage pond for dust suppression during operations. Upon closure of the mine, this pond will be filled in and regraded to approximately pre-mining topography. The disturbed area will be revegetated to minimize erosion and the contributing area will be allowed to drain via sheet using the regraded topography.

Closure erosion control and surface-water management practices for mine facilities are described in more detail in Section 3 and include the construction of diversion ditches and berms, swales, down-chutes, energy dissipaters, revetments, and collection and settling ponds as required.

2.4.3 General Amulsar Mine Socio-Economic Closure Issues

2.4.3.1 Local Expectations

There are high local expectations for employment and economic development resulting from the mining activities. Currently, unemployment in the villages is high and community morale is relatively low. As such, the Project carries high local expectations that must be well managed both in development and in closure.

2.4.3.2 Redundancy of Geoteam Employees

Redundancy of mine staff is regulated by the RoA Labor Code, as follows: In case of reduction of production volume or complete close down of a company (mine closure), the employer must give to the employee a written notice at least one month before a day that the employee will become redundant. If redundancy is result of the mine closure, then irrespective of employment duration the compensation for redundancy will be equal to one-month average salary to employees who will become redundant. In addition, under EBRD PR2, if a project anticipates collective dismissals as defined in Article 1 of EU Directive 98/59, the Project will develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of non-discrimination and consultation.

There is no obligation for the company to contribute, for any employee, pension or other funds, or create/maintain a pension plan for any employee. Therefore, irrespective of how long any particular employee has worked for the company, in the case of redundancy upon mine closure, the employee will be entitled a compensation for unused vacations (if any) and one-month average salary.

2.4.3.3 Local Unemployment and Related Socio-Economic Issues

Given the socio-economic context of the Project setting, there is a high probability of creating socio-economic dependency between the mine and the local people. Consequently, when the mine closes both

directly and indirectly employed local workers will be left without on-going employment. Local supply chains that have been set up to supply the mine with goods and services will no longer have a customer base and will be terminated if they have not managed to diversify their income streams prior to closure. Typically, the costs of meeting the economic decline in such circumstances are passed onto the government; however, Geoteam is committed to developing the RC&R Plan to minimize the socio-economic impacts of mine closure on local communities

In addition, it is common for mining companies to commit expenditure on local community development as the mine nears the end of its life. Usually this is too late in the mine life to significantly alter the overall outcome upon closure. During the life of the mine, the company's community development/management plans (or equivalent) should be to deliver long-term benefits to surrounding communities to help offset the concentration of local impacts that they experience and to assist in the development of economic activities that are sustainable beyond the life of the mine. Geoteam aims to achieve these benefits.

2.4.3.4 Traditional Land Uses and Cultural Heritage

The Project area has been used traditionally by local people for summer grazing, hay harvesting, foraging for herbs and mushrooms for medicinal and nutritional use for subsistence and selling, for apricot cultivation and for fishing and hunting. There have been numerous archaeological features of variable age and significance identified as part of the ESIA baseline studies. The development of the mine will have a negative impact on some of these cultural resources. Impacts upon these areas have been minimized where possible through the design of the mine layout and location of specific facilities. When potential archaeological sites cannot be avoided, (i.e., all or part of the site will be lost or damaged) excavation will be carried out to assess the scientific integrity and significance of the site through the recovery of artifacts and cultural information. Detail on the management of cultural heritage is captured in the Cultural Heritage Management Plan.

2.4.3.5 Economic Displacement Due to Land Acquisition and Herder Livelihoods

Land required for the construction and operation of the Amulsar Project is located in the communities of Gndevaz and Saravan. There is some land affected in the community of Gorayk but it is all state land and no private landowners or users will be affected. Some of the land, which is required, will be needed for the period of mining only (approximately 13 years) (e.g., mining pits, the conveyor between the crusher and the HLF and some of the barren rock storage facilities). Upon closure, this land will be re-contoured, restored and may be transferred to community ownership, following consultation and full engagement of local communities, for communal use as pasture or forest land, with some safety or other restrictions that might apply during hand-back.

While the mining pits are located high on the Amulsar mountain on State or Municipality owned land, the conveyor, HLF and access roads will all affect private land plots. The following number of private land plots will be affected:

- HLF: Approximately 280 private land plots. Currently, it is expected that 238 plots may be acquired. The remaining plots will depend on final design.
- Conveyor from crusher to HLF: Approximately 83 private land plots. The current plan is to rent portions of the plots within 40 meters either side of the conveyor.

Conveyor from crusher to HLF: Approximately 83 private land plots. The current plan is to rent portions of the plots within 40 meters either side of the conveyor. Key principles guiding land acquisition are the following:

- Land acquisition will be conducted based on willing seller/willing buyer transactions
- The process will comply with RoA legislation and EBRD's PR5 and IFC's PS5
- Any compensation will be at full replacement value
- Identification of affected plots and affected people will be based on the cadastral information, complemented and ground-truthed where claims may arise
- Impacts to livelihoods will be assessed and compensated where needed
- Wherever legally, technically and economically possible, land will be returned to its previous land use category (agricultural), physical condition and ownership after use for mine construction and operations
- A grievance management mechanism will be in place
- Affected people will be informed and consulted with
- Vulnerable individuals will be identified and assisted where needed

The land acquisition process started in 2015 will continue into 2016.

A socio-economic survey has identified all members of affected households and gathered basic livelihood information to understand the basis of their livelihoods currently and against which their future livelihood levels can be compared. The survey addresses both land owners and land users where possible, including herders. Vulnerable people (those who may be disproportionately affected by land acquisition) are being identified and will be specifically assisted. Adequate compensation will be granted, if required, based on the fair assessment of the need for livelihood restoration.

Livelihood monitoring, specifically a comparison of livelihood information in the post land acquisition situation to the baseline situation, will take place over the life of the Project. In particular, monitoring will take place at final closure in order to assess requirements for future land use.

3.0 SPECIFIC FACILITY RC&R ACTIVITIES

3.1 Major RC&R Plan Components

The major site facilities and layout were discussed briefly in Section 2.3. These areas represent the major areas requiring RC&R at the end of mine life and are discussed in more detail throughout this section. The Project Facilities General Arrangement is presented in Figure 02 for the End of Mine Life condition. Preliminary grading plans and preliminary design details for the post closure conditions are shown on the attached Drawings 01 through 06. The associated cost estimate to implement the RC&R plan is discussed in Section 5.0 with the details on implementation of each of the specific closure activities and the methods involved in those activities discussed in the following subsections.

The Project will include the following features as part of the active mining and mineral processing that will be subject to RC&R:

- Open pit mine and haul roads for development of the Tigranes, Artavazdes, and Erato deposits.
- Crushing and screening facilities, including an overland conveyor and stacking system.
- BRSF designed to contain non-ore-grade rock and soil materials.
- Contact water ponds at the BRSF if not required as part of the post-closure PWTF.
- PWTF for treatment of mine-impacted water (MIW) located downgradient of the HLF for post closure passive treatment.
- HLF including a lined ore heap leach pad designed to contain leached ore, collection ponds, and ADR plant for processing and refining of gold and silver ore. The closure and post-closure water treatment of HLF draindown effluent for residual cyanide and mobile elevated constituents will occur by active evaporation techniques and rinsing of the pad, until draindown flows are diminished to a level suitable for treatment in a PWTF.
- Mine workshop, warehouse, administration, fuel storage, lay down platform and truck shop facilities.
- Explosive magazine.
- Surface water diversions, a detention pond located near the HLF, and other sediment and erosion control features around the major facilities, most of which will be utilized for closure and post-closure water management.
- Haul roads, general access roads, and perimeter fencing, where required.
- Utility lines, including power and water for the various facilities as necessary.
- Mine waste landfill site and septic tanks used in various buildings.
- Various ancillary features such as growth media (i.e., topsoil) stockpiles and laydown/ construction yards.

3.2 Project-Specific Rehabilitation Features

3.2.1 Mine Pits

3.2.1.1 Open Pits

The mineable resource for the Artavazdes, Tigranes, and Erato Pits have a total open pit footprint area of approximately 135 ha as shown on Figure 2. Pit slopes will be designed for stability and safety considerations and constructed as part of operational mining activities based on pit slope stability assessments and in accordance with the Amulsar mine safety plan, to be developed by Geoteam for use during operations. Pit walls will be excavated during operational mining activities with engineered pit slopes and catch benches to meet operational stability and safety requirements. Barren rock from the Erato Pit will be used to partially backfill the Artavazdes and Tigranes Pits and a portion of the Erato Pit. The backfill within the pits will provide a stabilizing buttress, assist in reclamation of the pits, reduce the post-closure visual impact of the pits, reduce the overall volume, footprint, and impact of the BRSF, and minimize the formation of pit lakes. The pit closure design was completed by GRE. The proposed pit backfill grading plan for the Artavazdes and Tigranes Pits are shown on Figure 02 and Drawing 03, with pit closure design details provided on Drawing 06.

The slope of pit walls extending within the pit area will not be reduced in order to minimize the final closure footprint of the open pit. Natural revegetation may occur over time in isolated areas along the benches that are not reclaimed and the more rugged sections of the pit walls and benches may be suitable for future raptor and mammal habitat and habitat for the critically endangered plant species *Potentilla porphyrantha*.

Groundwater modeling indicates that the proposed pits will be situated above the regional water table (Golder 2012). As such, excavation and dewatering of the pits, due to inflows from precipitation and encountered perched water zones, is considered to have negligible influence on the regional groundwater system, and will have no detectable effect on flow to the Arpa, Darb, and Vorotan rivers. Groundwater quality in the perched system within the mineralized rock mass is currently poor, due to natural baseline conditions. Future RC&R Plan updates will incorporate the results of test work to evaluate the geochemistry and acid generation potential of bedrock surrounding the pit that will be representative of the final pit wall condition. The volume of impacted groundwater recharge that will flow from the pit area is very small in comparison to regional groundwater discharge to the major rivers to the east and west of the pit. Furthermore, groundwater modeling suggests long travel times in the saturated pathway to the point of discharge to either the Arpa, Vorotan, or Darb Rivers. On this basis, it is considered highly unlikely that changes in water chemistry in pit seepage will have any detectable effect on the quality of groundwater base flow to the two rivers. Therefore, no inclusion for post-closure management of groundwater within the pit has been included in the RC&R Plan at this time. There is the potential, following closure, for pit lakes to develop although current studies suggest they will be below the level of the pit rim and thus will not

discharge to surface water streams. Future updates to this RC&R Plan will be needed to evaluate the geochemistry and acid generation potential of the exposed pit walls based on studies currently being developed. No significant impact on the groundwater environment is anticipated, as groundwater quality in the perched system within the mineralized rock mass is currently poor, due to natural baseline conditions.

Pit backfill will begin in Year 4 in the Artavazdes Pit and progress northward to the Tigranes Pit., beginning in Year 5. The pit backfill for the Artavazdes and Tigranes Pits will be hauled directly from the Erato Pit and placed within the Artavazdes and Tigranes Pits in accordance with the backfill plan developed by Praetorian using the operational mining fleet. The backfill for Erato Pit will first be stockpiled by placement of upper volcanic, NAG, materials from the Erato Pit to the former Tigranes Pit during Erato mining operations. During the final stages of mining operations in the Erato Pit, the stockpiled materials will be hauled from the stockpile located in the Tigranes pit or from material on the haul road fill between the Erato Pit and the BRSF back to the Erato Pit and placed to an estimated depth of 30 meters above the pit bottom using the operational mining fleet. Following removal of the material from the ROM stockpile, the footprint will be ripped to reduce compaction, growth media placed to a depth of 0.2 meters and revegetated.

Backfill will be progressively reclaimed as each area is completed to final configuration. The reclamation activities for the pits and pit backfill are discussed in the following sections. The FS mine plan was not complete as of the development of this revised RC&R Plan. The estimated reclamation schedule based on the previous RC&R Plan is described as follows:

- Years 4 to 7 – Backfill Artavazdes Pit. Reclaim Years 7 and 8
- Years 5 to 8 – Backfill Tigranes Pit. Reclaim Year 9
- Years 8 to 9 – Backfill remaining Artavazdes Pit. Reclaim Year 10
- Year 9 – Backfill Erato Pit to elevation required to preclude formation of a pit lake. Reclaim Year 10

3.2.1.2 Open Pits Landform and Cover

The final pit backfill design for the Artavazdes and Tigranes Pits (prepared by GRE and Praetorian) includes overall composite slopes during both operations and closure of 3 Horizontal (H):1 Vertical (V). During closure, the outer slopes will be regraded to construct drainage swales at approximately 10 m vertical intervals Collection channels will be constructed in the swales. The channels will flow either to a perimeter channel or to a down drain channel, which will then convey flows to the perimeter channel or the pit bottom. The top surface will be constructed to provide a nominal 1% slope graded towards down drain channels.

In addition to drainage in the pit backfill area, this closure plan includes a run-on control drainage along the pit wall to reduce the intrusion of runoff into the pit from the pit wall and minimize meteoric contributions to

a potential pit lake. Runoff into the pit can be reduced by constructing a catch drain around the south perimeter of the pit along the 2,880-meter bench and discharging this water out of the pit limit.

A cover consisting of 0.5 meters of growth medium will be placed over the final regraded surface to facilitate revegetation, and minimize infiltration flux of precipitation into the underlying barren rock materials. Drawings 03 and 06 (prepared by GRE) show the regraded pit surface and channel details for the Artavazdes and Tigranes Pit backfill design.

The final pit backfill design for the Erato Pit includes placement of NAG upper volcanic materials to an estimated depth of 30 meters above the pit bottom to minimize formation of a pit lake. Growth media or other soil materials will not be placed over the coarse rock backfill.

3.2.1.3 Pit Access

Pit access will be prohibited during the post-closure period for public safety purposes with a large 2-meter high perimeter berm (also referred to as a bund), consisting of NAG barren rock, that will surround the areas of exposed pit walls. Vehicle access to the pit will be blocked by large rocks placed across the access roads leading into the pit. Prominent safety signs will be erected around the pit as well as in front of the access roads leading into the pit. This information will be shared with communities through the closure preparation engagement, and discussions will occur to determine the most culturally appropriate means of ensuring future community (and agricultural) safety in these areas.

3.2.1.3.1 Surface Water Management, Erosion Control, Grading and Rehabilitation

Surface water will be controlled and managed around the open pit and haul roads during operation by the use of culverts and diversion channels according to the Surface Water Management Plan (Golder 2015). Following the regrading and rehabilitation of the open pits, the haul roads, access roads and exploration roads, all unnecessary surface-water management structures will be removed and reclaimed. Grading and revegetation of the site will occur during RC&R activities to control surface runoff and erosion of affected areas and to promote positive drainage. Culverts will be replaced with dip-crossings. All disturbed and compacted areas will be regraded for positive drainage, scarified, and revegetated in general accordance with executable level design plans, design criteria, and specifications, to be developed as part of the LOM RC&R plans.

3.2.2 Growth Media Stockpiles

Geoteam intends to construct growth media stockpiles in close proximity to the mine facilities to be reclaimed. These will be used to aid screening of the operational works if they are positioned between the works and visual receptors. The strategy proposed by Geoteam includes removal of initial growth media by dozers with supplemental use of loaders and trucks, if required. Where space is available at the perimeter of the facilities, growth media will be pushed into berms at the perimeter of the facilities adjacent to the

access roads. Potential growth media stockpiles are envisioned, and included for purposes of this preliminary RC&R Plan as shown on Figure 02, totaling approximately 22.7 ha, and designed to contain approximately 1.2 Mm^3 of growth media. Growth media stockpiles will be limited in height in accordance with standard of care procedures to not adversely affect the growth media quality. They will be protected by establishing vegetation to reduce erosion and to maintain microbial activity throughout the LOM. Location of stockpiles near the salvage areas and proposed redistribution locations will provide conditions that maintain the growth media characteristics that support the local vegetation.

3.2.3 Haul Roads, Access Roads, and Exploration Roads

The haul roads and access roads as shown on Figure 02 have a total disturbed area footprint of approximately 65 ha, based on the overall mine plan and design as shown on Figure 02.

Haul roads, access roads and exploration roads outside of the pit area will be ripped and scarified, growth media placed to approximate the surrounding terrain and slopes in unconsolidated material will be revegetated in accordance with the final RC&R plan and design criteria to be developed during later stages of closure planning.

All roads in basalt are designed with a composite slope of 1.15H: 1V if cut is above 10 meters in height, and 0.5H: 1V if cut is less than 10 meters. The colluvium layer (average depth of 1 m) will be sloped at 1.5H: 1V and stripped back 3 meters from the crest of the first bench. Roads in upper volcanics are designed with a composite slope of 1H: 1V if cut is above 10 meters in length, and 0.4H: 1V if cut is less than 10 meters. Roads in lower volcanics will use a composite slope of 1.75H: 1V. All fill slopes will be constructed at 2.5H: 1V, to facilitate reclamation, where feasible or 2.0H: 1V where there are toe constraints.

At closure, cut and fill slopes will remain at operational slopes to minimize additional disturbance.

Access roads RD-1 and RD-2 will remain as-built to provide post-closure access. RD- 3 (Mine Haul road) will have the running surface reduced to 5 meter width by ripping and revegetating the ripped surface. To allow access for long term monitoring and for general site access. All other roads will be rehabilitated by ripping the entire width of the running surface and removing the safety berms. Road-side diversion channels will be removed in conjunction with regrading the safety berms. Some access road and haul road areas that are located in drainages, and thus may be subject to large surface water flows post-closure, will require the construction of revetment erosion control, stability, and surface water management features consisting of clean riprap. It has been assumed that the exploration roads will be closed in accordance with the Exploration Closure and Rehabilitation Plan prepared in May 2013. The main access road may remain to allow local community access to remote areas.

All exploration drill holes will be plugged in accordance with standard of care practices, during operations as an operating cost. A number of wells were closed in 2013 and 2014, in particular outside the proposed pit shells. The activities related to rehabilitation of exploration works (drill holes, pads, and access roads) are described in the Exploration Closure and Rehabilitation Plan prepared in May 2013.

3.2.4 Monitoring Well Abandonment

It has been assumed that a total of 48 monitoring wells across the site will be abandoned and plugged, in accordance with the Exploration Closure and Rehabilitation Plan. This plan will be incorporated into the RC&R Plan during future operational updates.

3.2.5 Crushing Facilities, Conveyor Corridor, Maintenance, Administration, and Workshop Areas

The crushing facilities (Figure 02) located southwest of the BRSF and those facilities (i.e., maintenance shop, administration facilities, and mine workshop) located northwest of the BRSF have a total disturbed area footprint of approximately 17.5 ha. The conveyor corridor has a total disturbed area of approximately 17 ha as shown by the design on Figure 02. This design includes the conveyor corridor, associated cut and fill slopes, and an access road.

It is assumed that the conveyor and all buildings will be dismantled, removed, and salvaged as described in the following section. If appropriate, some of these facilities may be refurbished and reorganized to be utilized by local communities, if requested.

3.2.5.1 Dismantle and Salvage

Following the completion of mining activities, and assuming that no future mining or mineral recovery activities are planned, the buildings, facilities, conveyors and equipment near the crushing facilities will be decommissioned and removed from site. Some buildings or portions of buildings may be required to remain after mining in order to support the post-closure monitoring and land use such as the maintenance and mine workshop buildings. Further, some buildings may be turned over to local communities for reuse, if suitable alternative uses are developed for these buildings. Equipment, surplus materials, and tanks will be removed and disposed of off-site and/or recycled in accordance with applicable regulations. All cyanide process facilities and pipelines will be rinsed and decommissioned in accordance with the ICMC or “Cyanide Code” protocol (ICMI 2014). Surface pipelines, power lines, and culverts will also be removed in accordance with applicable regulations. Smaller concrete building foundations may be broken in-place and buried on site with a minimum 1-meter reclamation cover.

3.2.5.2 Site Cleanup

Scrap material, refuse, unwanted equipment, and surplus materials will be removed and disposed of at the mine landfill site, returned to suppliers, or recycled, if possible. Any closed waste management units and/or

sewage facilities will be cleaned and all hazards will be remediated in accordance with applicable RoA rules and regulations. The lined stormwater collection ponds may be closed by cutting the lined portions of the side slopes, folding the material onto itself, and burying the liner materials in place. Any remaining sludge or sediment will first be stabilized by mixing with cement or removed and placed within the on-site landfill.

3.2.5.3 Surface Water Management, Erosion Control, Grading, and Rehabilitation

Surface water will be controlled and managed during operations around the plant site and mine facilities by the use of culverts and diversion channels. Following the demolition and dismantling of all facilities and equipment, all unnecessary surface-water management structures will be removed and reclaimed. Culverts will be removed and replaced with dip crossings (Small depressions that are designed to allow drainage to flow across roadways at-grade). All disturbed and compacted areas will be regraded for positive drainage, ripped or scarified, and revegetated. Cut and fill slopes will be regraded to approximately 3H: 1V where practical, or to match existing grades and contoured as necessary. It is assumed that cut slopes in competent rock will be deemed stable for the long-term and thus will not be regraded to 3H: 1V as this may result in adverse economic impacts, would not satisfy the intent of the RC&R plan, and would unnecessarily increase the disturbed area at the Project. In areas where large drainages exist or over-steepened closure slopes are required, an engineered revetment will be constructed of NAG riprap for erosion control, long-term stability, and surface water management. Retaining walls around the crusher location will be removed or backfilled and graded to provide positive drainage in the level areas of reclaimed crushing foundation areas. Disturbed areas in and around the plant site will be revegetated, in general accordance with the final RC&R Closure Plan, designs, and design criteria.

3.2.6 Barren Rock Storage Facility

The BRSF site is located approximately 1.5 km north of the planned Erato mine pit as shown on Figure 02 and has a total disturbed area footprint of approximately 102 ha, inclusive of the barren rock pad, the toe sump, and the BRSF surface water diversions. GRE prepared the operating and closure designs for the BRSF. The BRSF Reclamation & Drainage Plan and the BRSF Reclamation Details are included as Drawings 01 and 04 (as prepared by GRE).

In total, 70.3 Mm³ of material will be placed in the BRSF over an 11-year facility operations period, which will take place in phases that will include periods or barren rock placement and low-grade ore placement, periods of no rock placement, and periods of progressive reclamation as practical. Deposition is anticipated to be in 10-m thick lifts placed from the bottom up in three distinct phases, in accordance with the mine plan and schedule. The final design includes overall composite slopes during both operations and closure of 3H: 1V. The deposition schedule for the BRSF, as currently laid out, is described as follows:

- Prior to construction, topsoil will be removed and stockpiled.
- Subsoil will be re-compacted in place to form a low-permeability soil liner.

- NAG materials will be placed directly on the re-compacted soil liner.
- PAG and NAG materials will be placed in sequences to allow all PAG materials to be encapsulated by NAG materials in engineered cells.
- Phase 1 will include the placement of approximately 33.3 million tonnes (Mt) of barren rock starting with the first rock placement in the BRSF and continuing for approximately 15 months.
- Phase 2 will include the placement of approximately 29.6 Mt of barren rock starting immediately after the completion of Phase 1 and lasting an additional 14 months.
- Phase 3 will include the placement of approximately 59.4 Mt of barren rock starting immediately after the completion of Phase 2 and lasting until Year 8 of the mine life.
- Once each level of Phase 3 of barren rock placement is nearly complete, then the northern outslopes of the said level of the BRSF can begin to be reclaimed starting in Year 3 of the mine life.
- Low-grade ore placement will occur on the southern end of the BRSF concurrent with barren rock placement. In total, approximately 9.1 Mm^3 of low-grade ore will be placed in a stockpile on the BRSF from the start of the mine life until Year 6 of the mine life.
- Low-grade ore will be re-mined from the stockpile on the BRSF starting at approximately Year 1 of the mine life in small increments, and re-mining will start with larger volumes in Year 7. The low-grade ore will be completely removed from the BRSF in Year 10.5 of the mine life. Therefore, final RC&R of the BRSF will begin following complete removal of the low-grade ore stockpile.

The current BRSF design includes the segregation and encapsulation of PAG materials with NAG materials, as well as the segregation of low-grade ore that will be processed prior to closure. The BRSF feasibility-level closure design by GRE provides for regrading of the operational side slopes to provide 2.3H: 1V interbench slopes, with nominal 7.0-m wide rehabilitation benches (including the v-ditch and safety berm) sloping at a nominal 2%, to provide post-closure surface water management. As illustrated on Drawing 01, the outslope channels will flow either to the BRSF perimeter channel or to a down drain channel, which will then convey flows to the perimeter channel (see Drawing 01). The top surface will be constructed to provide a nominal 1% slope graded towards down drain channels. A cover system (described in the following section) will be placed over the final regraded surface to facilitate revegetation, control erosion, and minimize infiltration flux of precipitation into the underlying barren rock materials(see Drawing 04).

3.2.6.1 BRSF RC&R Cover

The BRSF cover system has been conceptually designed by GRE to be compatible with the RC&R Plan goals and objectives. The operational BRSF outslope grading design is illustrated on Drawing 01. Re-grading and recontouring of the BRSF outslopes will be required prior to construction of the BRSF cover as shown in the details on Drawing 04. Following placement of the BRSF cover, diversion ditches will be constructed (both bench channels and down drain channels) and the slopes will be revegetated. Rehabilitation of the slopes will also include the use of BMPs to mitigate wind and water erosion of the

slope during rehabilitation. If appropriate, specific areas will be left un-graded to allow flora and fauna that prefer rocky terrain to become established.

The cover for the BRSF is designed to minimize flux into the mine waste by use of an ET cover. The ET cover will consist of an active infiltration and storage zone underlain by a capillary break layer. It is anticipated that once the cover system is constructed, there will be a significant decrease in seepage reporting out of the toe of the BRSF. The BRSF feasibility-level cover design by GRE includes the following layers from top to bottom:

- 0.2-m thick topsoil and vegetation growth layer
- 1-m thick clay layer designed to act as a sponge to store and limit meteoric flux
- 0.5-m thick capillary break layer designed to minimize flux into the BRSF (this layer will consist of repurposed NAG materials already placed in the BRSF)

Details and sections of the BRSF feasibility-level cover design are shown on Drawing 04. It is anticipated that Geoteam will advance and optimize this design during the LOM with test plots, identify and further characterize soil cover sources, and complete infiltration prediction evaluations.

Potential borrow areas for the clay layer have been identified near the BRSF with sufficient volumes of clay soil. During construction of the cover, these areas will be disturbed for a short time. Growth media will be stripped and stored in berms adjacent to the borrow areas. The excavation will be designed to drain, so that there is no ponding following closure, and minimal regrading is required. The specific location and design will be developed in later revisions of this RC&R Plan. For the closure cost estimate, it has been assumed that approximately 36 Ha will be rehabilitated by respreading growth media and revegetating the borrow areas.

3.2.6.2 Passive Water Treatment of Mining Influenced Water (MIW) at the BRSF

The ET cover system was included in the closure design of the BRSF to minimize any post-closure flux of meteoric water (including snowmelt) into the barren rock. The proposed PWTF design was developed by Sovereign to treat excess contact water and to mitigate ARD and/or mine impacted water from the BRSF during operations, closure, and the post closure periods at a low cost. Seepage from the toe of the BRSF discharges to the PD-7 pond during operations (with a volume of 25,000 m^3). This pond will be maintained and retained at closure. A 450-mm gravity pipeline will connect the PWTF to the PD-8 pond near the HLF, and a pipeline will connect PD-8 to the HLF (see Drawing 02).

PD-8 will function as an equalization pond, leveling the peak BRSF seepage flows. Based on the results of the FS Site Wide Surface Water Balance (Golder, 2015), the nominal treatment rate will be approximately 40 m^3/hr, starting in 2021. The BRSF MIW will be continually treated in a PWTF. The MIW is predicted to

be mildly acidic and the primary constituents of concern (COC) will be nitrate and sulfate; with the exception of aluminum, dissolved metals concentrations in the MIW are predicted to be very dilute (GRE 2014b). The PWTF components, based on the Sovereign feasibility-level design, include:

- Nitrate Reducing Biochemical Reactor (BCR)
- Aerobic Polishing Wetland (APW) No. 1
- Sulfate Reducing BCR
- Sulfide scrubber unit
- APW No. 2
- Manganese removal beds (MRB)
- Infiltration gallery adjacent downslope from the PWTF

Sovereign reports that these technologies have been demonstrated at other mine sites at closure (in particular in California, Montana, Wyoming, and Vancouver Island, B.C. [active mine]), but not in the same, precise combinations and sequence because MIW chemistries can vary widely from site to site. PWTF technologies were originally developed in the USA about 25 years ago and these systems are found on virtually every continent in a wide variety of climates, including in the sub-arctic.

Preliminary PWTF design assumptions follow.

- All flows are gravity-driven, starting at the BRSF toe drain seep.
- The PWTF will treat 40 m^3 per hour (11.1 L/sec) of seepage (this includes a 30% safety factor) derived from a blend of MIW and natural ground water flow occurring in the BRSF footprint.
- The PWTF will be built for low visual impact with the two sets of BCRs buried beneath a vegetated soil cover. This design feature will also protect the components during harsh winter temperatures and from contact with or damage from grazing animals.
- The sulfide scrubber unit will be filled with an inexpensive sacrificial metal such as iron provided by:
  - a natural mineral source such as limonite or goethite [$Fe(OH)_3$], hematite [Fe_2O_3], magnetite [Fe_3O_4], or
  - zero valent iron derived from a local source of scrap iron such as steel food cans that could be procured from the local communities over the life of the mine.
- The two APWs (positioned after each BCR) will be populated with native plant species (including a local species of sphagnum peat moss) and configured to appear like a natural wetland ecosystem as much as practical.
- The MRBs will be integrated into the APW in a manner that preserves the natural appearance of the PWTF and local ecosystems.

Water will be discharged to the Arpa River according to agreements yet to be made between Geoteam, communities, and regulators. The system is designed to meet Arpa Category II discharge requirements (see Table 1).

It is anticipated that periodic maintenance (approximately 20-year intervals) to replace substrate in some components of the PWTF may be required. Geoteam will develop a monitoring plan during final design to determine when maintenance is required.

The final design of the PWTF would be based on the performance results of bench and pilot scale testing on site. The testing will be performed during the operation phase of the mine and will be used to demonstrate the efficacy of the PWTF. Lydian's consultants would design and construct these experiments and prepare sampling and analysis protocols. These protocols would be followed by professors and students from the Armenian Research Institute under the guidance of Lydian's consultants.

3.2.6.3 Surface Water Management, Erosion Control, Grading, and Rehabilitation

Surface water will be controlled and managed around the BRSF by the use of culverts, diversion channels, and other erosion control features in accordance with the site-wide closure and post-closure drainage plan. Following the completion of rehabilitation of the BRSF, all unnecessary surface-water management structures will be removed and reclaimed. Grading and revegetation of the site will occur in order to control surface runoff and erosion of affected areas and to promote positive drainage from the BRSF.

3.2.7 Heap Leach Facility (HLF)

The HLF site is located on the western side of Amulsar Mountain, approximately 1.2 km south of Gndevaz and approximately 8 km west of the planned mine pits as shown on Figure 02 and has a disturbed area footprint of approximately 140 ha inclusive of the collection ponds, detention pond, and ADR plant area. The HLF FS design was completed by SE, with the closure design prepared by GRE. The GRE closure design is summarized in the following sections.

Final RC&R of the HLF will begin following placement of the last trucks of crushed ore on the pad—these last trucks of ore are scheduled to be placed during Year 11 of the mine life.

There are three stages to closing the HLF:

- Stage1: Residual leaching with cyanide (with no additional ore placement
- Stage 2: Rinsing of the HLF;
- Stage 3: Passive treatment of leachate

3.2.7.1 Residual Leaching

Residual leaching is the process of applying cyanide to the HLF to extract additional precious metals after all mining is complete. For most mining operations, residual leaching continues until it is no longer economically-viable to do so. This will be dependent on the price of metals in the future, the recovery rate of gold, and the recovery rate of silver with in the ore. Residual leaching often lasts for years. However, the conservative assumption is that residual leaching will be short (thus moving forward the closure cost timeline). For this assessment, residual leaching is assumed to be 60 days— the standard leach cycle of the ore.

3.2.7.2 Rinsing

Once residual leaching is complete, the HLF will be rinsed. Rinsing involves the application of clean water to the HLF to remove cyanide, nitrate, salts, and other constituents of concern for water quality. The rinse water will be applied at the standard leaching application rate (5 Liters per minute per square meter) over the active leach area of the HLF. This will allow for the use of the existing barren solution pumps and the existing solution distribution system on the HLF. The HLF will be rinsed from top to bottom to allow for the placement of the evapotranspiration closure cover (ET cover) on the upper portions of the HLF. Rinsing will continue until a cell of the HLF produces water quality equivalent based on the results of meteoric water mobility procedure (MWMP) testing of spent ore. Table 1 shows the target water quality:

Table 1 HLF Drain-Down Water Quality After Detoxification

Wet Chemistry	Units	KCA MWMP Tests on Spent Heap Material		Arpa II Standards
		61790	61781	
Alkalinity, Total	mg/L as $CaCO_3$	55	100	
Bicarbonate	mg/L as $CaCO_3$	**36**	**55**	10
Carbonate	mg/L as $CaCO_3$	15	33	
Hydroxide	mg/L as $CaCO_3$	<1.0	<1.0	
Aluminum	mg/L	**4.6**	**3.8**	0.144
Antimony	mg/L	**0.0038**	**0.032**	0.00028
Arsenic	mg/L	**0.084**	**0.27**	0.02
Barium	mg/L	<0.010	0.03	0.028
Beryllium	mg/L	<0.0010	<0.0010	0.000038
Bismuth	mg/L	<0.10	<0.10	
Boron	mg/L	<0.10	<0.10	0.45
Cadmium	mg/L	<0.0050	<0.0050	0.001014
Calcium	mg/L	14	1.6	100
Chloride	mg/L	**19**	4	6.88
Chromium	mg/L	<0.0050	<0.0050	0.011
Cobalt	mg/L	<0.010	<0.010	0.00036

Wet Chemistry	Units	KCA MWMP Tests on Spent Heap Material		Arpa II Standards
		61790	61781	
Copper	mg/L	<0.050	<0.050	0.021
Cyanide (WAD)	mg/L	<0.010	<0.010	
Cyanide (Total)	mg/L	0.045	0.065	
Fluoride	mg/L	1.3	0.5	
Gallium	mg/L	<0.10	<0.10	
Iron	mg/L	<0.050	**3.9**	0.072
Lead	mg/L	<0.0025	0.0072	0.01014
Lithium	mg/L	<0.10	<0.10	0.003
Magnesium	mg/L	<0.50	<0.50	50
Manganese	mg/L	<0.0050	0.0091	0.012
Mercury	mg/L	0.001	0	
Molybdenum	mg/L	**0.018**	**0.054**	0.00082
Nickel	mg/L	<0.010	<0.010	0.01034
Nitrate + Nitrate Nitrogen	mg/L	0.2	0.28	2.5
Total Kjeldahl Nitrogen	mg/L	5	2.3	
Total Nitrogen	calculated	5.2	2.6	
pH	pH units	**9.18**	**9.51**	<8.0
Phosphorus	mg/L	<0.50	<0.50	0.1
Potassium	mg/L	**12**	4.6	3.12
Scandium	mg/L	<0.10	<0.10	
Selenium	mg/L	0.0054	<0.0050	0.02
Silver	mg/L	<0.0050	<0.0050	
Sodium	mg/L	58	52	
Strontium	mg/L	<0.10	<0.10	
Sulphate	mg/L	**99**	14	16.04
Thallium	mg/L	<0.010	<0.010	
Tin	mg/L	<0.10	<0.10	0.00008
Titanium	mg/L	0.13	0.13	
Total Dissolved Solids	mg/L	250	220	0
Vanadium	mg/L	<0.010	<0.010	0.01
Zinc	mg/L	<0.010	<0.010	0.1

Parameters included in the HLF Design

Exceedances of Arpa Standards at or Near Detection Limits

Rinse water will be applied to the HLF, collected in the existing pregnant solution pond, and pumped to the PD-8 contact water storage pond for evaporation. Enhanced evaporation techniques (foggers, sprays, etc.)

will be applied to dispose of rinse water. Once rinsing is complete, the water will be fully evaporated and the salt residual will be disposed of according to Armenian regulations.

3.2.7.3 HLF Landform and Cover

Following final rinsing, the HLF will be regraded and construction of the HLF closure cover will take place. The HLF closure cover will consist of an ET cover as described in the next section. The HLF closure cover is designed to promote revegetation, limit infiltration of meteoric water and snowmelt into the spent ore, manage stormwater, and limit long-term erosion of the cover.

Construction of the cover system will also prevent runoff from the HLF from coming into contact with the spent ore, making it suitable for direct discharge. This will ultimately reduce the volume of water entering the HLF that will require passive treatment.

The HLF cover system has been designed by GRE to be compatible with the RC&R goals and objectives. The feasibility-level HLF Closure Grading and Drainage Plan prepared by GRE is provided as Drawing 02. The HLF Reclamation Details prepared by GRE are provided as Drawing 05. The HLF closure design for the ultimate HLF involves regrading the ore heap top surfaces to nominally 1 to 2% and constructing surface water controls. The HLF closure design includes regrading the outslopes to an overall 3H: 1V slope, with 2.3H: 1V interbench slopes separated by drainage benches on every other bench to control the slope lengths and manage stormwater. The HLF closure cover includes benches (nominal 5.6-m wide – including v-ditch and safety berm) and outslope channels that will be constructed along the ore heap perimeter to provide long-term water management control and limit erosion of the reclaimed HLF. The top surface, outslope and downdrain channels will be designed for long-term hydraulic stability. The design of diversions and storm water controls will be advanced during future RC&R Plan updates.

The closure cover for the HLF is designed to minimize flux into the HLF by use of an ET cover. The ET cover will consist of an active infiltration and storage zone underlain by a capillary break layer. The feasibility-level closure cover design prepared by GRE includes the following layers from top to bottom:

- 0.2-m thick topsoil and vegetation growth layer
- 1-m thick clay layer designed to act as a sponge to store and limit meteoric flux
- 0.5-m thick capillary break layer designed to minimize flux into the HLF (this layer will consist of repurposed NAG materials from the BRSF)

Details and sections of the HLF cover design are shown on Drawing 05. It is anticipated that Geoteam will advance and optimize this design during the LOM with test plots, identify and characterize soil cover sources, and complete infiltration prediction evaluations.

Potential borrow areas for the clay layer have been identified near the HLF with sufficient volumes of clay soil. During construction of the cover, these areas will be disturbed, and subsequently reclaimed. Growth media will be stripped and stored in berms adjacent to the borrow areas. The excavation will be designed to drain, so that there is no ponding following closure, and minimal regrading is required. The specific location and design will be developed in later revisions of this RC&R Plan. For the closure cost estimate, it has been assumed that approximately 14 Ha will be rehabilitated by re-spreading growth media and revegetating the borrow areas.

3.2.7.4 HLF Process and Storm Event Ponds

The pregnant and barren solution ponds will be used to manage HLF rinse water during the rinsing phase. The process and storm event ponds will be converted to a PWTF upon rinsing. The barren solution pond will be converted to a PWTF, while the pregnant solution pond will be retained by the PWTF as a flow equalization pond. The PWTF will use the ponds in their current configuration (including the liner). This reduces PWTF construction costs because the bioreactor cell liners are in-place.

3.2.7.5 Post-Closure Passive Water Treatment of MIW at the HLF

GRE predicts that passive treatment may, initially, be required to reduce sulfate and metals concentrations in HLF seepage to bring the effluent into environmental compliance for metals and sulfates. Table 1 shows that the predicted post-rinsing water quality exceeds Arpa River Type II discharge standards for: aluminum, iron, chloride, and sulfate. Some metals, such as molybdenum, antimony, and arsenic may also be present in concentrations above standards. It is anticipated that passive treatment will be needed until it has been demonstrated that the effluent from the heap leach draindown meets applicable water quality standards. It is not clear when, or if, this condition will occur. Therefore the HLF PWTF has been designed in perpetuity.

The PWTF is anticipated to include a sulfate reducing bioreactor, manganese removal beds, and polishing wetlands similar to the system described for the BRSF. However, the HLF PWTF will not have a nitrate reducing bioreactor due to the lack of nitrate in the leachate (see Table 1). The PWTF design will be developed in subsequent updates to the RC&R plan. Passive water treatment systems do not require continuous chemical inputs and take advantage of naturally occurring chemical and biological processes. After the HLF outflow water has passed through the PWTF, the water will be collected and monitored to ensure it meets discharge standards prior to being placed in a pipe or channel that will pass to the Arpa River where it will be discharged back into the natural environment.

Geochemical modeling and prediction of post-closure HLF drain down flow will be advanced during the mine life with the results included in future RC&R Plan updates. It is anticipated that future drain down modeling and geochemical characterization data will be used to optimize the passive treatment process.

It is anticipated that Lydian will further optimize the HLF closure and post-closure treatment by completing additional characterization and predictions studies during the LOM, developing test plots to optimize cover materials and quantify flux estimates.

3.2.7.6 ADR Plant

The ADR plant and associated structures will be decommissioned in accordance with the Cyanide Code requirements (ICMI 2014). Equipment, surplus materials, and fuel and water tanks will be removed and disposed of off-site and/or recycled in accordance with applicable regulations. Surface pipelines, power lines, and culverts will also be removed in accordance with applicable regulations. Smaller concrete building foundations may be broken in-situ and remaining debris may be buried on site as allowable by RoA rules and regulations.

3.2.7.7 Site Cleanup

Scrap material, refuse, unwanted equipment, and surplus materials will be removed and disposed of at the Amulsar landfill site, returned to suppliers, or recycled, if possible. Any closed waste management units and/or sewage facilities will be cleaned and all hazards will be remediated in accordance with applicable RoA rules and regulations. Typical RC&R will include regrading, recontouring, and revegetation.

3.2.7.8 Surface Water Management, Erosion Control, Grading, and Rehabilitation

Surface water will be controlled and managed around the ADR plant site during operations by the use of culverts and diversion channels. In addition, a lined detention pond will be constructed to manage and divert surface water flows from the upstream surface water drainage basin located northwest of the HLF. The surface water diversions are designed to manage the 100-year/24-hour storm with runoff from smaller events from the upstream basin to the northwest of the HLF retained within the lined detention pond where excess water may be used as make-up water in the process plant. Following the demolition and dismantling of all facilities and equipment, all unnecessary surface-water management structures will be removed and reclaimed. Except where located on a remaining access road, all culverts will be replaced with dip crossings. As part of the RC&R activities, the liner system within the HLF detention pond will be removed and erosion protection placed on the upstream face of the embankment. The diversion channel and spillway that convey flows beyond the detention pond will be maintained at closure to safely pass flows in excess of the 100-year/24-hour storm event.

Grading and revegetation of the site will occur as soon as practical in order to help control surface runoff and erosion of affected areas and to promote positive drainage from the ADR plant site. All disturbed and compacted areas will be regraded for positive drainage, ripped or scarified, and revegetated in general accordance with established design criteria, plans, and specifications to be developed as part of the final LOM RC&R plan.

3.2.8 Mine Administration Buildings

Strategies for continued use of the Mine Administration Buildings will be discussed with the stakeholders and local community. It is anticipated that the facilities will be used by the communities during post-closure, e.g., it could be used to house seasonal herders, unless needed by Lydian to support on-going exploration activities or post-closure monitoring needs. If it is deemed necessary to close the Mine Administration Buildings, RC&R will occur in a manner similar to that described for the ADR Plant site.

3.2.9 Utilities

Power lines constructed as part of the Project will be approximately 18.5 km of power line will be installed for the Project as shown on Figure 02. This preliminary RC&R Plan assumes that 16.5 km of this power line would be removed with nominally 2 km of power line to remain for post mining beneficial use. It has been assumed that all water lines would be capped and buried in place, or repurposed for local population use, including approximately 20 km of clean water pipe and 11 km of discharge water pipe.

3.2.10 Quarries

Two quarries are planned to provide durable rock for rip rap, retaining walls, drainage layers and other needs. The potential locations are shown on Figure 02. The quarries' designs will be developed in future revisions of this plan. For closure, we have assumed that the quarries will be excavated into bedrock at final contours. No regrading will be required and no revegetation is planned. A berm will be constructed around each quarry to limit access.

3.2.11 Waste Disposal

This RC&R plan includes the removal of up to 1,000 m^3 of construction debris, 1,100 gallons of crusher grease and 275 gallons of other reagents (all in 55-gallon drums), and disposal of up to 500 m^3 of hydrocarbon contaminated soils. Where possible, recycling of some used hydrocarbon products will be achieved by return to suppliers. However, it is assumed that this waste will be disposed of at the on-site Amulsar landfill given lack of potentially suitable landfills in the region and uncertainty at this stage of the project.

3.3 Post Closure Monitoring

Post-closure monitoring of revegetation and rehabilitation progress and monitoring of water quality will be required for a period of up to five years after all closure construction activities are complete. The RC&R plan assumes that monitoring and maintenance may result in the reseeding of 20% of the revegetated cover areas. It is also assumed that a field rehabilitation specialist will provide periodic monitoring of the cover success over a five-year period with twice per year site visits and reporting. Ground and surface water monitoring and collection of sufficient water quality samples by a field technician is expected to be required four times a year for up to five years.

3.3.1 Monitoring of Success

Different parts of the Project will require different goals for closure and rehabilitation, each of which will require a different monitoring approach. Aftercare can be considered as a hierarchy of three generic elements, which require successively more input as the hierarchy is ascended:

- Walk away – The preferred option, where no additional monitoring or maintenance is required after the rehabilitation work has been carried out, over and above the management normally associated with land in the selected end use. This is often difficult to achieve.
- Passive aftercare – An on-going need for occasional monitoring and infrequent minor maintenance of surface water controls, passive water treatment systems, cover systems, or other structures.
- Active aftercare – The site requires on-going operation, maintenance, and monitoring. Typically applies to the management of ARD. This is the least preferred option and requires significant managerial and financial inputs.

The ultimate objective should be to achieve a “walk away” aftercare status having attained stable and acceptable environmental conditions with no residual liabilities or constraints, nor potential for water contamination, and sustainable landforms. It is anticipated that the passive treatment cells will require passive aftercare and maintenance. The intention will be to achieve compliant water quality, i.e., that does not affect downstream water use or biological quality. Drainage arrangements/treatments will be needed to ensure that site discharges will be sufficient to maintain the required water quality in the receiving surface and groundwater.

3.3.2 Monitoring and Aftercare

Post-closure environmental monitoring is anticipated for a five-year post-closure period and will occur in accordance with the operational environmental management and monitoring plan and the final closure design requirements. This plan will be developed during the LOM and build on the routine monitoring requirements and practices carried out during this period. Post-closure monitoring of groundwater in the vicinities of the HLF and BRSF will be particularly important and will continue using monitoring wells installed during the development of the site.

Towards the end of the LOM, the environmental monitoring records will be reviewed to establish whether there are any outstanding regulatory or lender requirements to be met before final closure can proceed.

It is anticipated that post-closure aftercare will be required in the revegetated areas, although such end-costs can be offset by developing and implementing appropriate RC&R design criteria to minimize erosion and implementing a revegetation research program during the early period of the mine life.

3.3.3 Closure and Rehabilitation Management

A full-time closure manager will be employed for a six-month active rehabilitation period for the initial closure of those facilities no longer required at the end of active mining, including the crushing facilities, conveyor and BRSF. Two further six-month periods will be necessary to account for the rehabilitation of the HLF after neutralization and the final rehabilitation of the remaining facilities at the end of the post-closure period.

3.4 Preliminary LOM Schedule

An approximate LOM and RC&R schedule has been estimated for this preliminary RC&R Plan, as summarized below:

- Years -2 and -1. Mine construction
- Years 1 through 9: Active mining
- Years 0 through 11: Develop and monitor instrumented revegetation test plots and closure cover test plots and optimize the RC&R Plan
- Years 1 through 3: Progressive rehabilitation of pipeline disturbance areas and road embankments
- Years 1 through 8: Placement of barren rock in BRSF (Phases 1 through 3)
- Years 1 through 6: Placement of low-grade ore in BRSF
- Year 2: Construct passive treatment cell for treatment of BRSF seepage
- Years 2+: Passive treatment of BRSF seepage
- Years 3 through 8: Progressive reclamation of BRSF starting from northern toe of facility (excluding low-grade ore area) including regrading, recontouring, and RC&R cover construction
- Years 4 through 9: Progressive backfill of Tigranes and Artavazdes Pits
- Years 7 through 11: Removal and processing of low-grade ore from BRSF
- Years 7 through 11: Progressive reclamation of pit backfill and resource areas including RC&R cover construction
- Years 10 through 11: Reclamation south facing BRSF slopes following removal of low-grade ore including regrading, recontouring, and RC&R cover construction
- Year 11: Residual leaching/rinsing of HLF
- Years 11 through 13
  - Reclaim crushing facility, structures non-essential to closure
  - Remove and reclaim conveyor system and corridor
- Years 12 through 13: HLF closure activities including regrading, cover placement and surface water controls (six-month construction period for RC&R) after neutralization/ rinsing.
- Years 9 through 11: Construct passive treatment cell for treatment of HLF seepage
- Year 13+ Passive treatment of HLF draindown solution
- Years 14 through 19: Post-closure period

- Monitoring of rehabilitated areas – five years
- Final closure of remaining facilities (six-month construction period)

3.5 Direct Labor Impacts

A major socio-economic impact of mine closure will be completed by Geoteam on the mine employees who will be retrenched. Lydian and Geoteam recognize the importance of providing timely information to employees who are likely to be thus affected and will offer various forms of support in the period leading up to retrenchment to avoid a drastic change in living standards. The company is aware of the risk of local dependency on the mine for employment and aims to promote economic diversification through various community initiatives and training and awareness programs during the mine life. A retrenchment plan will be developed in accordance with EU Directive 98/59 in advance of mine closure.

According to the Labor Code of Armenia, Article 129, a minimum payment of one month's average salary must be paid during retrenchment. The same code allows a company to set higher payments for retrenchments to be stipulated in individual employment contracts or collective job agreements. The costs for retrenchment have been included at $1,250,000 based on estimates prepared by Lydian.

3.5.1 Timing

In a typical planned closure scenario (i.e., the mine closing down due to exhaustion of reserves), employees will be retrenched in three stages:

- Stage 1 – General Tranche: A large number of employees at all levels, whose roles become redundant at or near the end of the mine's production life, will be retrenched first.
- Stage 2 – Closure Team: A small closure team comprised of at least one manager and a number of relevant technical specialists will be retained for the duration of the closure phase to manage closure related tasks. The labor-intensive elements of closure will be carried out by specialist contract labor and by Geoteam employees with the requisite skills. In the latter case, these employees would be excluded from stage 1 and would form part of the closure team. Once all closure actions are completed as outlined in this document, the closure team would be retrenched.
- Stage 3 – Post-Closure Monitoring Team: A skeleton team of specialists would be retained after stage 2 to carry out post-closure environmental, safety/security and social monitoring actions (post-closure monitoring requirements are specified elsewhere in this document). Geoteam will make a decision at the time of closure on whether a small team of local employees will be retained on part-time or variable hour contracts to carry out monitoring tasks, or whether a specialist environmental contractor will be better suited to this work. It might also be suitable to engage a locally active NGO to undertake the relevant social and community monitoring tasks, managed remotely by Geoteam.

3.5.2 Communication and Disclosure

All employees will be informed 12 months in advance of closure, giving key dates such as the last day of paid work for each stage of redundancy, the consultation period, etc. The selection process for the closure and monitoring teams would be objectively based on qualifications, skills, and experience. The process

would be disclosed to all employees, prior to being implemented, through the usual communication channels. Consultation meetings would be held with each employee to impart detailed information about closure and to discuss their issues and concerns. Any specific requests for support, such as recommendations to other companies, can be dealt with through these meetings.

3.5.3 Support

Capacity building, reskilling, and empowerment will be a key element of Geoteam's employee training program. This type of training received during the mine's working life would benefit retrenched employees at closure by making them more employable, better equipped to make life decisions and more able to survive the loss of their job.

Specific support to employees during the closure process would include sponsored counseling prior to and during retrenchment. Counseling would be provided to employees in small groups by skilled professionals aimed at helping employees to deal with their financial pressures at the time, to minimize distress and to find practical solutions to their immediate situation as well as their long-term survival. In addition, employees would be given a medical screening for mining related diseases such as silicosis so that timely support can be given where needed. This would also protect Lydian and Geoteam from any unnecessary litigation in the future.

Nearing closure, fiscal expenditure should be increased to assist with pension funds, redundancy payments and staged labor release in order to support the ex-workforce post-closure. Where possible, during the late operational years, voluntary redundancy and retraining schemes will be considered. Business counseling will be offered to those employees who wish to be assisted in this way.

Final closure will result in job losses for those engaged in both direct and indirect supporting activities. Geoteam will assess the feasibility and merit of developing a retrenchment and retraining strategy five years.

3.6 Social Issues at Closure

Alongside the closure impacts on the immediate workforce, there will be indirect economic impacts on the following:

- Supply chain businesses and services
- Community administrations
- Local land-users

3.6.1 Communication

Mine stakeholders, including statutory agencies and the local public will be informed 12 months in advance of closure. Consultation meetings would be held with the relevant organizations and groups with a close

relationship with the mine, such as the local hospital and affected Hamaynks, to work out the transfer of responsibilities from the company, and through the existing communication routes between the company and the local communities.

The stakeholders with a significant interest in mine closure will be identified early in the mine life. Geoteam is committed to a communication strategy that addresses the concerns of such groups in an inclusive process that will continue throughout the mine's life. Adequate resources will be provided for this process and, where possible, Geoteam will work with communities and other stakeholders to manage the potential social and environmental impacts of closure of its operations. A stakeholder engagement strategy and plan has been developed by Lydian and Geoteam that will incorporate the issue of mine closure as a standing item for discussion.

3.6.2 Local Economic Diversification

A strategic approach to the development of local economic diversification and the creation of non-mining livelihoods has been a goal from the exploration phase, in collaboration with local, regional, and national stakeholders. This will reduce the effects of socio-economic decline that often affects post-mining communities in areas that have been dominated by mining.

Geoteam will work with local communities during the construction and operation of the mine to develop economic initiatives that seek to offset the impacts of closure on those communities. The fiscal regime will ensure that, during the mine life, specific benefits are received by local communities as outlined in Geoteam's social strategy, the Amulsar CDP, and annual programs on social projects. These benefits are intended to offset the social and environmental costs of mining borne by the local community and can be used to develop non-mining business activities to reduce dependence on the mine if used well. These should focus on initiatives that avoid depopulation at the end of mine life and build on the socio-economic opportunities related to the existing communities' and eventual mine's assets and activities, and include consideration of government development objectives, where appropriate.

A number of initiatives during the mine's working life will catalyze diversification in the local economy to reduce dependency on the mine. Possible opportunities have been integrated within the community development plan to both enhance and diversify existing employment opportunities. These include: building transferable skills through the mine life, encouraging entrepreneurship in the agricultural sector, development of plant nursery(ies), agricultural produce storage and processing facilities, establishing milk cooperatives in the area and supporting herders in increasing milk yields, tourism, mountain resort, opportunities and the potential for renewable energy generation.

3.6.3 Community Administrations

At closure, Community administrations will cease receiving land taxes. Whilst these taxes will be of benefit during the operational mine life, the administrations will need to plan for a significant reduction in budget after closure. The land taxes are considerable compared to existing budgets, however the absolute value (at most around USD 500,000 per annum per village) remains relatively modest, in part reducing the effect, which will be caused by the cessation of this payment. It should be noted that the community administration boundaries will change during the life of operation as part of the municipal consolidation process, which is occurring in Armenia.

Support will be provided to help local communities make more informed decisions about how to invest the additional money in projects that are of long-term benefit to the community and how to plan for the change in budget in the future.

3.6.4 Asset Transfer

Geoteam will assess how local communities could benefit from the possible transfer of assets at closure e.g., administrative buildings and existing roads could potentially have post-closure uses of value to the community. Planning will enable optimization of asset transfer to ensure there is a good match between asset provision and community requirement.

4.0 IMPLEMENTATION

4.1 Responsibilities and Communication

At an early stage, a multi-disciplinary and multi-stakeholder closure team will be set-up to take responsibility and control of the closure planning process throughout the LOM. The team should contain high-level corporate representation from Lydian as well as mine management personnel from Geoteam. Geoteam has experience in establishing focus groups and ad-hoc committees to engage in a consultation process in order to properly, on a regular basis, update the RC&R plan. Suitable measures will be taken to involve all key stakeholders, locally as well as in Yerevan (NGOs, civil society, MNP and MENR) to aid this process. The mine closure issue will become, at the earliest stage, part of the portfolio of a board director.

The company's human resources, environmental and community relations department(s) will be responsible for communicating the plan within the company and with stakeholders, including local communities and regulatory agencies. Communication methods will follow those documented in the stakeholder engagement plan, which will be developed to cover the detailed consultations required around closure planning and closure itself. Feedback from meetings, workshops, etc. will be recorded and taken into account in developing the detailed plan.

4.2 Implementation

When the decision is made to permanently cease operations, the final RC&R Plan will include a full description of the infrastructure in place and of the decisions that will need to be taken to determine which installations will be dismantled and which features may be offered to other post-mining users, as discussed during the development of the RC&R Plan over the preceding years.

The RC&R Plan will be implemented within the framework of the environmental and social management system, which will include a number of management plans, procedures, policies, initiatives, and objectives, as detailed in the ESIA and ESMS documents. Adjusting these plans specifically for closure will ensure that the Project continues to operate within carefully prescribed limits and according to company, good international industry practice, and legislative requirements.

Social and environmental reports, ESMS and Lenders audits, regulatory inspections, and forward projections are to be used for regular operational reviews and will be considered in the closure planning process.

The standards to be adopted for closure need to be both acceptable and achievable. RC&R design and success criteria are intended to reflect the unique environmental, social, and economic circumstances of the Project. Indicators will be developed, over the life of the operation, as a benchmark for successful rehabilitation of the sites.

Site security during the early years of closure will be a high priority as there will be varying numbers of contractors and workers on-site and relatively few Geoteam employees. Security fencing and entrances should remain in place for at least five years of aftercare. Other security measures include the use of lockable gates, signs, and regular security checks. During consultation with local residents and land-users, Geoteam will ensure those details of site access and the progress of closure and rehabilitation work is imparted.

The rehabilitation of land previously used by local herders at the BRSF, the hayfields, pasture, and orchards at the HLF, and foraging areas on Mount Amulsar will be a priority to ensure livelihood restoration at the earliest possible date.

Although the RC&R Plan will primarily address closure on exhaustion of the mineable resources and completion of processing of stockpiled ore, it must also provide for orderly decommissioning and rehabilitation should premature closure be required.

4.3 Review and Development

This preliminary RC&R Plan will be reviewed and updated during the detailed RC&R design phase and closure construction when the details of what will be built are better understood, and developed into a detailed execution level design during the early operational phase. Thereafter, the plan will undergo a high-level annual review to verify the financial provisions and to consider the importance of key issues in relation to the plan, as well as ensuring that it remains consistent with national laws. Considerations will include:

- Has the mine plan changed?
- Has the Project footprint changed?
- Has the LOM increased or decreased?
- Have new environmental issues been identified?
- Have new socio-economic issues been identified?
- What are the effects of any changes to the environmental and social management plans?
- Has the legislative framework changed?
- What lessons have been learned from progressive rehabilitation?

If significant differences in any aspect of the plan are identified because of this high-level review, the relevant section of the plan will be updated accordingly. Thereafter, given the short mine life, detailed technical reviews and updates will take place at two yearly intervals and at key stages in Project development that will yield significant new information that will affect the scope and costs of the plan.

4.4 Temporary Closure (more than three months)

In case of a temporary cessation of activities, security personnel will continue to ensure that access to the site is restricted only to authorized people. The method of chemicals storage will continue as during operations, but the various buildings where they are stored will be locked. All entrances to mining areas will be locked. Environmental sampling will continue at the same frequencies as during normal activities if it is safe for staff to do so. Visual inspection of the installations will be carried out on a daily basis. Related security protocols to cover this should be more thoroughly detailed in the company's risk management plan.

4.5 Premature Closure

If early closure were to occur for any reason, local communities and regulatory authorities should be advised and consultation could take place if conditions allow it. Depending on the reason for early closure and time allowed to leave the country, should evacuation procedures be put in place, the temporary closure measures or final closure measures would be applied. Sufficient closure funding will have been accrued during the early phases of the Project to cover the costs of early closure.

5.0 PRELIMINARY RC&R COSTS

5.1 Financial Assurance

Best practice dictates that governments and communities should expect a large degree of future certainty that they will not have to bear the costs of mine RC&R. RC&R costs are usually substantially incurred in the phase of the mine's life when it is no longer generating revenue. Consequently, financial provisions for closure are accrued during the active operational phase, provided by other revenue streams, or made available through security of other assets. Various options are available, as outlined in Table 2.

It should be recognized that financial assurance for closure should be applied in a manner that ensures proper protection, but that does not place an unnecessary financial burden on the operator, which could discourage other types of corporate social responsibility investment.

According to the law and regulations of the Republic of Armenia, it is required that the design and cost calculation of RC&R works should be part of the designs and that environmental bonds should be paid at 15% of the costs in the first year after the license is granted with the rest of the sum divided into the remaining years of the project. Environmental bonds should be paid into a special account of the Central Bank of Armenia. Since its implementation in January 2012, financial assurance has been regulated in Armenia under the Mining Code.

Geoteam will set-up and maintain a separate closure and rehabilitation fund for the Amulsar mine, within their accounting system that can only be used for closure purposes. This is an IFC requirement to guard against the risks of premature termination of the Project for technical or financial reasons. There will also be adequate completion guarantees in place to ensure that closure obligations are met by the operator or the authorities. The Government of Armenia as well as the Lenders (per WBG/IFC Mining EHS Guidelines) will be seeking for such a financial guarantee.

The financial guarantee required in Armenia is regulated by the Ministry of Energy and Natural Resources Decree N249, Articles 17 and 49 of Mining Code. The base of the financial guarantee of the mine closure is the realistic prepayment of the total cost (the physical closure, rehabilitation of the environment and social implications). The financial guarantee should be given by a reputable financial institution and financial mechanisms of the mine closure should be established so that it is adjusted every time the mine closure design is changed. The guarantee should also foresee possible premature or temporary closure of the mine and have mechanisms of repayments. The guarantee should cover on average five years post closure period until the monitoring shows satisfactory results.

Table 2 Range of Financial Assurance Options Available for Mine Closure

Options	Description	Advantages	Disadvantages
Third-party guarantee	Includes unconditional bank guarantee and insurance bonds. All are required to be unconditional and/or irrevocable.	❖ Relatively inexpensive (usually 1-1.5% of amount) for the operator to establish ❖ Has full backing of financial institutions (funds available "on demand") ❖ Transparent and operation-specific ❖ Cannot normally be unilaterally withdrawn by the issuer ❖ Can be altered as requirements change	❖ Can be altered as requirements change Often considered by financial institution to be part of working capital, thereby reducing available operating funds
Cash deposit	Normally deposited direct with government and only usually accepted for "small" operations.	❖ Provides an advantage to the government which has direct control over funds and has sole responsibility for making funds available if required ❖ The cash is returned to the company, normally on completion of closure works	❖ Providing cash "upfront" is a financial impediment to the operator and potential loss of income through interest on funds ❖ If operator goes bankrupt, cash may be classed as a company asset and available to all creditors ❖ Government must have a system to ensure segregation of funds for their intended use
Letter of credit	A form of third-party guarantee that normally has a one-year term, usually extended following review by the issuer. If not extended, the beneficiary (government) is notified and has the option of drawing down the full value.	❖ Relatively inexpensive for the operator to establish	❖ Can be unilaterally withdrawn by the issuer at the end of the credit term ❖ May restrict company access to other credit
Trust fund	Administered by a third-party trustee with a defined investment policy. Intended to cover the costs of a specific closure plan through a structured series of contributions. Surplus funds are returned to the operator.	❖ The fund is visible to government (and public) ❖ Any surplus after the completion of the closure/decommissioning plan returned to the operator	❖ A transition period is required to allow the operator to build up the fund ❖ Administrative requirements (similar to a pension fund) can be cumbersome
Insurance policy	Several jurisdictions nominate this as an acceptable method of providing financial assurance. ICMM found no examples have been located of this being implemented.	❖ Relatively inexpensive for the operator to establish ❖ Less administration required than with a cash trust fund	❖ Only valid if annual premium paid ❖ Recourse to financial assurance often takes place some years after the operator becomes inactive and is unable to pay the premium
"Soft" options	Examples include: ❖ Financial strength rating (were a company is rated as investment grade) ❖ Self-funding ❖ Financial test (e.g., balance test sheet) ❖ Corporate guarantee based on financial grade ❖ Parent company guarantees ❖ Pledge of assets	❖ Does not involve direct costs ❖ Relatively inexpensive for the operator to establish	❖ Does not provide the same level of security as hard forms of assurance

5.2 Progressive Reclamation

Progressive reclamation during Project development and of worked areas during the operational phase of the mine will reduce the overall cost of closure, and reduce environmental and social impacts during the operational phase. A basic approach to progressive rehabilitation can focus on any disturbed areas of the license, which can be re-profiled/re-landscaped in order to receive a suitable growing medium and the introduction of appropriate plant species.

Progressive reclamation activities also allow for the benefits of on-site experiences to influence the development and implementation of the final mine closure and rehabilitation and should be considered during the regular reviews of the RC&R Plan during the mine's life. Interim rehabilitation will include areas that will not be re-disturbed until the end of mining.

5.3 Estimated Closure Costs

Mine decommissioning and rehabilitation involve significant costs, predominantly incurred at the end of the mine's life when there could be little revenue or capital to fund it. Progressive rehabilitation, where possible, during the mine life will reduce the end-costs on closure.

Estimated technical mine closure costs have been calculated and are presented in Table 3, based on the facility closure designs completed by SE, GRE and Golder. They are based on calculations using the Standardized Reclamation Cost Estimator (SRCE) model, developed by the United States' Nevada Department of Environmental Protection, Bureau of Mining Reclamation to standardize estimating rehabilitation and bonding costs for mine closure in Nevada. The model uses standardized and accepted methods to calculate rehabilitation quantities, productivity, and costs. Although originally developed for Nevada, the model is applicable to any geographic region, as the user provides local labor, equipment and material rates. The equipment operating costs are based on rates developed in the previous FS (SGS, 2015) to be similar to those used during the mining operations with unit labor costs derived from local Armenian wages and costs. Given the similarities in climate of the Project to the higher elevations in Nevada, the SRCE model is considered an appropriate cost-estimating tool for this stage of the Project. The estimated costs are also based on RoA regulation for estimating mine closure costs (Order 365 N, December 2012) and in part from estimates (or vendor quotes) for active and passive water treatment prepared by GRE and Sovereign

The preliminary RC&R Plan cost estimate includes the full RC&R closure costs, including both technical rehabilitation costs and non-technical costs provided by Lydian, such as retrenchment, community support, retraining, or any additional support to local communities for offsetting social impacts.

There are currently no recent RC&R costs from Armenia, on which to estimate unit costs, as recommended by Decree N365-N by the Ministry of Nature Protection (MNP 2012). Therefore, the unit costs used to

develop this preliminary estimate are based on SRCE, estimated owner equipment rates and operating costs provided by SGS (2015) (as directed by Lydian), and from estimates for active and passive water treatment provided by GRE and Sovereign. The SRCE RC&R cost estimate is provided in Appendix A, with the results summarized in Table 3. These unit costs are expected to be updated in future updates to this RC&R Plan based on in-country precedent costs from Armenian contractors and from actual operating costs realized during mining operations as determined by Geoteam.

The materials quantities and assumptions used in the SRCE cost estimate were based on the design criteria and designs as presented in this RC&R Plan provided by others (e.g., GRE, Sovereign, Praetorian and Samuel). The quantities noted on the various worksheets in the SRCE Cost estimate either were provided to Golder by the responsible design firm or were determined by Golder, in consultation with Lydian and GRE based on closure design criteria and assumptions. Where appropriate, quantities were determined using AutoCAD as a tool to measure lengths and areas taken from the design drawings. The SRCE model is an Excel-based spreadsheet that summarizes costs onto a two-page cost summary with detailed information developed with input from the user for various aspects of the mine rehabilitation. It is assumed that the salvage value for building demolition and mine infrastructure offset the demolition costs.

5.4 Indirect Costs

These costs consist of an allowance for preparation of engineering, design and construction plans as part of RC&R. Other RC&R costs for owner's management, administration, and contingency are also included. The indirect costs are based on default values used in SRCE, with the exception of G&A, Closure Planning, Contract Administration, and Contractor Profit, which are based on Armenian regulations. Armenian regulations N-365 N require an allowance for indirect expenses to be set at 5.3% of the total sum of direct expenses and for profit calculated at 10.0% of total expenses. A contingency allowance of 6% is included, for a total indirect cost plus contingency of 21.3%.

5.5 Summary of Closure and Rehabilitation Costs

The total of labor, equipment, and materials for the operational and maintenance costs of rehabilitation plus the indirect costs are summarized on Table 3. The summary of costs from the detailed SRCE cost estimate is included as Appendix A. Additional details can be provided if requested. The RC&R Cost Estimate prepared is based on Golder's understanding of the Project and the preliminary RC&R Plan as presented in this report. The total cost includes costs summarized into the various RC&R categories as shown below. Golder input the estimate quantities from the RC&R Plan as described in this report into the SRCE cost model.

The costs relating to revegetation research will be regarded as operational costs and will not be included in the estimate of mine closure costs.

Table 3 Closure Cost Estimate (See main text for explanation)

Item	Estimated Cost (US$)	Comment
EARTHWORK/RE-CONTOURING		
Roads	$159,708	
Well abandonment	$66,159	
Pits	$28,770	
Quarries and Borrow Areas	$340,224	
Process ponds	$23,853	
Heap Leach Facility	$2,836,031	
Barren Rock Disposal	$4,228,176	BRSF and Pit Backfill
Landfill	$16,312	Includes geocomposite installation and geosynthetic liner installation cost from “Other User “ table in appendix A.
Foundation and buildings areas	$42,676	
Yards, etc.	$320,517	
Drainage and sediment control	$3,213,529	Constructing closure diversions on HLF, BRSF and Pit Backfill and removing operational diversions and sediment ponds
General Material Hauling	$844,638	Haul and place Erato Pit Backfill Haul HLF Detention Pond Riprap Haul and place landfill low permeability clay layer Haul and place ROM stockpile growth media
Place HLF detention Pond riprap	$125,034	Included in “Other User’ table of Appendix A (SRCE model)
Mobilization/demobilization	$149,466	1.2% of Earthwork cost
TOTAL	**$12,604,993**	
REVEGETATION/STABILIZATION		
Roads	$109,636	
Well abandonment	N/A	
Pits	$47,225	
Process ponds	$7,799	
Quarries and Borrow Areas	$116,295	
Heap Leach Facility	$273,727	
Barren Rock Disposal	$499,085	BRSF and Pit Backfill
Landfill	$2,277	
Foundation and buildings areas	$8,423	
Yards, etc.	$126,160	
Drainage and sediment control	$51,194	
General Material Hauling	$10,486	Revegetate ROM Stockpile Area
TOTAL	**$1,252,289**	

Item	Estimated Cost (US$)	Comment
DETOXIFICATION/WATER TREATMENT/DISPOSAL OF WASTES		
Solid waste – on-site	$4,081	
Construct HLF PWTS	$759,844	
Construct BRSF PWTS	$0	Included in operational cost
Hazardous materials	$7,482	
Hydrocarbon contaminated soils	$9,274	
HLF Draindown Evaporation	$1,861,361	Active treatment for 8 months
ADR Decontamination	$752,643	Rinse ADR tanks and pipes
Reconfigure two sediment ponds	$20,000	
Monitoring and Maintenance Passive Water Treatment Systems	$5,558,510	
TOTAL	**$8,973,195**	
STRUCTURE, EQUIPMENT AND FACILITY REMOVAL AND MISC.		
Foundation and buildings areas	$45,868	
Equipment removal	$0	
Fence removal	$118,260	
Culvert Removal	$9,089	
Power line removal	$683,020	
Transformer removal	$82,500	
Construct Pit Wall Diversion	$19.181	
TOTAL	**$957,918**	
MONITORING		
Rehabilitation monitoring and maintenance	$286,252	
Ground and surface water monitoring	$124,324	
TOTAL	**$410,576**	
CONSTRUCTION MANAGEMENT AND SUPPORT		
Construction management	$359,292	
Road maintenance	$70,957	
TOTAL	**$430,249**	
CLOSURE PLANNING, G&A, HUMAN RESOURCES		
Closure planning, studies and design	$400,000	
General administration	$250,000	
Human resources	$2,750,000	Retrenchment, retraining and social/community projects
TOTAL	**$3,400,000**	

Item	Estimated Cost (US$)	Comment
CLOSURE COSTS SUB-TOTAL	**$28,029,220**	
Indirect Costs		
Contingency (6%)	$1,681,753	
Contractor Profit (10%)	$2,802,922	
Contract Administration (5.3%)	$1,485,549	
GRAND TOTAL	**$33,999,444**	

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FIGURES

DRAWINGS

APPENDIX A
PRELIMINARY CLOSURE COST ESTIMATE – SRCE MODEL

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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Golder Associates

APPENDIX A
PRELIMINARY CLOSURE COST ESTIMATE – SRCE MODEL

Closure Cost Estimate
Property Information
STANDARDIZED RECLAMATION COST ESTIMATOR

Version 1.4.1
Build 016

NOT YET VALIDATED FOR REGULATORY USE IN NEVADA

COST DATA FILE INFORMATION

File Name:	11381597DE XXX RX RevX Appendix A SRCE.xlsx
Cost Data File:	Amulsar COST DATA - 20140729am.xlsm
Cost Data Date:	August 11, 2014
Cost Data Basis:	User Data
Data Cost Units:	Metric
Author/Source:	Golder Associates Inc.

PROJECT INFORMATION

Property/Mine Name:	Amulsar
Property Code:	
Project Name:	Amulsar Mine Closure Plan
Date of Submittal:	10/20/2015
Average Altitude:	2500 m
Units of Measure:	(•) Metric (m, km, ha, etc.) ( ) Imperial (ft, mi, acres, etc.)
Select One:	( ) Notice or Sm Exploration Plan ( ) Lg Exploration Plan (•) Mine Operation
Select One:	( ) Private Land (•) Public or Public/Private
Cost Estimate Type:	LOM
Cost Basis Category:	Amulsar Owner Operator
Cost Basis Description:	**Equipment rates assume owner operator from AMC per Lydian direction July 2014.**

Closure Cost Estimate
Cost Summary

Project Name: Amulsar Mine Closure Plan
Project Date: 10/20/2015
Model Version: Version 1.4.1
File Name: 11381597DE XXX RX RevX Appendix A SRCE.xlsx
Data Cost File: Amulsar COST DATA - 20140729am.xlsm
Cost Basis: Amulsar Owner Operator

A. Earthwork/Recontouring	Labor (1)	Equipment (2)	Materials	Total
Exploration	$0	$0	$0	$0
Exploration Roads & Drill Pads	$0	$0	$0	$0
Roads	$19,865	$139,843	$0	$159,708
Well Abandonment	$8,802	$53,566	$3,791	$66,159
Pits	$1,786	$26,984	N/A	$28,770
Quarries & Borrow Areas	$21,045	$319,179	$0	$340,224
Underground Openings	$0	$0	$0	$0
Process Ponds	$3,297	$20,556	$0	$23,853
Heaps	$174,243	$2,661,788	$0	$2,836,031
Waste Rock Dumps	$259,789	$3,968,387	$0	$4,228,176
Landfills	$1,009	$15,303	$0	$16,312
Tailings	$0	$0	$0	$0
Foundation & Buildings Areas	$2,642	$40,034	$0	$42,676
Yards, Etc.	$19,759	$300,758	$0	$320,517
Drainage & Sediment Control	$836,416	$937,932	$1,439,181	$3,213,529
Generic Material Hauling	$54,383	$790,255	$0	$844,638
Other User Costs (from Other User sheet)	$134,487	$121,148	$79,300	$334,934
Other**				$0
Subtotal	**$1,537,522**	**$9,395,733**	**$1,522,272**	**$12,455,527**
Mob/Demob if included in Other User sheet	$0	$0	$0	$0
Mob/Demob **1.2% of Subtotal Cost**	$18,450	$112,749	$18,267	$149,466
Subtotal "A"	**$1,555,973**	**$9,508,481**	**$1,540,539**	**$12,604,993**

B. Revegetation/Stabilization	Labor (1)	Equipment (2)	Materials	Total
Exploration	$0	$0	$0	$0
Exploration Roads & Drill Pads	$0	$0	$0	$0
Roads	$1,754	$13,163	$94,720	$109,636
Well Abandonment				N/A
Pits	$2,163	$16,222	$28,840	$47,225
Quarries & Borrow Areas	$3,713	$27,840	$84,742	$116,295
Underground Openings				N/A
Process Ponds	$249	$1,867	$5,683	$7,799
Heaps	$8,738	$65,532	$199,457	$273,727
Waste Rock Dumps	$15,933	$119,488	$363,664	$499,085
Landfills	$69	$517	$1,691	$2,277
Tailings	$0	$0	$0	$0
Foundation & Buildings Areas	$720	$5,398	$2,306	$8,423
Yards, Etc.	$5,738	$43,022	$77,400	$126,160
Drainage & Sediment Control	$1,707	$12,798	$36,690	$51,194
Generic Material Hauling	$334	$2,506	$7,628	$10,468
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "B"	**$41,118**	**$308,352**	**$902,821**	**$1,252,289**

C. Detoxification/Water Treatment/Disposal of Wastes**	Labor (1)	Equipment (2)	Materials	Total
Process Ponds/Sludge				$0
Heaps	**Passive Treatment System**		**$759,844**	$759,844
Dumps (Waste & Landfill)				$0
Tailings				$0
Surplus Water Disposal				$0
Monitoring				$0
Miscellaneous		**Evaporation**	**$1,861,361**	$1,861,361
Solid Waste - On Site	$489	$3,592	N/A	$4,081
Solid Waste - Off Site				$0
Hazardous Materials				$7,482
Hydrocarbon Contaminated Soils	$233	$474	$8,567	$9,274
Pumping (from Solution Mgmt sheet)	$0	$0	N/A	$0
Evaporation (from Solution Mgmt sheet)	$0	$0	$0	$0
Treatment (from Solution Mgmt sheet)	$0	$0	$0	$0
Decontamination (from Solution Mgmt sheet)	$35,462	$717,180	$0	$752,643
Other User Costs (from Other User sheet)	$0	$0	$20,000	$20,000
Other** **Monitoring and Maintenance Passive Treatment Systems**			**$5,558,510**	$5,558,510
Subtotal "C"	**$36,184**	**$721,246**	**$8,208,282**	**$8,973,195**

D. Structure, Equipment and Facility Removal, and Misc.	Labor (1)	Equipment (2)	Materials	Total
Foundation & Buildings Areas	$5,009	$40,859	$0	$45,868
Other Demolition	$0	$0	$0	$0
Equipment Removal	$0	$0	$0	$0
Fence Removal	$66,877	$51,383		$118,260
Fence Installation	$0	$0	$0	$0
Culvert Removal	$4,207	$4,882	N/A	$9,089
Pipe Removal	$0	$0	N/A	$0
Powerline Removal	$683,020			$683,020
Transformer Removal	$82,500			$82,500
Rip-rap, rock lining, gabions	$0	$0	$0	$0
Other Misc. Costs	$5,115	$14,066	$0	$19,181
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other** **NEED TO UPDATE BUILDING DIMENSIONS.**				$0
Subtotal "D"	**$846,728**	**$111,190**	**$0**	**$957,918**

E. Monitoring	Labor (1)	Equipment (2)	Materials	Total
Reclamation Monitoring and Maintenance	$99,305	$66,781	$120,166	$286,252
Ground and Surface Water Monitoring	$19,400	$5,924	$99,000	$124,324
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Subtotal "E"	**$118,705**	**$72,705**	**$219,166**	**$410,576**

Closure Cost Estimate
Cost Summary

Project Name: Amulsar Mine Closure Plan
Project Date: 10/20/2015
Model Version: Version 1.4.1
File Name: 11381597DE XXX RX RevX Appendix A SRCE.xlsx
Data Cost File: Amulsar COST DATA - 20140729am.xlsm
Cost Basis: Amulsar Owner Operator

F. Construction Management & Support	Labor	Equipment (2)	Materials	Total
Construction Management	$202,188	$157,104	N/A	$359,292
Construction Support	$0	$0	$0	$0
Road Maintenance	$9,685	$61,272	$0	$70,957
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "F"	**$211,873**	**$218,376**	**$0**	**$430,249**

G. Closure Planning, G&A, Human Resources			Include?	Total
Closure Planning				$400,000
General & Administration				$250,000
Human Resources				$2,750,000
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "G"	**$0**	**$0**	**$0**	**$3,400,000**

Subtotal Operational & Maintenance Costs	Labor (1)	Equipment (2)	Materials (3)	Total
Subtotal A through G	**$2,810,581**	**$10,940,350**	**$10,870,808**	**$28,029,220**

** Other Operator supplied costs - additional documentation required.

Indirect Costs		Include?	Total
1. Engineering, Design and Construction (ED&C) Plan (7)			
2. Contingency (8)			$1,681,753
3. Insurance (9)	$42,159		
4. Performance Bond (10)			
5. Contractor Profit (11)			$2,802,922
6. Contract Administration (12)			$1,485,549
7. Government Indirect Cost (13)			
Subtotal Add-On Costs			**$5,970,224**
Total Indirect Costs as % of Direct Cost			21%
GRAND TOTAL			**$33,999,444**

Closure Cost Estimate
Solution Mgmt

Solution/Water Management - Cost Summary

	Labor	Equipment + Operating + Power	Materials	Capital	Totals
Pumping	$0	$0	N/A	$0	$0
Forced Evaporation	$0	$0		$0	$1,861,361
Water Treatment	$0	$0	$0	$0	$0
Decontamination	$35,462	$17,180		$700,000	$752,643
TOTALS	**$35,462**	**$17,180**	**$0**	**$700,000**	**$2,614,004**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Standard Power Cost $/kWh
User Override Power Cost $/kWh (used if costs for pumping differ from standard rates (e.g. use of diesel powered generator or pump)

1																			
2																			

Solution/Water Management - Water Treatment

	Description (required)	ID Code	Water Type (select)	Treatment Type (select)	Treatment Method	Montly Quantity m3	Treatment Labor Crew Size per Shift	Capital Cost $	Consumable Cost/ m3 $	Treatment Operating Cost/m3 $	Operating Period: Number of Months	Operating Period: Hour per Day

Notes:
1. Use pumping section (above) to calculate pumping costs (including groundwater pumping).
2. Include initial materials (e.g. chemicals, organic substrate, etc.) in capital cost.
3. Treatment crew includes 1 foreman (crew defined by user above), 1 light truck if crew size > 0
4. Assumes active treatement crew works 8 hr/day, 365 days/year.
5. Assumes 1 truck per each two employees per shift
6. **Evaporation cost provided by GRE and Samuel Engineering, October 2015.**
7. **Passive treatment capital and operating cost estimate, included on Cost Summary sheet, provided by GRE/Sovereign Consulting, October 2015.**

Solution/Water Management - User Input - Decontamation

	Description (required)	ID Code	Management Type (select)	Type	Disposal Location	Capital Cost $	Pumping Flow (Q) l/s	Pipeline Length m	Static Head m	Pipe Diameter (ID) mm	Pipe Material (select)	Pump Efficiency %	Total Concentated Losses (1)	Operating Period: Number of Work Days days	Operating Period: Pumping Hrs/Day	User Overrides: Crew Size	User Overrides: Power Cost ($/kWh)
1	**Lump Sum Decon at ADR Plant/Ponds**		**Active**	**Process - Plant & Buildings**		**$700,000**	**0.00**	**1,000**	**20.0**	**45**	**HDPE**	**50**	**50**	**24.0**	**20.0**	**10**	**0.051**

Notes:
1. Assumes triple rinse of all piping, tanks and vessels requiring decontamination
2. Standard crew includes 2 laborers and 1 foreman
3. Assumes 1-1.5 ton truck for every 2 laborers
4. Assumes crew works 8 hr/day

Closure Cost Estimate
Solution Mgmt

Water Management - Assumptions & Calculations

Manning's Roughness Coefficient

Pipe material	Manning n
HDPE	
ID < 4" (100 mm)	0.011
ID ≥ 4 in (100 mm) < 10 in (250 mm)	0.01
ID ≥ 10 in (250 mm)	0.009
PVC	
ID < 4" (100 mm)	0.011
ID ≥ 4 in (100 mm) < 10 in (250 mm)	0.01
ID ≥ 10 in (250 mm)	0.009
Brass	0.011
Cast Iron	0.013
Smooth Steel	0.012
Asbestos Cement	0.011

Water Treatment Costs

Water treatment cost = CapEx + Labor Cost + Equipment Cost (includes Operating Cost)

CapEx = User Entered Value
Consumable costs = cost of treatment chemicals or materials based quantity treated
Labor Cost = No. Months x Days/mo. x [(Supervisor Cost x 8 hrs) + (Laborer Cost x Crew Size x Hours/day)]
Operating Cost = Fuel, power, maintenance or other costs calculated based on quantity treated
Equipment Cost = No. Months x Days/mo. x [(Supervisor Truck Cost x 8 hrs) + (Labor Truck Cost x No. Crew Trucks x Hours/day)]
No. Crew Trucks = 1 per each two laborers per shift

Solution/Water Management - Water Treatment

	Description (required)	Total Quantity Treated m3	Capital Cost $	Total Consumables Cost $	Total Labor Cost $	Total Equipment + Operating Cost $	Total Treatment Cost $	Cost/ m3 $
			$0	$0	$0	$0	$0	

Solution/Water Management - Decontamination

	Description (required)	Flow l/s	Manning n (see above)	Losses k	Velocity m/sec	Friction Head m	Total Dynamic Head m	Pump Efficiency %	Power Required kW	Horsepower Required HP	Total Operating Hours hrs	Pump Capital Cost $	Total Operating Cost $	Total Labor Cost $	Total Equipment Cost $	Total Cost $
1	**Lump Sum Decon at ADR Plant/Ponds**	0.00	0.011	50	0.000	0	20	50	0.00	0	480	$700,000	$0	$35,462	$17,180	$752,643
											480	**$700,000**	**$0**	**$35,462**	**$17,180**	**$752,643**

Closure Cost Estimate
Other User

Project Name: Amulsar Mine Closure Plan - Reclamation Plan
Date of Submittal: 10/20/2015
File Name: 11381597DE XXX RX RevX Appendix A SRCE.xlsx
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Amulsar COST DATA - 20140729am.xlsm
Cost Estimate Type: LOM Cost Basis: Amulsar Owner Operator

Other User Costs

	Labor	Equipment	Materials & Capital	Totals
Other Cost Items	$134,487	$121,148	$99,300	$354,934

Color Code Key

User Input - Direct Input	Direct Input
User Input - Pull Down List	Pull Down Selection
Program Constant (can override)	Alternate Input
Program Calculated Value	Locked Cell - Formula or Reference

Other Cost Items Calculated Elsewhere

	Description (required)	ID Code	Facility Type	Quantity	Units	Total Capital Cost $	Material Unit Cost $	Labor Unit Cost $	Equipment/ Operating Unit Cost $	Cost Type (select)	Total Cost $	Comments
1	Place Riprap HLF Detention Pond Embankment	200	Ponds	3,406	m2			$22.75	$13.96	A. Earthwork	$125,034	Labor and equipment cost from RS Means 2013.
2	Install double sided geocomposite w/geonet core (2)	300	Landfills	10,000	m2		$7.68	$2.85	$3.68	A. Earthwork	$142,100	Agru total = $14.21/m2
3	Install double sided textured HDPE geomembrane 1.5mm	400	Landfills	10,000	m2		$0.25	$2.85	$3.68	A. Earthwork	$67,800	RS Means Heavy Construction 2013 item #2660-610-0010
4	Convert sediment ponds for closure (3)	500	Ponds	1	LS	$20,000				C. Water Management	$20,000	
						$20,000	$79,300	$134,487	$121,148		$354,934	

Notes: Capital cost is lump sum (i.e. not multiplied by the quantity).
Material, Labor and Equipment/Operating costs are unit costs (i.e. multiplied by the quantity).

1. Riprap will be prepared during operations from UV Barren Rock and transported by conveyor to the HLF ore stockpile. Cost to haul riprap from the stockpile to the enbankment is included on the Generic Hauling sheet. Unit costs for riprap placement are from RS Means 2013.
2. Vendor quotes from Agru America, Inc. July 2013. Includes material, shipping to site, and installation.
3. Retrofit sediment ponds PD-14 and 15 to function as energy dissipators to discharge flow to natural drainages $10,000 each pond.

Closure Cost Estimate
Closure Planning

Closure Plan Management	
	Totals
Technical Studies	$200,000
Engineering	$200,000
Permitting	$0
TOTALS	**$400,000**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Closure Plan Studies and Reporting

	Description (required)	ID Code	Type (select type)	Total Cost $	Comments
1	**Water Treatment Pilot and Bench Studies**		**water quality**	**$200,000**	
				$200,000	

Notes:

Closure Plan Engineering

	Description (required)	ID Code	Type (select type)	Total Cost $	Comments
1	**Final Closure and Rehabilitation**		**design**	**$200,000**	
				$200,000	

Closure Cost Estimate
G & A

General & Administration	
	Totals
Property Holding Costs	$0
Security & Maintenance	$100,000
Administration	$150,000
TOTALS	**$250,000**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Security and Maintenance

	Description (required)	ID Code	Type (select type)	Frequency (select type)	Cost/ Payment $	Number of Payments	Total Cost $	Comments
1	**General Project Security**	**100**	**Security**	**Annual**	**$50,000**	**1**	$50,000	
2	**Access Road Snow Removal**	**200**	**Snow Removal**	**Annual**	**$50,000**	**1**	$50,000	
							$100,000	

Notes:

Administration

	Description (required)	ID Code	Type (select type)	Frequency (select type)	Cost/ Payment $	Number of Payments	Total Cost $	Comments
1	**Closure & Rehabilitation Contract Management**	**100**	**Contract Manager**	**Annual**	**$50,000**	**1**	$50,000	
2	**Lydian/Geoteam Head Office Support**	**200**	**Head Office Supp**	**Annual**	**$250,000**	**1**	$75,000	
3	**Maintenance of Light Vehicles**	**300**	**Light Vehicles & E**	**Annual**	**$25,000**	**1**	$25,000	
4							$0	
							$150,000	

Closure Cost Estimate
Human Resources

Human Resources	
	Totals
Salaries & Benefits	$2,750,000
Severance & Relocation	$0
TOTALS	$2,750,000

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Human Resources - Salary & Benefits

	Job Description (required)	Avg. Annual Salary (incl. benefits) $	Type	Closure Year 1 #	Closure Year 2 #
1	**Retrenchment**	**$1,250,000**	**Social Commitments**	**1**	
2	**Retraining**	**$600,000**	**Social Commitments**	**1**	
3	**Social/ community grants**	**$900,000**	**Social Commitments**	**1**	
		SUBTOTAL		$ 2,750,000	$ -

Notes:

Retrenchment costs provided by Lydian (Aug 2014), equal to one month average salary for work force, per RoA Labor Code.
Retraining and social community grant cost estimate from Lydian July 2014.

Closure Cost Estimate
Reclamation Quantities

Reclamation Quantity Summary

	Description	Total Regrade or Haul Volume m3	Total Regrade or Haul Cost $	Total Cover Volume m3	Cover Placement Cost $	Total Growth Media Volume m3	Growth Media Placement Cost $	Total Surface Area ha	Total Scarify Cost $	Total Revetation Cost $	TOTALS $	Unit Costs: Regrade Unit Cost $/m3	Material Haul or Backfill Unit Cost $/m3	Cover Unit Cost $/m3	Growth Media Unit Cost $/m3	Scarify Unit Cost $/m3	Area Unit Cost $/Ha
1	Waste Rock Dumps	282,775	$ 43,027	1,443,511	$ 2,701,577	641,971	$ 1,400,519	215	$ 83,053	$ 499,085	$ 4,727,261	$0.15	N/A	$1.87	$2.18	$386.29	$21,987.26
2	Tailings Impoundments		$ -		$ -		$ -		$ -	$ -	$ -		N/A				
3	Heap Leach Pads	340,721	$ 70,795	1,179,256	$ 2,207,509	235,851	$ 502,913	117.92	$ 45,779	$ 273,727	$ 3,100,723	$0.21	N/A	$1.87	$2.13	$388.22	$26,295.14
5	Open Pits	87,913	$ 28,770					28.84		$ 47,225	$ 75,995	$0.33	N/A				$2,635.05
4	Quarries & Borrow Pits		$ -		$ -	150,288	$ 266,009	64.07	$ 21,014	$ 116,295	$ 403,318		N/A		$1.77	$327.99	$6,294.96
6	Roads	37,089	$ 25,942			83,999	$ 128,260	56	$ 5,506	$ 109,636	$ 269,344	$0.70	N/A		$1.53	$98.32	$4,809.72
7	Landfills		$ -		$ -	9,220	$ 16,061	0.93	$ 251	$ 2,277	$ 18,589		N/A		$1.74	$269.89	$19,988.17
8	Buildings			12,266	$ 36,652		$ -	1.36	$ 6,024	$ 8,423	$ 51,099		N/A	$2.99		$4,429.41	$37,573.06
9	Yards	48,006	$ 68,294		$ -	117,982	$ 220,951	77.4	$ 31,272	$ 126,160	$ 446,677	$1.42	N/A		$1.87	$404.03	$5,771.02
10	Ponds		$ -			29,604	$ 18,068	9.72		$ 7,799	$ 25,867	N/A			$0.61		$2,661.21
11	Exploration Roads		$ -				$ -		$ -	$ -	$ -		N/A				
12	Exploration Trenches		$ -							$ -	$ -		N/A				
13	Diversion Ditches		$ 33,763					21.12		$ 49,873	$ 83,636		N/A				$3,960.06
14	Sediment Ponds	22,000	$ 16,761	1,727			$ 3,011	0.57	$ 251	$ 1,321	$ 21,344	$0.76	$0.10			$440.35	$37,445.61
15	Generic Haulage/Backfill	369,672	$ 816,389		$ -	13,530	$ 26,748	7.9	$ 1,501	$ 10,468	$ 855,106	N/A	$2.21		$1.98	$190.00	#########
16	Adit/Decline Backfilling1		$ -								$ -	N/A					
17	Shaft Backfilling		$ -								$ -	N/A					
	TOTALS	1,188,176	$ 1,103,741	2,636,760	$ 4,945,738	1,282,445	$ 2,582,540	600.83	$ 194,651	$ 1,252,290	$ 10,078,960						
	Average Costs	per m3	$0.93	per m3	$1.88	per m3	$2.01	per Ha	$323.97	$6.43	$16,775	per Ha					

Closure Cost Estimate
Waste Rock Dumps

Waste Rock Dumps - Cost Summary

	Labor	Equipment	Materials	Totals
Grading Costs	$2,669	$40,358	N/A	$43,027
Cover Placement Cost	$165,909	$2,535,668	N/A	$2,701,577
Topsoil Placement Cost	$86,058	$1,314,461	N/A	$1,400,519
Ripping/Scarifying Cost	$5,153	$77,900	N/A	$83,053
Subtotal Earthworks	**$259,789**	**$3,968,387**	**$0**	**$4,228,176**
Revegetation Cost	$15,933	$119,488	$363,664	$499,085
TOTALS	**$275,722**	**$4,087,875**	**$363,664**	**$4,727,261**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Waste Rock Dumps - User Input

You must fill in ALL green cells in this section for each dump, lift or dump category

	Facility Description			Physical - MANDATORY									Cover				Growth Media			
	Description (required)	ID Code	Type	Underlying Ground Slope % Grade	Ungraded Slope _H:1V	Final Slope _H:1V	Final Top Slope % Grade	Lift (dump) Height m	Mid-Bench Length m	Average Flat Area Long Dimension (ripping distance) m	Final (Regraded) Dump Footprint ha	Regrade Volume (1) (if calculated elsewhere) m3	Cover Thickness Slopes mm	Cover Thickness Flat Areas mm	Distance from Cover Borrow m	Slope from Dump to Cover Borrow % grade	Slope Growth Media Thickness mm	Flat Area Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Dump to Stockpile % grade
1	**Barren Rock Disposal Area**	**100**	**Waste Rock Du**	**0.0**	**1.4**	**2.3**	**1.0**	**10**	**24,746**	**1,100**	**139.20**		**1,000.0**	**1,000.0**	**1,000**	**-4.8**	**200.0**	**200.0**	**1,286**	**-13.0**
2	**Pit Backfill**	**200**	**Waste Rock Du**	**0.0**	**3.0**	**3.0**	**1.0**	**10**	**14,119**	**706**	**68.39**					**-4.8**	**500.0**	**500.0**	**400**	**-4.8**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivity Sheet)

Waste Rock Dumps - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each dump, lift or dump category

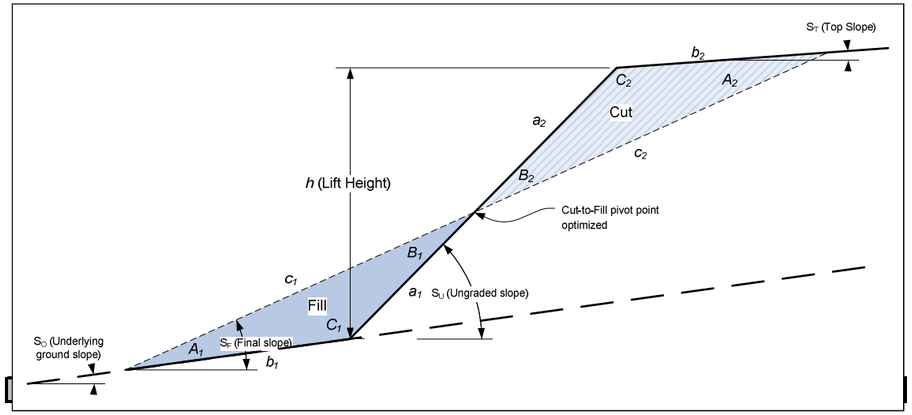
		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Dump Material Type (select)	Grading Equipment Fleet (select)	Slot/Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Slopes (select)	Seed Mix Flat Areas (select)	Mulch Slopes (select)	Mulch Flat Areas (select)	Fertilizer Slopes (select)	Fertilizer Flat Areas (select)	Slope Scarify/ Rip? (select)	Flat Area Scarify/ Rip? (select)	Scarify/ Ripping Fleet (select)
1	**Barren Rock Disposal Area**	**0.8**	**Clay - Dry**	**Large**	**No**	**Topsoil**	**XLarge Truck**	**Topsoil**	**XLarge Truck**	**User Mix 1**	**User Mix 1**	**Straw Mulch**	**Straw Mulch**	**None**	**None**	**Yes**	**Yes**	**Large Dozer**
2	**Pit Backfill**	**0.8**	**Clay - Dry**	**Large**	**No**	**Topsoil**	**XLarge Truck**	**Topsoil**	**XLarge Truck**	**User Mix 1**	**User Mix 1**	**Straw Mulch**	**Straw Mulch**	**None**	**None**	**Yes**	**Yes**	**Large Dozer**

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

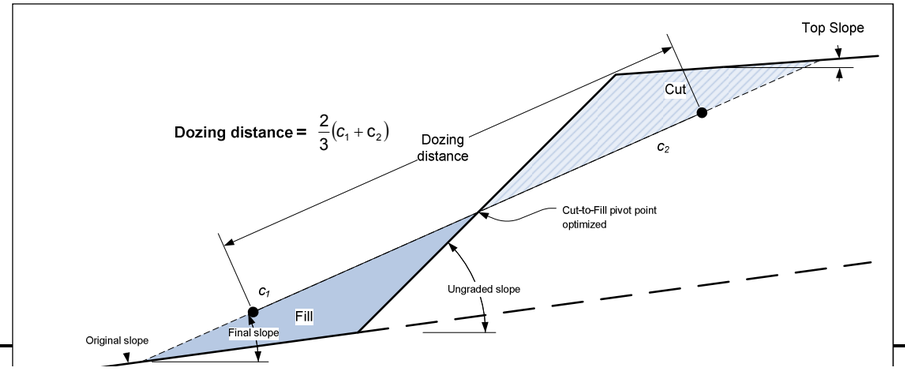
Closure Cost Estimate
Waste Rock Dumps

Waste Rock Dumps - Calculations

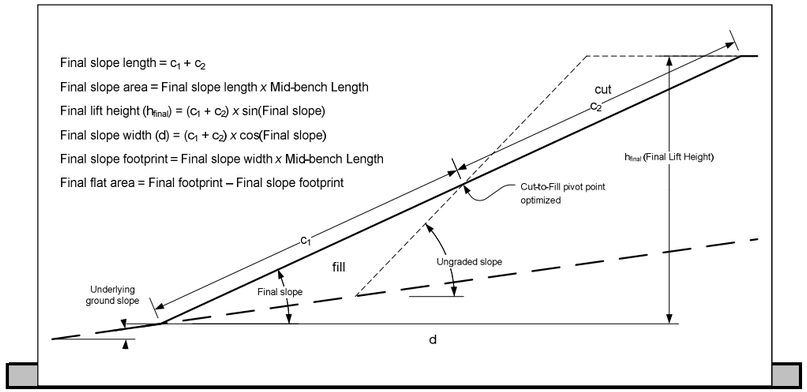
Regrading Volume Calculation



dozing distance: based on 2/3 final cut slope + 2/3 final fill slope (minimum = 15 m)



Final Slope Area and Footprint Area Calculations



Minimum 1 hr ripping/scarifying time per dump

Slopes:

Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Mid-bench length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr

Flat Areas:

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation: Minimum 1 acre revegetation crew time per area

Closure Cost Estimate
Waste Rock Dumps

Waste

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Regrading Fleet	Uncorrected Dozer Productivity m3/hr	Grade Correction	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Barren Rock Disposal Area**	282,775	15	D10R	2,243	1.6	0.8	0.92	1.0	1,645	172	$2,669	$40,358	$43,027
2	**Pit Backfill**	0		D10R								$0	$0	$0
		282,775									172	**$2,669**	**$40,358**	**$43,027**

Waste Rock Dumps - Cover and Growth Media Costs

		Cover (lower layer)								Growth Media Placement							
	Description (required)	Cover Volume m3	Cover Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume m3	Growth Media Replacement Fleet	Fleet Productivity BCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Barren Rock Disposal Area**	1,443,511	785C/992G	675	2	2,138	$165,909	$2,535,668	$2,701,577	288,702	785C/992G	850	4	339	$36,829	$567,669	$604,498
2	**Pit Backfill**	0					$0	$0	$0	353,269	785C/992G	446	1	793	$49,229	$746,792	$796,021
		1,443,511				2,138	**$165,909**	**$2,535,668**	**$2,701,577**	641,971				1,132	**$86,058**	**$1,314,461**	**$1,400,519**

Waste Rock Dumps - Scarifying/Revegetation Costs

	Description (required)	Slope Area ha	Flat Area ha	Total Surface Area ha	Final Slope Length m	Flat Area Long Dimension m	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Barren Rock Disposal Area**	62.60	81.75	144.35	25	1,100	D10R	92	129	$3,430	$51,855	$55,285	$10,697	$80,222	$244,162	$335,081
2	**Pit Backfill**	44.75	25.90	70.65	32	706	D10R	70	41	$1,723	$26,045	$27,768	$5,236	$39,266	$119,502	$164,004
		107.35	107.65	215.00				162	170	**$5,153**	**$77,900**	**$83,053**	**$15,933**	**$119,488**	**$363,664**	**$499,085**

Notes: 1) Minimum total ripping hours = 1 (i.e. If total ripping hrs (slope + flat) < 1, then one hour of fleet time is assumed, regardless of acres shown in in scarifying table.)
2) Assumes 50min/hr equipment availability

Closure Cost Estimate
Heap Leach

Heap Leach Pads - Cost Summary				
	Labor	Equipment	Materials	Totals
Drain Installation	$559	$8,476	$0	$9,035
Grading Costs	$4,392	$66,403	N/A	$70,795
Cover Placement Cost	$135,567	$2,071,942	N/A	$2,207,509
Topsoil Placement Cost	$30,885	$472,028	N/A	$502,913
Ripping/Scarifying Cost	$2,840	$42,939	N/A	$45,779
Subtotal Earthworks	**$174,243**	**$2,661,788**	**$0**	**$2,836,031**
Revegetation Cost	$8,738	$65,532	$199,457	$273,727
TOTALS	**$182,981**	**$2,727,320**	**$199,457**	**$3,109,758**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Heap Leach Pads - User Input — You must fill in ALL green cells and relevant blue cells in this section for each heap, lift or heap category

	Facility Description			Physical (1) - MANDATORY									Cover				Growth Media			
	Description (required)	ID Code	Type	Underlying Ground Slope % grade	Ungraded Slope _H:1V	Final Slope _H:1V	Final Top Slope % grade	Lift (heap) Height m	Mid-Bench Length m	Average Flat Area Long Dimension (ripping distance) m	Final (Regraded) Heap Footprint ha	Regrade Volume (if calculated elsewhere) m3	Cover Thickness Slopes mm	Cover Thickness Flat Areas mm	Distance from Cover Borrow m	Slope from Heap to Cover Borrow % grade	Slope Growth Media Thickness mm	Flat Area Growth Media Thickness mm	Distance from Growth Material Stockpile m	Slope from Heap to Stockpile % grade
1	**Heap Leach**	**200**	**Heap Leach**	**0.0**	**1.3**	**2.3**	**1.0**	**8**	**43147**	**1540.964286**	**111.35**		**1,000.0**	**1,000.0**	**1,000**	**-5.0**	**200.0**	**200.0**	**1,000**	**-9.6**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Heap Leach Pads - User Input (cont.) — You must fill in ALL green cells and relevant blue cells in this section for each heap, lift or heap category

		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Heap Material Type (select)	Grading Equipment Fleet (select)	Slot/ Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Slopes (select)	Seed Mix Flat Areas (select)	Mulch Slopes (select)	Mulch Flat Areas (select)	Fertilizer Slopes (select)	Fertilizer Flat Areas (select)	Slope Scarify/ Rip? (select)	Flat Area Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)
1	**Heap Leach**	**0.8**	**LS - crushed**	**Large**	**No**	**Topsoil**	**XLarge Truck**	**Topsoil**	**XLarge Truck**	**Mix 1**	**Mix 1**	**Straw Mulch**	**Straw Mulch**	**None**	**None**	**Yes**	**Yes**	**Large Dozer**

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Heap Leach Pads - User Input (cont.)

		Solution Collection Ditch Fill							Piping			
	Description (required)	Collection Ditch Length m	Collection Ditch Top Width m	Collection Ditch Depth m	Volume (if calculated elsewhere) m3	Distance from Borrow m	Slope to Borrow % grade	Drain Rock Equipment Fleet (select)	Solid Pipe Length m	Solid Pipe Type (select)	Drainage Pipe Length m	Drainage Pipe Type (select)
1	**Heap Leach**	**2380**	**14**	**0.3**		**250**	**5**	**Large Truck**	**0**	**4in (100 mm)**	**0**	**Drain 4in (100m**

Notes:

Closure Cost Estimate
Heap Leach

Heap Leach Pads - Calculations

Regrading Volume Calculation

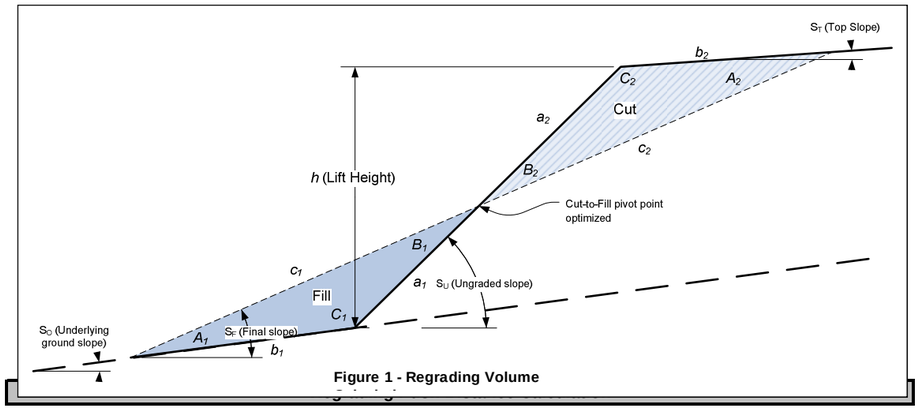
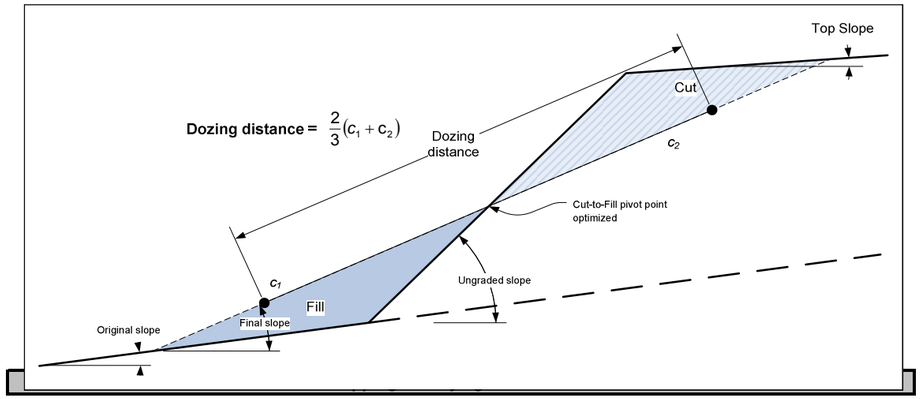


Figure 1 - Regrading Volume

dozing distance: based on 2/3 final cut slope + 2/3 final fill slope (minimum = 15 m)



Minimum 1 hr ripping/scarifying per area

Slopes:

Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Mid-bench length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

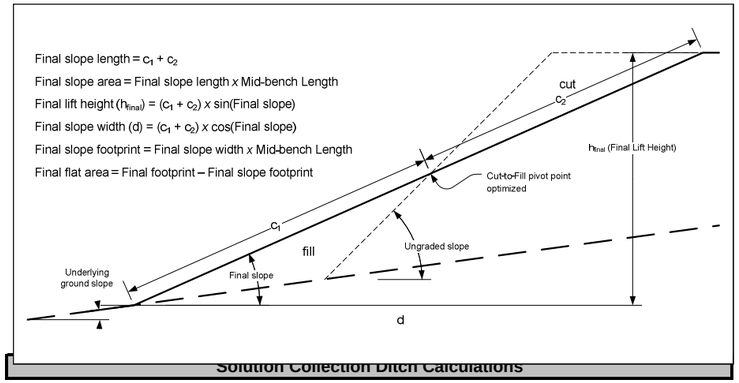
Flat Areas:

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation: Minimum 1 acre revegetation crew time per area

Final Slope Area and Footprint Area Calculations

Final slope length = $c_1 + c_2$
Final slope area = Final slope length x Mid-bench Length
Final lift height (h_{final}) = ($c_1 + c_2$) x sin(Final slope)
Final slope width (d) = ($c_1 + c_2$) x cos(Final slope)
Final slope footprint = Final slope width x Mid-bench Length
Final flat area = Final footprint – Final slope footprint



Solution Collection Ditch Calculations

Use when existing heap material is not suitable drain rock
Assume to be constructed in existing solution channels
Assume 2H:1V ditch sideslopes
Drain rock assumed to be Gravel - Dry at 2,550 lb/cy (1,510 kg/m3) from CAT Handbook 35th Ed.

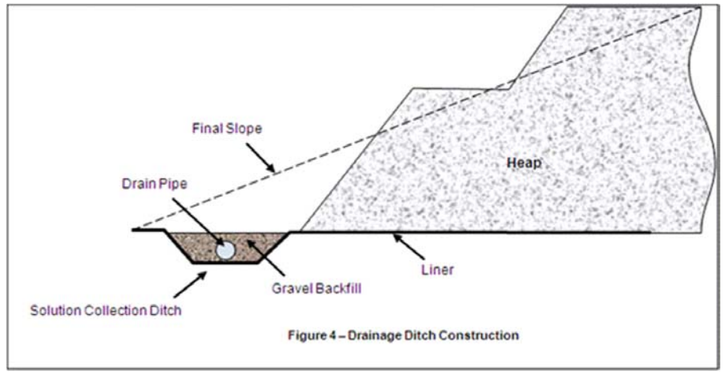


Figure 4 – Drainage Ditch Construction

Closure Cost Estimate
Heap Leach

Heap Leach Pad - Drainage Channel Fill & Drainage Pipe Installation

		Drain Rock Placement								Drainpipe Installation				
	Description (required)	Drain Rock Volume m3	Drain Rock Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours hrs	Drainage Labor Cost $	Drainage Equipment Cost $	Total Drainage Cost $	Piping Crew Hours hrs	Piping Labor Cost $	Piping Equipment Cost $	Piping Material Cost $	Total Pipe Installation Cost $
1	**Heap Leach**	5,085	785C/992G	569	1	9	$559	$8,476	$9,035		$0	$0	$0	$0
		5,085				9	**$559**	**$8,476**	**$9,035**		**$0**	**$0**	**$0**	**$0**

Heap Leach Pad - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Regrading Fleet	Uncorrected Dozer Productivity m3/hr	Grade Correction	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Heap Leach**	340,721	15	D10R	2,243	1.6	0.8	0.88	1.0	1,573	283	$4,392	$66,403	$70,795
		340,721									283	**$4,392**	**$66,403**	**$70,795**

Heap Leach Pad - Cover and Growth Media Costs

		Cover (lower layer)								Growth Media Placement							
	Description (required)	Cover Volume m3	Cover Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume m3	Growth Media Replacement Fleet	Fleet Productivity BCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Heap Leach**	1,179,256	785C/992G	675	2	1,747	$135,567	$2,071,942	$2,207,509	235,851	785C/992G	593	2	398	$30,885	$472,028	$502,913
		1,179,256				1,747	**$135,567**	**$2,071,942**	**$2,207,509**	235,851				398	**$30,885**	**$472,028**	**$502,913**

Heap Leach Pad - Scarifying/Revegetation Costs

	Description (required)	Slope Area ha	Flat Area ha	Total Surface Area ha	Final Slope Length m	Flat Area Long Dimension m	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Heap Leach**	86.80	31.12	117.92	20	1,541	D10R	134	49	$2,840	$42,939	$45,779	$8,738	$65,532	$199,457	$273,727
		86.80	31.12	117.92				134	49	**$2,840**	**$42,939**	**$45,779**	**$8,738**	**$65,532**	**$199,457**	**$273,727**

1) Minimum total ripping hours = 1 (i.e. If total ripping hrs (slope + flat) < 1, then one hour of fleet time is assumed, regardless of acres shown in in scarifying table.)

Closure Cost Estimate
Tailings

Tailings - Cost Summary	Labor	Equipment	Materials	Totals
Embankment Regrading Cost	$0	$0	N/A	$0
Tailings Surface Grading Cost	$0	$0	N/A	$0
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$0	$0	N/A	$0
Subtotal Earthworks	**$0**	**$0**	**$0**	**$0**
Revegetation Cost	$0	$0	$0	$0
TOTALS	**$0**	**$0**	**$0**	**$0**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Tailings - User Input — **You must fill in ALL green cells and relevant blue cells in this section for each tailings impoundment**

	Facility Description		Physical - MANDATORY								Cover				Growth Media			
	Description (required)	ID Code	Underlying Ground Slope % Grade	Ungraded Slope _H:1V	Final (Regraded) Embankment Slope _H:1V	Final Embankment Height m	Final Tailings Surface Area ha	Mid-Embankment or Ripping Length m	Embankment Regrade Volume (if calculated elsewhere) m3	Surface Regrade Volume (calculated elsewhere) m3	Embankment Cover Thickness mm	Tailings Surface Cover Thickness mm	Distance from Cover Borrow m	Slope from Tailings to Borrow % grade	Embankment Growth Media Thickness mm	Tailings Surface Growth Media Thickness mm	Distance from Growth Material Stockpile m	Slope from Tailings to Stockpile % grade

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Tailings - User Input (cont.) — **You must fill in ALL green cells and relevant blue cells in this section for each tailings impoundment**

		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Embankment Material Type (select)	Grading Equipment Fleet (select)	Slot/Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Embankment Slope (select)	Seed Mix Tailings Surface (select)	Mulch Embankment Slopes (select)	Mulch Tailings Surface (select)	Fertilizer Embankment Slopes (select)	Fertilizer Tailing Surface (select)	Embankment Slope Scarify/ Rip? (select)	Tailings Surface Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Closure Cost Estimate
Tailings

Tailings - Calculations

Surface Area Calculations

Top Surface Area provided by user

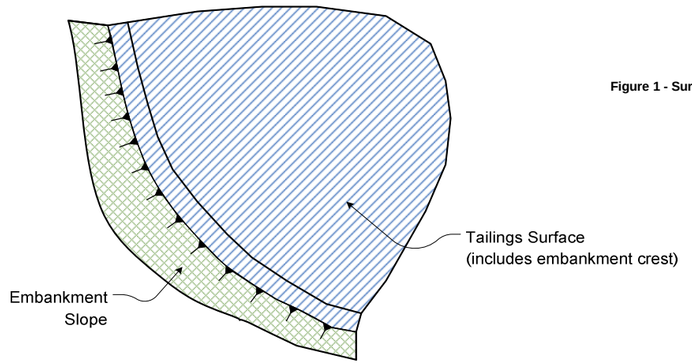


Figure 1 - Surface Areas

Final Slope Area and Footprint Area Calculations

$$\text{Overall slope length (c)} = \frac{\text{Embankment height}}{\cos(\text{Overall slope angle})}$$

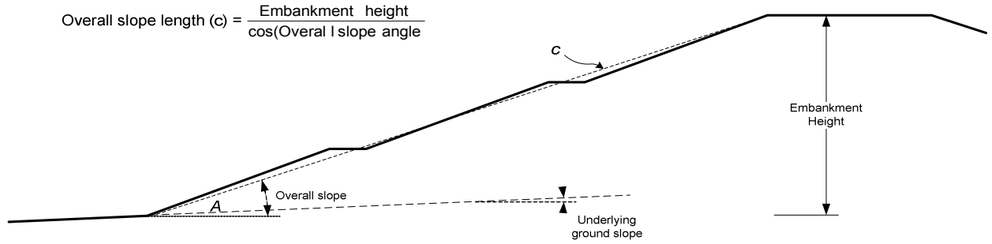


Figure 2 - Final Slope Area and Footprint Area Calculation

Grading Calculations

Grading assumed on impoundment surface only, not embankment
Average push distance assumed to be 2/3 of the 180 m maximum from Catepillar Handbook or 120 m
Material assumed to be loose stockile (1.2 productivity factor)
Dozing density correction based on dry sand = 2300/2400 = 0.96
Slope assumed to be 0 to 5% (1.0 productivity factor)

Ripping/Scarifying/Revegetation Calculation

Minimum 1 hr ripping/scarifying per area
Minimum 1 acre revegetation crew time per area

Regrading Volume Calculation

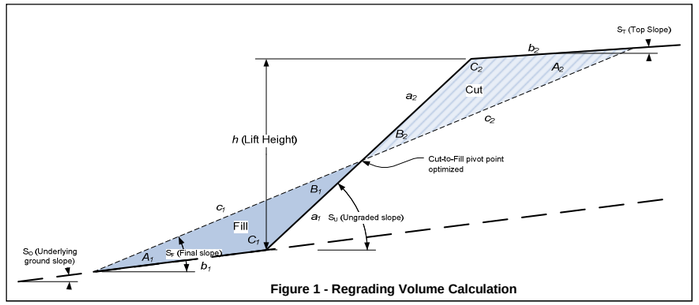


Figure 1 - Regrading Volume Calculation

Regrading Push Distance Calculation

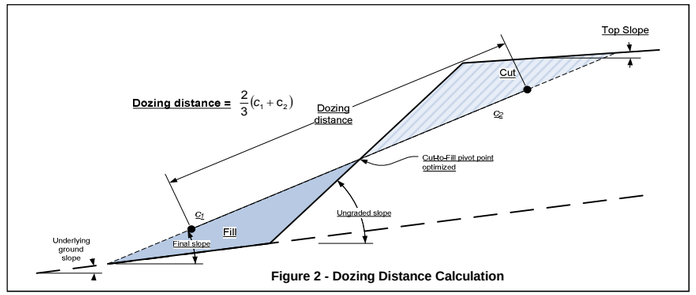


Figure 2 - Dozing Distance Calculation

Closure Cost Estimate
Tailings

Tailings - Embankment Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Regrading Fleet	Uncorrected Dozer Productivity m3/hr	Grade Correction	Dozing Material Condition	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
												$0	$0	$0

Tailings - Surface Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Regrading Fleet	Uncorrected Dozer Productivity m3/hr	Grade Correction	Density Correction	Dozing Material	Side-by-Side or Slot Dozing	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
												$0	$0	$0

Tailings - Cover and Growth Media Costs

		Cover Placement								Growth Media Placement							
	Description (required)	Cover Volume m3	Cover Placement Fleet	Cover Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Placement Cost $	Growth Media Volume m3	Growth Media Placement Fleet	Growth Media Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoil Placement Cost $
							$0	$0	$0						$0	$0	$0

Tailings - Scarifying/Revegetation Costs

	Description (required)	Embankment Slope Area ha	Tailings Surface Area ha	Total Surface Area ha	Final Slope Length m	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Cost $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Cost $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
									$0	$0	$0	$0	$0	$0	$0

Closure Cost Estimate
Roads

Roads - Cost Summary

	Labor	Equipment	Materials	Totals
Grading Costs	$4,157	$21,785	N/A	$25,942
Cover Placement Cost	$15,365	$112,895	N/A	$128,260
Ripping/Scarifying Cost	$343	$5,163	N/A	$5,506
Subtotal Earthworks	**$19,865**	**$139,843**		**$159,708**
Revegetation Cost	$1,754	$13,163	$94,720	$109,636
TOTALS	**$21,619**	**$153,006**	**$94,720**	**$269,344**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Maximum slope grade allowed for dozer: **40** % (max 40%)

Roads - User Input

You must fill in ALL green cells and relevant blue cells in this section for each road

	Facility Description			Physical (1) - MANDATORY						User Overrides		Growth Media		
	Description (required)	ID Code	Type	Underlying Ground Slope % grade	Ungraded Slope _H:1V	Cut Slope degrees	Road Width m	Road Length m	Slope Replacement Percent %	Regrade Volume (if calculated elsewhere) m3	Disturbed Area (if calculated elsewhere) ha	Growth Media Thickness mm	Haul Distance from Growth Media Stockpile m	Slope from Road to Stockpile % grade
1	**RD-1 Road - RD-5 to Truck Loadout**	**300**	**Access Road**	**10.0**	**2.5**	**45.0**	**8.5**	**3,000**	**10%**	**0**	**4.30**	**150.0**	**5**	**10%**
2	**RD-2 Road - Crusher to RD-5**	**300**	**Access Road**	**10.0**	**2.5**	**49.0**	**12.0**	**5,447**	**10%**	**0**	**4.05**	**150.0**	**5**	**10%**
3	**RD-3 Road - Mine Haul - Pit to Crusher (Running Area)**	**300**	**Haul Road**	**10.0**	**2.5**	**45.0**	**25.0**	**3,850**	**10%**	**0**	**11.55**	**150.0**	**5**	**10%**
4	**RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are**	**300**	**Haul Road**	**10.0**	**2.5**	**45.0**	**25.0**	**3,850**	**10%**	**0**	**15.28**	**150.0**	**5**	**10%**
5	**RD-4 Road - Loadout to ADR (Running Area)**	**300**	**Access Road**				**17.0**	**441**		**0**	**0.75**	**150.0**	**5**	**10%**
6	**RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)**	**300**	**Access Road**				**17.0**	**441**		**0**	**0.77**	**150.0**	**5**	**10%**
7	**RD-6 Road - RD-2 to Landfill/ToePond**	**300**	**Access Road**	**0.5**	**2.0**	**49.0**	**7.8**	**3,222**	**1%**	**0**	**2.73**	**150.0**	**5**	**1%**
8	**RD-7 Road - Explosives Storage (Running Area)**	**300**	**Access Road**				**6.0**	**768**		**0**	**0.46**	**150.0**	**5**	**10%**
9	**RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)**	**300**	**Access Road**				**6.0**	**768**		**0**	**1.70**	**150.0**	**5**	**10%**
10	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru**	**300**	**Access Road**				**12.0**	**1,250**		**0**	**1.50**	**150.0**	**5**	**10%**
11	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu**	**300**	**Access Road**				**12.0**	**1,250**		**0**	**1.54**	**150.0**	**5**	**10%**
12	**RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar**	**300**	**Access Road**				**12.0**	**850**		**0**	**1.02**	**150.0**	**5**	**10%**
13	**RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slop**	**300**	**Access Road**				**12.0**	**850**		**0**	**1.14**	**150.0**	**5**	**10%**
14	**RD-10 Road - RD-9 to Lower Crusher Platform (Running Ar**	**300**	**Access Road**				**12.0**	**248**		**0**	**0.30**	**150.0**	**5**	**10%**
15	**RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo**	**300**	**Access Road**				**12.0**	**248**		**0**	**0.19**	**150.0**	**5**	**10%**
16	**RD- 11 Road - Upper Crusher Platform to Truck Shop (Run**	**300**	**Access Road**				**12.0**	**1,291**		**0**	**1.55**	**150.0**	**5**	**10%**
17	**RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut/**	**300**	**Access Road**				**12.0**	**1,291**		**0**	**7.17**	**150.0**	**5**	**10%**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Because the work required for building roads with a dozer is similar to that required to regrade a road with a dozer, this sheet could be used to provide a rough estimate of road construction costs if a dozer is selected as the grading fleet.
4. All road cut and fills contructed at final grade . No regrading for closure is required. All cut and fill slopes are revegetated.
5. Roads 1, 2 and 6 will remain as -built for post-closure access.
6. Road 3 (Mine Haul road) running surface reduced to 5 meter width by ripping and revegetating ripped surface.
7. All other roads reclaimed by ripping entire running surface and revegetating. Safety berm removed from all roads.

Roads - User Input (cont.)

		Haul Road Safety Berms				
	Description (required)	Berm Length m	Berm Height m	Berm Base Width m	Berm Sideslope Angle _H:1V	Number of Berms (2) (1 or 2 sides)

Closure Cost Estimate
Roads

1	RD-1 Road - RD-5 to Truck Loadout	3,000.0	0.6	1.8	1.5	1
2	RD-2 Road - Crusher to RD-5	5,447.0	1.0	3.0	1.5	1
3	RD-3 Road - Mine Haul - Pit to Crusher (Running Area)	3,850.0	1.6	4.8	1.5	1
4	RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are	3,850.0	0.6	1.8	1.5	1
5	RD-4 Road - Loadout to ADR (Running Area)	441.0	0.6	1.8	1.5	1
6	RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)	441.0	0.6	1.8	1.5	1
7	RD-6 Road - RD-2 to Landfill/ToePond	3,222.0	0.6	1.8	1.5	1
8	RD-7 Road - Explosives Storage (Running Area)	768.0	0.6	1.8	1.5	1
9	RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)	768.0	0.6	1.8	1.5	1
10	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru	1,250.0	0.6	1.8	1.5	1
11	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu	1,250.0	0.6	1.8	1.5	1
12	RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar	850.0	0.6	1.8	1.5	1
13	RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slo	850.0	0.6	1.8	1.5	1
14	RD-10 Road - RD-9 to Lower Crusher Platform (Running A	248.0	0.6	1.8	1.5	1
15	RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo	248.0	0.6	1.8	1.5	1
16	RD- 11 Road - Upper Crusher Platform to Truck Shop (Run	1,291.0	1.0	3.0	1.5	1
17	RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut	1,291.0	1.0	3.0	1.5	1

(2) Enter 1 if berm on only one side of road, 2 if both sides of road are bermed.

Closure Cost Estimate
Roads

Roads - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each road

		Grading				Growth Media			Revegetation				
	Description (required)	Dozing Material Condition (select)	Cut Material Type (select)	Recontouring Equipment Fleet[2] (select)	No. of Excavators if grade >30% (select)	Growth Media Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarifying/ Ripping? (select)	Ripping Fleet (select)
1	RD-1 Road - RD-5 to Truck Loadout	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
2	RD-2 Road - Crusher to RD-5	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
3	RD-3 Road - Mine Haul - Pit to Crusher (Running Area)	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
4	RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
5	RD-4 Road - Loadout to ADR (Running Area)	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
6	RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
7	RD-6 Road - RD-2 to Landfill/ToePond	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
8	RD-7 Road - Explosives Storage (Running Area)	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
9	RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
10	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
11	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
12	RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
13	RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slop	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
14	RD-10 Road - RD-9 to Lower Crusher Platform (Running A	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
15	RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer
16	RD- 11 Road - Upper Crusher Platform to Truck Shop (Run	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
17	RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut	0.8	LS - broken	Sm Excavator		Topsoil	Small Truck		User Mix 1	Straw Mulch	None	No	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table
2. If original slope >30% only excavators are allowed.

Roads - Calculations

Regrading Volume and Footprint Volume

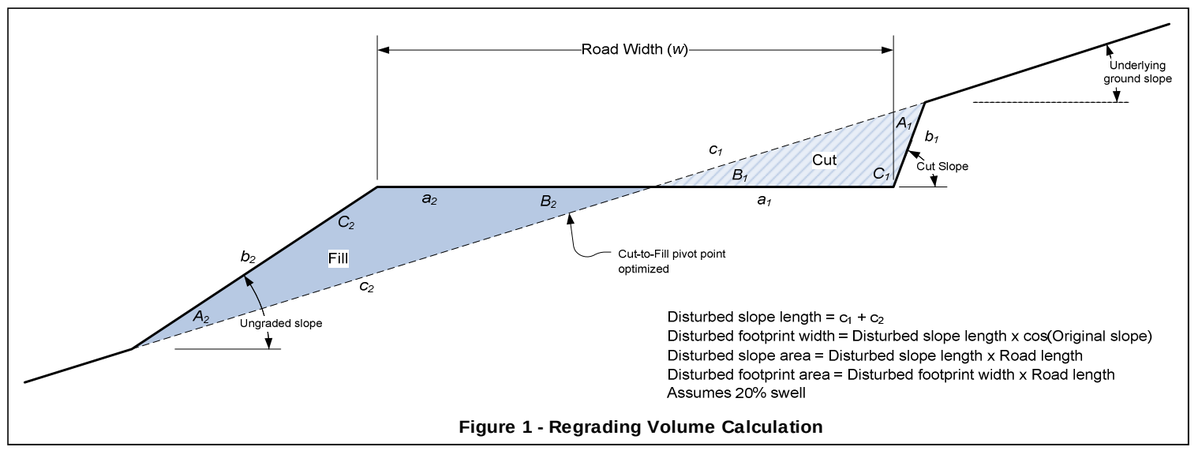


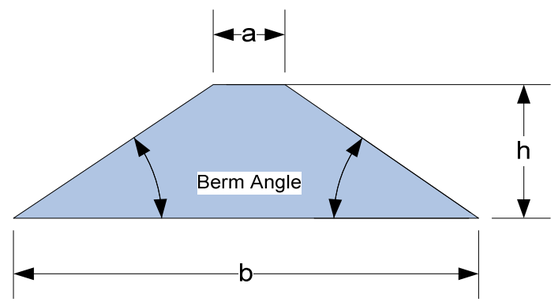
Figure 1 - Regrading Volume Calculation

Will not allow dozer for slopes greater than 30%
For dozer regrading push distance = road width
Assumes dozer push is uphill
Assumes minimum push distance of 30 m

Safety Berm Volume Calculation

Cross Sectional Area = $\frac{(a+b)}{2} \times h$

Berm Volume = Berm Length x Cross Sectional Area x No. Sides



Total berm volume doubled if both sides of road are bermed.
If length of berm on each side of road is different, input total length of both berms and input 1 for number of sides

Closure Cost Estimate
Roads

Ripping/Scarifying Calculations

Minimum 1 hr ripping/scarifying time per area
Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Road length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
For dozer regrading assumes push distance = 3 x road width

Revegetation Calculations

Minimum of 1 acre crew time per area

Roads - Regrading Costs

	Description (required)	Regrading Volume m3	Recontouring Fleet	Fleet Productivity m3/hr	Total Fleet Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**RD-1 Road - RD-5 to Truck Loadout**	1,672	330C	282	6	$186	$975	$1,161
2	**RD-2 Road - Crusher to RD-5**	8,350	330C	282	30	$931	$4,877	$5,808
3	**RD-3 Road - Mine Haul - Pit to Crusher (Running Area)**	15,201	330C	282	54	$1,676	$8,779	$10,455
4	**RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are**	2,146	330C	282	8	$248	$1,301	$1,549
5	**RD-4 Road - Loadout to ADR (Running Area)**	246	330C	282	1	$31	$163	$194
6	**RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)**	246	330C	282	1	$31	$163	$194
7	**RD-6 Road - RD-2 to Landfill/ToePond**	1,796	330C	282	6	$186	$975	$1,161
8	**RD-7 Road - Explosives Storage (Running Area)**	428	330C	282	2	$62	$325	$387
9	**RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)**	428	330C	282	2	$62	$325	$387
10	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru**	697	330C	282	2	$62	$325	$387
11	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu**	697	330C	282	2	$62	$325	$387
12	**RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar**	474	330C	282	2	$62	$325	$387
13	**RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slo**	474	330C	282	2	$62	$325	$387
14	**RD-10 Road - RD-9 to Lower Crusher Platform (Running A**	138	330C	282	1	$31	$163	$194
15	**RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo**	138	330C	282	1	$31	$163	$194
16	**RD- 11 Road - Upper Crusher Platform to Truck Shop (Run**	1,979	330C	282	7	$217	$1,138	$1,355
17	**RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut**	1,979	330C	282	7	$217	$1,138	$1,355
		37,089			134	**$4,157**	**$21,785**	**$25,942**

Roads - Growth Media Costs

	Description (required)	Growth Media Volume m3	Growth Media Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**RD-1 Road - RD-5 to Truck Loadout**	6,450	730/972G	425	2	15	$1,164	$8,553	$9,717
2	**RD-2 Road - Crusher to RD-5**	6,074	730/972G	425	2	14	$1,086	$7,982	$9,068
3	**RD-3 Road - Mine Haul - Pit to Crusher (Running Area)**	17,326	730/972G	425	2	41	$3,182	$23,377	$26,559
4	**RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are**	22,919	730/972G	425	2	54	$4,190	$30,789	$34,979
5	**RD-4 Road - Loadout to ADR (Running Area)**	1,125	730/972G	425	2	3	$233	$1,711	$1,944
6	**RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)**	1,155	730/972G	425	2	3	$233	$1,711	$1,944
7	**RD-6 Road - RD-2 to Landfill/ToePond**	4,095	730/972G	425	2	10	$776	$5,702	$6,478
8	**RD-7 Road - Explosives Storage (Running Area)**	690	730/972G	425	2	2	$155	$1,140	$1,295
9	**RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)**	2,550	730/972G	425	2	6	$466	$3,421	$3,887
10	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru**	2,250	730/972G	425	2	5	$388	$2,851	$3,239
11	**RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu**	2,310	730/972G	425	2	5	$388	$2,851	$3,239

Closure Cost Estimate
Roads

12	RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar	1,530	730/972G	425	2	4	$310	$2,281	$2,591
13	RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slop	1,710	730/972G	425	2	4	$310	$2,281	$2,591
14	RD-10 Road - RD-9 to Lower Crusher Platform (Running A	450	730/972G	425	2	1	$78	$570	$648
15	RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo	285	730/972G	425	2	1	$78	$570	$648
16	RD- 11 Road - Upper Crusher Platform to Truck Shop (Run	2,325	730/972G	425	2	5	$388	$2,851	$3,239
17	RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut	10,755	730/972G	425	2	25	$1,940	$14,254	$16,194
		83,999				198	**$15,365**	**$112,895**	**$128,260**

Roads - Scarifying/Revegetation Costs

	Description (required)	Total Surface Area ha	Final Slope Length m	Ripping Hours hrs	Ripping Labor Costs $	Ripping Equipment Cost $	Total Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	RD-1 Road - RD-5 to Truck Loadout	4.30	14.0		$0	$0	$0	$129	$967	$7,273	$8,369
2	RD-2 Road - Crusher to RD-5	4.05	7.0		$0	$0	$0	$121	$911	$6,850	$7,882
3	RD-3 Road - Mine Haul - Pit to Crusher (Running Area)	11.55	30.0	14	$217	$3,285	$3,502	$346	$2,598	$19,536	$22,480
4	RD-3 Road - Mine Haul - Pit to Crusher (Cut/Fill Slopes Are	15.28	40.0		$0	$0	$0	$458	$3,436	$25,846	$29,740
5	RD-4 Road - Loadout to ADR (Running Area)	0.75	17.0	1	$16	$235	$251	$30	$225	$1,269	$1,524
6	RD-4 Road - Loadout to ADR (Cut/Fill Slopes Area)	0.77	17.0		$0	$0	$0	$30	$225	$1,302	$1,557
7	RD-6 Road - RD-2 to Landfill/ToePond	2.73	9.0		$0	$0	$0	$82	$614	$4,618	$5,314
8	RD-7 Road - Explosives Storage (Running Area)	0.46	6.0	1	$16	$235	$251	$30	$225	$778	$1,033
9	RD-7 Road - Explosives Storage (Cut/Fill Slopes Area)	1.70	22.0		$0	$0	$0	$51	$382	$2,875	$3,308
10	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Ru	1.50	12.0	2	$31	$469	$500	$45	$337	$2,537	$2,919
11	RD-9A Road - RD-2 to Lower Crusher Bench via RD-10 (Cu	1.54	12.0		$0	$0	$0	$46	$346	$2,605	$2,997
12	RD-9B Road - RD-10 to Fuel Storage Platform (Running Ar	1.02	12.0	1	$16	$235	$251	$31	$229	$1,725	$1,985
13	RD-9B Road - RD-10 to Fuel Storage Platform (Cut/Fill Slop	1.14	13.0		$0	$0	$0	$34	$256	$1,928	$2,218
14	RD-10 Road - RD-9 to Lower Crusher Platform (Running A	0.30	12.0	1	$16	$235	$251	$30	$225	$507	$762
15	RD-10 Road - RD-9 to Lower Crusher Platform (Cut/Fill Slo	0.19	8.0		$0	$0	$0	$30	$225	$321	$576
16	RD- 11 Road - Upper Crusher Platform to Truck Shop (Run	1.55	12.0	2	$31	$469	$500	$46	$349	$2,622	$3,017
17	RD- 11 Road - Upper Crusher Platform to Truck Shop (Cut	7.17	55.0		$0	$0	$0	$215	$1,613	$12,128	$13,956
		56.00		22	**$343**	**$5,163**	**$5,506**	**$1,754**	**$13,163**	**$94,720**	**$109,636**

Closure Cost Estimate
Pits

Pits - Cost Summary

	Labor	Equipment	Materials	Totals
Safety Berm Construction Cost	$1,786	$26,984	N/A	$28,770
Safety Berm Revegetation Cost	$2,163	$16,222	$28,840	$47,225
TOTALS	**$3,949**	**$43,206**	**$28,840**	**$75,995**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Pits - User Input

	Facility Description			Pit Berms					Berm Construction		Excavate or Doze	Hauling (if selected method)				Revegetation		
	Description (required)	ID Code	Type	Berm (or Highwall) Length m	Berm Height m	Berm Base Width m	Berm Sideslope Angle _H:1V	Volume (if calculated elsewhere) m3	Construction Method (select)	Berm Material Type (select)	Berm Construction Equipment Fleet (select)	Berm Hauling Fleet (select)	Distance to Borrow Source m	Slope to Borrow Source % grade	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)
1	**Tigranes/Artavasdes Pit Berms**	**400**	**Pit**	**5,000.0**	**2.0**	**10.0**	**2.0**		**Dozer**	**Stone - crus**	**Large**	**Large Truck**	**500**	**1.0**		**Mix 1**	**None**	**None**
2	**Erato Pit Berms**	**400**	**Pit**	**2,100.0**	**2.0**	**10.0**	**2.0**		**Dozer**	**Stone - crus**	**Large**	**Large Truck**	**500**	**1.0**		**Mix 1**	**None**	**None**
3	**Road Access Berms**	**400**	**Pit**	**15.0**	**2.0**	**10.0**	**2.0**		**Dozer**	**Stone - crus**	**Large**	**Large Truck**	**500**	**1.0**		**Mix 1**	**None**	**None**

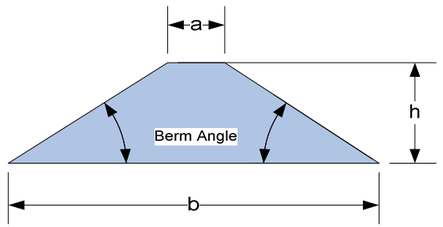
Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table
4. **Material for berm (bund) will be UV NAG barren rock, sourced from near the run of mine stockpile adjacent to the Erato Pit.**

Pits - Calculations

Safety Berm Volume Calculation

Cross Sectional Area = $\frac{(a+b)}{2} \times h$

Berm Volume = Berm Length x Cross Sectional Area



Dozer productivity assumes push distance of:
100 feet

Dozer:
Length x (Berm Base Width + Dozer Push Distance) - accounts for disturbance created in borrow area

Excavator:
Length x (Berm Base Width + (2 x Excavator Track Width) - accounts for disturbance created in borrow area

Haul & Place:
Length x Berm Base Width - if necessary use Yards sheet to account for disturbance created in borrow area

Revegetation Calculations

Minimum 1 acre revegetation crew time per area

Closure Cost Estimate
Pits

Pits - Safety Berm Construction Costs

		Safety Berm							
	Description (required)	Safety Berm Volume m3	Selected Fleet	Number of Trucks/ Scrapers	Corrected Fleet Productivity m3/hr	Total Hours	Safety Berm Labor Cost $	Safety Berm Equipment Cost $	Total Safety Berm Cost $
1	**Tigranes/Artavasdes Pit Berms**	61,780	Large (D10R)		774	80	$1,242	$18,771	$20,013
2	**Erato Pit Berms**	25,949	Large (D10R)		774	34	$528	$7,978	$8,506
3	**Road Access Berms**	184	Large (D10R)		774	1	$16	$235	$251
		87,913				115	**$1,786**	**$26,984**	**$28,770**

Pits - Safety Berms - Revegetation Costs

	Description (required)	Flat Area ha	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Tigranes/Artavasdes Pit Berms**	20.27	$1,502	$11,265	$20,270	$33,037
2	**Erato Pit Berms**	8.51	$631	$4,732	$8,510	$13,873
3	**Road Access Berms**	0.06	$30	$225	$60	$315
		28.84	**$2,163**	**$16,222**	**$28,840**	**$47,225**

Closure Cost Estimate
Quarries & Borrow Pits

Waste Rock Dumps - Cost Summary	Labor	Equipment	Materials	Totals
Grading Costs	$0	$0	N/A	$0
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$16,451	$249,558	N/A	$266,009
Ripping/Scarifying Cost	$1,304	$19,710	N/A	$21,014
Safety Berm Construction Cost	$3,290	$49,911	N/A	$53,201
Subtotal Earthwork	**$21,045**	**$319,179**	**$0**	**$340,224**
Revegetation Cost	$3,713	$27,840	$84,742	$116,295
Safety Berm Revegetation Cost	$0	$0	$0	$0
	$3,713	**$27,840**	**$84,742**	**$116,295**
TOTALS	**$24,758**	**$347,019**	**$84,742**	**$456,519**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Quarries & Borrow Pits - User Input — **You must fill in ALL green cells in this section for each dump, lift or dump category**

	Facility Description			Physical - MANDATORY									Cover				Growth Media			
	Description (required)	ID Code	Type	Underlying Ground Slope % Grade	Ungraded Slope _H:1V	Final Slope _H:1V	Final Top Slope % Grade	Bench or Highwall Height m	Mid-Bench Length m	Average Flat Area Long Dimension (ripping distance) m	Final (Regraded) Footprint ha	Regrade Volume (1) (if calculated elsewhere) m3	Cover Thickness Slopes mm	Cover Thickness Flat Areas mm	Distance from Cover Borrow m	Slope from Dump to Cover Borrow % grade	Slope Growth Media Thickness mm	Flat Area Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Dump to Stockpile % grade
1	**Site 13 Clay Borrow (BRSF)**	**100**	**Borrow Pit**	**24.0**	**2.5**	**2.5**	**24.0**	**5**	**800**	**100**	**36.00**	**0**					**300.0**	**300.0**	**100**	**0.0**
2	**Site 14 Clay Borrow (HLF)**	**200**	**Borrow Pit**	**16.0**	**2.5**	**2.5**	**16.0**	**5**	**250**	**100**	**14.00**	**0**					**300.0**	**300.0**	**100**	**0.0**
3	**Quarry #1 - Central**	**300**	**Quarry**	**27.0**	**2.5**	**2.5**	**27.0**	**5**	**385**	**385**	**10.99**	**0**					**0.0**	**0.0**	**100**	**0.0**
4	**Quarry #2 - Crusher**	**300**	**Quarry**	**30.0**	**2.5**	**2.5**	**30.0**	**5**	**435**	**435**	**2.90**	**0**					**0.0**	**0.0**	**100**	**0.0**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Quarries & Borrow Pits - User Input (cont.) — **You must fill in ALL green cells and relevant blue cells in this section for each dump, lift or dump category**

		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Highwall Material Type (select)	Grading Equipment Fleet (select)	Slot/Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Slopes (select)	Seed Mix Flat Areas (select)	Mulch Slopes (select)	Mulch Flat Areas (select)	Fertilizer Slopes (select)	Fertilizer Flat Areas (select)	Slope Scarify/ Rip? (select)	Flat Area Scarify/ Rip? (select)	Scarify/ Ripping Fleet (select)
1	**Site 13 Clay Borrow (BRSF)**	**1.2**	**Clay - Dry**	**Large**	**Yes**	**Alluvium**	**Large Truck**	**Alluvium**	**Large Truck**	**Mix 1**	**Mix 1**	**Straw Mulch**	**Straw Mulch**	**None**	**None**	**Yes**	**Yes**	**Large Dozer**
2	**Site 14 Clay Borrow (HLF)**	**1.2**	**Clay - Dry**	**Large**	**Yes**	**Alluvium**	**Large Truck**	**Alluvium**	**Large Truck**	**Mix 1**	**Mix 1**	**Straw Mulch**	**Straw Mulch**	**None**	**None**	**Yes**	**Yes**	**Large Dozer**
3	**Quarry #1 - Central**	**1.2**	**Clay - Dry**	**Large**	**Yes**	**Alluvium**	**Large Truck**	**Alluvium**	**Large Truck**	**None**	**None**	**None**	**None**	**None**	**None**	**No**	**No**	**Large Dozer**
4	**Quarry #2 - Crusher**	**1.2**	**Clay - Dry**	**Large**	**Yes**	**Alluvium**	**Large Truck**	**Alluvium**	**Large Truck**	**None**	**None**	**None**	**None**	**None**	**None**	**No**	**No**	**Large Dozer**

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Quarries & Borrow Pits - User Input (cont.)

	Facility Description	Highwall Berms					Berm Construction		Excavate or Doze	Hauling (if selected method)				Revegetation		
	Description (required)	Berm (or Highwall) Length m	Berm Height m	Berm Base Width m	Berm Sideslope Angle _H:1V	Volume (if calculated elsewhere) m3	Construction Method (select)	Berm Material Type (select)	Berm Construction Equipment Fleet (select)	Berm Hauling Fleet (select)	Distance to Borrow Source m	Slope to Borrow Source % grade	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)
1	**Site 13 Clay Borrow (BRSF)**															
2	**Site 14 Clay Borrow (HLF)**															
3	**Quarry #1 - Central**	**1,099.0**	**2.0**	**10.0**	**2.0**		**Haul & Place**	**Stone - crush**	**Large**	**Large Truck**	**500**	**1.0**				
4	**Quarry #2 - Crusher**	**965.0**	**2.0**	**10.0**	**2.0**		**Haul & Place**	**Stone - crush**	**Large**	**Large Truck**	**500**	**1.0**				

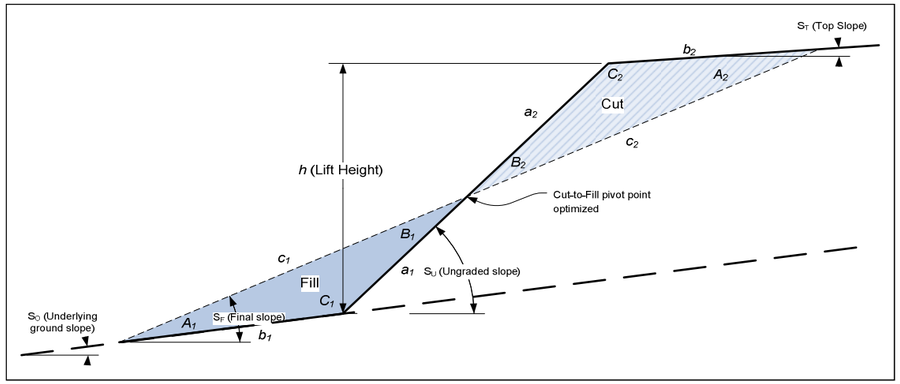
Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.

Closure Cost Estimate
Quarries & Borrow Pits

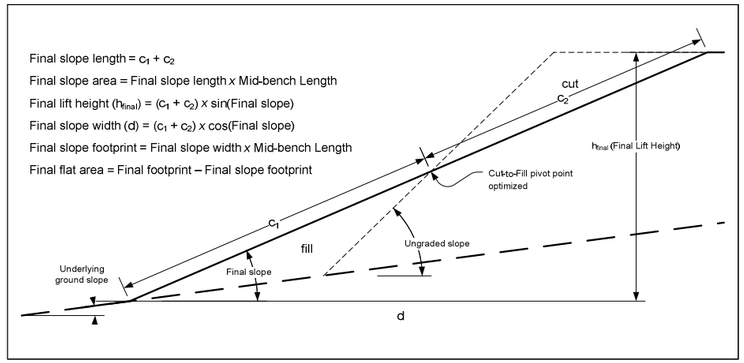
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Quarries & Borrow Pits - Calculations

Regrading Volume Calculation

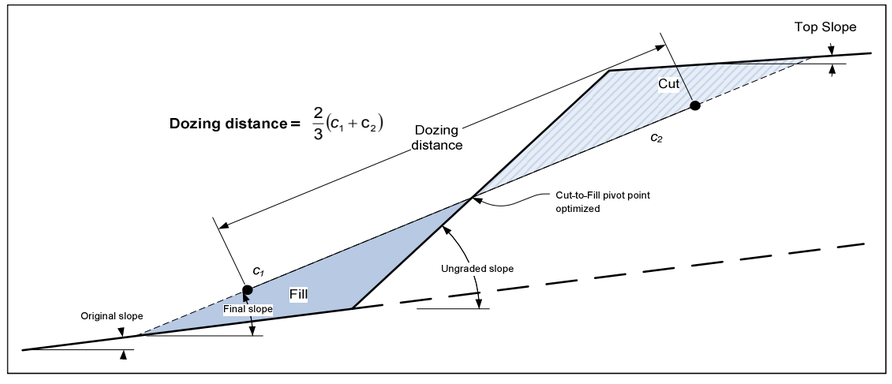


Final Slope Area and Footprint Area Calculations



Regrading Push Distance Calculation

dozing distance: based on 2/3 final cut slope + 2/3 final fill slope (minimum = 15 m)



Ripping/Scarifying Calculations

Minimum 1 hr ripping/scarifying time per dump

Slopes:
Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Mid-bench length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr

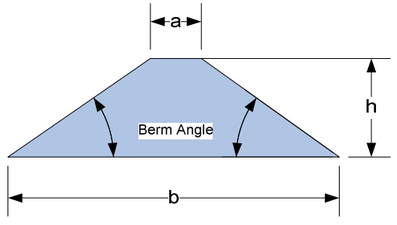
Flat Areas:
Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation: Minimum 1 acre revegetation crew time per area

Safety Berm Volume Calculation

Cross Sectional Area = $\frac{(a+b)}{2} \times h$

Berm Volume = Berm Length x Cross Sectional Area



Dozer productivity assumes push distance of:
100 feet

Dozer:
Length x (Berm Base Width + Dozer Push Distance) - accounts for disturbance created in borrow area

Excavator:

Length x (Berm Base Width + (2 x Excavator Track Width) - accounts for disturbance created in borrow area

Haul & Place:
Length x Berm Base Width - if necessary use Yards sheet to account for disturbance created in borrow area

Closure Cost Estimate
Quarries & Borrow Pits

Quarries & Borrow Pits - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Regrading Fleet	Uncorrected Dozer Productivity m3/hr	Grade Correction	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Site 13 Clay Borrow (BRSF)**	0		D10R								$0	$0	$0
2	**Site 14 Clay Borrow (HLF)**	0		D10R								$0	$0	$0
3	**Quarry #1 - Central**	0		D10R								$0	$0	$0
4	**Quarry #2 - Crusher**	0		D10R								$0	$0	$0
												$0	**$0**	**$0**

Quarries & Borrow Pits - Cover and Growth Media Costs

		Cover (lower layer)								Growth Media Placement							
	Description (required)	Cover Volume m3	Cover Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume m3	Growth Media Replacement Fleet	Fleet Productivity BCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Site 13 Clay Borrow (BRSF)**						$0	$0	$0	108,218	785C/992G	569	1	191	$11,857	$179,870	$191,727
2	**Site 14 Clay Borrow (HLF)**						$0	$0	$0	42,070	785C/992G	569	1	74	$4,594	$69,688	$74,282
3	**Quarry #1 - Central**						$0	$0	$0	0					$0	$0	$0
4	**Quarry #2 - Crusher**						$0	$0	$0	0					$0	$0	$0
							$0	**$0**	**$0**	150,288				265	**$16,451**	**$249,558**	**$266,009**

Quarries & Borrow Pits - Scarifying/Revegetation Costs

	Description (required)	Slope Area ha	Flat Area ha	Total Surface Area ha	Final Slope Length m	Flat Area Long Dimension m	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Site 13 Clay Borrow (BRSF)**	1.05	35.02	36.07	13	100	D10R	2	59	$947	$14,313	$15,260	$2,674	$20,047	$61,011	$83,732
2	**Site 14 Clay Borrow (HLF)**	0.33	13.70	14.03	13	100	D10R	0	23	$357	$5,397	$5,754	$1,039	$7,793	$23,731	$32,563
3	**Quarry #1 - Central**	0.51	10.52	11.03	13		D10R			$0	$0	$0	$0	$0	$0	$0
4	**Quarry #2 - Crusher**	0.57	2.37	2.94	13		D10R			$0	$0	$0	$0	$0	$0	$0
		2.46	61.61	64.07				2	82	**$1,304**	**$19,710**	**$21,014**	**$3,713**	**$27,840**	**$84,742**	**$116,295**

Notes: 1) Minimum total ripping hours = 1 (i.e. If total ripping hrs (slope + flat) < 1, then one hour of fleet time is assumed, regardless of acres shown in in scarifying table.)

Closure Cost Estimate
Underground Openings

Underground Openings Cost Summary	Labor	Equipment	Materials	Totals
Adits, Portals & Declines Plugging	$0	$0	$0	$0
Shaft Backfill/Cover	$0	$0	N/A	$0
Shaft Capping	$0	$0	$0	$0
TOTALS	**$0**	**$0**	**$0**	**$0**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Adits, Portals & Declines - User Input

	Facility Description		Physical Characteristics				Backfill Material			
	Description (required)	**ID Code**	**Height** m	**Width** m	**Backfill/ Plug Type**	**Distance to Bulkhead** m	**Backfill Material Condition** (select)	**Backfill Material Type** (select)	**Distance to Backfill Borrow** m	**Slope from Adit to Borrow Area** % grade

Notes: 1) Foam (adit) option is for smaller openings that can be plugged with simple forms and a 1.5 m thick plug.
2) Foam (production) option is for larger production openings (declines, etc.) and requires larger form construction and minimum 3 m thick plug.
3) All foam plugs include minimum 5m of backfill from opening to plug.
4) Bat gate option is for small openings and the material cost is the same for any size opening.
5) Backfilling assumes that small dozer will push material from nearby stockpile or dump
6) Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Shaft Openings - User Input

You must fill in ALL green cells and relevant blue cells in this section for each shaft

	Facility Description		Physical Characteristics			Backfill or Foundation Cover					
	Description (required)	**ID Code**	**Diameter** m	**Shaft Depth (for backfill method)** m	**Backfill/ Plug Type** (select)	**Backfill Material Type** (select)	**Cover/ Backfill Fleet** (select)	**Thickness (if not complete backfill)** m	**Distance to Backfill Borrow** m	**Slope from Shaft to Borrow Area** % grade	**Maximum Fleet Size** (user override)

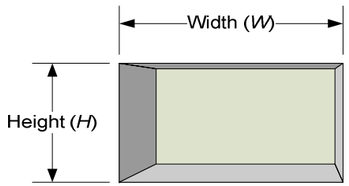
Notes:
1. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
2. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

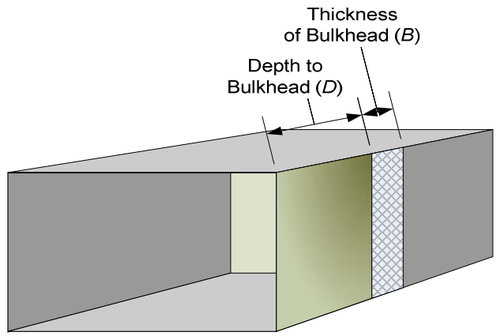
Notas: Los tiros rectangulares estan calculados en promedio para obtener un diametro, los robins en base a su diametro original

Closure Cost Estimate
Underground Openings

Underground Openings - Calculations

Adits, Declines and Portals - Volume Calculations





Cross-Sectional Area (A) = $W \times H$
Volume of Concrete Bulkhead = $A \times B$
Volume of Backfill = $A \times D$

Concrete Cover/Bulkhead Volume Calculation

Using Means Heavy Construction Cost Data (2004)
- Estimage cover/bulkhead thickness
- Assumes that all concrete works are reinforced
- Productivity for crew from Means Heavy Construction Cost Data (2004) adjusted for supervision (addressed in Misc. Costs) and Davis-Bacon Wage Rates
- Assumes 450 mm thick slab

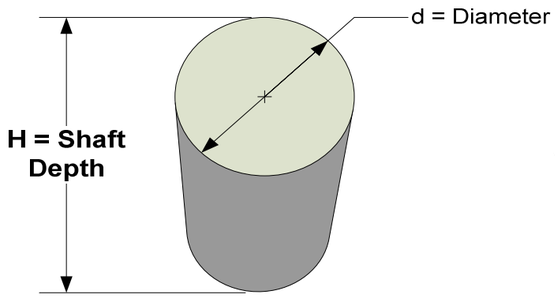
Backfill Calculations

Uses 1 large and 1 small dozer for adit backfill
- Assumes max 120 m push
- Assumes average operator and 50 min/hr availability

Uses truck & loader load, haul place fleets for shafts
- Concrete cap will be 450 mm thick, reinforced, structually supported.
- If concrete cap is used, assume 3 m of rock backfill on top of cap.
- Assumes that all concrete works are reinforced
- If backfill is used, assume overfill by 1.5 m

Carpenter rate incl Fringe: 0 per hour

Shaft Volume Calculations



Radius (r) = ½d
Cross-Sectional Area (A) = πr^2
Volume = A x H

Closure Cost Estimate
Underground Openings

Adits, Portals & Declines Plugging

Uses RS Means Heavy Construction Cost Data for bulkhead production rate, material costs and crews

				Bulkhead Construction				Backfill or Foam (1)				Bat Gate or Culvert (2,3,4)				Total Costs			
	Description (required)	Bulkhead Volume m3	Backfill (rock) Volume m3	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Bulkhead Cost $	Total Labor Cost $	Total Equipment Cost $	Material (Foam) Cost $	Total Backfill Cost $	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Bat Gate Cost $	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Plugging Costs $
				$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Notes:
1) Foam costs include 1 hour move to and setup + 1 hr. minimum crew time
2) Assumes 1 hr walk-in/walk-out time for equipment
3) Batgate assumes 8 hr install time each
4) Bat culvert backfill costs based on one 8-hr day (i.e. backfilling hours = 8 hrs).

Shaft Plugging

			Cover/Cap				Backfill/Cover		
	Description (required)	Cover Area m2	Backfill or Cover Volume m3	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Shaft Cap Cost $	Total Labor Cost $	Total Equipment Cost $	Total Backfill Cost $
				$0	$0	$0	$0	$0	$0	$0

Closure Cost Estimate
Haul Material

Generic Material Hauling - Cost Summary	Labor	Equipment	Materials	Totals
Hauling/Crush/Screen/Compact	$52,660	$763,729	N/A	$816,389
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$1,630	$25,118	N/A	$26,748
Ripping/Scarifying Cost	$93	$1,408	N/A	$1,501
Subtotal Earthworks	**$54,383**	**$790,255**	**$0**	**$844,638**
Revegetation Cost	$334	$2,506	$7,628	$10,468
TOTALS	**$54,717**	**$792,761**	**$7,628**	**$855,106**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Generic Material Hauling - User Input

	Facility Description			Physical		Hauled Material			Crushing & Screening					Cover			Growth Media		
	Description (required)	ID Code	Type	Final Surface Area ha	Average Ripping Distance m	Material Volume Required m3	Distance from Borrow Source (1) m	Slope to Borrow Source % grade	Crush Material	Screen Material	Loss to Crushing/ Screening %	Distance to Placement Location (2) m	Slope to Placement % grade	Cover Thickness mm	Distance to Cover Borrow m	Slope to Borrow % grade	Growth Media Thickness mm	Distance to Growth Material Stockpile m	Slope to Stockpile % grade
1	**Erato Pit backfill**	**100**	**Pit**	**2.11**	**185**	**365,152**	**2,700**	**7.0**											
2	**Riprap to HLF detention pond**	**200**	**Ponds**	**0.34**	**0**	**1,031**	**1,553**	**1.0**											
3	**Landfill low perm cover layer**	**300**	**Landfills**	**0.94**	**0**	**3,489**	**95**	**0.0**											
4	**ROM stockpile growth media**	**400**	**Ore Stockpile**	**4.51**	**286**	**0**											**300**	**2,900**	**6.0**

Notes:
1. Input distance to crusher if material to be crushed
2. Input distance from crusher to placement if material to be crushed
3. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
4. **Erato pit backfill material source is UV NAG rock placed during operation in the Tigranes Pit.**
5. **Riprap for detention pond source will be hauled from material stockpiled during operations at the truck load out facility near the HLF.**
6. **Landfill low perm cover layer source will be material execavated during construction and stored adjacent to the landfill.**
7. **Run of mine stockpile growth media will be from the topsoil stockpile north of the Erato Pit.**

Generic Material Hauling - User Input (cont.)

		Hauling Material				Cover			Growth Media			Revegetation				
	Description (required)	Haul Material Type (select)	Material Hauling Fleet (select)	Each Fleet Size (from/to crusher) (user override)	Compact After Placement?	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch Type (select)	Fertilizer Type (select)	Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)
1	**Erato Pit backfill**	**LS - crushed**	**Large Truck**		**No**											
2	**Riprap to HLF detention pond**	**LS - broken**	**Large Truck**		**No**											
3	**Landfill low perm cover layer**	**Clay - Dry**	**Large Truck**		**Yes**											
4	**ROM stockpile growth media**	**Alluvium**	**Large Truck**		**No**				**Alluvium**	**Large Truck**		**Mix 1**	**Straw Mulch**	**None**	**Yes**	**Large Dozer**

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Closure Cost Estimate
Haul Material

Generic Material Hauling - Load, Haul, Place and Grade

		Material Haulage								Crush and/or Compact			
	Description (required)	Material Volume to Crusher m3	Final Material Volume m3	Material Haulage Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Hauling Labor Cost $	Hauling Equipment Cost $	Total Crush/ Screen Cost $	Compact Labor Cost $	Compact Equipment Cost $	Total Load/Haul/ Place Cost $
1	**Erato Pit backfill**	365,152	365,152	785C/992G	696	3	525	$48,888	$750,892	$0	$0	$0	$799,780
2	**Riprap to HLF detention pond**	1,031	1,031	785C/992G	684	2	2	$155	$2,372	$0	$0	$0	$2,527
3	**Landfill low perm cover layer**	3,489	3,489	785C/992G	573	1	6	$372	$5,650	$0	$3,245	$4,815	$14,082
4	**ROM stockpile growth media**							$0	$0	$0	$0	$0	$0
		369,672	369,672				533	**$49,415**	**$758,914**	**$0**	**$3,245**	**$4,815**	**$816,389**

Notes: Final Material Volume includes allowance for additional material hauled to crushing/screening plant based on Loss to Crushing/Screening input above.

Generic Material Hauling - Cover and Growth Media Costs

		Cover Placement								Growth Media Placement							
	Description (required)	Cover Volume m3	Cover Placement Fleet	Cover Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Placement Cost $	Growth Media Volume m3	Growth Media Placement Fleet	Growth Media Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoil Placement Cost $
1	**Erato Pit backfill**						$0	$0	$0	0					$0	$0	$0
2	**Riprap to HLF detention pond**						$0	$0	$0	0					$0	$0	$0
3	**Landfill low perm cover layer**						$0	$0	$0	0					$0	$0	$0
4	**ROM stockpile growth media**						$0	$0	$0	13,530	785C/992G	888	4	15	$1,630	$25,118	$26,748
							$0	**$0**	**$0**	13,530				15	**$1,630**	**$25,118**	**$26,748**

Generic Material Hauling - Scarifying/Revegetation Costs

	Description (required)	Total Surface Area ha	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Cost $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Cost $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Erato Pit backfill**	2.11		$0	$0	$0	$0	$0	$0	$0
2	**Riprap to HLF detention pond**	0.34		$0	$0	$0	$0	$0	$0	$0
3	**Landfill low perm cover layer**	0.94		$0	$0	$0	$0	$0	$0	$0
4	**ROM stockpile growth media**	4.51	6	$93	$1,408	$1,501	$334	$2,506	$7,628	$10,468
		7.90	6	**$93**	**$1,408**	**$1,501**	**$334**	**$2,506**	**$7,628**	**$10,468**

Closure Cost Estimate
Foundations & Buildings

Buildings & Foundation Demolition Cost Summary

	Labor	Equipment	Materials	Totals
Building Demolition Cost	$0	$0	N/A	$0
Wall Demolition Cost	$0	$0	N/A	$0
Slab Demolition	$5,009	$40,859	N/A	$45,868
Subtotal Demolition	**$5,009**	**$40,859**	**$0**	**$45,868**
Cover Placement Cost	$2,258	$34,394	N/A	$36,652
Growth Media Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$384	$5,640	N/A	$6,024
Subtotal Earthworks	**$2,642**	**$40,034**	**$0**	**$42,676**
Revegetation Cost	$720	$5,398	$2,306	$8,423
TOTALS	**$8,371**	**$86,291**	**$2,306**	**$96,967**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Minimum thickness of cover over unbroken slab: 1 m

Buildings & Foundation - User Input

You must fill in ALL green cells and relevant blue cells in this section for each building or facility

	Facility Description			Physical - MANDATORY								Foundation Cover (1)			Growth Media (1) (entire footprint)		
	Description (required)	ID Code	Type	Length m	Width m	Eve Height m	Slab Thickness mm	Foundation Wall Thickness mm	Foundation Wall Height mm	Average Flat Area Long Dimension (ripping distance) m	Building Area Footprint (including surrounding facilities) ha	Foundation Cover Thickness mm	Distance from Foundation Cover Borrow Area m	Slope from Facility to Borrow Area % grade	Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Facility to Stockpile % grade
1	**Crusher building**	**620**	**Process - Plant & Buildings**	**4.9**	**3.0**	**3.3**	**305**	**305**	**610**	**6**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
2	**Screening Building**	**620**	**Process - Crushing & Screening**	**67.25**	**20.0**	**17.7**	**305**	**305**	**610**	**55**	**0.07**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
3	**Transfer Tower to Overland**	**620**	**Process - Crushing & Screening**	**8**	**10.0**	**10**	**305**	**305**	**610**	**8**	**0.01**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
4	**Air compressor (2)**	**620**	**Process - Crushing & Screening**	**15.2**	**8.4**	**8**	**305**	**305**	**610**	**11**	**0.01**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
5	**Load-out lime silo**	**620**	**Process - Crushing & Screening**	**11**	**6.0**	**28**	**305**	**305**	**610**	**9**	**0.07**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
6	**Load-out MCC**	**620**	**Process - Crushing & Screening**	**12.2**	**2.4**	**4**	**305**	**305**	**610**	**6**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
7	**Load-out tower**	**620**	**Process - Crushing & Screening**	**12**	**12.8**	**29**	**305**	**305**	**610**	**12**	**0.02**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
8	**Stockpile Cover**	**620**	**Process - Plant & Buildings**	**7**	**5.8**	**5**	**305**	**305**	**610**	**6**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
9	**Drive House Overland**	**620**	**Process - Crushing & Screening**	**24**	**15.3**	**6**	**305**	**305**	**610**	**20**	**0.04**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
10	**MCC Overland**	**620**	**Process - Crushing & Screening**	**15.2**	**31.8**	**6**	**305**	**305**	**610**	**24**	**0.05**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
11	**Mine Truck Maintenance Building**	**630**	**Site Facilities - Buildings**	**85**	**44.0**	**13.5**	**305**	**305**	**610**	**46**	**0.10**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
12	**Warehouse**	**630**	**Site Facilities - Buildings**	**42.7**	**15.2**	**6.0**	**305**	**305**	**610**	**45**	**0.06**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
13	**Maintenance Shop Building**	**630**	**Site Facilities - Buildings**	**38.1**	**15.2**	**6.0**	**305**	**305**	**610**	**41**	**0.06**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
14	**Multipurpose & Infirmary Building**	**630**	**Site Facilities - Buildings**	**41**	**15.5**	**6.0**	**305**	**305**	**610**	**42**	**0.06**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
15	**Fuel Storage**	**630**	**Site Facilities - Structures**	**19.8**	**18**	**7**	**305**	**305**	**610**	**20**	**0.04**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
16	**Change Houseand Mine Offices**	**630**	**Site Facilities - Buildings**	**21.9**	**18.3**	**2.4**	**305**	**305**	**610**	**29**	**0.04**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
17	**Mine Area Security Gate**	**630**	**Site Facilities - Buildings**	**6.1**	**2.4**	**3.6**	**305**	**305**	**610**	**7**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
18	**Jermuk Road Security Gate**	**630**	**Site Facilities - Buildings**	**6.1**	**2.4**	**2.4**	**305**	**305**	**610**	**7**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
19	**ADR Plant Building**	**640**	**Process - Plant & Buildings**	**45**	**30.0**	**20.5**	**305**	**305**	**610**	**45**	**0.27**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
20	**Laboratory Building**	**640**	**Process - Plant & Buildings**	**22.8**	**15**	**7**	**305**	**305**	**610**	**23**	**0.03**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
21	**Haul Truck Wash**	**640**	**Process - Plant & Buildings**	**53.6**	**15**	**11**	**305**	**305**	**610**	**54**	**0.08**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
22	**Multipurpose & Infirmary Building**	**650**	**Site Facilities - Buildings**	**41**	**15.5**	**4.8**	**305**	**305**	**610**	**42**	**0.06**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
23	**Main Access Security Gate**	**650**	**Site Facilities - Buildings**	**6.1**	**2.4**	**3.6**	**305**	**305**	**610**	**7**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**
24	**ADR Plant Security Gate**	**650**	**Site Facilities - Buildings**	**6.1**	**2.4**	**3.6**	**305**	**305**	**610**	**7**	**0.00**	**1000**	**1,000**	**1.0**	**0**	**0**	**0.0**

Notes:

1. Foundation cover only calculated to cover slab. Growth media estimated over entire footprint area
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. **Building demolition cost is assumed to be offset by salvage value of materials and equipment.**

Closure Cost Estimate
Foundations & Buildings

Buildings & Foundation - User Input (cont.) — You must fill in ALL green cells and relevant blue cells in this section for each building or facility

		Construction Materials		Slab Demolition		Foundation Cover			Growth Media			Revegetation				
	Description (required)	Building Type (select)	Foundation Wall Type (select)	Slab Demo Method (select)	Slab Breaking Equipment Fleet (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Ripping Fleet (select)
1	Crusher building	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
2	Screening Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
3	Transfer Tower to Overland	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
4	Air compressor (2)	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
5	Load-out lime silo	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
6	Load-out MCC	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
7	Load-out tower	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
8	Stockpile Cover	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
9	Drive House Overland	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
10	MCC Overland	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
11	Mine Truck Maintenance Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
12	Warehouse	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
13	Maintenance Shop Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
14	Multipurpose & Infirmary Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
15	Fuel Storage	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		User Mix 1	Straw Mulch	None	Yes	Large Dozer
16	Change Houseand Mine Offices	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
17	Mine Area Security Gate	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
18	Jermuk Road Security Gate	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
19	ADR Plant Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
20	Laboratory Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
21	Haul Truck Wash	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
22	Multipurpose & Infirmary Building	Lg. steel	Conc 12 in (300 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
23	Main Access Security Gate	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
24	ADR Plant Security Gate	Sm. steel	Conc 8 in (200 mm) thick	Break & bury	Sm Excavator	Topsoil	Large Truck		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Buildings & Foundation - Calculations

Building Volume Calculations

Using Means Heavy Construction Cost Data (2004) calculates cubic feet from building dimensions
- Estimage slab thickness and wall thickness if not known
- Assumes that all concrete slabs are reinforced
- Productivity for crew from Means Heavy Construction Cost Data (2004) adjusted for supervision (addressed in Misc. Costs) and Davis-Bacon Wage Rates
- Demolition costs do not include hauling or disposing if debris - Use Waste Disposal module

Slab Demolition Calculations

Minimum 1 hr excavator time for slab demolition

Cover Volume Calculation

Foundation area x cover thickness
- If "Bury in Place" is selected as slab demolition method, cover thickness is adjusted such that total cover (cover + growth media) equals value entered in "Minimum thickness of cover over unbroken slab" cell above

Ripping/Scarifying Calculations

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation

Minimum 1 acre revegetation crew time per area

Closure Cost Estimate
Foundations & Buildings

Building & Foundation Demolition Costs — Uses RS Means Heavy Construction Cost Data for building and wall demolition cost calculations. Uses CAT Handbook for slab breaking production.

								Building Demolition			Wall Demolition			Slab Demolition			Total Costs		
	Description (required)	Building Footprint (slab area) m2	Building Volume m3	Wall Length m	Wall Area m2	Slab Demolition Fleet	Slab Volume m3	Total Labor Cost $	Total Equipment Cost $	Total Building Demolition Cost $	Total Labor Cost $	Total Equipment Cost $	Total Wall Demolition Cost $	Total Labor Cost $	Total Equipment Cost $	Total Slab Breaking Cost $	Total Labor Cost $	Total Equipment Cost $	Total Demolition Costs $
1	**Crusher building**	15	48	16	10	325C	5	$121	$170	$291	$847	$128	$975	$31	$253	$284	$999	$551	$1,550
2	**Screening Building**	1,345	23,807	175	107	325C	411	$45,987	$79,280	$125,267	$13,088	$1,980	$15,068	$531	$4,329	$4,860	$59,606	$85,589	$145,195
3	**Transfer Tower to Overland**	80	800	36	22	325C	24	$2,000	$2,808	$4,808	$1,863	$282	$2,145	$31	$253	$284	$3,894	$3,343	$7,237
4	**Air compressor (2)**	128	970	47	29	325C	39	$2,426	$3,406	$5,832	$2,456	$371	$2,827	$50	$405	$455	$4,932	$4,182	$9,114
5	**Load-out lime silo**	66	1,848	34	21	325C	20	$4,620	$6,487	$11,107	$1,778	$269	$2,047	$31	$253	$284	$6,429	$7,009	$13,438
6	**Load-out MCC**	29	106	29	18	325C	9	$264	$370	$634	$1,524	$230	$1,754	$31	$253	$284	$1,819	$853	$2,672
7	**Load-out tower**	154	4,393	50	30	325C	47	$10,984	$15,421	$26,405	$2,540	$384	$2,924	$62	$506	$568	$13,586	$16,311	$29,897
8	**Stockpile Cover**	41	219	26	16	325C	12	$548	$770	$1,318	$1,355	$205	$1,560	$31	$253	$284	$1,934	$1,228	$3,162
9	**Drive House Overland**	367	2,203	79	48	325C	112	$5,509	$7,734	$13,243	$4,065	$614	$4,679	$146	$1,190	$1,336	$9,720	$9,538	$19,258
10	**MCC Overland**	483	2,900	94	57	325C	148	$7,251	$10,180	$17,431	$4,827	$730	$5,557	$192	$1,570	$1,762	$12,270	$12,480	$24,750
11	**Mine Truck Maintenance Building**	3,740	50,490	258	157	325C	1,141	$97,531	$168,139	$265,670	$19,204	$2,905	$22,109	$1,474	$12,025	$13,499	$118,209	$183,069	$301,278
12	**Warehouse**	649	3,894	116	71	325C	198	$7,523	$12,969	$20,492	$8,685	$1,314	$9,999	$258	$2,101	$2,359	$16,466	$16,384	$32,850
13	**Maintenance Shop Building**	579	3,475	107	65	325C	177	$6,712	$11,571	$18,283	$7,951	$1,203	$9,154	$230	$1,873	$2,103	$14,893	$14,647	$29,540
14	**Multipurpose & Infirmary Building**	635	3,813	113	69	325C	194	$7,366	$12,698	$20,064	$8,440	$1,277	$9,717	$251	$2,051	$2,302	$16,057	$16,026	$32,083
15	**Fuel Storage**	362	2,500	76	46	325C	111	$6,251	$8,776	$15,027	$3,895	$589	$4,484	$143	$1,165	$1,308	$10,289	$10,530	$20,819
16	**Change Houseand Mine Offices**	401	962	80	49	325C	122	$1,858	$3,203	$5,061	$5,994	$907	$6,901	$158	$1,291	$1,449	$8,010	$5,401	$13,411
17	**Mine Area Security Gate**	15	53	17	10	325C	5	$132	$185	$317	$847	$128	$975	$31	$253	$284	$1,010	$566	$1,576
18	**Jermuk Road Security Gate**	15	35	17	10	325C	5	$88	$123	$211	$847	$128	$975	$31	$253	$284	$966	$504	$1,470
19	**ADR Plant Building**	1,350	27,675	150	91	325C	412	$53,460	$92,162	$145,622	$11,131	$1,684	$12,815	$534	$4,354	$4,888	$65,125	$98,200	$163,325
20	**Laboratory Building**	342	2,463	76	46	325C	104	$4,757	$8,200	$12,957	$5,627	$851	$6,478	$133	$1,089	$1,222	$10,517	$10,140	$20,657
21	**Haul Truck Wash**	804	8,844	137	84	325C	245	$17,084	$29,452	$46,536	$10,275	$1,554	$11,829	$317	$2,582	$2,899	$27,676	$33,588	$61,264
22	**Multipurpose & Infirmary Building**	635	3,051	113	69	325C	194	$5,892	$10,158	$16,050	$8,440	$1,277	$9,717	$251	$2,051	$2,302	$14,583	$13,486	$28,069
23	**Main Access Security Gate**	15	53	17	10	325C	5	$132	$185	$317	$847	$128	$975	$31	$253	$284	$1,010	$566	$1,576
24	**ADR Plant Security Gate**	15	53	17	10	325C	5	$132	$185	$317	$847	$128	$975	$31	$253	$284	$1,010	$566	$1,576
			144,655				3,745	**$288,628**	**$484,632**	**$773,260**	**$127,373**	**$19,266**	**$146,639**	**$5,009**	**$40,859**	**$45,868**	**$421,010**	**$544,757**	**$965,767**

Closure Cost Estimate
Foundations & Buildings

Building & Foundation - Foundation Cover and Growth Media Costs

		Foundation Cover								Growth Media								Total Cover & Growth Media Costs			
	Description (required)	Cover Volume m3	Cover Repacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Cost $	Growth Media Volume m3	Growth Media Repacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Growth Media Cost $	Total Labor Cost $	Total Equipment Cost $	Total Costs $
1	**Crusher building**	15	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
2	**Screening Building**	1,345	785C/992G	849	2	2	$155	$2,372	$2,527						$0	$0	$0	$155	$2,372	$2,527
3	**Transfer Tower to Overland**	80	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
4	**Air compressor (2)**	128	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
5	**Load-out lime silo**	66	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
6	**Load-out MCC**	29	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
7	**Load-out tower**	154	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
8	**Stockpile Cover**	41	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
9	**Drive House Overland**	367	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
10	**MCC Overland**	483	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
11	**Mine Truck Maintenance Building**	3,740	785C/992G	849	2	4	$310	$4,744	$5,054						$0	$0	$0	$310	$4,744	$5,054
12	**Warehouse**	649	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
13	**Maintenance Shop Building**	580	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
14	**Multipurpose & Infirmary Building**	635	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
15	**Fuel Storage**	362	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
16	**Change Houseand Mine Offices**	401	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
17	**Mine Area Security Gate**	15	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
18	**Jermuk Road Security Gate**	15	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
19	**ADR Plant Building**	1,350	785C/992G	849	2	2	$155	$2,372	$2,527						$0	$0	$0	$155	$2,372	$2,527
20	**Laboratory Building**	342	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
21	**Haul Truck Wash**	804	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
22	**Multipurpose & Infirmary Building**	635	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
23	**Main Access Security Gate**	15	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
24	**ADR Plant Security Gate**	15	785C/992G	849	2	1	$78	$1,186	$1,264						$0	$0	$0	$78	$1,186	$1,264
		12,266				29	**$2,258**	**$34,394**	**$36,652**						**$0**	**$0**	**$0**	**$2,258**	**$34,394**	**$36,652**

Closure Cost Estimate
Foundations & Buildings

Building & Foundation - Scarifying/Revegetation Costs

					Scarifying/Ripping			Revegetation				Total Scarify & Revegation Costs			
	Description (required)	Flat Area ha	Area Long Dimension m	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Costs $
1	**Crusher building**	0.04	6	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
2	**Screening Building**	0.08	55	1	$16	$235	$251	$30	$225	$135	$390	$46	$460	$135	$641
3	**Transfer Tower to Overland**	0.04	8	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
4	**Air compressor (2)**	0.04	11	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
5	**Load-out lime silo**	0.08	8	1	$16	$235	$251	$30	$225	$135	$390	$46	$460	$135	$641
6	**Load-out MCC**	0.04	6	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
7	**Load-out tower**	0.04	12	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
8	**Stockpile Cover**	0.04	6	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
9	**Drive House Overland**	0.04	20	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
10	**MCC Overland**	0.04	24	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
11	**Mine Truck Maintenance Building**	0.08	46	1	$16	$235	$251	$30	$225	$135	$390	$46	$460	$135	$641
12	**Warehouse**	0.04	45	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
13	**Maintenance Shop Building**	0.04	41	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
14	**Multipurpose & Infirmary Building**	0.04	42	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
15	**Fuel Storage**	0.04	20	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
16	**Change Houseand Mine Offices**	0.04	29	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
17	**Mine Area Security Gate**	0.04	7	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
18	**Jermuk Road Security Gate**	0.04	7	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
19	**ADR Plant Building**	0.28	45	1	$16	$235	$251	$30	$225	$474	$729	$46	$460	$474	$980
20	**Laboratory Building**	0.04	23	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
21	**Haul Truck Wash**	0.08	54	1	$16	$235	$251	$30	$225	$135	$390	$46	$460	$135	$641
22	**Multipurpose & Infirmary Building**	0.04	42	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
23	**Main Access Security Gate**	0.04	7	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
24	**ADR Plant Security Gate**	0.04	7	1	$16	$235	$251	$30	$225	$68	$323	$46	$460	$68	$574
		1.36		**24**	**$384**	**$5,640**	**$6,024**	**$720**	**$5,398**	**$2,306**	**$8,423**	**$1,104**	**$11,038**	**$2,306**	**$14,447**

Closure Cost Estimate
Other Demo & Equip Removal

Other Demoltion and Equipment Removal - Cost Summary	Labor	Equipment	Materials	Totals
Other Demolition	$0	$0	$0	$0
Equipment Removal	$0	$0	$0	$0
TOTALS	**$0**	**$0**	**$0**	**$0**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Other Demolition

Facility Description									
	Description (required)	ID Code	Type	Quantity	Units	Labor Unit Cost $	Equipment Unit Cost $	Material Unit Cost $	Total Cost $
						$0	**$0**	**$0**	

Notes:

Closure Cost Estimate
Other Demo & Equip Removal

Equipment & Material Removal

Facility Description

	Description (required)	ID Code	Type	Quantity	Units	Labor Unit Cost ($)	Equipment Unit Cost ($)	Material Unit Cost ($)	Total Cost ($)
1	ADR Plant Emergency Generators		Process - Other	0	Each	$408.74	$2,227.85		$0
2	ADR Plant Potable Water Tank		Process - Other	0	Each	$204.37	$1,113.92		$0
3	ADR Plant Raw Water Tank		Process - Other	0	Each	$1,634.94	$8,911.38		$0
4	ADR Plant Diesel Storage Tank		Process - Other	0	Each	$3,269.88	$17,822.76		$0
5	ADR Plant Diesel Storage Day Tank		Process - Other	0	Each	$3,269.88	$17,822.76		$0
6	Barren Solution Surge Tank & Reagent Equipment		Process - Other	0	Lot	$4,904.82	$26,734.14		$0
7	Truck Shop Tank Farm Tanks (x7)		Process - Other	0	Each	$1,634.94	$8,911.38		$0
8	Truck Shop Fuel Storage Tanks (x2)		Process - Other	0	Each	$3,269.88	$17,822.76		$0
9	Truck Shop Fuel Filling Station Equipment		Process - Other	0	Lot	$1,634.94	$8,911.38		$0
10	Truck Shop Raw & Fire Water Tank		Process - Other	0	Each	$1,634.94	$8,911.38		$0
11	WTP Clarifier Tank		Process - Other	0	Each	$4,904.82	$26,734.14		$0
12	Overland Conveyor		Process - Other	0	m	$27.25	$148.52		$0
13	Conveyor - Overland Conveyor to Loading Hopper		Process - Other	0	m	$27.25	$148.52		$0
14	Conveyor - Overland Conveyor to Surge Bin		Process - Other	0	m	$27.25	$148.52		$0
15	Conveyor - Surge Bin to Screening Building		Process - Other	0	m	$27.25	$148.52		$0
16	Conveyor - Screening Building to Secondary & Tertiary Crusher Building (x3)		Process - Other	0	m	$27.25	$148.52		$0
17	Conveyor - Screening Building to Primary Crusher		Process - Other	0	m	$27.25	$148.52		$0
						$0	$0	$0	

Notes: **Assumed that demolition cost will be offset by salvage value.**

Closure Cost Estimate
Sediment & Drainage Control

Drainage Control - Cost Summary

	Labor	Equipment	Materials	Totals
Diversion Ditch Construction	$5,046	$28,717	N/A	$33,763
Diversion Ditch Liner	$489,007	$691,562	$982,527	$2,163,096
Diversion Ditch Rip-Rap	$341,121	$198,872	$456,654	$996,647
Sed Pond Construct/Regrade	$1,040	$15,721	N/A	$16,761
Liner Installation	$0	$0	$0	$0
Sed Pond Cover	$186	$2,825	N/A	$3,011
Ripping/Scarifying Cost	$16	$235	N/A	$251
Subtotal Earthworks	**$836,416**	**$937,932**	**$1,439,181**	**$3,213,529**
Diversion Ditch Revegetation	$1,665	$12,483	$35,726	$49,873
Sediment Pond Revegetation	$42	$315	$964	$1,321
Subtotal Revegetation	**$1,707**	**$12,798**	**$36,690**	**$51,194**
TOTALS	**$838,123**	**$950,730**	**$1,475,871**	**$3,264,723**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Diversion Ditches - User Input

			Diversions Ditches							Revegetation			Liner and Rip-Rap Installation			
	Description (required)	ID Code	Diversion Length m	Diversion Depth m	Ditch Bottom Width m	Ditch Sideslope Angle _H:1V	Excavate Volume (if calculated elsewhere) m3	Excavating Material Condition (select)	Excavating Equipment Fleet (select)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Liner Area m2	Liner Type (select)	Rip-Rap Area m2	Rip-Rap Type (select type)
1	BRSF Dump Terrace Channels	100	24,746	1.0	0.2	1.0	22,519	0.6	Small	Mix 1	Straw Mulch	None	64339.6	3D Turf reinforcement Mat		
2	BRSF Downchutes	100	435	0.5	0.5	1.0	827	0.6	Small	Mix 1	Straw Mulch	None	1696.5	ACB		
3	BRSF perimeter Drain - Grouted Riprap	100	2071	1.0	1.0	1.0	6,006	0.6	Small	Mix 1	Straw Mulch	None	12011.8	3D Turf reinforcement Mat		
4	BRSF Perimeter Drain HD TRM	100	3046	1.0	1.0	3.0	8,833	0.6	Small	Mix 1	Straw Mulch	None			11,270	Rip-Rap 3/8 to 1/4 CY (m3) p
5	Heap Leach Terrace Channels	200	20283	1.0	0.2	1.0	2,434	0.6	Small	Mix 1	Straw Mulch	None	60849	3D Turf reinforcement Mat		
6	Heap Leach Downchutes	200	867	0.8	0.5	1.0	1,327	0.6	Small	Mix 1	Straw Mulch	None	2273	ACB		
7	Heap Leach Downchutes	200	96	0.5	0.5	1.0	92	0.6	Small	Mix 1	Straw Mulch	None	184	ACB		
8	Heap Leach Topdeck Drain	200	1281	0.8	0.5	1.0	5,123	0.6	Small	Mix 1	Straw Mulch	None	10246	3D Turf reinforcement Mat		
9	Pit Backfill Bench Drain	250	8305	0.5	1.0	1.5	27,407	0.6	Small	Mix 1	Straw Mulch	None	33220	3D Turf reinforcement Mat		
10	Pit Backfill Topdeck Drain	250	795	0.8	1.0	4.0	2,385	0.6	Small	Mix 1	Straw Mulch	None	6757.5	3D Turf reinforcement Mat		
11	Pit Backfill Downdrain	250	66	0.8	1.0	1.0	125	0.6	Small	Mix 1	Straw Mulch	None	257.4	ACB		
12	Pit Backfill Channel Drain	250	1894	0.8	1.0	1.5	5,474	0.6	Small	Mix 1	Straw Mulch	None	9470	3D Turf reinforcement Mat		
13	Pit Backfill Channel Drain - steep	250	3125	0.8	1.0	1.5	9,031	0.6	Small	Mix 1	Straw Mulch	None			11,563	Rip-Rap 3/8 to 1/4 CY (m3) p

Notes:

1. Items 1 to 13 are cost to construct and line closure water management chanels.
2. Liner for diversions steeper tthan 7% is articulated concrete block (ACB).

0

Closure Cost Estimate
Sediment & Drainage Control

Sediment/Evaporation Pond Construction/Removal - User Input

			Sediment Ponds								Growth Media		
	Description (required)	ID Code	Pond Width m	Pond/Berm Length m	Berm Height m	Crest Width m	Sideslope Angle _H:1V	Final Area (if calculated elsewhere) ha	Regrade Volume (if calculated elsewhere) m3	Cover Volume (if calculated elsewhere) m3	Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Pond to Borrow % grade
1	PD-12 Sediment Pond Removal	400	75.32	77	3.5	1.0	2.5	0.58	22,000		300	5	0.0
2													

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table
4. Diversion channels along roads that will be removed are accounted in the "Roads" section. Diversion channels will be kept for Roads RD-1, 2, 3 and 6.
5. All sediment ponds will remain, except PD-12, at closure to manage flows from the roads. PD-14 and PD-15 will be redesigned to function as energy dissipators prior to releasing flows to the natural water courses. Cost for retrofitting are included on the "Other User" sheet.

Sediment/Evaporation Pond Construction/Removal - User Input (cont.)

		Sediment Ponds				Growth Media			Revegetation			Ripping/Scarifying	
	Description (required)	Excavating Material Condition (select)	Material Type (select)	Excavating Equipment Fleet (select)	Liner Type (select)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Scarify/ Ripping Fleet (select)
1	PD-12 Sediment Pond Removal	1	Clay - Dry	Large		Topsoil	Large Truck		Mix 1	Straw Mulch	None	Yes	Large Dozer
2													

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Drainage Control - Calculations

Diversion Ditch Volume Calculation

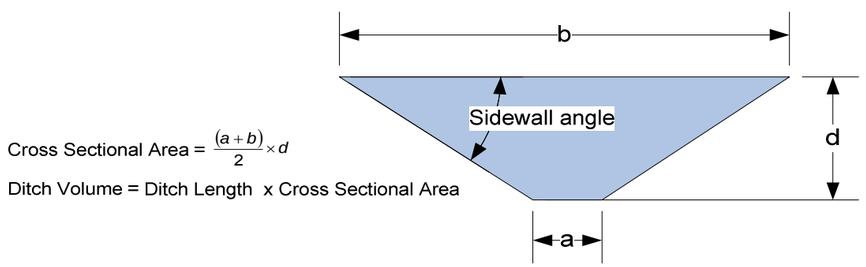
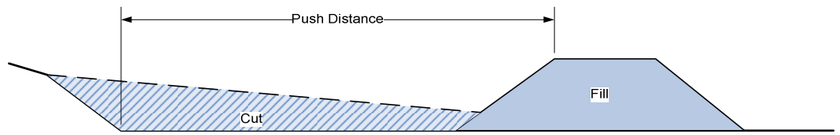


Figure 1 - Ditch Volume Calculation

1) Assume 20% swell for excavations
2) Assumes heavy duty trenching bucket is used

Sediment/Evaporation Pond Construction Calculation



Cut = Fill
Push distance = pond width up to 2/3 max push distance (120 m)

Figure 2 - Sediment Ponds

1) Assume balanced cut-to-fill for berm construction
2) Include cost for liner, if required.
3) Include line items for removal, if necessary.
4) Assume 20% swell for excavations
5) Minimum 1 hr ripping/scarifying per area
6) Minimum 0.4 ha revegetation crew time per area

Closure Cost Estimate
Sediment & Drainage Control

Diversion Ditches - Excavation Costs

	Description (required)	Diversion Ditch Volume LCM	Diversion Ditch Equipment	Corrected Excavator Productivity LCM/hr	Total Hours	Diversion Ditch Labor Cost $	Diversion Ditch Equipment Cost $	Total Diversion Ditch Cost $	Liner Installation: Total Labor Cost $	Liner Installation: Total Equipment Cost $	Liner Installation: Total Material Cost $	Liner Installation: Total Liner Cost $	Rip-Rap Installation: Labor Cost $	Rip-Rap Installation: Equipment Cost $	Rip-Rap Installation: Material Cost $	Rip-Rap Installation: Total Cost $
1	**BRSF Dump Terrace Channels**	27,023	330C	369	80	$1,242	$7,069	$8,311	$104,230	$153,772	$165,996	$423,998	$0	$0	$0	$0
2	**BRSF Downchutes**	992	330C	369	3	$47	$265	$312	$65,400	$84,995	$182,516	$332,911	$0	$0	$0	$0
3	**BRSF perimeter Drain - Grouted Riprap**	7,207	330C	369	21	$326	$1,856	$2,182	$19,459	$28,708	$30,990	$79,157	$0	$0	$0	$0
4	**BRSF Perimeter Drain HD TRM**	10,600	330C	369	31	$481	$2,739	$3,220	$0	$0	$0	$0	$168,377	$98,163	$225,404	$491,944
5	**Heap Leach Terrace Channels**	2,921	330C	369	9	$140	$795	$935	$98,575	$145,429	$156,990	$400,994	$0	$0	$0	$0
6	**Heap Leach Downchutes**	1,592	330C	369	5	$78	$442	$520	$87,624	$113,877	$244,538	$446,039	$0	$0	$0	$0
7	**Heap Leach Downchutes**	110	330C	369	0	$16	$88	$104	$7,093	$9,218	$19,795	$36,106	$0	$0	$0	$0
8	**Heap Leach Topdeck Drain**	6,148	330C	369	18	$279	$1,590	$1,869	$16,599	$24,488	$26,435	$67,522	$0	$0	$0	$0
9	**Pit Backfill Bench Drain**	32,888	330C	369	97	$1,505	$8,571	$10,076	$53,816	$79,396	$85,708	$218,920	$0	$0	$0	$0
10	**Pit Backfill Topdeck Drain**	2,862	330C	369	8	$124	$707	$831	$10,947	$16,150	$17,434	$44,531	$0	$0	$0	$0
11	**Pit Backfill Downdrain**	150	330C	369	0	$16	$88	$104	$9,923	$12,896	$27,692	$50,511	$0	$0	$0	$0
12	**Pit Backfill Channel Drain**	6,569	330C	369	19	$295	$1,679	$1,974	$15,341	$22,633	$24,433	$62,407	$0	$0	$0	$0
13	**Pit Backfill Channel Drain - steep**	10,837	330C	369	32	$497	$2,828	$3,325	$0	$0	$0	$0	$172,744	$100,709	$231,250	$504,703
		109,900			323	**$5,046**	**$28,717**	**$33,763**	**$489,007**	**$691,562**	**$982,527**	**$2,163,096**	**$341,121**	**$198,872**	**$456,654**	**$996,647**

Notes: LCM assumes 20% swell from ditch volume

Diversion Ditches - Revegetation Costs

	Description (required)	Surface Area ha	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**BRSF Dump Terrace Channels**	7.16	$531	$3,981	$12,111	$16,623
2	**BRSF Downchutes**	0.12	$30	$225	$203	$458
3	**BRSF perimeter Drain - Grouted Riprap**	0.73	$54	$405	$1,235	$1,694
4	**BRSF Perimeter Drain HD TRM**	2.02	$150	$1,125	$3,417	$4,692
5	**Heap Leach Terrace Channels**	5.87	$435	$3,261	$9,929	$13,625
6	**Heap Leach Downchutes**	0.20	$30	$225	$338	$593
7	**Heap Leach Downchutes**	0.04	$30	$225	$68	$323
8	**Heap Leach Topdeck Drain**	0.28	$30	$225	$474	$729
9	**Pit Backfill Bench Drain**	2.59	$192	$1,439	$4,381	$6,012
10	**Pit Backfill Topdeck Drain**	0.49	$36	$270	$829	$1,135
11	**Pit Backfill Downdrain**	0.04	$30	$225	$68	$323
12	**Pit Backfill Channel Drain**	0.61	$45	$337	$1,032	$1,414
13	**Pit Backfill Channel Drain - steep**	0.97	$72	$540	$1,641	$2,253
		21.12	**$1,665**	**$12,483**	**$35,726**	**$49,873**

Closure Cost Estimate
Sediment & Drainage Control

Sediment/Evaporation Ponds - Construction/Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83)

	Description (required)	Regrading Volume m3	Sed/Evap Pond Equipment	Dozing Distance (see above) m	Uncorrected Dozer Productivity LCM/hr	Grade Correction	Density Correction	Excavating Material	Corrected Productivity LCM/hr	Total Dozer Hours hr	Earthwork: Total Labor Cost $	Earthwork: Total Equipment Cost $	Earthwork: Total Constr/ Regrading Cost $	Liner: Total Labor Cost $	Liner: Total Equipment Cost $	Liner: Total Material Cost $	Liner: Total Liner Cost $
1	**PD-12 Sediment Pond Removal**	22,000	D10R	75	576	1.00	0.92	1.00	330	67	$1,040	$15,721	$16,761	$0	$0	$0	$0
2											$0	$0	$0	$0	$0	$0	$0
		22,000								67	**$1,040**	**$15,721**	**$16,761**	**$0**	**$0**	**$0**	**$0**

Sediment/Evaporation Ponds - Growth Media Costs

	Description (required)	Growth Media: Growth Media Volume m3	Growth Media Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Placement Cost $
1	**PD-12 Sediment Pond Removal**	1,727	785C/992G	591	1	3	$186	$2,825	$3,011
2							$0	$0	$0
		1,727				3	**$186**	**$2,825**	**$3,011**

Sediment/Evaporation Ponds - Revegetation Costs

	Description (required)	Surface Area ha	Long Ripping Distance m	Area Width m	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**PD-12 Sediment Pond Removal**	0.57	75	75	1	$16	$235	$251	$42	$315	$964	$1,321
2						$0	$0	$0	$0	$0	$0	$0
		0.57	75		1	**$16**	**$235**	**$251**	**$42**	**$315**	**$964**	**$1,321**

Closure Cost Estimate
Process Ponds

Process Ponds - Cost Summary	Labor	Equipment	Materials	Totals
Backfilling Costs	$0	$0	N/A	$0
Growth Media Placement Costs	$1,117	$16,951	N/A	$18,068
Liner Cutting & Folding Costs	$2,180	$3,605	N/A	$5,785
Subtotal Earthworks	**$3,297**	**$20,556**	**$0**	**$23,853**
Revegetation Costs	$249	$1,867	$5,683	$7,799
TOTALS	**$3,546**	**$22,423**	**$5,683**	**$31,652**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Process Ponds - User Input — **You must fill in ALL green cells and relevant blue cells in this section for each pond**

	Facility Description		Pond Dimensions (1)					Backfill - (If trucks are used) (1)				Growth Media		
	Description (required)	ID Code	Pond Length m	Pond Width m	Pond Depth m	Pond Sideslope Angle _H:1V	Disturbed Area (if calculated elsewhere) ha	Percent Backfill (100% if blank)	Distance from Backfill Borrow m	Slope from Facility to Borrow Area % grade	Pond Volume (if calculated elsewhere) m3	Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Facility to Stockpile % grade
1	**HLF Detention Pond**	**100**	**294**	**90**	**10.0**	**2.0**	**3.36**	**0%**				**300**	**100**	**1%**
2	**PD-1 Storm Pond #1 - HLF**	**100**	**137**	**113**	**14.0**	**2.5**	**1.55**	**0%**	**0**	**0%**		**300**	**100**	**1%**
3	**PD-2 Storm Pond #2 - HLF**	**100**	**126**	**126**	**14.0**	**2.5**	**1.59**	**0%**	**0**	**0%**		**300**	**100**	**1%**
4	**PD-3 Storm Pond #3 - HLF**	**100**	**232**	**139**	**14.0**	**2.5**	**3.22**	**0%**	**0**	**0%**		**300**	**100**	**1%**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivity Sheet)
3. PD-1,2,3 and (HLF Process) and PD-8 will be used for the Passive Water Treatment System. No closure cost is required. PWTS cost is included in Table User 2.
4. HLF detention pond (D-1) will be closed by removing the liner, ripping the clay layer, placing 0.3 m of growth medium and revegetating.
The embankment face will be protected by placing a layer of rip rap. Rip rap costs are included in Other User sheet (placement cost) and Haulage.

Process Ponds - User Input (cont.)

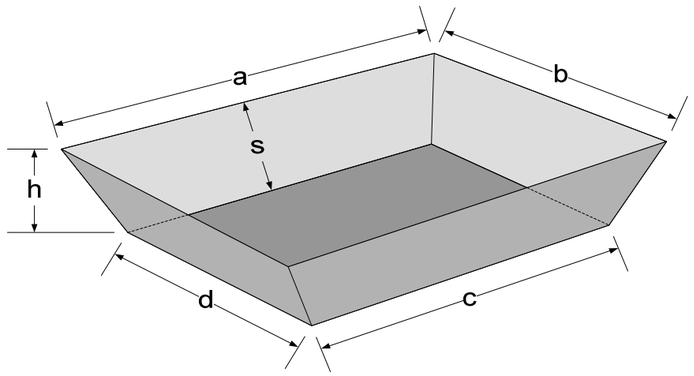
		Liner	Backfill			Growth Media			Revegetation		
	Description (required)	Crew Cut & Fold Time (2) hrs	Backfill Material Type (select)	Backfill Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)
0											
1	**HLF Detention Pond**	**53.7**	**Clay - Dry**	**Large Dozer**		**Topsoil**	**Large Truck**		**Mix 1**	**Straw Mulch**	**None**
2	**PD-1 Storm Pond #1 - HLF**										
3	**PD-2 Storm Pond #2 - HLF**										
4	**PD-3 Storm Pond #3 - HLF**										

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table
(2) Pond liner removal crew (2Clab + excavator) = 2 General Laborers + 325C Excavator

Closure Cost Estimate
Process Ponds

Process Ponds - Calculations

Pond Volume Calculation



Area and Volume of the Frustrum of a Pyramid

$$\text{Surface Area} = ab + cd + (a+b+c+d) \times \frac{s}{2}$$

$$\text{Volume} = \frac{h\,(ab + cd + \sqrt{abcd}\,)}{3}$$

Revegetation Calculations

Minimum 0.4 ha revegetation crew time per area

Closure Cost Estimate
Process Ponds

Process Ponds - Liner Cutting and Folding

	Description (required)	Crew Hours hrs	Total Labor Cost $	Total Equipment Cost $	Total Cover Cost $
0			$0	$0	$0
1	**HLF Detention Pond**	54	$2,180	$3,605	$5,785
2	**PD-1 Storm Pond #1 - HLF**		$0	$0	$0
3	**PD-2 Storm Pond #2 - HLF**		$0	$0	$0
4	**PD-3 Storm Pond #3 - HLF**		$0	$0	$0
		54	**$2,180**	**$3,605**	**$5,785**

Process Ponds - Backfill and Growth Media Costs

		Pond Backfill								Growth Media							
	Description (required)	Backfill Volume m3	Backfill Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours hrs	Total Labor Cost $	Total Equipment Cost $	Total Backfill Cost $	Growth Media Volume m3	Growth Media Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**HLF Detention Pond**	0					$0	$0	$0	10,238	785C/992G	573	1	18	$1,117	$16,951	$18,068
2	**PD-1 Storm Pond #1 - HLF**	0					$0	$0	$0	4,687	**Select Fleet**	**Material Type!**	**Material Type!**	**Material Type!**	$0	$0	$0
3	**PD-2 Storm Pond #2 - HLF**	0					$0	$0	$0	4,811	**Select Fleet**	**Material Type!**	**Material Type!**	**Material Type!**	$0	$0	$0
4	**PD-3 Storm Pond #3 - HLF**	0					$0	$0	$0	9,868	**Select Fleet**	**Material Type!**	**Material Type!**	**Material Type!**	$0	$0	$0
							$0	**$0**	**$0**	29,604				18	**$1,117**	**$16,951**	**$18,068**

Process Ponds - Revegetation Costs

	Description (required)	Surface Area ha	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revegetation Material Cost $	Total Revegetation Cost $
1	**HLF Detention Pond**	3.36	$249	$1,867	$5,683	$7,799
2	**PD-1 Storm Pond #1 - HLF**	1.54	$0	$0	$0	$0
3	**PD-2 Storm Pond #2 - HLF**	1.58	$0	$0	$0	$0
4	**PD-3 Storm Pond #3 - HLF**	3.24	$0	$0	$0	$0
		9.72	**$249**	**$1,867**	**$5,683**	**$7,799**

Closure Cost Estimate
Landfills

Landfills - Cost Summary	Labor	Equipment	Materials	Totals
Grading Costs	$0	$0	N/A	$0
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$993	$15,068	N/A	$16,061
Ripping/Scarifying Cost	$16	$235	N/A	$251
Subtotal Earthworks	**$1,009**	**$15,303**	**$0**	**$16,312**
Revegetation Cost	$69	$517	$1,691	$2,277
TOTALS	**$1,078**	**$15,820**	**$1,691**	**$18,589**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Landfills - User Input — You must fill in ALL green cells and relevant blue cells in this section for each landfill

	Facility Description		Physical (1)			Cover			Growth Media		
	Description (required)	ID Code	Final Landfill Footprint ha	Average Long Dimension (ripping distance) m	Regrade Volume (calculated elsewhere) m3	Cover Thickness mm	Distance from Cover Borrow m	Slope from Landfill to Cover Borrow % grade	Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Landfill to Stockpile % grade
1	**Amulsar Landfill**	**400**	**0.94**	**86**	**0**				**1000**	**95**	**0.0**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Landfills - User Input (cont.) — You must fill in ALL green cells and relevant blue cells in this section for each landfill

		Grading				Cover			Growth Media			Revegetation				
	Description (required)	Dozing Material Condition (select)	Landfill Material Type (select)	Grading Equipment Fleet (select)	Slot/ Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch Type (select)	Fertilizer (select)	Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)
1	**Amulsar Landfill**	**1**	**Alluvium**	**Large**	**Yes**	**Clay - Dry**	**Large Truck**		**Alluvium**	**Large Truck**		**User Mix 1**	**Straw Mulch**	**None**	**Yes**	**Large Dozer**

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Closure Cost Estimate
Landfills

Landfills - Calculations

Dozing, Ripping/Scarifying & Revegetation Calculations

Dozing: Dozing distance = 2/3 of the 180 m maximum from Catepillar Handbook or 120 m
Assumes flat push (grade correction factor = 1)
Minimum 1 hr per area

Ripping: Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr per area

Revegetation: Minimum 0.4 ha revegetation crew time per area

Landfills - Regrading Costs

Productivity = Dozer Productivity x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side)

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Uncorrected Dozer Productivity m3/hr	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity LCM/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Amulsar Landfill**									$0	$0	$0
										$0	**$0**	**$0**

Landfills - Cover and Growth Media Costs

		Cover Placement								Growth Media Placement							
	Description (required)	Cover Volume m	Cover Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume m	Growth Media Replacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Amulsar Landfill**						$0	$0	$0	9,220	785C/992G	570	1	16	$993	$15,068	$16,061
							$0	**$0**	**$0**	9,220				16	**$993**	**$15,068**	**$16,061**

Landfills - Scarifying/Revegetation Costs

	Description (required)	Surface Area ha	Long Dimension m	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Amulsar Landfill**	0.93	86	1	$16	$235	$251	$69	$517	$1,691	$2,277
		0.93		1	**$16**	**$235**	**$251**	**$69**	**$517**	**$1,691**	**$2,277**

Closure Cost Estimate
Yards, Etc.

Yards, Etc. - Cost Summary	Labor	Equipment	Materials	Totals
Regrading Cost	$4,237	$64,057	N/A	$68,294
Cover Placement Cost	$0	$0	N/A	$0
Growth Media Placement Cost	$13,579	$207,372	N/A	$220,951
Ripping/Scarifying Cost	$1,943	$29,329	N/A	$31,272
Subtotal Earthworks	**$19,759**	**$300,758**		**$320,517**
Revegetation Cost	$5,738	$43,022	$77,400	$126,160
TOTALS	**$25,497**	**$343,780**	**$77,400**	**$446,677**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Yards, Etc. - User Input — You must fill in ALL green cells and relevant blue cells in this section for each building or facility

	Facility Description			Physical			Cover			Growth Media		
	Description (required)	ID Code	Type	Area ha	Average Flat Area Long Dimension (ripping distance) m	Regrade Volume (calculated elsewhere) m3	Cover Thickness mm	Distance from Cover Borrow Area m	Slope from Facility to Borrow Area % grade	Growth Media Thickness mm	Distance from Growth Media Stockpile m	Slope from Facility to Stockpile % grade
1	**Topsoil Stockpiles (5)**	**500**	**Other Facilities**	**22.68**	**500**	**0**				**150**	**5**	**1.0**
2	**ADR Platform (PL2)**	**100**	**Yard**	**2.93**	**186**	**0**				**150**	**168**	**-2.6**
3	**Fine Ore stockpile/Truck Loadout (PL3)**	**100**	**Yard**	**4.13**	**286**	**0**				**150**	**2,900**	**1.0**
4	**Conveyor Corridor Platform (PL4)**	**200**	**Yard**	**16.79**	**240**	**48,006**				**150**	**5**	**1.0**
5	**Facilities/admin (PL7)**	**400**	**Yard**	**4.07**	**200**	**0**				**150**	**250**	**2.0**
6	**Camp Platform (PL8)**	**400**	**Yard**	**2.02**	**214**	**0**				**150**	**1,200**	**6.0**
7	**Truck Shop (PL9)**	**400**	**Yard**	**5.21**	**71**	**0**				**150**	**800**	**4.4**
8	**Substation (PL10)**	**400**	**Yard**	**2.78**	**185**	**0**				**150**	**4,600**	**17.0**
9	**Explosive Facility (PL11)**	**400**	**Yard**	**1.15**	**143**	**0**				**150**	**450**	**-5.6**
10	**Crusher (PL12)**	**400**	**Yard**	**7.20**	**486**	**0**				**150**	**3,450**	**-2.9**
11	**Fuel Storage (PL13)**	**400**	**Yard**	**7.61**	**371**	**0**				**150**	**2,830**	**10.2**
12	**Contractor HLF Ore Placement Facilities (PL21)**	**400**	**Yard**	**0.85**	**134**	**0**				**150**	**500**	**1.0**
13												

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Yards, Etc. - User Input (cont.) — You must fill in ALL green cells and relevant blue cells in this section for each building or facility

		Grading			Cover			Growth Media			Revegetation				
	Description (required)	Dozing Material Condition (select)	Dozing Material Type (select)	Grading Equipment Fleet (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Ripping Fleet (select)
1	**Topsoil Stockpiles (5)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
2	**ADR Platform (PL2)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
3	**Fine Ore stockpile/Truck Loadout (PL3)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
4	**Conveyor Corridor Platform (PL4)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
5	**Facilities/admin (PL7)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
6	**Camp Platform (PL8)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**

Closure Cost Estimate
Yards, Etc.

7	**Truck Shop (PL9)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
8	**Substation (PL10)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
9	**Explosive Facility (PL11)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
10	**Crusher (PL12)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
11	**Fuel Storage (PL13)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
12	**Contractor HLF Ore Placement Facilities (PL21)**	**0.8**	**Clay - Dry**	**Large**	**Topsoil**	**Large Truck**		**Topsoil**	**Large Truck**		**Mix 1**	**None**	**None**	**Yes**	**Large Dozer**
13															

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Closure Cost Estimate
Yards, Etc.

Yards, Etc. - Calculations

Grading Calculations

Average push distance assumed to be 2/3 of the 180 m maximum from Catepillar Handbook or 120 m
Material assumed to be loose stockile (1.2 productivity factor)
Slope assumed to be 0 to 5% (1.0 productivity factor)

Cover Volume Calculation

Yard area x cover thickness

Ripping/Scarifying Calculations

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr ripping/scarifying per area

Revegetation

Minimum 0.4 ha revegetation crew time per area

Yards, Etc. - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side

	Description (required)	Regrading Volume m3	Dozing Distance (see above) m	Uncorrected Dozer Productivity m3/hr	Grade Correction	Dozing Material	Density Correction	Total Hourly Productivity m3/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	Topsoil Stockpiles (5)									$0	$0	$0
2	ADR Platform (PL2)									$0	$0	$0
3	Fine Ore stockpile/Truck Loadout (PL3)									$0	$0	$0
4	Conveyor Corridor Platform (PL4)	48,006	122	383	1.0	0.8	0.92	176	273	$4,237	$64,057	$68,294
5	Facilities/admin (PL7)									$0	$0	$0
6	Camp Platform (PL8)									$0	$0	$0
7	Truck Shop (PL9)									$0	$0	$0
8	Substation (PL10)									$0	$0	$0
9	Explosive Facility (PL11)									$0	$0	$0
10	Crusher (PL12)									$0	$0	$0
11	Fuel Storage (PL13)									$0	$0	$0
12	Contractor HLF Ore Placement Facilities (PL21)									$0	$0	$0
13										$0	$0	$0
		48,006							273	**$4,237**	**$64,057**	**$68,294**

Yards, Etc. - Cover and Growth Media Costs

		Cover								Growth Media							
	Description (required)	Cover Volume m3	Topsoil Repacement Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Cost $	Growth Media Volume m3	Growth Media Fleet	Fleet Productivity LCM/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	Topsoil Stockpiles (5)						$0	$0	$0	34,537	785C/992G	591	1	58	$3,601	$54,620	$58,221
2	ADR Platform (PL2)						$0	$0	$0	4,441	785C/992G	535	1	8	$497	$7,534	$8,031
3	Fine Ore stockpile/Truck Loadout (PL3)						$0	$0	$0	6,291	785C/992G	797	3	8	$745	$11,442	$12,187
4	Conveyor Corridor Platform (PL4)						$0	$0	$0	25,595	785C/992G	591	1	43	$2,669	$40,494	$43,163
5	Facilities/admin (PL7)						$0	$0	$0	6,229	785C/992G	539	1	12	$745	$11,301	$12,046
6	Camp Platform (PL8)						$0	$0	$0	3,083	785C/992G	742	2	4	$310	$4,744	$5,054
7	Truck Shop (PL9)						$0	$0	$0	7,956	785C/992G	881	2	9	$698	$10,674	$11,372

Closure Cost Estimate
Yards, Etc.

8	**Substation (PL10)**						$0	$0	$0	4,256	785C/992G	839	9	5	$931	$14,479	$15,410
9	**Explosive Facility (PL11)**						$0	$0	$0	1,727	785C/992G	823	2	2	$155	$2,372	$2,527
10	**Crusher (PL12)**						$0	$0	$0	10,978	785C/992G	855	4	13	$1,412	$21,769	$23,181
11	**Fuel Storage (PL13)**						$0	$0	$0	11,594	785C/992G	774	4	15	$1,630	$25,118	$26,748
12	**Contractor HLF Ore Placement Facilities (PL21)**						$0	$0	$0	1,295	785C/992G	498	1	3	$186	$2,825	$3,011
13							$0	$0	$0						$0	$0	$0
							$0	**$0**	**$0**	117,982				180	**$13,579**	**$207,372**	**$220,951**

Closure Cost Estimate
Yards, Etc.

Yards, Etc. - Scarifying/Revegetation Costs

	Description (required)	Surface Area ha	Area Long Dimension m	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Topsoil Stockpiles (5)**	22.66	500	36	$559	$8,447	$9,006	$1,679	$12,594	$22,660	$36,933
2	**ADR Platform (PL2)**	2.91	186	5	$78	$1,173	$1,251	$216	$1,619	$2,910	$4,745
3	**Fine Ore stockpile/Truck Loadout (PL3)**	4.13	286	7	$109	$1,642	$1,751	$306	$2,294	$4,130	$6,730
4	**Conveyor Corridor Platform (PL4)**	16.79	240	27	$419	$6,335	$6,754	$1,245	$9,333	$16,790	$27,368
5	**Facilities/admin (PL7)**	4.09	200	7	$109	$1,642	$1,751	$303	$2,271	$4,090	$6,664
6	**Camp Platform (PL8)**	2.02	214	3	$47	$704	$751	$150	$1,125	$2,020	$3,295
7	**Truck Shop (PL9)**	5.22	71	9	$140	$2,112	$2,252	$387	$2,901	$5,220	$8,508
8	**Substation (PL10)**	2.79	185	5	$78	$1,173	$1,251	$207	$1,552	$2,790	$4,549
9	**Explosive Facility (PL11)**	1.13	143	2	$31	$469	$500	$84	$630	$1,130	$1,844
10	**Crusher (PL12)**	7.20	486	11	$171	$2,581	$2,752	$534	$4,003	$7,200	$11,737
11	**Fuel Storage (PL13)**	7.61	371	12	$186	$2,816	$3,002	$564	$4,228	$7,610	$12,402
12	**Contractor HLF Ore Placement Facilities (PL21)**	0.85	134	1	$16	$235	$251	$63	$472	$850	$1,385
13					$0	$0	$0	$0	$0	$0	$0
		77.40		125	**$1,943**	**$29,329**	**$31,272**	**$5,738**	**$43,022**	**$77,400**	**$126,160**

Closure Cost Estimate
Waste Disposal

Waste Disposal - Cost Summary

	Labor	Equipment	Fees	Totals
Solid Waste - On Site	$489	$3,592	N/A	$4,081
Solid Waste - Off Site				$0
Hazardous Materials				$7,482
Hydrocarbon Contaminated Soils	$233	$474	$8,567	$9,274
TOTALS	**$722**	**$4,066**	**$8,567**	**$20,837**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Waste Disposal - User Input - Solid Waste

						Landfill (Bulk) Disposal			Dumpster
	Description (required)	ID Code	Waste Type (select)	Disposal Method (select)	Quantity m3	Distance to Landfill m	Slope to Landfill % grade	Number of Trucks (user override)	Months Dumpster Rental months
1	**Construction Debris removal**		**Other Facilities**	**Landfill (bulk)**	**1,000**	**2500**	**1.0**		**12**
2									

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Waste Disposal - User Input - Hazardous Materials

	Description (required)	ID Code	Waste Type (select)	Container Type (select)	Vacuum Truck Size (select)	Liquid Quantity litres	Soild Quantity m3	One Way Travel Distance to Disposal Site km	One Way Travel Time to Disposal Site hr
1	**Crusher Grease and Reagent Disposal**		**Other Facilities**	**Liquid 200-L drum**	**Large (5,000 ga**	**4,163**		**2.5**	**0.5**
2	**"Other" Reagents**		**Other Facilities**	**Liquid 200-L drum**	**Large (5,000 ga**	**1,040**		**2.5**	**0.5**

Notes:
1. Use Other Demo & Equip Removal Sheet for tank removal

Closure Cost Estimate
Waste Disposal

Waste Disposal - User Input - Hydrocarbon Contaminated Soils

	Description (required)	ID Code	Waste Type (select)	Disposal Method (select)	Quantity m3	Travel Distance to Offsite Disposal km
1	**Hydrocarbon Contaminated Soils**		**Other Facilities**	**On site**	**500**	**3**

Notes:
1. Use Yards or Landfills Sheets for bioremediation facility reclamation

Waste Disposal - Assumptions & Calculations

Solid Waste Disposal

Off site disposal assumes use of average rolloff dumpster [30 cy (m3), 10 ton (tonne)]
On site disposal assumes use of small loader/truck fleet for haulage
Average density for on site disposal = 2,600 lb/cy (1,540 kg/m3)
For on site disposal only 1 truck is required unless total truck hours > 8, only 2 trucks unless total truck hours are > 16

Hazardous Materials Disposal

Assumes all hazardous materials are known
Enter EITHER solid or liquid quantity each line.
If container type = 55 gallon (200 liter) drum then solid waste hauling costs apply
Average density for solids assumed to be 2,600 lb/cy (1,540 kg/m3)
Vacuum truck sizes: small = 2,200 gal (~8,300 litres), large = 5,000 gal (~19,000 litres)
Vacuum truck on site for 4 hours for each load

Hydrocarbon Contaminated Soils Disposal

Assumes all hazardous materials are known
On site disposal assumes biopad treatment
Exavation productivity =45 cy./hr (35 m3/hr) (Means Heavy Construction, 2006: 02315-424-0360)

Closure Cost Estimate
Waste Disposal

Waste Disposal - Solid Waste Disposal

	Description (required)	Waste Volume m3	Number of Off Site Dumpster Loads	Landfill Fleet Equipment	Landfill Fleet Productivity LCM/hr	Number of Trucks	Total Fleet Hours	Total Dumpster Cost $	Total Labor Cost $	Total Equipment Cost $	Total Waste Disposal Cost $
1	**Construction Debris removal**	1,000		730	159	2	6	$0	$489	$3,592	$4,081
2								$0	$0	$0	$0
		1,000					6	**$0**	**$489**	**$3,592**	**$4,081**

Waste Disposal - Hazardous Materials Disposal

	Description (required)	Liquid Waste Volume litres	Solid Waste Volume m3	Number of Truck Loads	Tonnes of Waste Tonnes	Pick-up Fees $	Transport Fees $	Disposal Fees $	Total Hazardous Material Cost $
1	**Crusher Grease and Reagent Disposal**	4,163		1	5	$4,740	$33	$1,243	$6,016
2	**"Other" Reagents**	1,040		1	1	$1,185	$33	$249	$1,467
		5,203			6	**$5,925**	**$66**	**$1,491**	**$7,482**

Waste Disposal - Hydrocarbon Contaminated Soils

	Description (required)	Quantity m3	Total Fleet Hours	Treatment Cost $	Transport Fees $	Disposal Fees $	Total Labor Cost $	Total Equipment Cost $	Total Waste Disposal Cost $
1	**Hydrocarbon Contaminated Soils**	500		$8,567	$0	$0	$233	$474	$9,274
		500		**$8,567**	**$0**	**$0**	**$233**	**$474**	**$9,274**

Closure Cost Estimate
Well Abandonment

Well Abandonment	Labor	Equipment	Materials	Totals
Production, Dewatering, Infiltration Wells	$0	$0	$0	$0
Monitoring Wells	$8,802	$53,566	$3,791	$66,159
TOTALS	**$8,802**	**$53,566**	**$3,791**	**$66,159**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Well seal thickness: **50** m
Minimum seal above groundwater table: **20** m

Production, Dewatering and Infiltration Well Closure

	Description (required)	ID Code	Number of Holes	Casing Diam mm	Average Depth[1] m bgs	Depth to First Water m bgs	Original Static Water Level m bgs	Top of Slotted Casing[2] m bgs	Blank Casing Below Top of Screen[2] m	Type of Pump (if any) (select)	Depth to Pump m bgs	Hole Plug Method (select)	Casing Volume per m m3	Perforation Length [3,4] m	Grout Volume per Hole[4,5] m3	Cement Volume per Hole[6] m3	Inert Media Volume per Hole[7] m3	Pump Removal Labor Cost $	Pump Removal Equip Cost $	Perf Labor Cost $	Perf Equip Cost [8] $	Grout + Cement Labor Cost[9] $	Grout + Cement Equip Cost[9] $	Grout + Cement Material Cost $	Inert Media Labor Cost[10] $	Inert Media Equip Cost[9] $	Total Cost $
																		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

(1) For previously abandoned holes enter "0" for depth
(2) Wells abandoned per Nevada Administrative Code (NAC 534.420). Hole grouted and perforated from bottom to 50 feet (15.24m) above the top of the screen, or first water encountered or original static water level, depending on vertical hydraulic gradient and well construction parameters. Inert media (cuttings or alluvium) used from top of grout to top seal.
(3) Perforation length = amount of blank casing below first water (for confined aquifers) or predicted recovered water table (unconfined aquifers) + 50 feet (15.24m) of blank casing above water table
(4) Assumes 50' (15.24m) sanitary seal at top of hole. Therefore, perforation and grouting only required to bottom of sanitary seal.
(5) Assumes 100% loss to formation for grout (abandonite) for screened and perforated sections.
(6) Assumes 10' (3m) top seal of cement in casing only. See note 4.
(7) Inert material is cuttings or alluvium sourced locally.
(8) Includes perforation tool wear cost/ft of perforation (see Productivty Sheet).
(9) See Productivity Sheet for hourly production. Minimum 1 hr per hole + fixed hours per hole for move and setup. If no perforation required, use standard drill rig.
(10) See Productivity Sheet for hourly production. Minimum 1 hr per hole.

Notes:

Closure Cost Estimate
Well Abandonment

Monitoring Well Closure

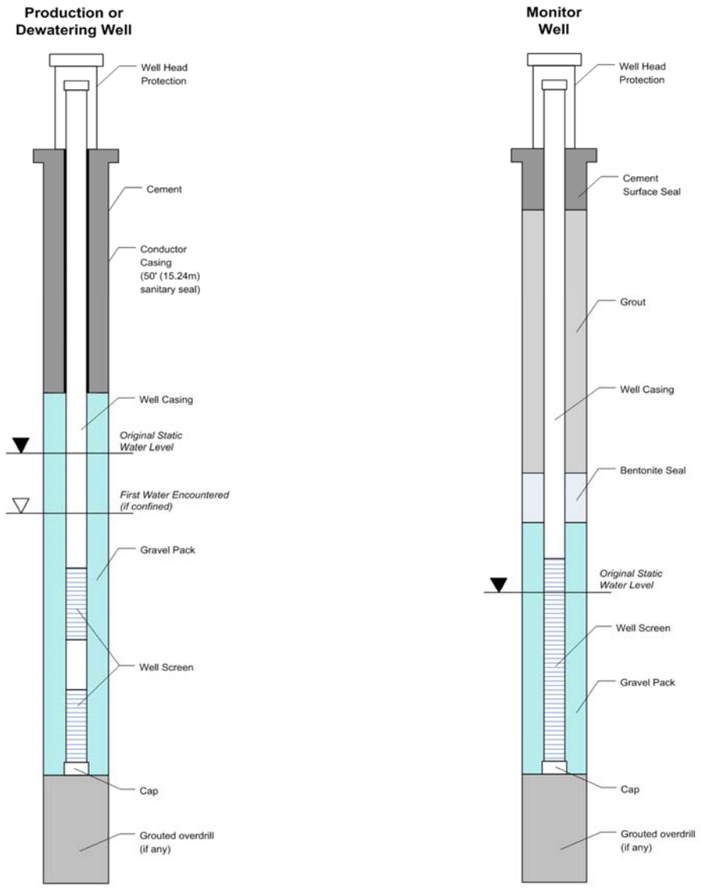
	Description (required)	ID Code	Number of Holes	Casing Diam mm	Average Depth m bgs	Top of Screen[1] m bgs	Hole Plug Method (select)	Casing Volume per m m3	Grout Volume/ Well[2,3] m3	Cement Volume per Hole[4] m3	Inert Backfill Volume per Hole[5] m3	Total Grouting Hours/ Hole hr	Total Inert Media Hours/ Hole hr	Grout + Cement Labor Cost[6] $	Grout + Cement Equip Cost[6] $	Grout + Cement Material Cost $	Inert Material Labor Cost[7] $	Inert Material Equip Cost[7] $	Total Cost $
1	**Abandon GW Monitoring Wells**		**70**	**108.0**	**63**	**40**	**Grout + Ba**	0.003	0.14	0.52		3.1		$8,802	$53,566	$3,791	$0	$0	$66,159
														$8,802	**$53,566**	**$3,791**	**$0**	**$0**	**$66,159**

Wells abandoned per NAC 534.420 with bentonite grout placed to 50 feet above the top of the screen (see note 1).
(1) Assumes top of screen is at or above the static water level (in unconfined aquifers) or the depth of first water encountered (in confined aquifers).
(2) Assumes 25% loss to formation for grouting
(3) Grouting only required to 50' (15.24m) above the top of screen because monitor wells are constructed with a seal in the annular space.
(4) Assumes top 10' (3m) plugged with cement.
(5) Assumes hole plugged with inert material (cuttings or alluvium) above grout up to cement surface plug.
(6) See Productivity Sheet for hourly production. Minimum 1 hr per hole + fixed hours per hole for move and setup (see Productivty Sheet).
(7) See Productivity Sheet for hourly production. Minimum 1 hr per hole.

Notes:

Closure Cost Estimate
Well Abandonment

Well Construction



Closure Cost Estimate
Misc. Costs

Miscellaneous Cost Summary

	Labor	Equipment	Materials	Totals
Fence Removal	$66,877	$51,383	N/A	$118,260
Fence Installation	$0	$0	$0	$0
Culvert & Buried Pipe Removal	$4,207	$4,882	N/A	$9,089
Surface Pipe Removal	$0	$0	N/A	$0
Power Lines	$683,020	N/A	N/A	$683,020
Substations/Transformers	$82,500	N/A	N/A	$82,500
Rip-rap, rock lining, gabions	$0	$0	$0	$0
Other Costs	$5,115	$14,066	$0	$19,181
TOTALS	**$841,719**	**$70,331**	**$0**	**$912,050**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Fence Removal

You must fill in ALL green and blue cells

					Costs		
	Description (required)	ID Code	Length m	Type (select type)	Labor Cost $	Equipment Cost $	Total Cost $
1	**Fencing and Gates**	**100**	**9933**	**Chain link 8-10 ft**	$23,740	$27,514	$51,254
2	**Fencing and Gates**	**100**	**14379**	**Barbed 4-strand**	$43,137	$23,869	$67,006
					$66,877	**$51,383**	**$118,260**

Notes:

Fence Installation

You must fill in ALL green and blue cells

			Input		Costs			
	Description (required)	ID Code	Length m	Type (select type)	Labor Cost $	Equipment Cost $	Material Cost ($)	Total Cost $
					$0	**$0**	**$0**	**$0**

Notes:

Closure Cost Estimate
Misc. Costs

Culvert & Buried Pipe Removal

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Length m	Input: Type (select type)	Input: Location (select)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Total Cost $
0	Culverts	100	234	36 in (1m) Diame	On site	$2,813	$3,264	$6,077
1	Culverts	100	116	36 in (1m) Diame	On site	$1,394	$1,618	$3,012
2	Culverts	100		24 in (600 mm) Di	On site	$0	$0	$0
3	Culverts	100	0	12 in (300 mm) D	On site	$0	$0	$0
						$4,207	**$4,882**	**$9,089**

Notes:

Surface Pipe Removal

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Length m	Input: Type (select type)	Input: Location (select)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Total Cost $
						$0	**$0**	**$0**

Notes:

Power Line and Substation Removal

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Power Line Length km	Input: Power Line Type (select)	Input: Number of Substations #	Input: Location (select)	Costs: Power Line Removal $	Costs: Substation Removal $	Costs: Total Cost $	Cost Breakdown: Labor Cost $	Cost Breakdown: Equipment Cost $
1	Overhead Power Services to Demoed Bldgs.		18.55	Single Pole	3	On-site	$683,020	$82,500	$765,520	$153,104	$612,416
							$683,020	**$82,500**	**$765,520**	**$153,104**	**$612,416**

Notes: If substation owned by operator, use Other Demo & Equipment Removal sheet
User may need to add line items in Foundations & Buildings for substation slab demolition and fence removal
Labor/Equipment costs assume approximately 80% of cost are equipment and 20% are labor related costs
Power line and substation removal unit rates from SRCE provided estimate for Nevada.

Closure Cost Estimate
Misc. Costs

Rip-Rap & Rock Lining

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Area m2	Input: Type (select type)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Material Cost $	Costs: Total Cost $
					$0	$0	$0	$0

Notes:

Other Costs

	Description (required)	Input: Quantity	Input: Units	Costs: Labor Unit Cost ($)	Costs: Equipment Cost ($)	Costs: Material Cost ($)	Costs: Total Cost $		
0	**Excavate pit wall diversion**	**1738**	**m3**	**$2.94**	**$8.09**	**$0.00**	$19,181		
				$5,115	**$14,066**	**$0**	**$19,181**		

Notes: **1. Cost to excavate pit wall cutoff diversion on 2830 bench, assumes 385BL excavator with H180D hammer**

Closure Cost Estimate
Monitoring

Reclamation Monitoring & Maintenance - Cost Summary				
	Labor	**Equipment**	**Lab & Materials**	**Totals**
Revegetation Maintenance	$8,905	$66,781	$120,166	$195,852
Erosion Maintenance	$0	$0	N/A	$0
Reclamation Monitoring	$90,400	$0	N/A	$90,400
Subtotal Reclamation Monitoring	**$99,305**	**$66,781**	**$120,166**	**$286,252**
Water Quality Monitoring	$19,400	$5,924	$99,000	$124,324
TOTAL MONITORING	**$118,705**	**$72,705**	**$219,166**	**$410,576**

Reclamation Maintenance

Description	Total Revegetation Surface Area (1,2) ha	% Area Requiring Reseeding	Seed Mix (select)	Area Requiring Reseeding ha	Seed $/ha	Labor $/ha	Equipment $/ha	Totals $
Revegetation Maintenance	601	**20%**	**User Mix 1**	120.2	$1,000.00	$74.11	$555.74	
Labor								$8,905
Equipment								$66,781
Materials								$120,166
Cost/Ha								$1,630
							Subtotal	**$195,852**

Notes: 1) Surface area is NOT the same as footprint disturbance area typically used for permitting purposes.
2) If BRCE model, revegetation surface area determined by area included in PER, LOM or Surety estimate

	Total Volume Growth Media m3	% Volume Requiring Maintenance	Average Growth Media Placement Cost $/m3	Volume Requiring Replacement m3		Labor (assume: 25%) $/ha	Equipment (assume: 75%) $/ha	Total $
Erosion Maintenance	1,282,445		$2.01	0		$0.00	$0.00	$0

Notes:

Reclamation Monitoring

Description	Hrs/Day	Days/Year	Number of Years	Rate $/hr		
Field Work						
Field Geologist/Engineer				$95.00		$0
Range Scientist	**12**	**20**	**5**	$59.50		$71,400
Reporting						
Field Geologist/Engineer	**8**	**5**	**5**	$95.00		$19,000
Range Scientist				$59.50		$0
					Subtotal	**$90,400**
Travel						
	Hrs/Trip hr	**Trips/Year**	**Years**	**Truck Cost** $/hr		
Travel				$22.37		$0
					Subtotal	**$0**
					Total Reclamation Monitoring	**$90,400**

Notes:

Closure Cost Estimate
Monitoring

Water and Rock Sample Analysis

Description	Samples #	Events/Year	No. Years	First Sample Year closure year (1-100)	No. of Samplers	Days/Event	Hrs/Day	Analysis Cost $/sample	Supplies $/sample	Lab Cost $	Material Cost $	Equipment Cost $	Labor Cost $	Cost $	Comments
Lab Costs	**9**	**4**	**5**	**1**	**1**	**2**	**10**	$500.00	$50.00	$90,000	$9,000	$5,924	$19,400	$124,324	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
														$0	
										$90,000.00	$9,000.00	$5,924.00	$19,400.00		
													Subtotal Sampling Costs	**$124,324**	

Notes: Sampling labor cost = No. Samplers x Years x Events/year x Days/event x Hour/Day x Labor Rate
Sampling equipment costs include 1 pickup truck for every two samplers

Ground & Surface Water Monitoring

Pump Costs

Description	No. of units		Years		Cost $
Pump (purchased)		Replacement period (yrs):			$0
				Subtotal Field Work	**$0**

Notes: Replacement period = frequency of pump replacement

Reporting

Description	Hrs/Event	Rate $/hr	Cost $
Field Geologist/Engineer			
		Subtotal Reporting	

Notes:

Closure Cost Estimate
Constr. Mgmt

Construction Management & Road Maintenance - Cost Summary				
	Labor	Equipment	Materials	Totals
Construction Management	$202,188	$157,104	N/A	$359,292
Construction Support		$0		$0
Road Maintenance	$9,685	$61,272	$0	$70,957
TOTAL CONSTRUCTION MANAGEMENT	**$211,873**	**$218,376**	**$0**	**$430,249**

Construction Management

Construction Management Staff

Description	Duration mo.	Hours/ Month hr.	Number of Supervisors	Supervisor Rate $/hr	Labor Cost $	Equipment Cost[1] $	Totals $
Active Reclamation	**18**	**220**	**2**	$19.06	$150,955	$117,295	$268,250
Monitoring & Maintenance	**84**	**16**	**2**	$19.06	$51,233	$39,809	$91,042
				Total Staff	**$202,188**	**$157,104**	**$359,292**

Construction Management Support

Description	Duration mo.	Number of Units		Rental Rate $/mo	Generator Cost $/mo	Equipment Cost[1] $	Totals $
Temporary Office Rental						$0	$0
Temporary Toilets						$0	$0
					Total Support	**$0**	**$0**

Notes: Office rental assumes only 1 generator required for every 4 trailers

Total Construction Management	**$359,292**

Closure Cost Estimate
Constr. Mgmt

Road Maintenance

Description	Fleet Size (select)	Number	Duration mo.	Hours/ Month hr.	Labor Cost $	Equipment Cost $	Totals $
Active Reclamation							
Water Truck	Medium	1	18	8	$2,235	$9,975	$12,210
Grader	Medium	1	18	8	$2,235	$15,389	$17,624
Monitoring & Maintenance							
Water Truck	Medium				$0	$0	$0
Grader	Medium	1	42	8	$5,215	$35,908	$41,123

Description	Litres/ Day	Days/ Month	Duration mo.	Cost/ Litre $			Totals $
Water Fees							
Water Fees							$0
				Total Project Maintenance	**$9,685**	**$61,272**	**$70,957**

Notes: 1) Supervisor equipment = pickup truck

Closure Cost Estimate
Labor Rates

Color Code Key	
User Input - Direct Input	Direct Input
User Input - Pull Down List	Pull Down Selection
Program Constant (can override)	Alternate Input
Program Calculated Value	Locked Cell - Formula or Reference

ZONE ADJUSTMENTS

Cost Basis/Project Region	Amulsar Owner Operator	Equipment rates assume owner operator from AMC per Lydian direction July 2014.
Power Equipment Operators	KDE Cost Est. Rate	$0.00
Truck Drivers	KDE Cost Est. Rate	$0.00
Laborers	KDE Cost Est. Rate	$0.00

INDIRECT COSTS

Unemployment (%)	
Retirement/SS/Medicare (%)	
Workman's Compensation (%)	

Other Indirects

State Payroll Tax (13),(15),(17),(1	
Total Other Indirects	**0.00%**

HOURLY LABOR RATE TABLE

EQUIPMENT TYPE (1) OR JOB DESCRIPTION	Labor Group	Base Rate ($/hr)	Zone Adjustment ($/hr)	Hourly Wage ($/hr)	Fringe ($/hr)	Retirement/ Medicare ($/hr)	Unemployment Insurance ($/hr)	Workman's Compensation ($/hr)	Other Indirect Costs ($/hr)	Additional User Markups to Base Rate† ($/hr)	Additional User Markups to Base Rate† %	Additional User Markups to Base Rate† ($/hr)	Total ($/hr)
Equipment Operators ($/hr) (2)													
Bulldozers													
D6R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D6R w/ Winch	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D7R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D8R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D9R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D10R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
D11R	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Wheeled Dozers													
824G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
834G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
844	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
854G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Motor Graders													
120H	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
14G/H	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
16G/H	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
24M	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52

Closure Cost Estimate
Labor Rates

Track Excavators													
312C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
320C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
325C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
330C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
345B	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
365BL	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
385BL	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Scrapers													
631G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
637G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Wheeled Loaders													
924G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
928G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
950G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
966G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
972G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
980G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
988G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
990	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
992G	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
994D	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
L2350	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Shovels													
PC2000	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
PC3000	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
PC4000	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
PC5500	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
PC8000	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Hydraulic Hammers													
H-120 (fits 325)													
H-160 (fits 345)													
H-180 (fits 365/385)													
Demolition Shears													
S340 (fits 322/325/330)													
S365 (fits 330/345)													
S390 (fits 365/385)													
Demolition Grapples													
G315 (fits 322/325)													
G320 (fits 325/330)													
G330 (fits 345/365)													

Closure Cost Estimate
Labor Rates

Other Equipment													
420D 4WD Backhoe	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
428D 4WD Backhoe	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
CS533E Vibratory Roller	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
CS633E Vibratory Roller	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
CP533E Sheepsfoot Compactor	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
CP633E Sheepsfoot Compactor	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Light Truck - 1.5 Ton	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Supervisor's Truck	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Flatbed Truck	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Air Compressor + tools	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Welding Equipment	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Heavy Duty Drill Rig	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Pump (plugging) Drill Rig	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Concrete Pump					$0.00							$0	
Gas Engine Vibrator	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Generator 5KW					$0.00							$0	
HDEP Welder (pipe or liner)					$0.00							$0	
5 Ton Crane	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
20 Ton Crane	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
50 Ton Crane	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
120 Ton Crane	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52

NOTES:

(1) Equipment Type:	Catepillar model or equivalent, LeTourneau
(2) Equipment Operator Source:	
(3) Zone Basis:	

Truck Drivers ($/hr) (4)													
725	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
730	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
735	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
740	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
769D	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
773E	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
777D	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
785C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
793C	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
797B	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
613E (5,000 gal) Water Wagon	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
621E (8,000 gal) Water Wagon	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
777D Water Truck	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
785C Water Truck	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52
Dump Truck (10-12 yd3)	KDE Cost Est. Rate	$15.52	$0.00	$15.52	$0.00	$0.00	$0.00	$0.00	$0.00			$0	$15.52

NOTES:

(4) Truck Driver Source:	
(5) Zone Basis:	

Closure Cost Estimate
Labor Rates

Laborers ($/hr) (6,7)													
General Laborer	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52
Skilled Laborer	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52
Driller's Helper	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52
Rodmen (reinforcing concrete)	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52
Cement finisher	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52
Carpenter	KDE Cost Est. Rate	$12.52	$0.00	$12.52		$0.00	$0.00	$0.00	$0.00			$0	$12.52

NOTES:

(6) Laborer Source:	
(7) Carpenter Source:	
(8) Zone Basis:	

Project Management and Technical Labor ($/hr) (9)													
Project Manager		$19.06	$0.00	$19.06		$0.00	$0.00	$0.00	$0.00			$0	$19.06
Foreman		$59.50	$0.00	$59.50		$0.00	$0.00	$0.00	$0.00			$0	$59.50
Field Geologist/Engineer		$95.00	$0.00	$95.00		$0.00	$0.00	$0.00	$0.00			$0	$95.00
Field Tech/Sampler		$48.50	$0.00	$48.50		$0.00	$0.00	$0.00	$0.00			$0	$48.50
Range Scientist		$59.50	$0.00	$59.50		$0.00	$0.00	$0.00	$0.00			$0	$59.50
Senior Planning Engineer		$122.50	$0.00	$122.50		$0.00	$0.00	$0.00	$0.00			$0	$122.50
Project Engineer		$78.50	$0.00	$78.50		$0.00	$0.00	$0.00	$0.00			$0	$78.50
Mechanic/Fitter		$15.52	$0.00	$15.52		$0.00	$0.00	$0.00	$0.00			$0	$15.52

NOTES:

(9) Project Manager:	
(9) Foreman Source:	
(9) Techical Labor Source:	
Other Labor Source:	
Other Labor Source:	
†Additional User Markups	
(These are added by the user to the	
base rate to account for site-specific	
conditions or corporate requirements)	

Closure Cost Estimate
Equipment Costs

Color Code Key	
User Input - Direct Input	Direct Input
User Input - Pull Down List	Pull Down Selection
Program Constant (can override)	Alternate Input
Program Calculated Value	Locked Cell - Formula or Reference

Monthly Rental Basis: 291.067 hrs month

EQUIPMENT RENTAL RATE TABLE

EQUIPMENT TYPE (1)	Monthly Owner/Rental Rate	Equipment Hourly Rate	Fuel/Lube/ Wear	Total Rate
Bulldozers				
D6R	$10,800.00	$37.10	$37.11	$74.22
D6R w/ Winch			$27.44	$27.44
D7R	$16,000.00	$54.97	$45.54	$100.51
D8R	$18,000.00	$61.84	$56.98	$118.82
D9R	$21,700.00	$74.55	$85.81	$160.36
D10R			$234.64	$234.64
D11R	$52,000.00	$178.65	$155.92	$334.57
Wheeled Dozers				
824G			$176.91	$176.91
834G			$55.33	$55.33
844			$65.86	$65.86
854G			$83.43	$83.43
Motor Graders				
120H	$14,400.00	$49.47	$47.51	$96.99
14G/H	$14,400.00	$49.47	$57.39	$106.87
16G/H			$114.37	$114.37
24M			$68.06	$68.06
Track Excavators				
312C	$4,800.00	$16.49	$15.73	$32.23
320C	$7,240.00	$24.87	$30.52	$55.39
325C	$8,100.00	$27.83	$39.25	$67.08
330C			$88.36	$88.36
345B	$10,800.00	$37.10	$59.54	$96.65
365BL			$57.96	$57.96
385BL	$22,200.00	$76.27	$95.88	$172.15
Scrapers				
631G	$23,400.00	$80.39	$80.72	$161.12
637G	$33,490.00	$115.06	$124.35	$239.40
Wheeled Loaders				
924G	$4,615.00	$15.86	$24.89	$40.75
928G	$5,495.00	$18.88	$28.19	$47.07
950G	$7,600.00	$26.11	$36.26	$62.37
966G	$10,900.00	$37.45	$51.46	$88.91
972G	$13,000.00	$44.66	$56.23	$100.89
980G	$13,000.00	$44.66	$64.50	$109.16
988G	$21,600.00	$74.21	$92.38	$166.59
990			$74.65	$74.65
992G			$228.18	$228.18
994D			$158.07	$158.07
L2350			$289.80	$289.80
Shovels				
PC2000			$162.47	$162.47
PC3000			$219.55	$219.55
PC4000			$307.37	$307.37
PC5500			$522.52	$522.52
PC8000			$654.25	$654.25
Hydraulic Hammers				
H-120 (fits 325)	$6,000.00	$20.61	$5.11	$25.72
H-160 (fits 345)	$8,400.00	$28.86	$9.96	$38.82
H-180 (fits 365/385)	$12,000.00	$41.23	$11.80	$53.03
Demolition Shears				
S340 (fits 322/325/330)				$0.00
S365 (fits 330/345)				$0.00
S390 (fits 365/385)				$0.00
Demolition Grapples				
G315 (fits 322/325)				$0.00
G320 (fits 325/330)				$0.00
G330 (fits 345/365)				$0.00

Closure Cost Estimate
Equipment Costs

Other Equipment				
420D 4WD Backhoe	$3,045.00	$10.46	$21.15	$31.61
428D 4WD Backhoe	$3,295.00	$11.32	$21.25	$32.57
CS533E Vibratory Roller	$7,370.00	$25.32	$16.47	$41.79
CS633E Vibratory Roller			$20.86	$20.86
CP533E Sheepsfoot Compactor			$16.47	$16.47
CP633E Sheepsfoot Compactor			$20.86	$20.86
Light Truck - 1.5 Ton	$4,594.00	$15.78	$6.59	$22.37
Supervisor's Truck	$3,032.00	$10.42	$4.39	$14.81
Flatbed Truck	$4,594.00	$15.78	$20.64	$36.42
Air Compressor + tools	$4,230.00	$14.53	$4.39	$18.92
Welding Equipment	$2,655.00	$9.12	$8.78	$17.90
Heavy Duty Drill Rig	$59,070.00	$202.94	$52.69	$255.63
Pump (plugging) Drill Rig	$59,070.00	$202.94	$43.91	$246.85
Concrete Pump	$15,664.00	$53.82	$43.91	$97.73
Gas Engine Vibrator	$597.00	$2.05	$4.39	$6.44
Generator 5KW	$895.00	$3.07	$6.59	$9.66
HDEP Welder (pipe or liner)	$8,202.00	$28.18	$8.78	$36.96
5 Ton Crane	$5,782.00	$19.86	$13.17	$33.04
20 Ton Crane	$15,224.00	$52.30	$17.56	$69.87
50 Ton Crane	$15,224.00	$52.30	$20.64	$72.94
120 Ton Crane			$22.83	$22.83
Trucks				
725	$12,000.00	$41.23	$52.42	$93.65
730	$12,000.00	$41.23	$54.62	$95.85
735	$12,000.00	$41.23	$76.68	$117.91
740	$14,400.00	$49.47	$86.16	$135.64
769D	$0.00		$58.57	$58.57
773E			$67.35	$67.35
777D	$0.00		$124.79	$124.79
785C	$0.00		$244.27	$244.27
793C			$183.32	$183.32
797B			$257.97	$257.97
613E (5,000 gal) Water Wagon	$9,500.00	$32.64	$36.64	$69.27
621E (8,000 gal) Water Wagon	$15,000.00	$51.53	$63.23	$114.76
777D Water Truck	$54,071.00	$185.77	$102.72	$288.49
785C Water Truck			$106.48	$106.48
Dump Truck (10-12 yd^3)	$12,760.00	$43.84	$24.45	$68.29

NOTES:

(1) Power Equipment Source:	
(2) Power Equipment Type:	Catepillar model or equivalent, LeTourneau loader, Komatsu shovels
(3) Drilliing Equipment Source:	
(4) Other Equipment Source:	
(5) Drill rig includes support (pipe) truck	

Closure Cost Estimate
Equipment Costs

FUEL, LUBE AND WEAR CALCULATIONS						
EQUIPMENT TYPE	**PM Cost Per Hour**(1)	**Under carriage or Tires** (2)	**G.E.T Consumption** (3)	**Fuel Use Rate L/hr (4)**	**Cost@** 1.16/L	**Total Hourly Equipment Cost**
Bulldozers						
D6R	$5.21		$4.46	23.66	$27.44	$37.11
D6R w/ Winch				23.66	$27.44	$27.44
D7R	$5.99		$6.62	28.39	$32.93	$45.54
D8R	$5.61		$8.56	36.91	$42.81	$56.98
D9R	$9.93		$13.31	53.94	$62.57	$85.81
D10R	$133.35		$22.25	68.14	$79.04	$234.64
D11R	$11.87		$27.69	100.31	$116.36	$155.92
Wheeled Dozers						
824G	$98.71	$4.80	$26.20	40.69	$47.20	$176.91
834G		$0.00		47.69	$55.33	$55.33
844		$0.00		56.78	$65.86	$65.86
854G		$0.00		71.92	$83.43	$83.43
Motor Graders						
120H	$6.08	$10.57	$13.30	15.14	$17.56	$47.51
14G/H	$6.08	$10.57	$13.30	23.66	$27.44	$57.39
16G/H	$53.71	$5.33	$22.40	28.39	$32.93	$114.37
24M				58.67	$68.06	$68.06
Track Excavators						
312C	$3.85		$3.63	7.12	$8.25	$15.73
320C	$4.96		$4.04	18.55	$21.52	$30.52
325C	$5.18		$5.09	24.98	$28.98	$39.25
330C	$37.35		$15.00	31.04	$36.01	$88.36
345B	$6.56		$6.44	40.12	$46.54	$59.54
365BL				49.97	$57.96	$57.96
385BL	$7.31		$11.73	66.24	$76.84	$95.88
Scrapers						
631G	$7.55		$7.31	56.78	$65.86	$80.72
637G	$10.87		$9.19	89.90	$104.29	$124.35
Wheeled Loaders						
924G	$4.08	$4.90	$3.84	10.41	$12.08	$24.89
928G	$3.95	$4.90	$3.97	13.25	$15.37	$28.19
950G	$4.71	$6.59	$7.39	15.14	$17.56	$36.26
966G	$6.60	$10.33	$9.28	21.77	$25.25	$51.46
972G	$6.72	$10.33	$11.73	23.66	$27.44	$56.23
980G	$6.72	$13.11	$11.73	28.39	$32.93	$64.50
988G	$9.17	$17.51	$12.57	45.80	$53.13	$92.38
990				64.35	$74.65	$74.65
992G	$87.28	$18.00	$21.91	87.06	$100.99	$228.18
994D				136.27	$158.07	$158.07
L2350				249.83	$289.80	$289.80
Shovels						
PC2000				140.06	$162.47	$162.47
PC3000				189.27	$219.55	$219.55
PC4000				264.97	$307.37	$307.37
PC5500				450.45	$522.52	$522.52
PC8000				564.01	$654.25	$654.25
Hydraulic Hammers						
H-120 (fits 325)	N/A		$5.11			$5.11
H-160 (fits 345)	N/A		$9.96			$9.96
H-180 (fits 365/385)	N/A		$11.80			$11.80
Demolition Shears						
S340 (fits 322/325/330)	N/A					$0.00
S365 (fits 330/345)	N/A					$0.00
S390 (fits 365/385)	N/A					$0.00
Demolition Grapples						
G315 (fits 322/325)	N/A					$0.00
G320 (fits 325/330)	N/A					$0.00
G330 (fits 345/365)	N/A					$0.00

Closure Cost Estimate
Equipment Costs

Other Equipment						
420D 4WD Backhoe	$3.55	$1.31	$3.11	11.36	$13.17	$21.15
428D 4WD Backhoe	$3.55	$1.31	$3.21	11.36	$13.17	$21.25
CS533E Vibratory Roller				14.19	$16.47	$16.47
CS633E Vibratory Roller				17.98	$20.86	$20.86
CP533E Sheepsfoot Compactor				14.19	$16.47	$16.47
CP633E Sheepsfoot Compactor				17.98	$20.86	$20.86
Light Truck - 1.5 Ton				5.68	$6.59	$6.59
Supervisor's Truck				3.79	$4.39	$4.39
Flatbed Truck				17.79	$20.64	$20.64
Air Compressor + tools			N/A	3.79	$4.39	$4.39
Welding Equipment			N/A	7.57	$8.78	$8.78
Heavy Duty Drill Rig				45.42	$52.69	$52.69
Pump (plugging) Drill Rig				37.85	$43.91	$43.91
Concrete Pump			N/A	37.85	$43.91	$43.91
Gas Engine Vibrator			N/A	3.79	$4.39	$4.39
Generator 5KW			N/A	5.68	$6.59	$6.59
HDEP Welder (pipe or liner)			N/A	7.57	$8.78	$8.78
5 Ton Crane				11.36	$13.17	$13.17
20 Ton Crane				15.14	$17.56	$17.56
50 Ton Crane				17.79	$20.64	$20.64
120 Ton Crane				19.68	$22.83	$22.83
Trucks						
725	$6.77	$22.26	$2.76	17.79	$20.64	$52.42
730	$6.77	$22.26	$2.76	19.68	$22.83	$54.62
735	$6.77	$34.87	$2.76	27.82	$32.27	$76.68
740	$6.77	$44.26	$2.86	27.82	$32.27	$86.16
769D	$7.24	$7.81	$2.91	35.01	$40.62	$58.57
773E		$15.75		44.48	$51.59	$67.35
777D	$15.65	$19.70	$15.89	63.40	$73.55	$124.79
785C	$84.35	$29.20	$24.24	91.79	$106.48	$244.27
793C				158.04	$183.32	$183.32
797B				222.39	$257.97	$257.97
613E (5,000 gal) Water Wagon	$5.49	$4.80		22.71	$26.35	$36.64
621E (8,000 gal) Water Wagon	$6.54	$9.49		40.69	$47.20	$63.23
777D Water Truck	$11.10	$18.07		63.40	$73.55	$102.72
785C Water Truck				91.79	$106.48	$106.48
Dump Truck (10-12 yd3) (5)	N/A	$1.61	N/A	19.68	$22.83	$24.45

Notes:

(1) PM Source:	
(2) Undercarriage Source:	
(3) G.E.T. Source:	CAT Historical Data
(4) Fuel Use Source:	Caterpillar Handbook, Edition 35, Ch. 20; or estimated average for smaller vehicles
(5) Dump Truck Oper. Cost Source:	Means Heavy Construction (2008)

Closure Cost Estimate
Equipment Costs

TIRE COST TABLES

Equipment	Tire Size	# of Tires Per Piece of Equipment	Cost Per Tire	Tire Cost (1)(2)	Life Expectency Hours (Low/Zone A) (3)	Tire Cost per Hour
Bulldozers						
D6R			N/A			
D6R w/ Winch			N/A			
D7R			N/A			
D8R			N/A			
D9R			N/A			
D10R			N/A			
D11R			N/A			
Wheeled Dozers						
824G	29.5R25	4	$4,200.00	$16,800.00	3,500	$4.80
834G	35/65-R33	4		$0.00	3,500	$0.00
844	45/65-R39	4		$0.00	3,500	$0.00
854G	45/65-R45	4		$0.00	3,500	$0.00
Motor Graders						
120H	13PR24	6	$6,165.81	$36,994.86	3,500	$10.57
14G/H	20.5R25	6	$6,165.81	$36,994.86	3,500	$10.57
16G/H	23.5R25	6	$3,108.76	$18,652.56	3,500	$5.33
24M	23.5R25	6		$0.00	3,500	
Track Excavators						
312C			N/A			
320C			N/A			
325C			N/A			
330C			N/A			
345B			N/A			
365BL			N/A			
385BL			N/A			
Scrapers						
631G	37.25R35	4		$0.00	4,000	
637G	37.25R35	4		$0.00	4,000	
Wheeled Loaders						
924G	17.5R25	4	$5,510.69	$22,042.76	4,500	$4.90
928G	17.5R25	4	$5,510.69	$22,042.76	4,500	$4.90
950G	26.5R25	4	$7,419.03	$29,676.12	4,500	$6.59
966G	26.5R25	4	$11,624.64	$46,498.56	4,500	$10.33
972G	26.5R25	4	$11,624.64	$46,498.56	4,500	$10.33
980G	29.5R25	4	$14,753.36	$59,013.44	4,500	$13.11
988G	35/65-33	4	$19,693.61	$78,774.44	4,500	$17.51
990	41.25/70-39	4		$0.00	4,500	
992G	45/65R45	4	$20,252.31	$81,009.24	4,500	$18.00
994D	55/85R57	4		$0.00	4,500	
L2350	55/85R57	4		$0.00	4,500	
Shovels						
PC2000			N/A			
PC3000			N/A			
PC4000			N/A			
PC5500			N/A			
PC8000			N/A			
Hydraulic Hammers						
H-120 (fits 325)			N/A			
H-160 (fits 345)			N/A			
H-180 (fits 365/385)			N/A			
Demolition Shears						
S340 (fits 322/325/330)			N/A			
S365 (fits 330/345)			N/A			
S390 (fits 365/385)			N/A			
Demolition Grapples						
G315 (fits 322/325)			N/A			
G320 (fits 325/330)			N/A			
G330 (fits 345/365)			N/A			

Closure Cost Estimate
Equipment Costs

Other Equipment						
420D 4WD Backhoe	340/80R18-19.5LR24	2	$1,968.84	$3,937.68	3,000	$1.31
428D 4WD Backhoe	340/80R18-16.9R28	2	$1,968.84	$3,937.68	3,000	$1.31
CS533E Vibratory Roller			N/A			
CS633E Vibratory Roller			N/A			
CP533E Sheepsfoot Compactor			N/A			
CP633E Sheepsfoot Compactor			N/A			
Light Truck - 1.5 Ton		4		$0.00	3,000	
Supervisor's Truck		4		$0.00	3,000	
Flatbed Truck		22		$0.00	3,000	
Air Compressor + tools			N/A			
Welding Equipment			N/A			
Heavy Duty Drill Rig		4		$0.00	3,000	
Pump (plugging) Drill Rig		4		$0.00	3,000	
Concrete Pump			N/A			
Gas Engine Vibrator			N/A			
Generator 5KW			N/A			
HDEP Welder (pipe or liner)			N/A			
5 Ton Crane		4		$0.00	3,000	
20 Ton Crane		4		$0.00	3,000	
50 Ton Crane		6		$0.00	3,000	
120 Ton Crane		6		$0.00	3,000	
Trucks						
725	23.5R25	6	$7,419.03	$44,514.18	2,000	$22.26
730	23.5R25	6	$7,419.03	$44,514.18	2,000	$22.26
735	26.5R25	6	$11,624.64	$69,747.84	2,000	$34.87
740	29.5R25	6	$14,753.36	$88,520.16	2,000	$44.26
769D	18.00R33	6	$7,807.96	$46,847.76	6,000	$7.81
773E	24.00R35	6	$13,128.50	$78,771.00	5,000	$15.75
777D	27.00R49	6	$16,414.51	$98,487.06	5,000	$19.70
785C	33.00R51	6	$19,466.67	$116,800.02	4,000	$29.20
793C	40.00R57	6		$0.00	4,000	
797B	40.00R57	6		$0.00	4,000	
613E (5,000 gal) Water Wagon	23.5R25	6	$4,800.24	$28,801.44	6,000	$4.80
621E (8,000 gal) Water Wagon	33.25R29	6	$12,647.96	$75,887.76	8,000	$9.49
777D Water Truck	27.00R49	6	$15,057.00	$90,342.00	5,000	$18.07
785C Water Truck	33.00R51	6		$0.00	4,000	
Dump Truck (10-12 yd3)		10	$968.00	$9,680.00	6,000	$1.61

Notes:

(1) Unit Cost Basis:	Cost per tyre each
(2) Cost Basis:	
(3) Tire Cost Source:	
(4) Tire Wear Source:	Caterpillar Handbook, Edition 37

Closure Cost Estimate
Material Costs

Revegetation Materials

Seed Mixes

Seed Mix	Description	Cost/Ha
None		
Mix 1	Basins	$1,000.00
Mix 2	Low Hills	$355.00
Mix 3	Uplands	$355.00
Mix 4	Riparian or Custom	$355.00
User Mix 1		**$1,000.00**
User Mix 2		
User Mix 3		
User Mix 4		

	Cost/lb	kg/Ha	Cost/Ha
User Mix 5 (from Seed Mix sheet)	$9.94	$27.21	$270.48

Notes:

Mulch

Item	Cost/kg	kg/Ha	Cost/Ha
None			
Straw Mulch	$0.31	**2245**	$691.46
Hydro Mulch	$0.57	**2250**	$1,287.00
Timber Mulch		**10**	
		10	

Notes: Granite Seed $510 per Ton in 50# bag Wood (Hydro) Mulch (May 2012)

Amendments

Item	Cost/kg	kg/Ha	Cost/Ha
None			
Organic Matter	$0.70	**10**	$7.00
Treated Sludge		**10**	
Chemical	$0.62	**10**	$6.20
		10	

Notes: Western Nevada Supply $31.18 per 50 # bag (May 2012)

Well Abandonment Materials

Description	Cost/20kg bag	Units	Cost/unit*
Cement	$14.98	m3	$93.61
Grout (Low Grade Bentonite)	$6.38	m3	$39.88
Inert Material/Cuttings	$0.00	m3	$0.00
		m3	
		m3	

* Assumes 1 bag mixes with water to make 0.21 y3 or 0.16 m3 of grout/cement slurry.

Closure Cost Estimate
Material Costs

Monitoring Costs

Description	Units	Cost/unit
Monitor Well Pump	ea.	$50.00
Sampling Supplies	ea.	$50.00
Lab Costs	ea.	$500.00
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	

Fuel, Etc.

Description	Units	Cost/unit	User Overrides
Off-road Diesel - delivered (1)	$/Litre	$1.160	
Pickup Truck Mileage	$/km		
Electical Power	$/kWh		

Closure Cost Estimate
Material Costs

Revegetation Method

Slopes

Disturbance Type	Seed Application Method	Labor Cost/Ha	Equipment Cost/Ha	Total Cost/Ha
Waste Rock Dumps	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Heap Leach	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Tailings	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Quarries & Borrow Pits	**Mechanical Broadcast**	$74.10	$555.75	$629.85

Flat Areas and Undifferentiated

Disturbance Type	Seed Application Method	Labor Cost/Ha	Equipment Cost/Ha	Total Cost/Ha
Exploration Trenches	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Exploration Roads	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Waste Rock Dumps	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Heap Leach	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Tailings	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Quarries & Borrow Pits	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Roads	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Pits	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Haul Material	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Foundations & Buildings	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Sediment & Drainge Control	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Process Ponds	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Landfills	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Yards, Etc.	**Mechanical Broadcast**	$74.10	$555.75	$629.85
Revegetation Maintenance	**Mechanical Broadcast**	$74.10	$555.75	$629.85

Closure Cost Estimate
Misc. Unit Costs

Color Code Key	
User Input - Direct Input	Direct Input
User Input - Pull Down List	Pull Down Selection
Program Constant (can override)	Alternate Input
Program Calculated Value	Locked Cell - Formula or Reference

Revegetation

	Means Number	Unit	Crew	Daily Output	Daily Output User	Materials	Labor	Equipment	Total	Notes
Seeding - Broadcast Hand (1)		ha					$424.72	$0.00	$424.72	
Seeding - Broadcast Mechanical (1)		ha					$74.10	$555.75	$629.85	
Seeding - Drill (1)		ha		365	0.6		$166.93	$0.00	$166.93	
Seeding - Hydroseeding (1)				365			$0.27	$0.00	$0.27	
Shrub Planting - bare root 6-10 in (150- 250mm) (2)	02910-400-0561	ea.	1 Clab	365			$0.27	$0.00	$0.27	
Tree Planting - bare root 11-16 in (270- 400mm) (3)	02910-400-0562	ea.	1 Clab	260			$0.39	$0.00	$0.39	
Cactus Planting (4)		ea.	1 Clab						$0.00	
NOTES:										
(1) Seeding Source:										
(2) Shrub Source:										
(3) Tree Source:										
(4) Cactus Source:										

Building and Wall Demolition

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Daily Output User	Labor	Equipment	Premium	Total	Notes
Building Demolition										
Lg. steel	02220-110-0012	m3	B-8	609		$1.93	$3.33		$5.26	
Lg. concrete	02220-110-0050	m3	B-8	433		$2.71	$4.68		$7.39	
Lg. masonry	02220-110-0080	m3	B-8	569		$2.06	$3.56		$5.62	
Lg. mixed	02220-110-0100	m3	B-8	569		$2.06	$3.56		$5.62	
Sm. steel	02220-110-0500	m3	B-3	419		$2.50	$3.51		$6.01	
Sm. concrete	02220-110-0600	m3	B-3	320		$3.28	$4.59		$7.87	
Sm. masonry	02220-110-0650	m3	B-3	419		$2.50	$3.51		$6.01	
Sm. wood	02220-110-0700	m3	B-3	419		$2.50	$3.51		$6.01	
Wall Demolition										
Block 4 in (100 mm) thick	02220-130-2000	m2	1 Clab	17		$5.89	$0.00	20%	$7.07	
Block 6 in (150 mm) thick	02220-130-2040	m2	1 Clab	16		$6.26	$0.00	20%	$7.51	
Block 8 in (200 mm) thick	02220-130-2080	m2	1 Clab	14		$7.15	$0.00	20%	$8.58	
Block 12 in (300 mm) thick	02220-130-2100	m2	1 Clab	14		$7.15	$0.00	20%	$8.58	
Conc 6 in (150 mm) thick	02220-130-2400	m2	B-9	15		$66.72	$10.09	10%	$84.49	
Conc 8 in (200 mm) thick	02220-130-2420	m2	B-9	13		$76.98	$11.64	10%	$97.48	
Conc 10 in (250 mm) thick	02220-130-2440	m2	B-9	11		$90.98	$13.76	10%	$115.21	
Conc 12 in (300 mm) thick	02220-130-2500	m2	B-9	9		$111.20	$16.82	10%	$140.82	

Closure Cost Estimate
Misc. Unit Costs

Waste Disposal

Unit rates from Means Heavy Construction 2006 Edition by permission of R.S.Means/Reed Construction Data .

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment		Total	Notes
Rubbish Handling										
Dumpster delivery (average for all sizes)	02220-350-0910	ea.			$41.50				$41.50	
Haul (average for all sizes)	02220-350-0920	ea.			$111.00				$111.00	
Rent per month (average for all sizes)	02220-350-0940	ea.			$41.50				$41.50	
Disposal fee per ton (tonne) (average for all sizes)	02220-350-0950	tonne			$45.50				$45.50	
NOTES:										
Dumpster Cost Source										
Dumpster Disposal Fee Source:										
Hazardous Material Handling - Solids (+ Liquids in drums)										
Pickup fees 55 gal (200 L). drums	02110-300-1100	ea.			$237.00				$237.00	
Bulk material (average)	02110-300-1220/1230	tonne			$390.00				$390.00	
Transport - truck load (80 drums, 25 cy (m3), 18 tons)	02110-300-1260/1270	km			$5.18				$5.18	
Dump site solid disposal fee	02110-300-6000/6020	tonne			$274.00				$274.00	
NOTES:										
Solid Handling Cost Source										
Solid Disposal Fee Source:										
Hazardous Material Handling - Liquids										
Vacuum Truck Pickup (2200 gal/8300 L)	02110-300-3110	hr.			$128.00				$128.00	
Vacuum Truck Pickup (5000 gal/19000 L)	02110-300-3120	hr.			$180.00				$180.00	
Dump site liquid disposal fee	02110-300-6000/6020	tonne			$274.00				$274.00	
NOTES:										
Liquid Handling Cost Source										
Liquid Disposal Fee Source:										
Hydrocarbon Contaminated Soils (HCS)										
Insitu Biotreatment	02115-200-2020/2021	m3			$17.14				$17.14	
HCS disposal fee	02115-200-2050/2055	m3			$274.00				$274.00	
NOTES:										
Insitu Treatement Cost Source										
HCS Disposal Fee Source:										

Concrete Structure Installation

Weekly dumpster rental rates from Means Heavy Construction 2005 Edition with permission by R.S.Means/Reed Construction Data .
Weekly dumpster rental rates include haul to off-site disposal site and disposal fees

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Reinforced Concrete Bulkheads and Shaft Covers										
Grade walls - 15 in (400mm) thick, 8 ft (2.5m) high	03310-240-4300	m3	C-14D	61.18		$49.49	$15.56		$65.05	includes reinforcing
Grade walls - 15 in (400mm) thick, 12 ft (3.7m) high	03310-240-4350	m3	C-14D	39.19		$77.26	$24.29		$101.55	includes reinforcing
Elevated conc, 1-way beam & slab - 15ft (4.6m) span	03310-240-2700	m3	C-14B	15.74		$198.74	$60.47		$259.21	includes reinforcing
Elevated conc, 1-way beam & slab - 25ft (7.5m) span	03310-240-2750	m3	C-14B	21.68		$144.29	$43.90		$188.19	includes reinforcing

Closure Cost Estimate
Misc. Unit Costs

Bat Gate/Foam Plug Installation

Bat Gate (5)		ea.								materials $/ea. Installed
Culvert Gate (5)		ea.								materials $/ea. Installed
Adit Foam Plug (6)		ea./m3								materials $/cy placed
Production Opening Foam Plug (6)		ea./m3								materials $/cy placed
NOTES:										
(5) Bat Gate Source:										
(6) Foam Plug Source:										

Misc. Linear Projects

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Fencing Installation										
Barbed 3-strand	02820-170-1650	m	B-80A	232	$0.45	$1.83	$0.77		$3.05	
Barbed 4-strand	extrapolated	m	B-80A	174	$0.60	$2.44	$1.03		$4.07	
Barbed 5-strand	02820-130-0920	m	B-80A	139	$0.75	$3.05	$1.29		$5.09	
Chain link 8-10ft (2.5-3m) Install	02820-130-0920	m	B-80C	55	$32.50	$7.72	$3.25		$43.47	
Wood stockade fence 6 ft (2 m) high - Install	02820-510-1240	m	B-80C	46	$13.75	$9.23	$3.89		$26.87	
	user	m							$0.00	
	user	m							$0.00	
	user	m							$0.00	
	user	m							$0.00	
Fencing Removal										
Barbed 3-strand Removal	02220-220-1600	m	2 Clab	131		$2.48	$1.37		$3.85	
Barbed 4-strand Removal	extrapolated	m	2 Clab	108		$3.00	$1.66		$4.66	
Barbed 5-strand Removal	02220-220-1650	m	2 Clab	85		$3.82	$2.11		$5.93	
Chain link 8-10 ft (2.5-3 m) Removal	02220-220-1700	m	B-6	136		$2.39	$2.77		$5.16	
Wood, all types 4-6 ft ("1.5-2 m) high - Removal	02220-220-1775	m	2 Clab	131		$2.48	$1.37		$3.85	
	user	m								
	user	m							$0.00	
	user	m							$0.00	
	user	m							$0.00	
Culvert Removal										
12 in (300 mm) Diameter	02220-220-2900	m	B-6	53		$6.12	$7.10		$13.22	
18 in (450 mm) Diameter	02220-220-2930	m	B-6	46		$7.05	$8.19		$15.24	
24 in (600 mm) Diameter	02220-220-2960	m	B-6	37		$8.77	$10.18		$18.95	
36 in (1m) Diameter	02220-220-3000	m	B-6	27		$12.02	$13.95		$25.97	
Pipeline Removal										
0.75 in (20mm) - 4 in (100 mm) diameter	02220-381-1600	m	B-20	213		$3.76	$0.84		$4.60	
6 in (150 mm) - 8 in (200 mm)	02220-381-1700	m	B-20	152		$5.27	$1.18		$6.45	
10 in (250 mm) - 18 in (450 mm)	02220-381-1800	m	B-20	91		$8.80	$1.97		$10.77	
20 in (500 mm) - 36 in (1 m)	02220-381-1900	m	B-20	61		$13.12	$2.93		$16.05	

Closure Cost Estimate
Misc. Unit Costs

Pipe and Drainpipe Installation										
Water 4in (100mm) 40ft (12m) length, welded HDPE	02510-760-0100	m	B-22A	122	$3.39	$5.52	$13.19		$22.10	
Water 6in (150mm) 40ft (12m) length, welded HDPE	02510-760-0200	m	B-22A	116	$9.95	$5.80	$13.87		$29.62	
Water 12in (300mm) 40ft (12m) length, welded HDPE	02510-760-0500	m	B-22A	79	$1.72	$8.52	$20.37		$30.61	
Drain 4in (100mm) perforated PVC	02620-630-2100	m	B-14	96	$3.42	$11.72	$4.50		$19.64	
Drain 6in (150mm) perforated PVC	02620-630-2110	m	B-14	91	$0.57	$12.36	$4.75		$17.68	
Drain 4in (100mm) corrugated, perf or plain	02620-660-0040	m	2 Clab	366	$1.82	$0.89	$0.49		$3.20	
Drain 6in (150mm) corrugated., perf or plain	02620-660-0060	m	2 Clab	274		$1.18	$0.65		$1.83	
Drain Rock Preparation										
Crushing		m3							$0.12	
Screening		m3							$0.01	
TOTAL									$0.13	
Misc.										
Backhoe work	02210-700-0120	m3	B-11M	21		$5.91	$12.04		$17.95	
Powerline and Transformer Removal										
Single Pole		km							$36,820.47	
Double Pole		km							$42,080.54	
Transformer (9)		ea.							$27,500.00	
NOTES:										
(7) Single Pole Source:										
(8) Double Pole Source:										
(9) Transformer Source:										

Erosion and Sedimentation Control

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Rip-Rap & Rock Lining										
Rip-Rap 3/8 to 1/4 CY (m3) pieces, grouted	02370-450-0110	m2	B-13	67	$20.00	$14.94	$8.71		$43.65	assumes on-site source of rip-rap
Rip-Rap 18 in (450 mm) min thick, no grout	02370-450-0200	m2	B-13	44	$5.90	$22.75	$13.26		$41.91	assumes on-site source of rip-rap
Gabions, 6 in (150 mm) deep	02370-450-0400	m2	B-13	167	$8.80	$5.99	$3.49		$18.28	assumes on-site source rock fill for gabions
Gabions, 9 in (250 mm) deep	02370-450-0500	m2	B-13	136	$11.05	$7.36	$4.29		$22.70	assumes on-site source rock fill for gabions
Gabions, 12 in (300 mm) deep	02370-450-0200	m2	B-13	128	$16.15	$7.82	$4.56		$28.53	assumes on-site source rock fill for gabions
Gabions, 18 in (450 mm) deep	02370-450-0200	m2	B-13	85	$21.50	$11.77	$6.86		$40.13	assumes on-site source rock fill for gabions
Gabions, 36 in (1m) deep	02370-450-0200	m2	B-13	50	$34.50	$20.02	$11.67		$66.19	assumes on-site source rock fill for gabions
HDEP Liner Installation										
Finish grading large area	2310-100-0100	m2	B-11L	5017		$0.04	$0.17		$0.21	
Compaction-riding, vibrating roller - 12in (300mm) lifts	2315-310-5100	m3	B-10Y	242		$0.93	$1.38		$2.31	
1.5mm HDPE	2660-610-0010	m2	3 Skwk	149	$0.25	$2.85	$3.68	10%	$7.46	
80 mil HDPE	user	m2	3 Skwk	149	$7.70	$2.85	$3.68		$14.23	
3D Turf reinforcement Mat	user	m2	3 Skwk	650	$2.58	$0.65	$0.84		$4.07	MEANS 2013 3125-1416-0060
Jute mesh, revegetation n	user	m2	3 Skwk	1484	$1.53	$0.29	$0.37		$2.19	MEANS 2013 3125-1416-0020
ACB	user	m2	3 Skwk	11.3	$107.58	$37.58	$48.55		$193.71	MEANS 2013 3531-1918-0110

Closure Cost Estimate
Misc. Unit Costs

Construction Management Support											
Office Trailer, Furnished, no hook-ups	0150-500-0250	mo.							$0.00		
Toilet Portable, chemical	1590-400-6410	mo.							$0.00		
TOTAL					$0.00				$0.00		
Pump and Casing Removal											
	Pump Type	**Measurement**	**Unit**				**Labor**	**Equipment**		**Total**	**Notes**
Pump Removal											
Submersible		ft to pump	m				$2.39	$5.19		$7.58	
Line Shaft		ft to pump	m				$5.57	$12.11		$17.68	
NOTES:											
(10) Pump Removal Source:											

EQUIPMENT FLEETS

ACTIVITY AND FLEET		Standard Labor Crew	User Defined Labor Crew	EQUIPMENT UNIT COST (Hourly)	TOTAL LABOR UNIT COST (Hourly)	TOTAL COST (Hourly)
RIPPING						
Rip road						
Waste rock dumps, heaps, tails - rip flat surfaces						
Surface preparation						
Scarify						
Small Dozer w/ multi-shank						
D6R				$74.22	$15.52	$89.74
Totals				$74.22	$15.52	$89.74
Medium Dozer w/ multi-shank						
D8R				$118.82	$15.52	$134.34
Totals				$118.82	$15.52	$134.34
Large Dozer w/ multi-shank						
D10R				$234.64	$15.52	$250.16
Totals				$234.64	$15.52	$250.16
Grader w/ multi-shank						
16G/H				$114.37	$15.52	$129.89
Totals				$114.37	$15.52	$129.89
GRADING						
Grading storage and structure areas						
Grading waste rock dumps and heaps						
Grading landfills						
Constructing pit safety berms						
Small Dozer Fleet						
D6R				$74.22	$15.52	$89.74
Totals				$74.22	$15.52	$89.74
Medium Dozer Fleet						
D8R				$118.82	$15.52	$134.34
Totals				$118.82	$15.52	$134.34
Large Dozer Fleet						
D10R				$234.64	$15.52	$250.16
Totals				$234.64	$15.52	$250.16
EXPLORATION GRADING						
Backfilling and grading exploration trenches						
Grading flat exploration roads						
Small Dozer Fleet						
D6R				$74.22	$15.52	$89.74
Totals				$74.22	$15.52	$89.74
Medium Dozer Fleet						
D8R				$118.82	$15.52	$134.34
Totals				$118.82	$15.52	$134.34
Large Dozer Fleet						
D10R				$234.64	$15.52	$250.16
Totals				$234.64	$15.52	$250.16
EXCAVATING						
Earthen Berms						
Diversion ditch excavation and backfill						
Underground openings backfill - excavate and place						
Pit berm construction (excavator option)						
Small Excavator						
330C				$88.36	$15.52	$103.88
Totals				$88.36	$15.52	$103.88
Medium Excavator						
345B				$96.65	$15.52	$112.17
Totals				$96.65	$15.52	$112.17
Large Excavator						
385BL				$172.15	$15.52	$187.67
Totals				$172.15	$15.52	$187.67

EXCAVATE AND RECONTOUR

Recontour large roads (haul roads, access roads, etc.)
Ponds - Excavate and pull liner and bury

Small Excavator + Dozer

330C				$88.36	$15.52	$103.88
D6R				$74.22	$15.52	$89.74
Total Equipment				$162.58	$31.04	$193.62

Medium Excavator + Dozer

345B				$96.65	$15.52	$112.17
D8R				$118.82	$15.52	$134.34
Totals				$215.47	$31.04	$246.51

Large Excavator + Dozer

330C				$88.36	$15.52	$103.88
D10R				$234.64	$15.52	$250.16
Totals				$323.00	$31.04	$354.04

EXPLORATION ROAD/PAD RECONTOUR

Recontour small roads (exploration roads, service roads, etc.)
Cut and Fill reclamation on slopes
Drill pad recountour
Drill sump backfill

Small Dozer

D10R				$234.64	$15.52	$250.16
Totals				$234.64	$15.52	$250.16

Large Dozer

D10R				$234.64	$15.52	$250.16
Totals				$234.64	$15.52	$250.16

Grader

16G/H				$114.37	$15.52	$129.89
Totals				$114.37	$15.52	$129.89

Small Excavator

330C				$88.36	$15.52	$103.88
Totals				$88.36	$15.52	$103.88

Medium Excavator

345B				$96.65	$15.52	$112.17
Totals				$96.65	$15.52	$112.17

LOAD, HAUL AND PLACE MATERIAL

Rock placement
Haul overburden for backfill
Haul borrow for backfill
Haul cover or growth media

Small Truck/Loader Fleet

730				$0.00	$15.52	$15.52
972G	**Loader**			$100.89	$15.52	$116.41
D10R		1	**2**	$469.28	$31.04	$500.32
Totals				$570.17	$62.08	$632.25

Medium Truck/Loader Fleet

777D				$124.79	$15.52	$140.31
992G	**Loader**			$228.18	$15.52	$243.70
D10R		1	**2**	$469.28	$31.04	$500.32
Totals				$822.25	$62.08	$884.33

Large Truck/Loader Fleet

785C				$244.27	$15.52	$259.79
992G	**Loader**			$228.18	$15.52	$243.70
D10R		1	**2**	$469.28	$31.04	$500.32
Totals				$941.73	$62.08	$1,003.81

Extra Large Truck/Loader Fleet

785C				$244.27	$15.52	$259.79
992G	**Loader**			$228.18	$15.52	$243.70
D10R		1	**2**	$469.28	$31.04	$500.32
Totals				$941.73	$62.08	$1,003.81

Scraper/Dozer Fleet						
631G				$161.12	$15.52	$176.64
D10R				$234.64	$15.52	$250.16
D10R		1		$234.64	$15.52	$250.16
Totals				$630.40	$46.56	$676.96
Tandem Scraper Fleet						
637G				$239.40	$15.52	$254.92
D7R		1		$100.51	$15.52	$116.03
Totals				$339.91	$31.04	$370.95
MISC. LOAD AND HAUL AND EARTHWORKS						
Sludge removal						
Drainage controls						
Misc. - Cat 325B Excavator / 10-12 yd3 Truck						
325C				$67.08	$15.52	$82.60
Dump Truck (10-12 yd3)				$68.29	$15.52	$83.81
Totals				$135.37	$31.04	$166.41
Misc. - Cat D9R Dozer/ Loader (5 yd3) / 10-12 yd3 Truck						
D9R				$160.36	$15.52	$175.88
966G				$88.91	$15.52	$104.43
Dump Truck (10-12 yd3)				$68.29	$15.52	$83.81
Totals				$317.56	$46.56	$364.12
Misc. - Cat D6 Dozer / Cat 966 Loader / 10-12 yd3 Truck						
D6R				$74.22	$15.52	$89.74
966G				$88.91	$15.52	$104.43
Dump Truck (10-12 yd3)				$68.29	$15.52	$83.81
Totals				$231.42	$46.56	$277.98
CONCRETE BREAKING						
Slab demolition						
Footing demolition						
Wall demolition						
Small - Cat 325B Excavator w/ H140D s Hammer						
325C				$67.08	$15.52	$82.60
H-120 (fits 325)				$25.72	$0.00	$25.72
D9R				$160.36	$15.52	$175.88
Totals				$253.16	$31.04	$284.20
Medium - Cat 345B Excavator w/ H180D s Hammer						
345B				$96.65	$15.52	$112.17
H-160 (fits 345)				$38.82	$0.00	$38.82
D9R				$160.36	$15.52	$175.88
Totals				$295.83	$31.04	$326.87
Large - Cat 385B Excavator w/ H180D s Hammer						
385BL				$172.15	$15.52	$187.67
H-180 (fits 365/385)				$53.03	$0.00	$53.03
D9R				$160.36	$15.52	$175.88
Totals				$385.54	$31.04	$416.58
DRILL HOLE ABANDONMENT						
Drill Hole - Grout or Cement						
Pump (plugging) Drill Rig				$246.85	$15.52	$262.37
Driller's Helper		2		$0.00	$25.04	$25.04
Totals				$246.85	$40.56	$287.41
Drill Hole - Inert Media (Means Crew B-11M+ 1 Laborer)						
420D 4WD Backhoe				$31.61	$15.52	$47.13
General Laborer		1		$0.00	$12.52	$12.52
Totals				$31.61	$28.04	$59.65
Drill Hole - Casing Perforation or Removal						
Heavy Duty Drill Rig				$255.63	$15.52	$271.15
Driller's Helper		2		$0.00	$25.04	$25.04
Totals				$255.63	$40.56	$296.19
MAINTENANCE FLEET						
Road Grading, Dust Suppression, Clean Up						
Maintenance - Small Water Truck and Cat 14G Grader						
613E (5,000 gal) Water Wagon				$69.27	$15.52	$84.79
120H				$96.99	$15.52	$112.51
Totals				$166.26	$31.04	$197.30

Maintenance - Medium Water Truck and Cat 16G Grader						
613E (5,000 gal) Water Wagon				$69.27	$15.52	$84.79
14G/H				$106.87	$15.52	$122.39
Totals				$176.14	$31.04	$207.18
Maintenance - Large Water Truck and Cat 16G Grader						
777D Water Truck				$288.49	$15.52	$304.01
16G/H				$114.37	$15.52	$129.89
Totals				$402.86	$31.04	$433.90
PROJECT SUPERVISION						
Foreman		1		$0.00	$59.50	$59.50
Supervisor's Truck		1		$14.81	$15.52	$30.33
Totals				$14.81	$75.02	$89.83
MEANS CREW DEFINITIONS						
Crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .						
For use with misc. unit costs where Means is the source for productivity						
1 Clab - Seedling Planting/Block Wall Demolition						
General Laborer		1		$0.00	$12.52	$12.52
Totals				$0.00	$12.52	$12.52
2 Clab - Barbed Wire/Wood Fence Removal, Drainpipe Installation, Pumping, Evaporation						
General Laborer		2		$0.00	$25.04	$25.04
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$22.37	$40.56	$62.93
2 Clab + Excavator - Pond Liner Cut and Fold						
General Laborer		2		$0.00	$25.04	$25.04
325C				$67.08	$15.52	$82.60
Totals				$67.08	$40.56	$107.64
2 Clab + Welder - Bat Gates						
General Laborer		2		$0.00	$25.04	$25.04
Welding Equipment				$17.90	$15.52	$33.42
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$40.27	$56.08	$96.35
3 Clab - Foam Adit Plugs						
General Laborer		2		$0.00	$25.04	$25.04
420D 4WD Backhoe				$31.61	$15.52	$47.13
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$53.98	$56.08	$110.06
3 Clab + Welder - Culvert Bat Gate						
General Laborer		2		$0.00	$25.04	$25.04
Welding Equipment				$17.90	$15.52	$33.42
420D 4WD Backhoe				$31.61	$15.52	$47.13
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$71.88	$71.60	$143.48
3 Clab D - 3 Laborers + Foreman - Decontamination						
General Laborer		3		$0.00	$37.56	$37.56
Foreman		1		$0.00	$59.50	$59.50
Supervisor's Truck		1		$14.81	$15.52	$30.33
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$37.18	$128.10	$165.28
3 SKWK - Liner Installation						
Skilled Laborer		3		$0.00	$37.56	$37.56
HDEP Welder (pipe or liner)		1		$36.96	$0.00	$36.96
420D 4WD Backhoe		1		$31.61	$15.52	$47.13
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
Totals				$68.57	$53.08	$121.65

B-3 - Small Building Demoltion						
LABOR						
General Laborer		2		$0.00	$25.04	$25.04
Foreman		1		$0.00	$59.50	$59.50
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
EQUIPMENT						
928G		1		$47.07	$15.52	$62.59
Dump Truck (10-12 yd3)		2		$136.58	$31.04	$167.62
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
Totals				$183.65	$131.10	$314.75
B-6 - Chain Link Fence/Culvert Removal						
General Laborer		2		$0.00	$25.04	$25.04
928G		1		$47.07	$15.52	$62.59
Totals				$47.07	$40.56	$87.63
B-8 - Large Building Demolition						
LABOR						
General Laborer		2		$0.00	$25.04	$25.04
Foreman		1		$0.00	$59.50	$59.50
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
EQUIPMENT						
928G		1		$47.07	$15.52	$62.59
20 Ton Crane		1		$69.87	$15.52	$85.39
Dump Truck (10-12 yd3)		2		$136.58	$31.04	$167.62
777D Water Truck				$0.00	$0.00	$0.00
365BL				$0.00	$0.00	$0.00
H-180 (fits 365/385)				$0.00	$0.00	$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
				$0.00		$0.00
Totals				$253.52	$146.62	$400.14
B-9 - Concrete Wall Demolition						
General Laborer		4		$0.00	$50.08	$50.08
Foreman		1		$0.00	$59.50	$59.50
Air Compressor + tools				$18.92	$15.52	$34.44
Totals				$18.92	$125.10	$144.02
B-10Y - General Compaction						
General Laborer		1		$0.00	$12.52	$12.52
CS533E Vibratory Roller		1		$41.79	$15.52	$57.31
Totals				$41.79	$28.04	$69.83
B-11L - Fine Grading for Evaporation Pond Liner Base						
General Laborer		1		$0.00	$12.52	$12.52
14G/H		1		$106.87	$15.52	$122.39
Totals				$106.87	$28.04	$134.91
B-11M - Backhoe Work						
420D 4WD Backhoe		1		$31.61	$15.52	$47.13
Totals				$31.61	$15.52	$47.13
B-12G - Rip-Rap Machine Placed (Modified)						
966G		1		$88.91	$15.52	$104.43
325C		1		$67.08	$15.52	$82.60
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$178.36	$46.56	$224.92
B-13 - Grouted Rip-Rap & Gabion Baskets						
General Laborer		4		$0.00	$50.08	$50.08
Foreman		1		$0.00	$59.50	$59.50
50 Ton Crane		1		$72.94	$15.52	$88.46
Totals				$72.94	$125.10	$198.04

B-14 PVC Drain Pipe Installation						
Foreman		1		$0.00	$59.50	$59.50
General Laborer		4		$0.00	$50.08	$50.08
420D 4WD Backhoe		1		$31.61	$15.52	$47.13
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$53.98	$140.62	$194.60

B-20 - Remove Pipelines						
Foreman		1		$0.00	$59.50	$59.50
Skilled Laborer		1		$0.00	$12.52	$12.52
General Laborer		1		$0.00	$12.52	$12.52
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$22.37	$100.06	$122.43

B-22A - HDEP Installation - Pipe or Liner						
Skilled Laborer		1		$0.00	$12.52	$12.52
General Laborer		2		$0.00	$25.04	$25.04
D7R		1		$100.51	$15.52	$116.03
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
420D 4WD Backhoe		1		$31.61	$15.52	$47.13
Generator 5KW		1		$9.66	$0.00	$9.66
HDEP Welder (pipe or liner)		1		$36.96	$0.00	$36.96
Totals				$201.11	$84.12	$285.23

B-80A - Install Barbed Wire Fence						
General Laborer		3		$0.00	$37.56	$37.56
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$22.37	$53.08	$75.45

B-80C - Install Chain Link Fence (Flatbed truck has small crane)						
General Laborer		3		$0.00	$37.56	$37.56
Light Truck - 1.5 Ton		1		$22.37	$15.52	$37.89
Totals				$22.37	$53.08	$75.45

C-14B - Elevated Concrete Slabs (Reinforced Concrete Shaft Covers)						
Foreman		1		$0.00	$59.50	$59.50
Supervisor's Truck		1		$14.81	$15.52	$30.33
Carpenter		16		$0.00	$200.32	$200.32
General Laborer		2		$0.00	$25.04	$25.04
Rodmen (reinforcing concrete)		4		$0.00	$50.08	$50.08
Cement finisher		2		$0.00	$25.04	$25.04
Gas Engine Vibrator		1		$6.44	$15.52	$21.96
Concrete Pump		1		$97.73	$0.00	$97.73
Totals				$118.98	$391.02	$510.00

C-14D - Concrete Walls Formed in Place (Reinforced Concrete Adit Bulkheads)						
Foreman		1		$0.00	$59.50	$59.50
Supervisor's Truck		1		$14.81	$15.52	$30.33
Carpenter		18		$0.00	$225.36	$225.36
General Laborer		2		$0.00	$25.04	$25.04
Rodmen (reinforcing concrete)		2		$0.00	$25.04	$25.04
Cement finisher		1		$0.00	$12.52	$12.52
Gas Engine Vibrator		1		$6.44	$15.52	$21.96
Concrete Pump		1		$97.73	$0.00	$97.73
Totals				$118.98	$378.50	$497.48

Closure Cost Estimate
Fleets (Crews)

User Crew #1

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
D10R			**1**	$234.64	$15.52	$250.16
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$506.04	$177.66	$683.70

User Crew #2

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #3						
Description:						
LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #4						
Description:						
LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #5

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #6

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #7

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #8

Description:

LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

User Crew #9						
Description:						
LABOR						
General Laborer			**2**	$0.00	$25.04	$25.04
Foreman			**1**	$0.00	$59.50	$59.50
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$162.14	$433.54

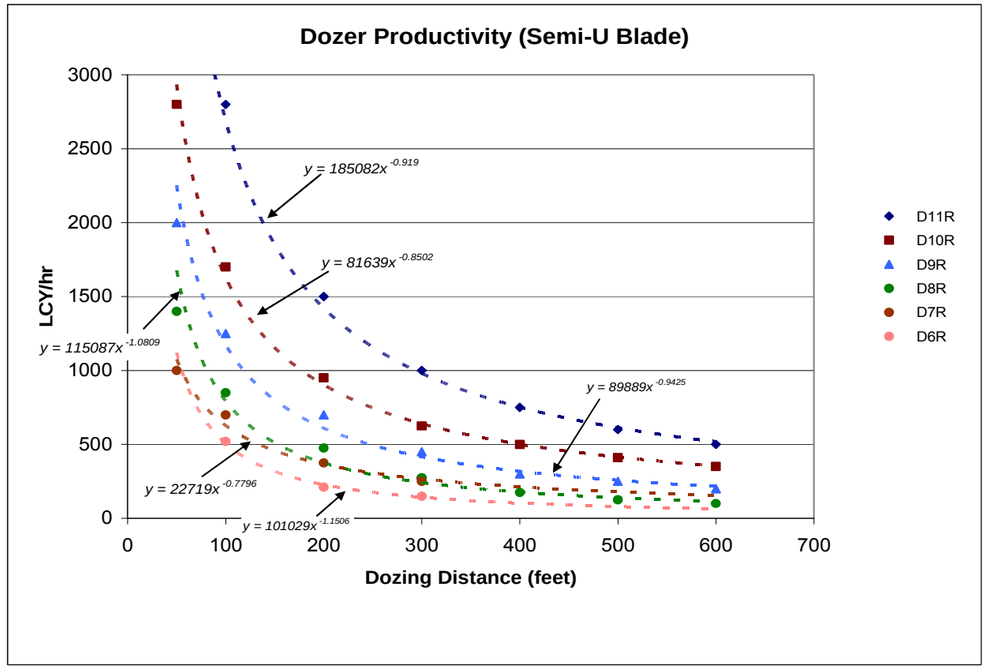
User Crew #10						
Description:						
LABOR						
General Laborer			**1**	$0.00	$12.52	$12.52
Foreman				$0.00	$0.00	$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$47.07	$15.52	$62.59
50 Ton Crane			**1**	$72.94	$15.52	$88.46
Dump Truck (10-12 yd3)			**2**	$136.58	$31.04	$167.62
Supervisor's Truck			**1**	$14.81	$15.52	$30.33
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$271.40	$90.12	$361.52

Closure Cost Estimate
Productivity

Productivity - Bulldozers

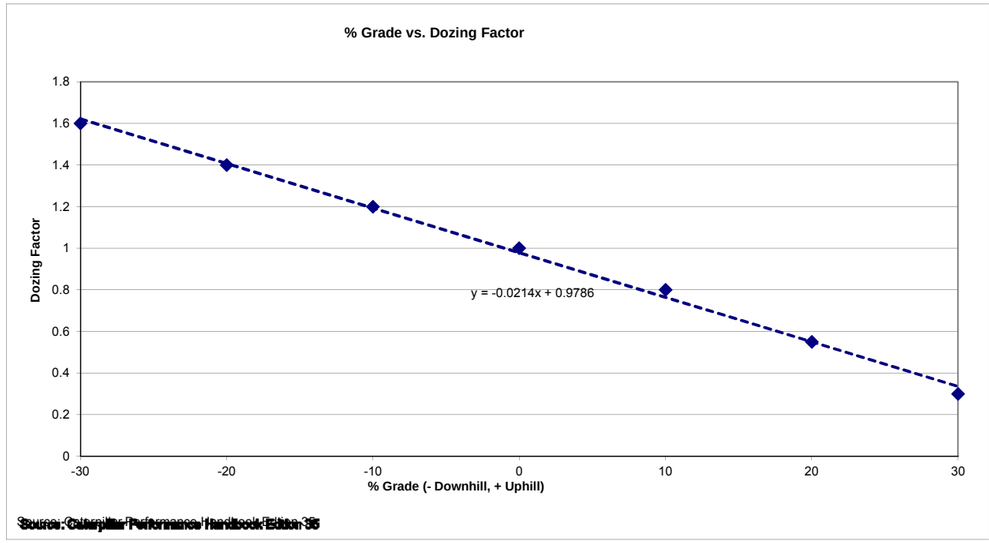
Dozer Specifications						
Description	**D11R**	**D10R**	**D9R**	**D8R**	**D7R**	**D6R**
Blade Width (SU) (ft)	18.33	15.92	14.17	12.92	12.08	10.67
Shank Guage (3 shanks) (ft)	9.83	8.67	7.67	7.08	6.5	6.5
Pocket Spacing (ft)	4.75	4.33	3.87	3.58	3.25	3.25
Ripping Width (Ripper + 1 Pocket) (ft)	14.58	13	11.54	10.66	9.75	9.75
Ripping Speed (mph)	1	1	1	1	1	1
Ripping Maneuver (turn) Time (min)	0.25	0.25	0.25	0.25	0.25	0.25
Altitude Deration Factor	0.93	1	0.93	0.93	1	1
Ripping Hourly Production (excluding maneuvering time) (ft)	4,910	5,280	4,910	4,910	5,280	5,280
Source: Caterpillar Performance Handbook Edition 35						

Dozer Productivity vs. Grading Distance						
Average Dozing Distance (feet)	**Production (LCY/hr)**					
	D11R	**D10R**	**D9R**	**D8R**	**D7R**	**D6R**
50	4,800	2,800	2,000	1,400	1,000	
100	2,800	1,700	1,250	850	700	520
200	1,500	950	700	475	375	210
300	1,000	625	450	275	250	150
400	750	500	300	175		
500	600	410	250	125		
600	500	350	200	100		
Source: Caterpillar Performance Handbook Edition 35						
dozer productivity = k x Dozing Distance^{p} (see graph)						
k =	185082	81639	89889	115087	22719	101029
p =	-0.919	-0.8502	-0.9425	-1.0809	-0.7796	-1.1506



Productivity - Bulldozers (cont.)

% Grade vs. Dozing Factor	
% Grade	**Dozing Factor**
-30	1.6
-20	1.4
-10	1.2
0	1
10	0.8
20	0.55
30	0.3
Source: Caterpillar Performance Handbook Edition 35	
% Grade Dozing Factor = -0.0214x + 0.9786 (see graph)	



Job Condition Correction Factors - Bulldozers	
OPERATOR	
Average	0.75
MATERIAL (1)	
Loose stockpile	1.2
Normal	1
Hard to cut; frozen — with tilt cylinder	0.8
Hard to drift; "dead" (dry,non-cohesive material) or very sticky material	0.8
Rock, ripped or blasted	0.6
SLOT DOZING OR SIDE BY SIDE (1)	1.2
VISIBILITY	
Good conditions	1
JOB EFFICIENCY	
50 min/hr	0.83
(1) Selected in facility worksheets. Other factors included as standard factors.	
Source: Caterpillar Performance Handbook Edition 35	

Material Densities(1)		
Material	**lb/cy**	**kg/m^3**
Alluvium	2,900	1,720
Basalt	3,300	1,960
Clay - Dry	2,500	1,480
Granite - broken	2,800	1,660
Gravel	2,550	1,510
LS - broken	2,600	1,540
LS - crushed	2,600	1,540
Sandstone	2,550	1,510
Shale	2,100	1,250
Stone - crushed	2,700	1,600
Tailings - Coarse (dry, loose sand)	2,400	1,420
Tailings - Slimes (loose sand & clay)	2,700	1,600
Topsoil	1,600	950
(1) Source: Caterpillar Performance Handbook Edition 35		

Note: uses Sand & Gravel - Dry from Caterpillar Handbook

Closure Cost Estimate
Productivity

Productivity - Scrapers

Scraper Specifications		
Description	**631G**	**637G**
Empty Weight	100,600	112,760
Payload Capacity (cy)		
Struck	24	24
Heaped	34	34
Average	29	29
Loaded by	One D10R	Self*
Load Time (min)	1	1
Maneuver and Spread (min)	1	1
Job Efficiency	1	1
Rolling Resistance**	3	3
Altitude Deration Factor	1	1

* Requires pair

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials			Downhill Scraper Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)											
			631G						637G PP					
Material	**lb/cy**	**Scraper Load lb**	**Loaded Weight (lbs)**	**22**	**16**	**10**	**5**	**1**	**Loaded Weight (lbs)**	**25**	**15**	**10**	**5**	**1**
Alluvium	2,900	84,100	184,700	7.5	10	13	33	33	196,860	7	10	18.5	34	34
Basalt	3,300	95,700	196,300	7.5	10	13	24.5	33	208,460	7	10	18.5	25	34
Clay - Dry	2,500	72,500	173,100	7.5	10	13	33	33	185,260	7	10	18.5	34	34
Granite - broken	2,800	81,200	181,800	7.5	10	13	33	33	193,960	7	10	18.5	34	34
Gravel	2,550	73,950	174,550	7.5	10	13	33	33	186,710	7	10	18.5	34	34
LS - broken	2,600	75,400	176,000	7.5	10	13	33	33	188,160	7	10	18.5	34	34
LS - crushed	2,600	75,400	176,000	7.5	10	13	33	33	188,160	7	10	18.5	34	34
Sandstone	2,550	73,950	174,550	7.5	10	13	33	33	186,710	7	10	18.5	34	34
Shale	2,100	60,900	161,500	7.5	10	18	33	33	173,660	10	13.5	18.5	34	34
Stone - crushed	2,700	78,300	178,900	7.5	10	13	33	33	191,060	7	10	18.5	34	34
Tailings - Coarse (dry, loose sand)	2,400	69,600	170,200	7.5	10	13	33	33	182,360	7	10	18.5	34	34
Tailings - Slimes (loose sand & clay)	2,700	78,300	178,900	7.5	10	13	33	33	191,060	7	10	18.5	34	34
Topsoil	1,600	46,400	147,000	7.5	10	18	33	33	159,160	10	13.5	18.5	34	34
			Empty	10	18	24.5	33	33	Empty	10	13.5	18.5	34	34

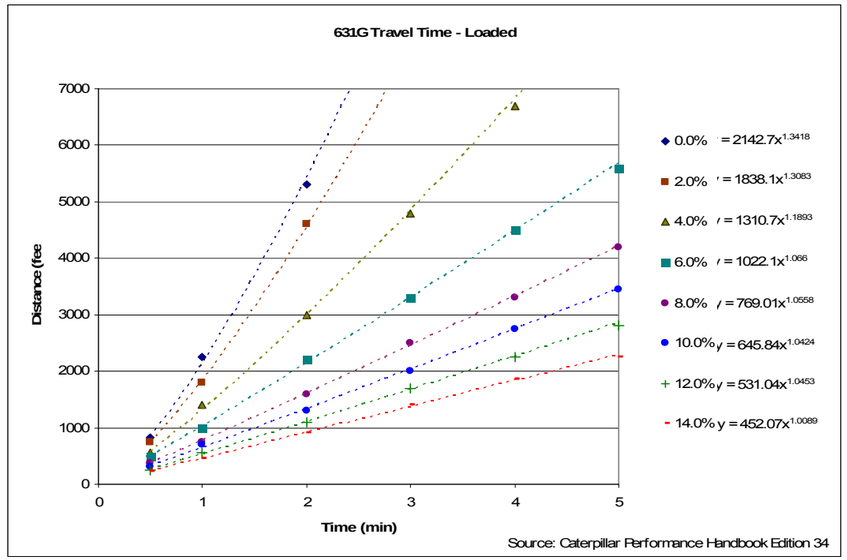
Source: Caterpillar Performance Handbook Edition 34

Productivity - Scrapers (cont.)

631G Scraper Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.5	1	2	3	4	5		
0	825	2,250	5,300				2142.7	1.3418
2	750	1,800	4,600				1838.1	1.3083
4	550	1,400	3,000	4,800	6,700		1310.7	1.1893
6	490	1,000	2,200	3,300	4,500	5,600	1022.1	1.066
8	375	750	1,600	2,500	3,300	4,200	769.01	1.0558
10	300	700	1,300	2,000	2,750	3,450	645.84	1.0424
12	250	550	1,100	1,700	2,250	2,800	531.04	1.0453
14	225	450	900	1,400	1,850	2,250	452.07	1.0089

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35

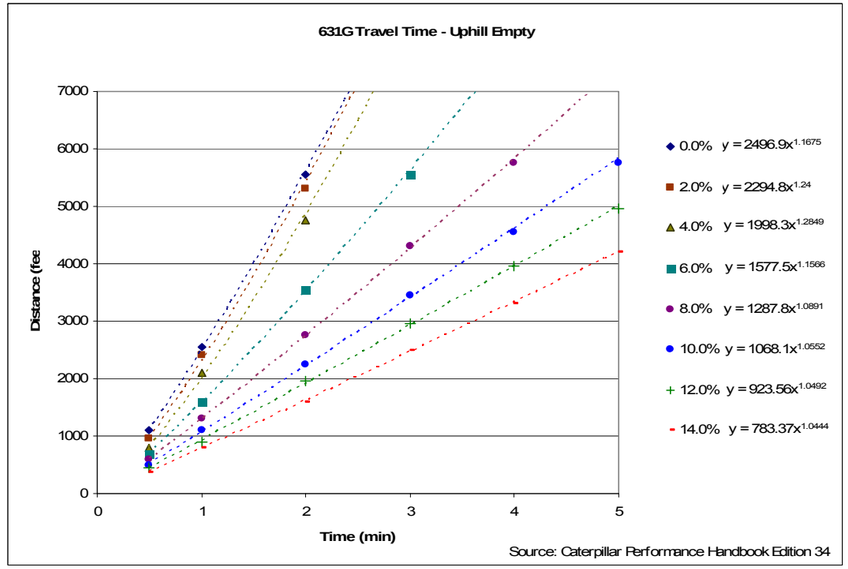


Source: Caterpillar Performance Handbook Edition 34

631G Scraper Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.5	1	2	3	4	5		
0	1,100	2,550	5,550				2496.9	1.1675
2	950	2,400	5,300				2294.8	1.24
4	800	2,100	4,750				1998.3	1.2849
6	700	1,600	3,550	5,550			1557.5	1.1566
8	600	1,300	2,750	4,300	5,750		1287.8	1.0891
10	500	1,100	2,250	3,450	4,550	5,750	1068.1	1.0552
12	450	900	1,950	2,950	3,950	4,950	923.56	1.0492
14	375	800	1,600	2,500	3,300	4,200	783.37	1.0444

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

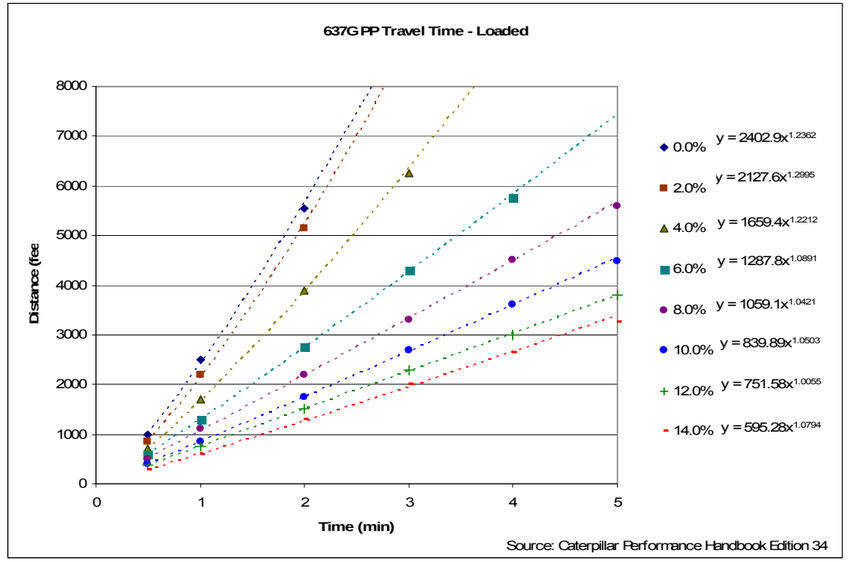
Closure Cost Estimate
Productivity

Productivity - Scrapers (cont.)

637G Push-Pull Scraper Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,000	2,500	5,550				2402.9	1.2362
2	850	2,200	5,150				2127.6	1.2995
4	700	1,700	3,900	6,250			1659.4	1.2212
6	600	1,300	2,750	4,300	5,750		1287.8	1.0891
8	500	1,100	2,200	3,300	4,500	5,600	1059.1	1.0421
10	400	850	1,750	2,700	3,600	4,475	839.89	1.0503
12	375	750	1,500	2,300	3,000	3,800	751.58	1.0055
14		600	1,300	2,000	2,650	3,250	595.28	1.0794

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

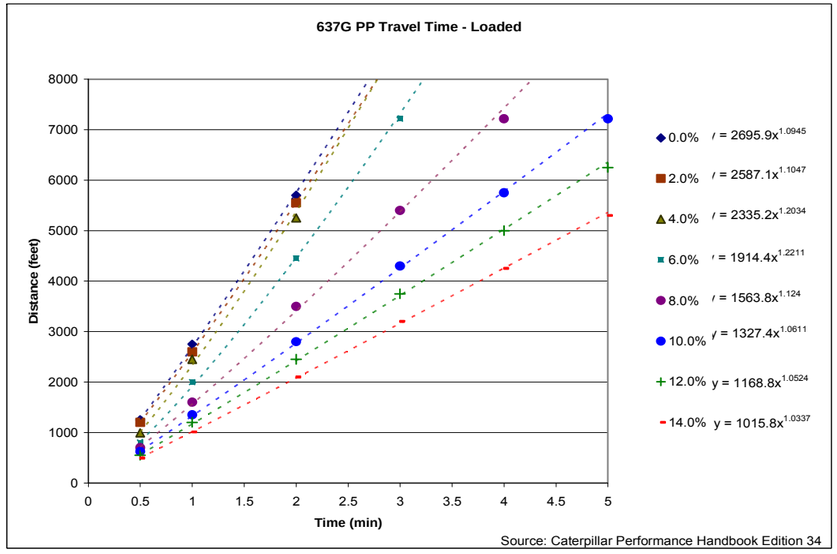


Source: Caterpillar Performance Handbook Edition 34

637G Push-Pull Scraper Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,250	2,750	5,700				2695.9	1.0945
2	1,200	2,600	5,550				2587.1	1.1047
4	990	2,450	5,250				2335.2	1.0234
6	800	2,000	4,450	7,216			1914.4	1.2211
8	700	1,600	3,500	5,400	7,216		1563.8	1.124
10	625	1,350	2,800	4,300	5,750	7,216	1327.4	1.0611
12	550	1,200	2,450	3,750	5,000	6,250	1168.8	1.0524
14		1,010	2,100	3,200	4,250	5,300	1015.8	1.0337

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

Closure Cost Estimate
Productivity

Productivity - Haul Trucks

Haul Truck Specifications						
Description	**769D**	**773E**	**777D**	**785C**	**793C**	**797B**
Chassis Weight (lb)	53,506	70,330	113,160	170,000	259,500	473,600
Body Weight (lb)	17,350	20,300	34,785	36,788	70,785	104,200
Standard Liner Weight (lb)	7,000	8,600	12,040	16,846	24,418	8,800
Total Truck Weight (lb)	77,856	99,230	159,985	223,634	354,703	586,600
Payload Capacity (cy)						
Struck	21.6	34.8	55	78.5	126	228
Heaped	31.7	46	78.6	102	169	290
Average	26.65	40.4	66.8	90.25	147.5	259
Maneuver to Load Time (min)	0.7	0.7	0.7	0.7	0.7	0.7
Maneuver and Dump Time (min)	1.1	1.1	1.1	1.1	1.1	1.1
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5	2.5
Altitude Deration Factor	0.93	1	1	0.93	1	1

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Closure Cost Estimate
Productivity

Weight of Materials					Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)															
					769D					773E					777D					
Material	lb/cy	Truck (769D) Load lb	Truck (773E) Load lb	Truck (777D) Load lb	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	77,285	117,160	193,720	155,141	11	11	15	26	216,390	7	7	13	23	353,705	7	9	12	29
Basalt	3,300	87,945	133,320	220,440	165,801	11	11	11	20	232,550	7	7	13	23	380,425	7	7	12	21
Clay - Dry	2,500	66,625	101,000	167,000	144,481	11	11	15	26	200,230	7	9	13	23	326,985	7	9	16	29
Granite - broken	2,800	74,620	113,120	187,040	152,476	11	11	15	26	212,350	7	7	13	23	347,025	7	9	12	29
Gravel	2,550	67,958	103,020	170,340	145,814	11	11	15	26	202,250	7	9	13	23	330,325	7	9	16	29
LS - broken	2,600	69,290	105,040	173,680	147,146	11	11	15	26	204,270	7	9	13	23	333,665	7	9	12	29
LS - crushed	2,600	69,290	105,040	173,680	147,146	11	11	15	26	204,270	7	9	13	23	333,665	7	9	12	29
Sandstone	2,550	67,958	103,020	170,340	145,814	11	11	15	26	202,250	7	9	13	23	330,325	7	9	16	29
Shale	2,100	55,965	84,840	140,280	133,821	11	11	15	26	184,070	7	9	13	31	300,265	7	9	16	29
Stone - crushed	2,700	71,955	109,080	180,360	149,811	11	11	15	26	208,310	7	7	13	23	340,345	7	9	12	29
Tailings - Coarse (dry, loose sand)	2,400	63,960	96,960	160,320	141,816	11	11	15	26	196,190	7	9	13	23	320,305	7	9	16	29
Tailings - Slimes (loose sand & clay)	2,700	71,955	109,080	180,360	149,811	11	11	15	26	208,310	7	7	13	23	340,345	7	9	12	29
Topsoil	1,600	42,640	64,640	106,880	120,496	11	11	15	26	163,870	7	9	17	31	266,865	9	12	16	29
					Empty	15	15	26	36	Empty	13	17	23	42	Empty	16	16	29	39

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials					Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)															
					785C					793C					797B					
Material	lb/cy	Truck (785C) Load lb	Truck (793C) Load lb	Truck (797B) Load lb	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	261,725	427,750	751,100	485,359	8	8	14	27	782,453	7	7	10	17	1,337,700	7	7	9	17
Basalt	3,300	297,825	486,750	854,700	521,459	8	8	14	27	841,453	7	7	10	17	1,441,300	7	7	9	17
Clay - Dry	2,500	225,625	368,750	647,500	449,259	8	11	14	36	723,453	7	7	10	25	1,234,100	7	7	9	23
Granite - broken	2,800	252,700	413,000	725,200	476,334	8	8	14	27	767,703	7	7	10	17	1,311,800	7	7	9	17
Gravel	2,550	230,138	376,125	660,450	453,772	8	8	14	36	730,828	7	7	10	25	1,247,050	7	7	9	23
LS - broken	2,600	234,650	383,500	673,400	458,284	8	8	14	27	738,203	7	7	10	25	1,260,000	7	7	9	23
LS - crushed	2,600	234,650	383,500	673,400	458,284	8	8	14	27	738,203	7	7	10	25	1,260,000	7	7	9	23
Sandstone	2,550	230,138	376,125	660,450	453,772	8	8	14	36	730,828	7	7	10	25	1,247,050	7	7	9	23
Shale	2,100	189,525	309,750	543,900	413,159	8	11	14	36	664,453	7	7	10	25	1,130,500	7	7	13	23
Stone - crushed	2,700	243,675	398,250	699,300	467,309	8	8	14	27	752,953	7	7	10	17	1,285,900	7	7	9	23
Tailings - Coarse (dry, loose sand)	2,400	216,600	354,000	621,600	440,234	8	11	14	36	708,703	7	7	10	25	1,208,200	7	7	9	23
Tailings - Slimes (loose sand & clay)	2,700	243,675	398,250	699,300	467,309	8	8	14	27	752,953	7	7	10	17	1,285,900	7	7	9	23
Topsoil	1,600	144,400	236,000	414,400	368,034	8	11	19	36	590,703	7	10	13	25	1,001,000	7	9	13	23
					Empty	14	19	36	36	Empty	10	13	17	33	Empty	13	17	23	42

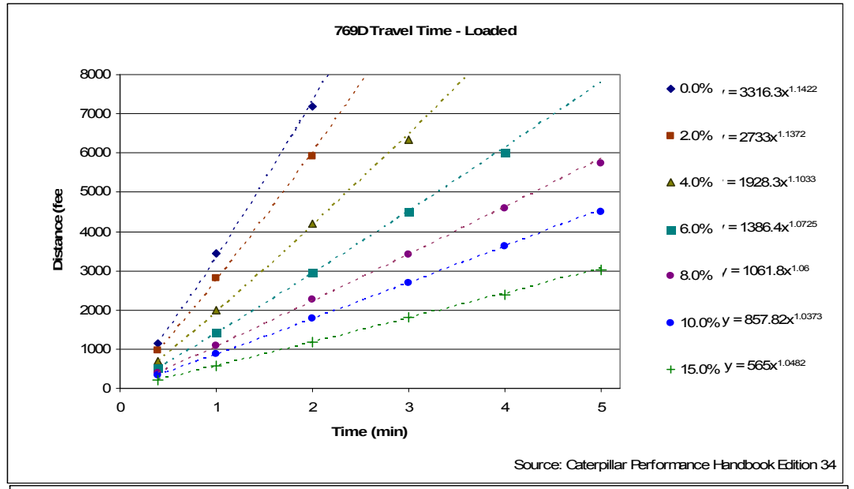
Source: Caterpillar Performance Handbook Edition 35

Productivity - Haul Trucks (cont.)

769D Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	1,148	3,428	7,183				3316.3	1.1422
4	689	1,984	4,198	6,330			1928.3	1.1033
6	508	1,427	2,952	4,510	6,002		1386.4	1.0725
8	394	1,082	2,263	3,411	4,592	5,740	1061.8	1.06
10		869	1,771	2,690	3,608	4,510	857.82	1.0373
15		574	1,181	1,804	2,394	3,018	565	1.0482

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

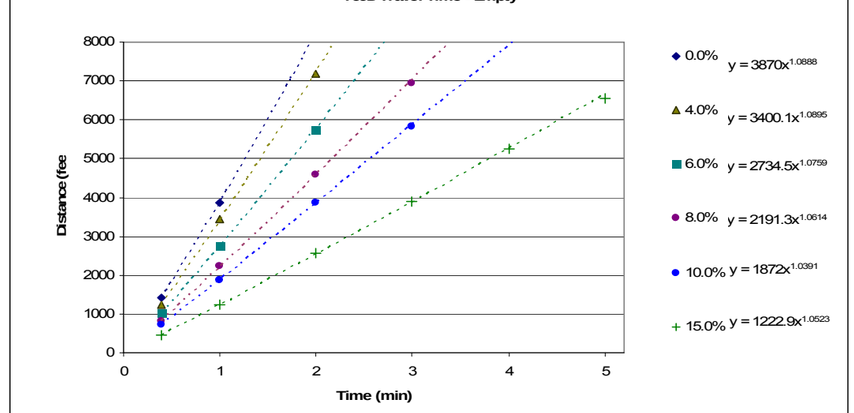


Source: Caterpillar Performance Handbook Edition 34

769D Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	1,427	3,870					3870	1.0888
4	1,246	3,444	7,183				3400.1	1.0895
6	1,017	2,755	5,740				2734.5	1.0759
8	820	2,230	4,592	6,954			2191.3	1.0614
10	722	1,870	3,870	5,838			1872	1.0391
15		1,246	2,558	3,903	5,248	6,560	1222.9	1.0523

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



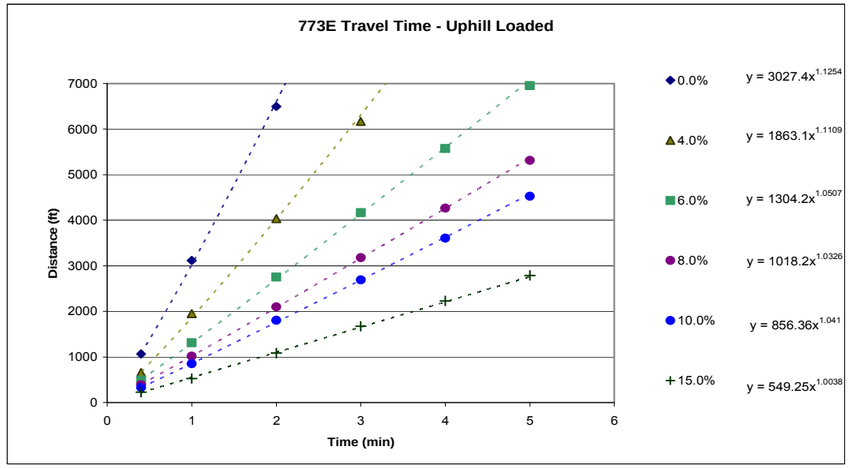
Source: Caterpillar Performance Handbook Edition 34

Productivity - Haul Trucks (cont.)

773E Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	1,066	3,117	6,496				3027.4	1.1254
4	656	1,952	4,035	6,168			1863.1	1.1109
6	492	1,312	2,756	4,167	5,577	6,955	1304.2	1.0507
8	394	1,017	2,100	3,182	4,265	5,315	1018.2	1.0326
10	328	853	1,804	2,690	3,609	4,528	856.36	1.041
15		525	1,083	1,673	2,231	2,789	549.25	1.0038

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

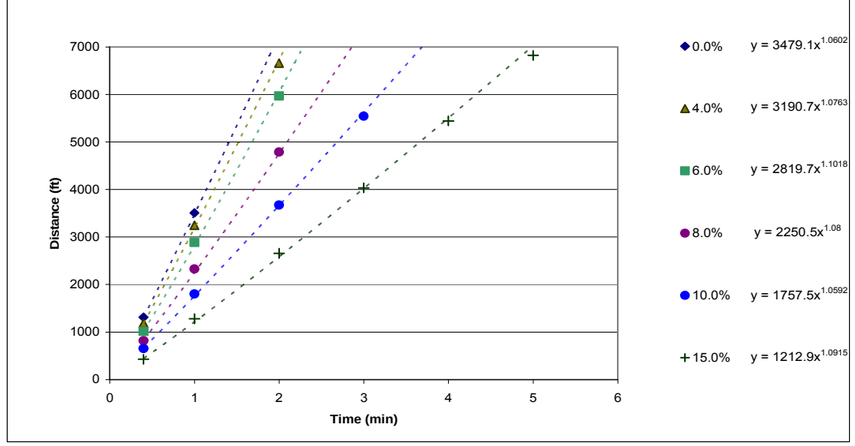
Source: Caterpillar Performance Handbook Edition 35



773E Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	1,312	3,510	7,218				3479.1	1.0602
4	1,181	3,248	6,660				3190.7	1.0763
6	1,017	2,887	5,971				2819.7	1.1018
8	820	2,329	4,790	7,218			2250.5	1.08
10		1,804	3,675	5,545			1757.5	1.0592
15		1,280	2,657	4,035	5,446	6,824	1212.9	1.0915

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

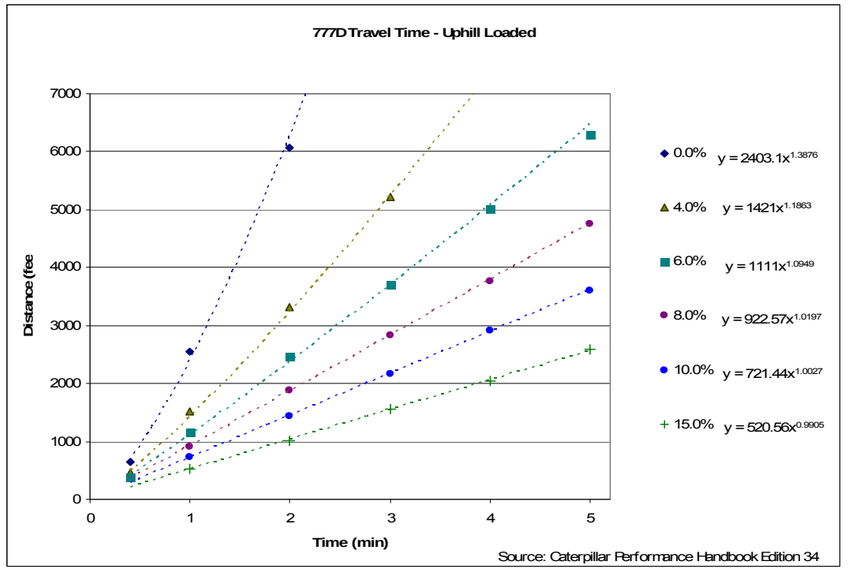


Productivity - Haul Trucks (cont.)

777D Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	656	2,558	6,068				2403.1	1.3876
4	459	1,509	3,313	5,215	7,085		1412	1.1863
6	394	1,148	2,460	3,706	5,018	6,298	1111	1.0949
8		918	1,886	2,837	3,772	4,756	922.57	1.0197
10		722	1,443	2,165	2,919	3,608	721.44	1.0027
15		525	1,017	1,558	2,034	2,591	520.56	0.9905

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35

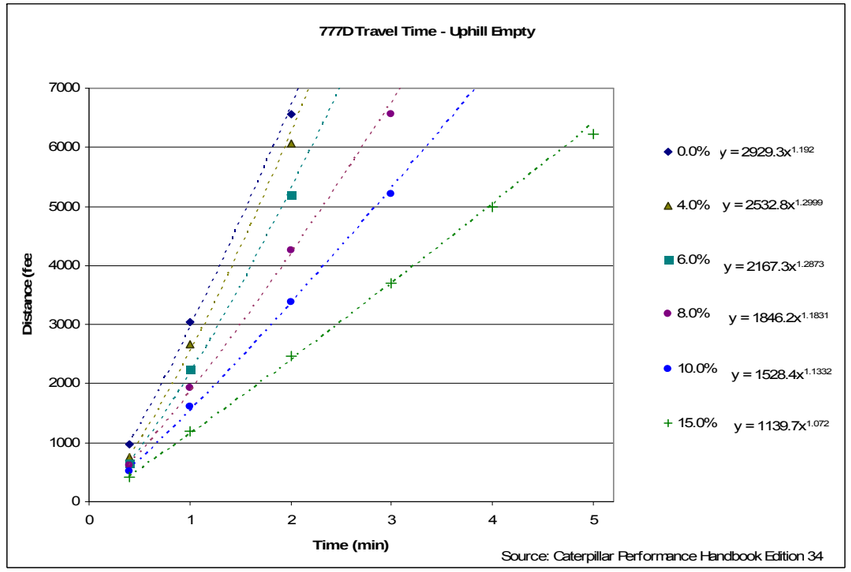


Source: Caterpillar Performance Handbook Edition 34

777D Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.4	1	2	3	4	5		
0	968	3,034	6,560				2929.3	1.192
4	754	2,657	6,068				2532.8	1.2999
6	656	2,247	5,182				2167.3	1.2873
8		1,935	4,248	6,560			1846.2	1.1831
10		1,607	3,378	5,215	7,282		1528.4	1.1332
15		1,197	2,460	3,706	4,986	6,232	1139.7	1.072

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

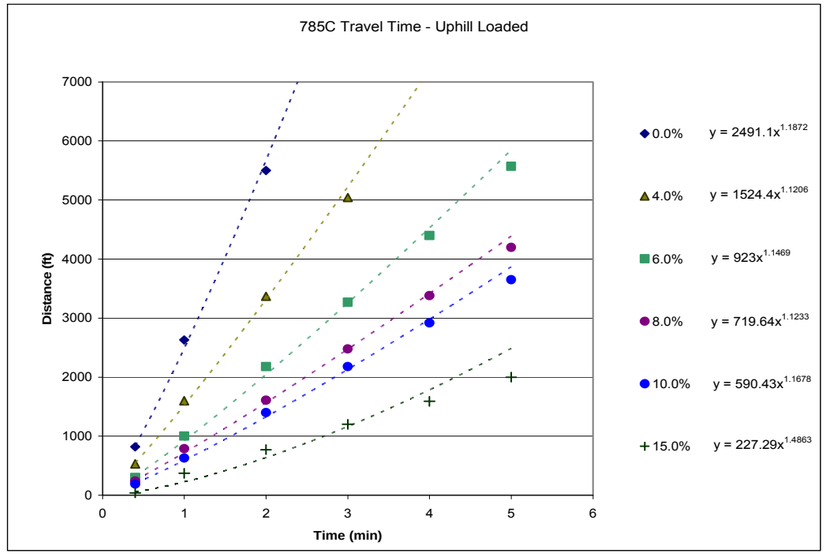
Closure Cost Estimate
Productivity

Productivity - Haul Trucks (cont.)

785C Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	820	2,630	5,500				2491.1	1.1872
4	530	1,600	3,370	5,040			1524.4	1.1206
6	300	1,000	2,180	3,270	4,400	5,570	923	1.1469
8		790	1,610	2,480	3,380	4,200	719.64	1.1233
10		630	1,400	2,180	2,920	3,650	590.43	1.1678
15		370	770	1,200	1,590	2,000	227.29	1.4863

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

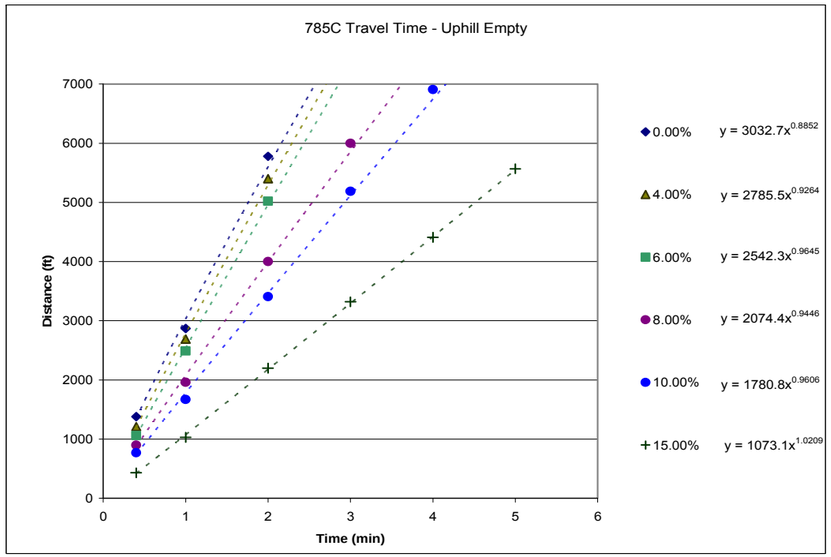
Source: Caterpillar Performance Handbook Edition 35



785C Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,380	2,870	5,780				3032.7	0.8852
4	1,210	2,690	5,400				2785.5	0.9264
6	1,060	2,490	5,020				2542.3	0.9645
8		1,960	4,000	6,000			2074.4	0.9446
10		1,670	3,410	5,190	6,910		1780.8	0.9606
15	430	1,030	2,200	3,320	4,410	5,570	1073.1	1.0209

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35

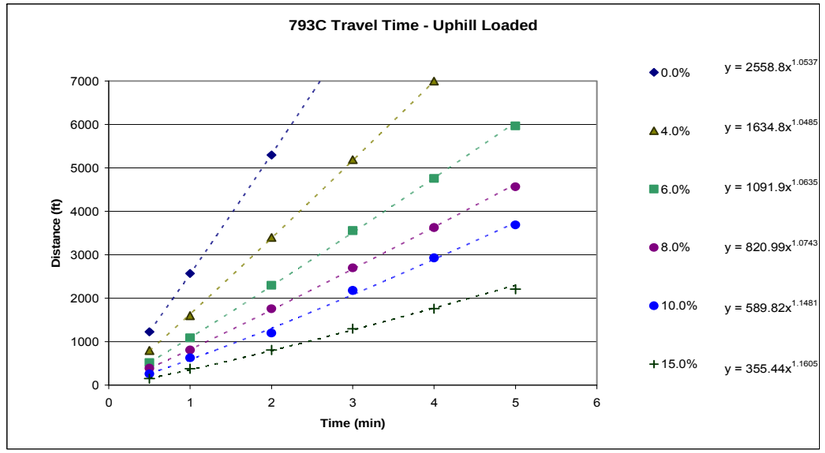


Productivity - Haul Trucks (cont.)

793C Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,230	2,570	5,300				2558.8	1.0537
4	800	1,600	3,400	5,190	7,000		1634.8	1.0485
6	$\sqrt[p]{\frac{\text{distance}}{k}}$	1,090	2,300	3,560	4,760	5,970	1091.9	1.0635
8		810	1,760	2,700	3,630	4,570	820.99	1.0743
10		630	1,200	2,180	2,930	3,690	589.82	1.1481
15	150	380	810	1,300	1,760	2,210	355.44	1.1605

Travel Time (min) =

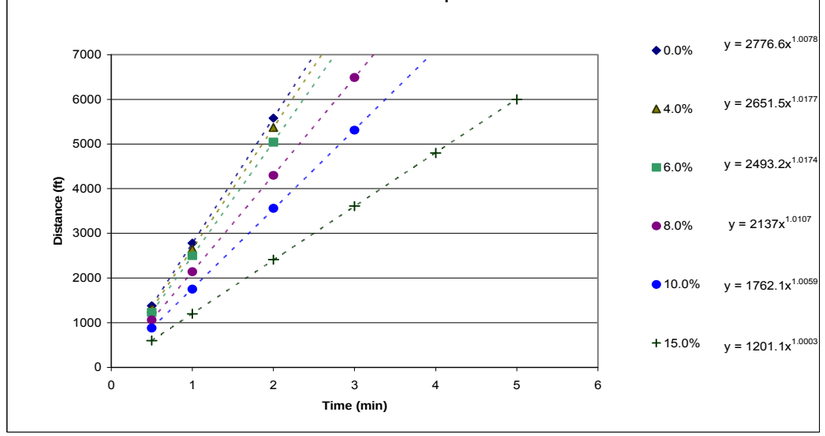
Source: Caterpillar Performance Handbook Edition 35



793C Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,380	2,780	5,580				2776.6	1.0078
4	1.310	2,650	5,370				2651.5	1.0177
6	$\sqrt[p]{\frac{\text{distance}}{k}}$	2,500	5,040				2493.2	1.0174
8		2,140	4,300	6,490			2137	1.0107
10		1,750	3,560	5,310			1762.1	1.0059
15	600	1,200	2,410	3,610	4,800	6,000	1201.1	1.0003

Travel Time (min) =

Source: Caterpillar Performance Handbook Edition 35

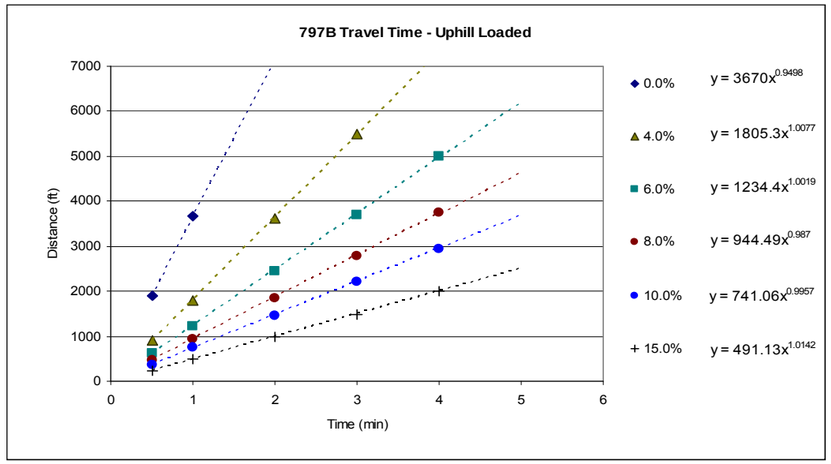


Productivity - Haul Trucks (cont.)

797B Haul Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.5	1	2	3	4	5		
0	1,900	3,670					3670	0.9498
4	[illegible]	1,800	3,620	5,480			1805.3	1.0077
6	$\sqrt[p]{\frac{distance}{k}}$	1,230	2,450	3,700	5,000		1234.4	1.0019
8		940	1,850	2,790	3,750		944.49	0.987
10	370	750	1,460	2,220	2,950		741.06	0.9957
15	240	500	1,000	1,480	2,000		491.13	1.0142

Travel Time (min) =

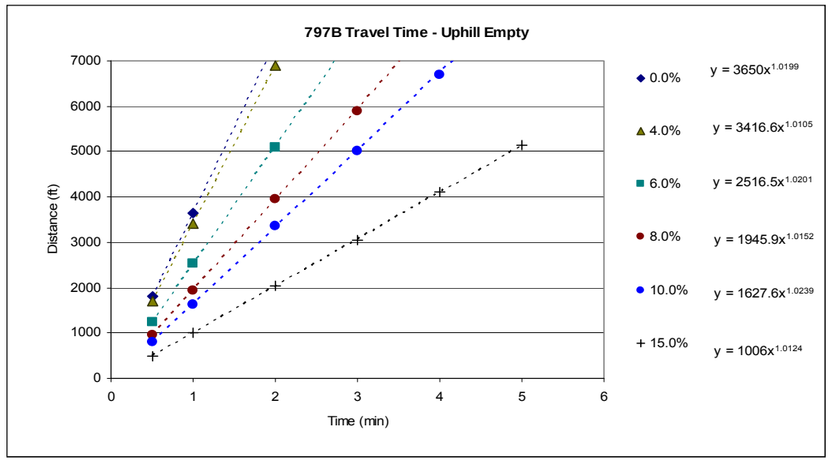
Source: Caterpillar Performance Handbook Edition 35



797B Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	Time (min)						k	p
	0.5	1	2	3	4	5		
0	1,800	3,650					3650	1.0199
4	$\sqrt[p]{\frac{distance}{k}}$	3,400	6,900				3416.6	1.0105
6		2,520	5,100				2516.5	1.0201
8		1,950	3,960	5,900			1945.9	1.0152
10	800	1,620	3,350	5,000	6,700		1627.6	1.0239
15	500	1,000	2,040	3,050	4,100	5,130	1006	1.0124

Travel Time (min) =

Source: Caterpillar Performance Handbook Edition 35



Closure Cost Estimate
Productivity

Productivity - Articulated Trucks

Articulated Truck Specifications				
Description	**725**	**730**	**735**	**740**
Chassis Weight (lb)				
Body Weight (lb)				
Standard Liner Weight (lb)				
Operating Weight (Empty) (lb)	50,120	51,220	65,830	72,070
Payload Capacity (cy)				
Struck	14.5	17.1	19.3	23.3
Heaped	18.8	22.1	31.8	30.2
Average	16.65	19.6	25.55	26.75
Maneuver to Load Time (min)	0.7	0.7	0.7	0.7
Maneuver and Dump Time (min)	1.1	1.1	1.1	1.1
Job Efficiency	0.83	0.83	0.83	0.83
Rolling Resistance**	2.5	2.5	2.5	2.5
Altitude Deration Factor	1	1	1	1

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Closure Cost Estimate
Productivity

Weight of Materials				Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)									
				725					730				
Material	lb/cy	Truck (725) Load lb	Truck (730) Load lb	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	48,285	56,840	98,405	9	9	13	30	108,060	5	8	13	29
Basalt	3,300	54,945	64,680	105,065	5	9	13	22	115,900	5	8	13	29
Clay - Dry	2,500	41,625	49,000	91,745	9	13	13	30	100,220	8	8	13	29
Granite - broken	2,800	46,620	54,880	96,740	9	13	13	30	106,100	5	8	13	29
Gravel	2,550	42,458	49,980	92,578	9	13	13	30	101,200	8	8	13	29
LS - broken	2,600	43,290	50,960	93,410	9	13	13	30	102,180	8	8	13	29
LS - crushed	2,600	43,290	50,960	93,410	9	13	13	30	102,180	8	8	13	29
Sandstone	2,550	42,458	49,980	92,578	9	13	13	30	101,200	8	8	13	29
Shale	2,100	34,965	41,160	85,085	9	13	22	30	92,380	8	13	13	29
Stone - crushed	2,700	44,955	52,920	95,075	9	13	13	30	104,140	8	8	13	29
Tailings - Coarse (dry, loose sand)	2,400	39,960	47,040	90,080	9	13	13	30	98,260	8	8	13	29
Tailings - Slimes (loose sand & clay)	2,700	44,955	52,920	95,075	9	13	13	30	104,140	8	8	13	29
Topsoil	1,600	26,640	31,360	76,760	9	13	22	30	82,580	8	13	22	35
				Empty	13	13	22	30	Empty	13	13	22	35

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials				Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)									
				735					740				
Material	lb/cy	Truck (735) Load lb	Truck (740) Load lb	Loaded Weight (lbs)	20	15	10	5	Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	74,095	77,575	139,925	7	9	13	27	149,645	7	9	17	23
Basalt	3,300	84,315	88,275	150,145	7	9	13	27	160,345	7	9	13	23
Clay - Dry	2,500	63,875	66,875	129,705	7	9	13	27	138,945	9	13	17	31
Granite - broken	2,800	71,540	74,900	137,370	7	9	13	27	146,970	7	9	17	23
Gravel	2,550	65,153	68,213	130,983	7	9	13	27	140,283	7	9	17	31
LS - broken	2,600	66,430	69,550	132,260	7	9	13	27	141,620	7	9	17	31
LS - crushed	2,600	66,430	69,550	132,260	7	9	13	27	141,620	7	9	17	31
Sandstone	2,550	65,153	68,213	130,983	7	9	13	27	140,283	7	9	17	31
Shale	2,100	53,655	56,175	119,485	9	9	18	27	128,245	7	13	17	31
Stone - crushed	2,700	68,985	72,225	134,815	7	9	13	27	144,295	7	9	17	23
Tailings - Coarse (dry, loose sand)	2,400	61,320	64,200	127,150	7	9	13	27	136,270	9	13	17	31
Tailings - Slimes (loose sand & clay)	2,700	68,985	72,225	134,815	7	9	13	27	144,295	7	9	17	23
Topsoil	1,600	40,880	42,800	106,710	9	13	18	36	114,870	9	13	17	31
				Empty	13	18	27	42	Empty	17	17	23	31

Source: Caterpillar Performance Handbook Edition 35

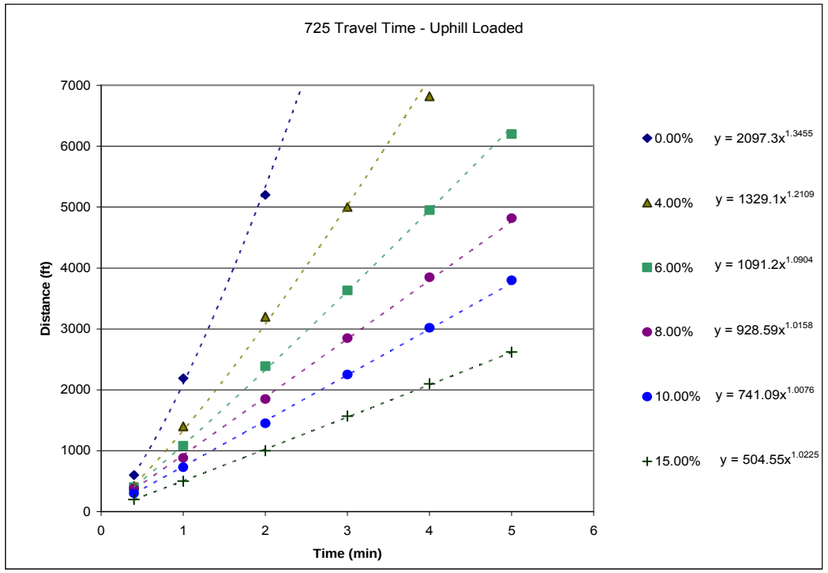
Productivity - Articulated Trucks (cont.)

725 Articulated Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0		2,190	5,200				2097.3	1.3455
4		1,400	3,200	5,000	6,820		1329.1	1.2109
6	400	1,080	2,390	3,630	4,950	6,200	1091.2	1.0904
8	380	880	1,850	2,850	3,850	4,820	928.59	1.0158
10	300	729	1,450	2,250	3,020	3,800	741.09	1.0076
15	200	500	1,000	1,570	2,100	2,620	504.55	1.0225

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35

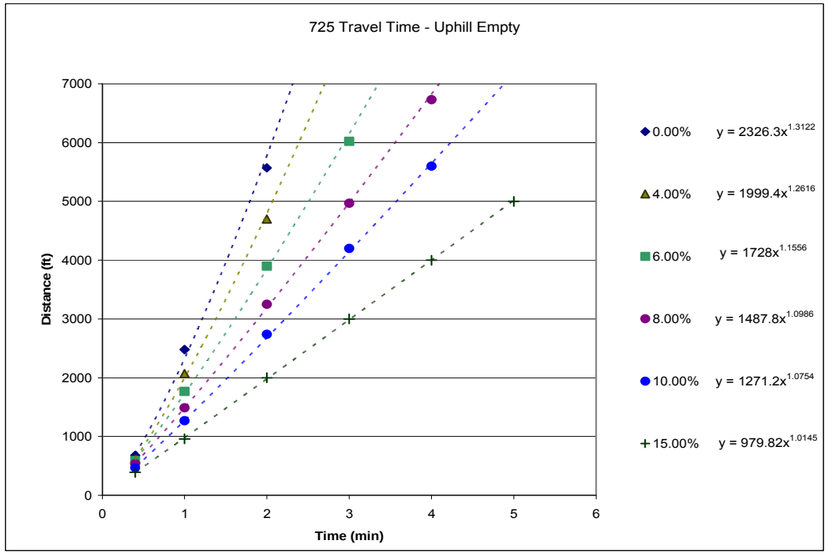


725 Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0		2,480	5,570				2326.3	1.3122
4		2,070	4,700				1999.4	1.2616
6	590	1,770	3,900	6,020			1728	1.1556
8	540	1,490	3,250	4,970	6,730		1487.8	1.0986
10	470	1,270	2,740	4,200	5,600	7,050	1271.2	1.0754
15	390	960	2,000	3,000	4,000	5,000	979.82	1.0145

Travel Time (min) = $\sqrt[p]{\frac{\text{distance}}{k}}$

Source: Caterpillar Performance Handbook Edition 35

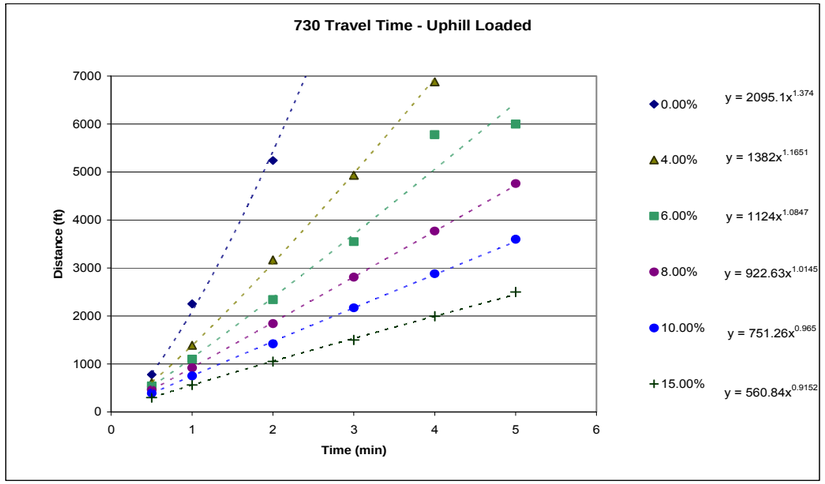


Productivity - Articulated Trucks (cont.)

730 Articulated Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{\text{distance}}{k}}$	Time (min) 1	2	3	4	5	k	p
0		2,250	5,240				2095	1.374
4		1,390	3,170	4,930	6,880		1382	1.1651
6	540	1,100	2,340	3,550	5,780	6,000	112	1.0847
8	460	920	1,840	2,810	3,770	4,760	922.63	1.0145
10	390	750	1,420	2,170	2,880	3,600	751.26	0.965
15	300	560	1,050	1,500	1,995	2,500	560.84	0.9152

Travel Time (min) =

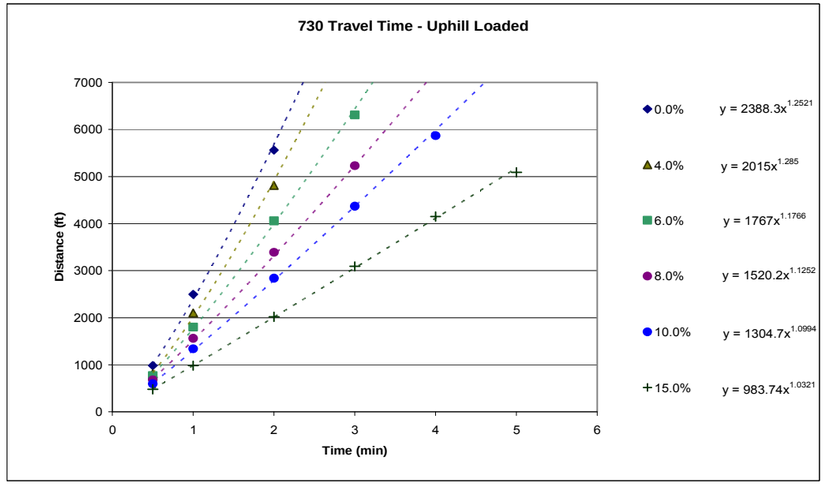
Source: Caterpillar Performance Handbook Edition 35



730 Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{\text{distance}}{k}}$	Time (min) 1	2	3	4	5	k	p
0		2,500	5,560				2388	1.25621
4	810	2,100	4,810				2015	1.285
6	770	1,800	4,060	6,310			1767	1.1766
8	680	1,560	3,390	5,230	7,070		1520.2	1.1252
10	595	1,340	2,840	4,370	5,870		1304.7	1.0994
15	480	980	2,020	3,090	4,150	5,090	983.74	1.0321

Travel Time (min) =

Source: Caterpillar Performance Handbook Edition 35



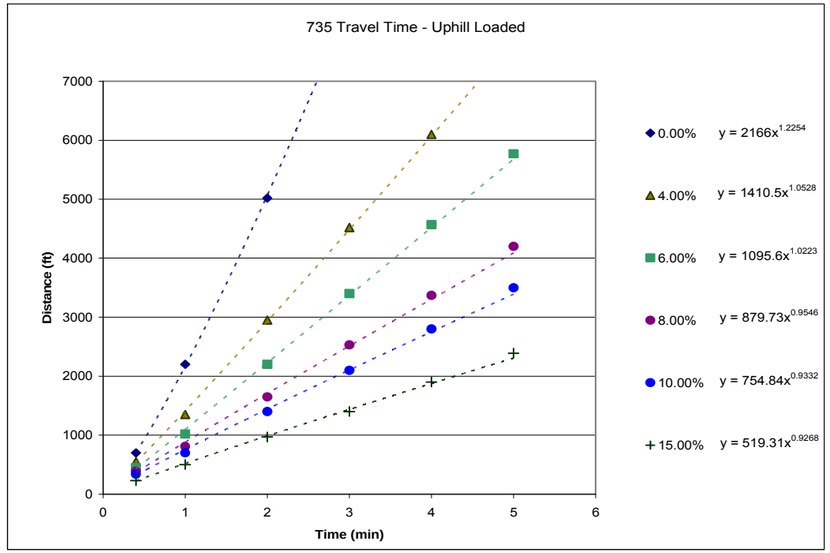
Closure Cost Estimate
Productivity

Productivity - Articulated Trucks (cont.)

735 Articulated Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{\text{distance}}{k}}$	Time (min) 1	2	3	4	5	k	p
0		2,200	5,020				2166	1.2254
4	550	1,350	2,950	4,520	6,100		1410.5	1.0528
6	450	1,020	2,200	3,400	4,570	5,770	1095.6	1.0223
8	390	810	1,650	2,530	3,370	4,200	879.73	0.9546
10	340	700	1,400	2,100	2,800	3,500	754.84	0.9332
15	230	500	970	1,400	1,900	2,390	519.31	0.9268

Travel Time (min) =

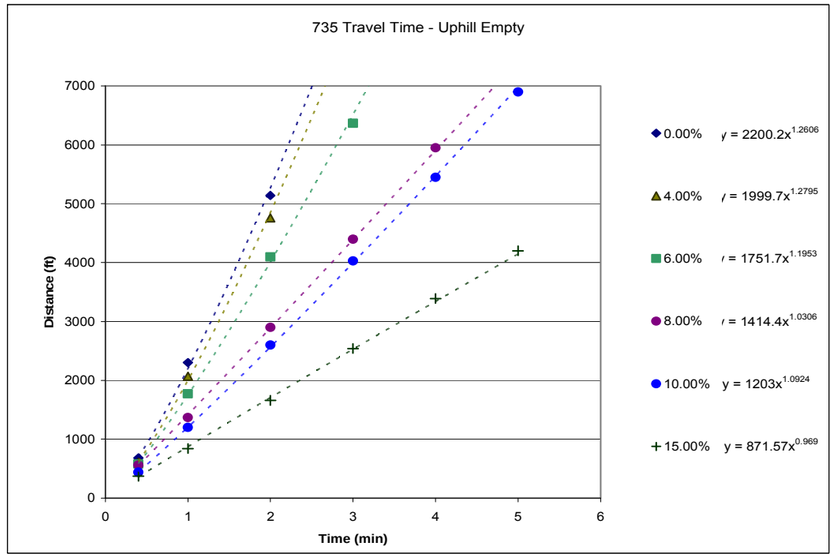
Source: Caterpillar Performance Handbook Edition 35



735 Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{\text{distance}}{k}}$	Time (min) 1	2	3	4	5	k	p
0		2,300	5,140				2200.2	1.2606
4	610	2,070	4,760				1999.7	1.2795
6	580	1,770	4,100	6,370			1751.7	1.1953
8	560	1,370	2,900	4,400	5,950		1414.4	1.0306
10	440	1,200	2,600	4,030	5,450	6,900	1203	1.0924
15	370	840	1,660	2,540	3,390	4,200	871.57	0.969

Travel Time (min) =

Source: Caterpillar Performance Handbook Edition 35



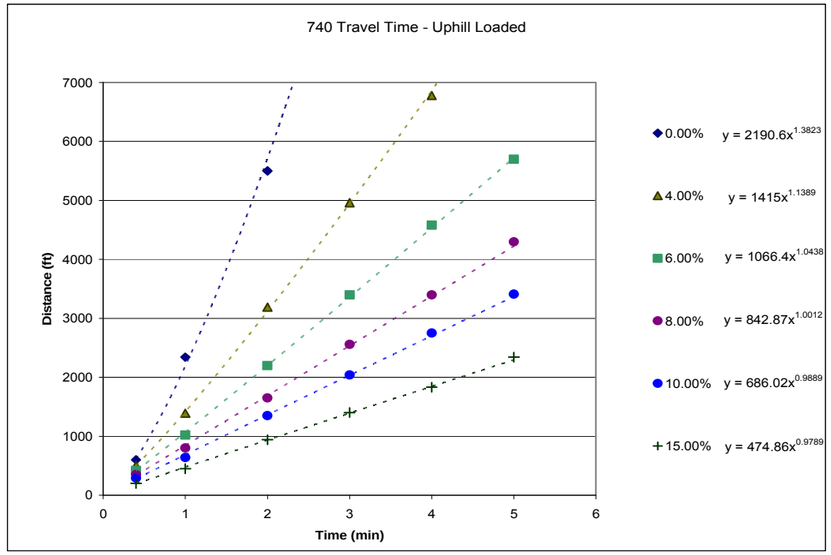
Closure Cost Estimate
Productivity

Productivity - Articulated Trucks (cont.)

740 Articulated Truck Travel Time - Uphill Loaded								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{distance}{k}}$	Time (min)					k	p
		1	2	3	4	5		
0	600	2,340	5,500				2190.6	1.3823
4	500	1,390	3,190	4,960	6,780		1415	1.1389
6	420	1,020	2,200	3,400	4,580	5,700	1066.4	1.0438
8	350	800	1,650	2,560	3,400	4,300	842.87	1.0012
10	290	640	1,350	2,040	2,750	3,410	686.02	0.9889
15	200	450	940	1,400	1,830	2,340	474.86	0.9789

Travel Time (min) =

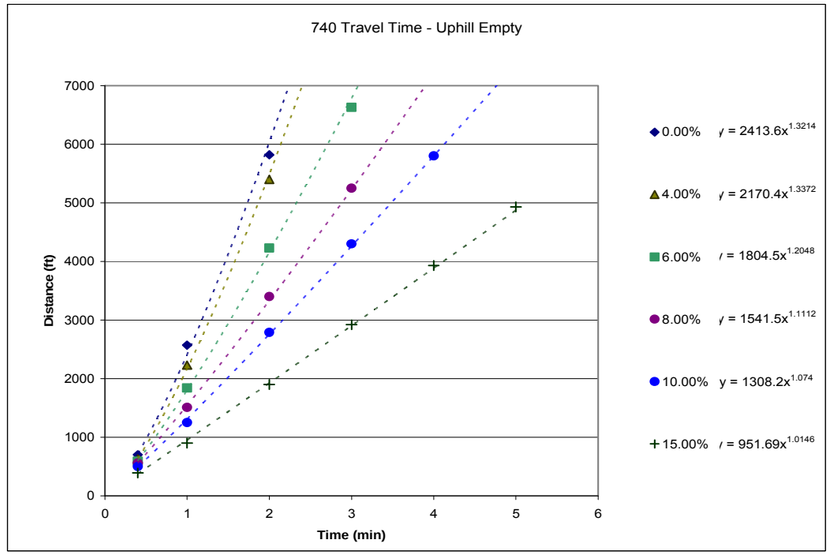
Source: Caterpillar Performance Handbook Edition 35



740 Haul Truck Travel Time - Uphill Empty								
Total Resistance (%) (rolling + grade)	$\sqrt[p]{\frac{distance}{k}}$	Time (min)					k	p
		1	2	3	4	5		
0	700	2,570	5,820				2413.6	1.3214
4	630	2,230	5,400				2170.4	1.3372
6	590	1,840	4,230	6,630			1804.5	1.2048
8	560	1,510	3,400	5,250	7,120		1541.5	1.1112
10	500	1,250	2,790	4,300	5,800		1308.2	1.074
15	390	900	1,900	2,920	3,930	4,930	951.69	1.0146

Travel Time (min) =

Source: Caterpillar Performance Handbook Edition 35



Closure Cost Estimate
Productivity

Productivity - Wheel Loaders

Wheel Loader Specifications

Description	924G	928G	950G	966G	972G	972G (2)	980G	988G	988G(2)	990	992G	992G(2)	994D	L2350
Payload Capacity (cy)														
Struck	2.2	2.5	3.46	4.46	4.71	4.71	6.34	6.9	6.9	9.5	13.2	13.2	18	
Heaped	2.7	3.25	4	5.25	5.5	5.5	7.25	8.33	8.33	11.25	16	16	22.5	
Average	2.45	2.875	3.73	4.855	5.105	5.105	6.795	7.615	7.615	10.375	14.6	14.6	20.25	53
Matched Truck	N/A	N/A	N/A	725	730	735	N/A	740	769D	773D	777D	785C	793C	797B
Average Cycle Time (min)	0.45	0.45	0.5	0.5	0.5	0.5	0.55	0.55	0.55	0.55	0.6	0.6	0.6	0.75
Passes to Fill Truck	N/A	N/A	N/A	3	4	5	N/A	4	3	4	5	6	7	5
Altitude Deration Factor	1	1	1	1	0.84	0.84	1	0.95	0.95	1	1	1	1	1
Operator Efficiency	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Time to Fill Truck	N/A	N/A	N/A	1.5	1.68	2.1	N/A	2.09	1.57	2.2	3	3.6	4.2	3.75
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Loader matched to small truck fleet
Loader matched to medium truck fleet
Loader matched to large truck fleet
Loader matched to extra large truck fleet

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

992G (2) - can be used to load 785 with 6 passes

Source: Caterpillar Performance Handbook Edition 35; LeTourneau/actual Chilean mine operating data for L2350.

Wheeled Loaders	General Purpose	Spade Nose-Rock
928G	3.25 cubic yard	not available
966G	5.0 cubic yard	not available
972G	5.5 cubic yard	not available
988G	not available	8.3 cubic yard
992G	not available	16.0 cubic yard

note: capacities are 2:1 heaped, SAE standards
NOTES: Buckets for both Track Excavators and Wheel Loaders are offered by CECo & available for the rental rates quoted. Bucket sizes and capacities obtained from CATERPILLAR PERFORMANCE HANDBOOK, ED 34; Section 12, Wheel Loader and Section 4, Excavators

Bucket capacity and width dictated by material weight and configuration, ie., shot, loose, tight bank, stockpile, rock, etc. Typical Nevada applications were used to determine above bucket capacities as related to materials & densities. Job site specifics may alter specific bucket requirements. (Cashman Equipment, Elko, Nevada - February 21, 2005)

Closure Cost Estimate
Productivity

Productivity - Shovels

Shovel Specifications (Komatsu equivalent)					
Description	**PC2000**	**PC3000**	**PC4000**	**PC5500**	**PC8000**
Payload Capacity (cy)					
Struck	10.46	18.84	26.16	33.48	47.09
Heaped	14.39	25.9	35.97	46.04	64.75
Average	12.43	22.37	31.07	39.76	55.92
Matched Truck	740	777D	785C	793C	797B
Average Cycle Time (min)	0.49	0.49	0.59	0.59	0.69
Passes to Fill Truck	2.05	2.84	3.38	4.69	5.11
Altitude Deration Factor	1	1	0.9	1	1
Operator Efficiency	1	1	1	1	1
Job Efficiency	0.83	0.83	0.83	0.83	0.83
Time to Fill Truck	1.68	2.33	3.32	4.61	5.86
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5

Shovel matched to small truck fleet
Shovel matched to medium truck fleet
Shovel matched to large truck fleet
Shovel matched to extra large truck fleet

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

992G (2) - can be used to load 785 with 6 passes

Source: Caterpillar Performance Handbook Edition 35; Komatsu actual Peruvian mine (Lagunas Norte) operating data for PC4000.

Productivity - Motor Graders

Motor Grader Specifications				
Description	**120H**	**14G/H**	**16G/H**	**24M**
Grader Width (ft)	8	9.25	10.08	14.04
Blade Width (ft)	12	14	16	16
Ripper Width (7 shanks) (ft)	7.6	8.5	9.75	12.83
Road Maintence Speed (mph)				
Minimum	3	3	3	3
Maximum	9.5	9.5	9.5	9.5
Average	6.25	6.25	6.25	6.25
Hourly Production	33,000	33,000	33,000	33,000
Ripping Speed (mph)	1	1	1	1
Minimum	0	0	0	0
Maximum	3	3	3	3
Average	1.5	1.5	1.5	1.5
Altitude Deration Factor	1	1	1	1
Hourly Production (with job efficiency correction & altitude deration factors) (excluding manuever time)	6,574	6,574	6,574	6,574
Maneuver time per pass (min)	0.5	0.5	0.5	0.5
Operator Efficiency	1	1	1	1
Job Efficiency	0.83	0.83	0.83	0.83

Source: Caterpillar Performance Handbook Edition 35

Closure Cost Estimate
Productivity

Productivity - Excavators

Track Excavator Specifications							
Description	**312C**	**320C**	**325C**	**330C**	**345B**	**365BL**	**385BL**
Bucket Capacity (cy)	0.68	1.57	2.22	2.22	3	4.6	7.3
Fill Factor	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Average Bucket Load (cy)	0.612	1.413	1.998	1.998	2.7	4.14	6.57
Soil Type	packed earth	hard clay	hard clay	hard clay	hard clay	hard clay	hard clay
Job Condition	med-hard	med-hard	med-hard	med-hard	med-hard	med-hard	med-hard
Cycle Times (minutes) - based on hard clay							
Load Bucket	0.07	0.09	0.09	0.09	0.13	0.1	0.19
Swing Loaded	0.06	0.06	0.06	0.07	0.07	0.09	0.06
Dump Bucket	0.03	0.03	0.04	0.04	0.02	0.04	0.03
Swing Empty	0.05	0.05	0.06	0.07	0.06	0.07	0.07
Total Cycle Time	0.21	0.23	0.25	0.27	0.28	0.3	0.35
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Operator Efficiency	1	1	1	1	1	1	1
Altitude Deration Factor	0.83	0.87	1	1	1	0.86	0.93
Corrected Productivity (LCY/hr)	120	266	398	369	480	591	869
Exploration Road Cycle Time [1] (min)	N/A	0.38	0.4	N/A	0.42	N/A	N/A
Exploration Road Corr Prod (LCY/hr)	N/A	161	249	N/A	320	N/A	N/A
Track Width (ft)	8.17	9.17	9.83	10.5	11.42	11.5	11.5
Ditch/Trench Excavation							
Bucket Capacity (cy)	0.42	0.58	0.88	0.89	2.09	3.27	2.75
Fill Factor	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Corrected Productivity (LCY/hr)	41	55	88	82	186	233	182

Source: Caterpillar Performance Handbook Edition 35

Track Excavators	Hvy Duty Rock	Extreme Service Exc (e.g. haulroad recontour)	Hvy Duty Trench
312C	30", 0.68 cubic yd	47", 0.94 cubic yd	22", .42 cubic yd
320C	30", 0.90 cubic yd	55.1", 1.57 cubic yd	23.6", .58 cubic yd
325C	36", 1.25 cubic yd	60", 2.22 cubic yd	30", .88 cubic yd
330C	36", 1.25 cubic yd	60", 2.22 cubic yd	30", .89 cubic yd
345B	43.2", 1.69 cubic yd	65", 3.0 cubic yd	48", 2.09 cubic yd
365BL	60", 3.25 cubic yd	82", 4.6 cubic yd	59", 3.27 cubic yd
385BL	85", 6.30 cubic yd.	96.0, 7.30 cubic yd	57", 2.75 cubic yd

Note: capacities are 2:1 heaped, SAE standards
NOTES: Buckets for both Track Excavators and Wheel Loaders are offered by CECo &

available for the rental rates quoted. Bucket sizes and capacities obtained from CATERPILLAR PERFORMANCE HANDBOOK, ED 34; Section 12, Wheel Loader and Section 4, Excavators
Bucket capacity and width dictated by material weight and configuration, ie., shot, loose, tight bank, stockpile, rock, etc. Typical Nevada applications were used to determine above bucket capacities as related to materials & densities. Job site specifics may alter specific bucket requirements (Cashman Equipment, Elko, Nevada - February 21, 2005)

(1) Exploration cycle time assumes feathering/smoothing performed by excavator

Concrete Breaking Production

Track Excavator w/Hammer Specifications			
Description	**325C**	**345B**	**385BL**
Hydraulic Hammer	H120D s	H160D s	H180D s
Material	reinforced concrete		
Min Shift Production (yd3/8hr)	160	300	350
Max Shift Production (yd3/8hr)	300	850	1,550
Avg Shift Production (8hr)	230	575	950
Job Efficiency	0.83	0.83	0.83
Altitude Deration Factor	1	1	0.93

Source: Caterpillar Performance Handbook Edition 35

Closure Cost Estimate
Productivity

Drill Hole Plugging Productivity

Drill Hole Plugging Productivity		
Description	**Drill Rig**	**Pump Rig**
Move-to-hole, set-up, tear-down [1]	2	2
Trip in tremmie pipe [1]	500	
Pulling casing (threaded, not cemented)	200	
Single-pass perforating (water wells)	Productivity(all p	Passes
4	60	4
6	60	4
8	50	4
12	45	6
18	40	9
24	28	12
Perforation setup,trip in/out,tear-down	2	
Perforation tool cost (wear cost)[3]	2.5	
Inert Material Placement (backfill)		
Grouting/Cement [4] (cy/hr)		5.33
Cuttings (see below) (cy/hr)		3.5

Sources:
1. Drillers daily logs from Newmont, Barrick, New West Gold, Agnico Eagle, Idaho General Mines Inc.
2. Drillers daily logs from Newmont, Barrick, Target Minerals
3. Drillers daily logs from Newmont
4. WDC Exploration, Dec 2005

Sournce: WDC Exploration, Dec 2005

Cuttings Placement Productivity		
Shift productivity (Means 02210-700-0120; Crew B11M)	28	cy / shift
Shift length	8	hours
Estimated Hourly Productivity	3.5	cy / hour

Closure Cost Estimate
Productivity

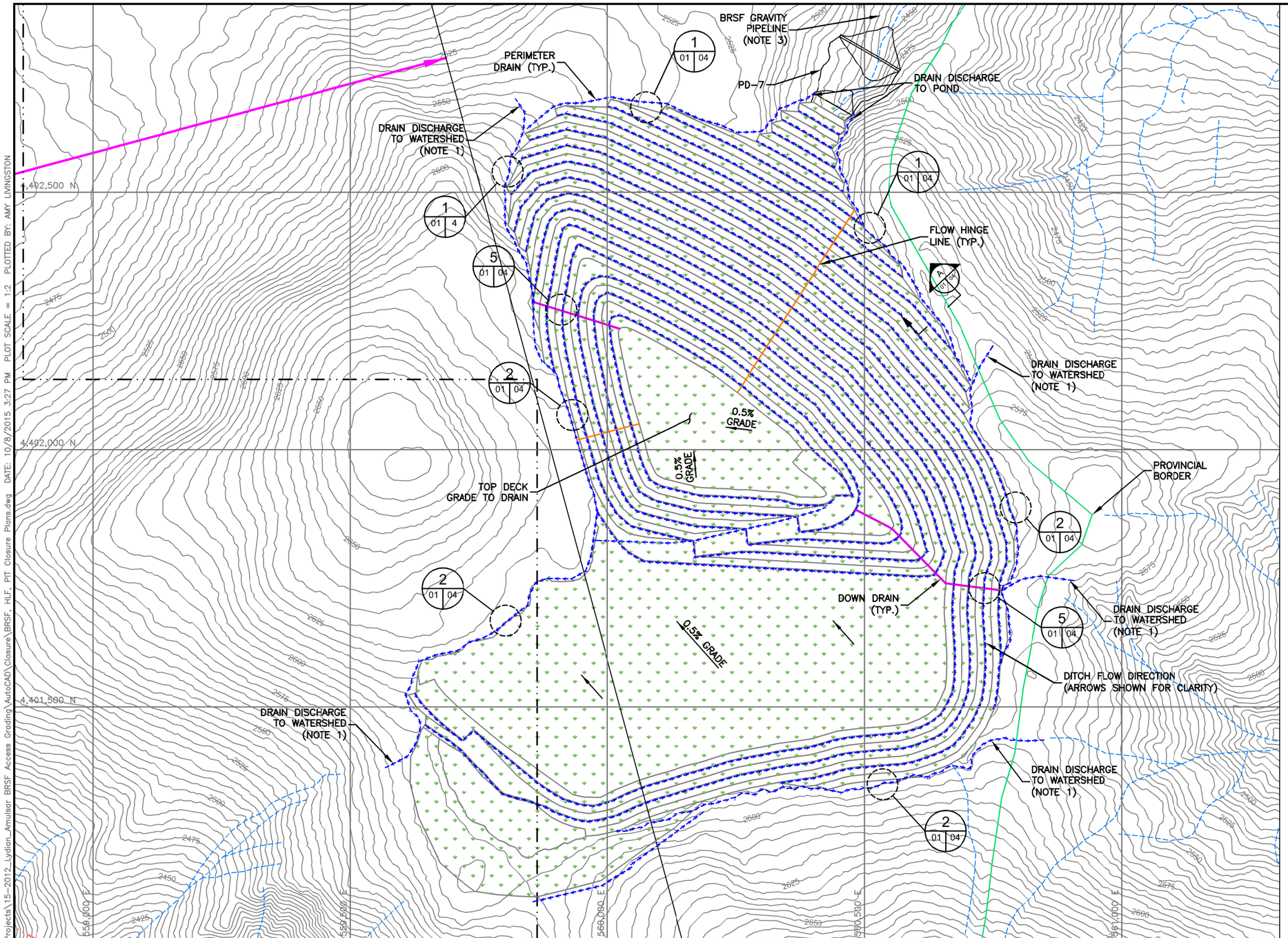
Altitude Deration Table

MODEL	Elevation											
	0-760 m (0-2500')		760-1500 m (2500-5000')		1500-2300 m (5000-7000')		2300-3000 m (7500-10,000')		3000-3800 m (10,000-12,000')		3800-4600 m (12,500-15,000')	
	CAT	User	CAT	User	CAT	User	CAT	User	CAT	User	CAT	User
Bulldozers												
D6R	100		100		100		100		92		84	
D6R w/ Winch	100		100		100		100		92		84	
D7R	100		100		100		100		100		96	
D8R	100		100		100		93		85		77	
D9R	100		100		100		93		85		77	
D10R	100		100		100		100		97		89	
D11R	100		100		100		93		85		77	
Wheeled Dozers												
824G	100		100		100		100		92		84	
834G	100		100		100		100		92		84	
844	100		100		100		100		100		96	
854G	100		100		100		93		85		77	
Graders												
120H	100		100		100		100		96		93	
14G/H	100		100		100		100		98		96	
16G/H	100		100		100		100		98		96	
24M	100		100		100		100		98		96	
Excavators												
312C	100		100		100		83		78		73	
320C	100		100		90		87		83		76	
325C	100		100		100		100		100		100	
330C	100		100		100		100		100		100	
345B	100		100		100		100		93		93	
365BL	100		100		100		86		86		86	
385BL	100		100		100		93		85		78	
Scrapers												
631G	100		100		100		100		97		90	
637G	100		100		100		95		87		80	
Loaders												
924G	100		100		100		100		97		89	
928G	100		100		100		100		92		85	
950G	100		100		100		100		100		100	
966G	100		100		100		100		96		88	
972G	100		100		92		84		77		70	
980G	100		100		100		100		96		88	
988G	100		100		100		95		85		75	
990	100		100		100		100		92		85	
992G	100		100		100		100		93		87	
994D	100		100		100		100		96		88	
L2350	100		100		100		100		96		90	
Shovels												
PC2000	100		100		100		100		96		90	
PC3000	100		100		100		100		96		90	
PC4000	100		100		100		100		96		90	
PC5500	100		100		100		100		96		90	
PC8000	100		100		100		100		96		90	

Closure Cost Estimate
Productivity

Other Equipment												
420D 4WD Backhoe	99		97		95		91		91		91	
428D 4WD Backhoe	99		97		95		91		91		91	
CS533E Vibratory Roller	100		100		98		95		91		86	
CS633E Vibratory Roller	100		100		100		100		91		86	
CP533E Sheepsfoot Compactor	100		100		98		95		91		100	
CP633E Sheepsfoot Compactor	100		100		100		100		91		86	
Light Truck - 1.5 Ton												
Supervisor's Truck												
Flatbed Truck												
Air Compressor + tools												
Welding Equipment												
Heavy Duty Drill Rig												
Pump (plugging) Drill Rig												
Concrete Pump												
Gas Engine Vibrator												
Generator 5KW												
HDEP Welder (pipe or liner)												
5 Ton Crane												
20 Ton Crane												
50 Ton Crane												
120 Ton Crane												
Trucks												
725	100		100		100		100		100		95	
730	100		100		100		100		100		95	
735	100		100		100		100		99		91	
740	100		100		100		100		99		91	
769D	100		100		100		93		88		82	
773E	100		100		100		100		93		85	
777D	100		100		100		100		93		87	
785C	100		100		100		93		86		80	
793C	100		100		100		100		100		93	
797B	100		100		100		100		100		93	
613E (5,000 gal) Water Wagon	100		100		100		100		95		87	
621E (8,000 gal) Water Wagon	100		100		100		100		97		90	
777D Water Truck	100		100		100		100		93		87	
785C Water Truck	100		100		100		93		86		80	
Dump Truck (10-12 yd^3) (5)												

Notes:
User entered deration value will override values from CAT Performance Handbook, except L2350 Loader: data from actual mine performance in Chile.
Komatsu altitude deration assumed from LeTourneau L2350



LEGEND

- EXISTING GROUND TOPOGRAPHY CONTOURS (REF. 1)
- SPANKADRYAN–KECHUT TUNNEL BUFFER ZONE – 3km ON EITHER SIDE OF TUNNEL ALIGNMENT
- FINAL VEGETATIVE CLOSURE COVER
- PROJECT LICENSE BOUNDARY
- EXISTING UNPAVED ROAD
- EXISTING DRAINAGE
- DOWN DRAIN
- FLOW LINES
- FLOW HINGE LINE

NOTES

1. STORM WATER DISCHARGE TO BE MONITORED FOR WATER QUALITY BY OWNER AS REQUIRED.
2. FACILITIES TO BE REMOVED AND SALVAGED AT CLOSURE. EXISTING SURFACE WATER CHANNELS RECLAIMED AT CLOSURE AS NEEDED BY OWNER.
3. FINAL PIPELINE ALIGNMENT NOT AVAILABLE AT TIME OF PUBLICATION.

REFERENCES

1. 1m CONTOUR INTERVAL TOPOGRAPHY FOR THE BRSF SITE RECEIVED FROM LYDIAN ON 30 JUN. 2015.

N W E S

80 0 80 160 320

SCALE IN METERS
CONTOUR INTERVAL: 5m

Rev	Description	By	Date
A	ISSUED FOR REVIEW	GRE	10/2015

REFERENCE | REVISIONS

Scale: As Shown
Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

DRAFT
NOT FOR CONSTRUCTION

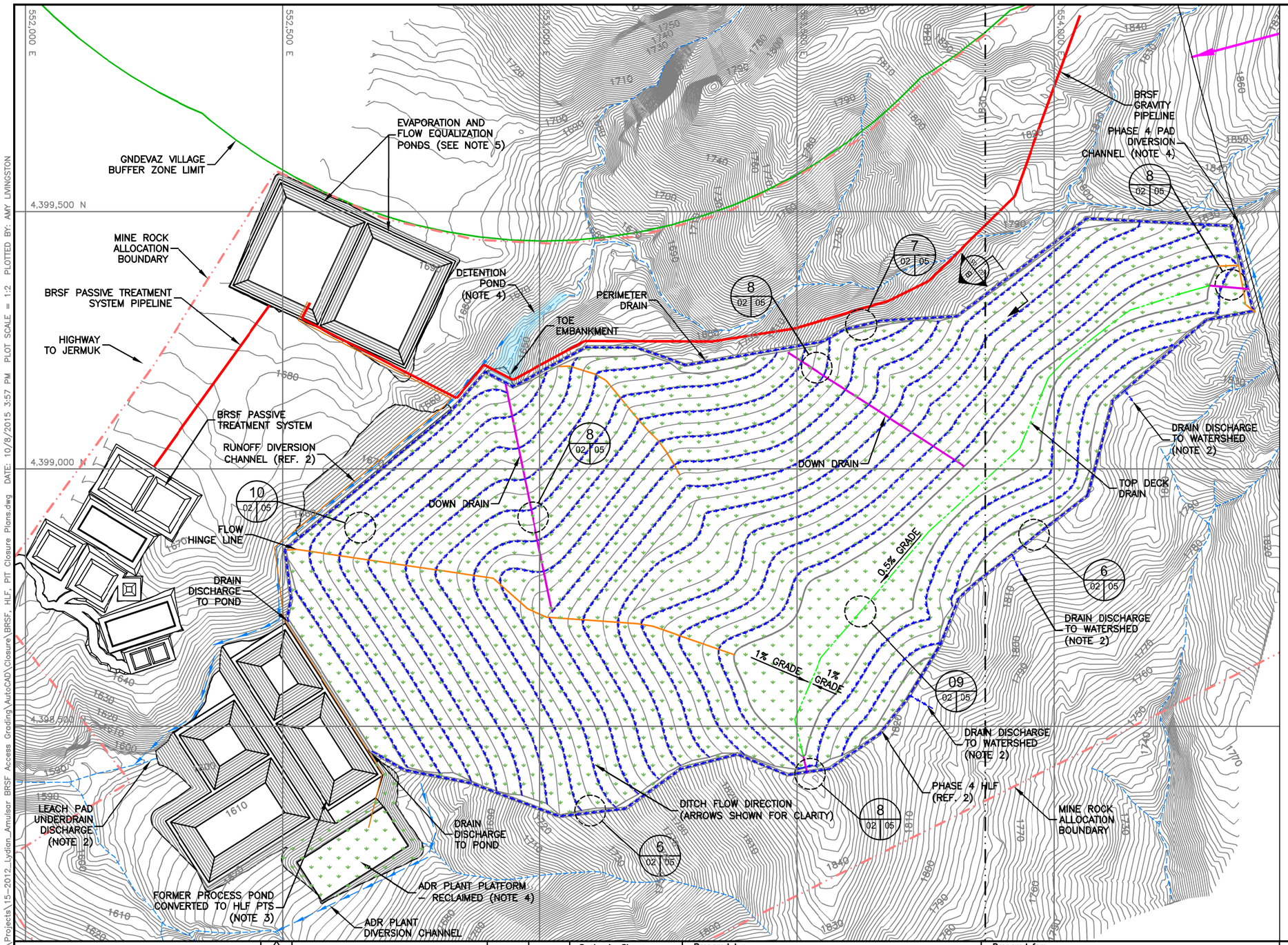
Prepared by: GRE Global Resource Engineering

Prepared for: Lydian International

BRSF CLOSURE DRAIN PLAN

A REVISION

Project:	Project No.:	DRAWING
AMULSAR	15–2012	01
Location: CENTRAL ARMENIA	Date: 10/2015	



LEGEND

- EXISTING GROUND TOPOGRAPHY CONTOURS (REF. 1)
- SPANKADRYAN–KECHUT TUNNEL BUFFER ZONE – 3km ON EITHER SIDE OF TUNNEL ALIGNMENT
- FINAL VEGETATIVE CLOSURE COVER
- PROJECT LICENSE BOUNDARY
- EXISTING UNPAVED ROAD
- EXISTING DRAINAGE
- TOP DECK DRAIN
- DOWN DRAIN
- FLOW LINE
- FLOW HINGE LINE

NOTES

1. CLOSURE GRADING CONTOURS BASED ON SMOOTHING OF DESIGN GRADING OFF HLF DESIGN DRAWINGS FROM SAMUEL ENGINEERING RECEIVED ON 30 SEP 2015. QUANTITIES BASED OFF OF CONTOUR LENGTHS SHOWN HERE.
2. UNDER DRAIN & STORM WATER DISCHARGE TO BE MONITORED FOR WATER QUALITY BY OWNER AS REQUIRED.
3. AT CLOSURE THE STORM PONDS AND PROCESS POND ARE CONVERTED TO A PASSIVE TREATMENT SYSTEM FOR THE HLF.
4. FACILITIES TO BE REMOVED AND SALVAGED AT CLOSURE. EXISTING SURFACE WATER CHANNELS RECLAIMED AT CLOSURE AS NEEDED BY OWNER.
5. PONDS UTILIZED TO EVAPORATE HLF RINSE WATER TO PROVIDE FLOW EQUALIZATION FOR PASSIVE TREATMENT SYSTEM. FINAL SIZE TO BE DETERMINED DURING OPERATIONS.

REFERENCES

1. 1m CONTOUR INTERVAL TOPOGRAPHY FOR THE HLF SITE RECEIVED FROM LYDIAN ON 26 FEB. 2015.
2. EXISTING STRUCTURES AND PROPOSED FACILITIES RECEIVED FROM SAMUEL ENGINEERING ON 01 OCT 2015.

N W E S

80 0 80 160 320

SCALE IN METERS
CONTOUR INTERVAL: 2m

Rev	Description	By	Date
A	ISSUED FOR REVIEW	GRE	10/2015

REFERENCE | REVISIONS

Scale: As Shown

Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

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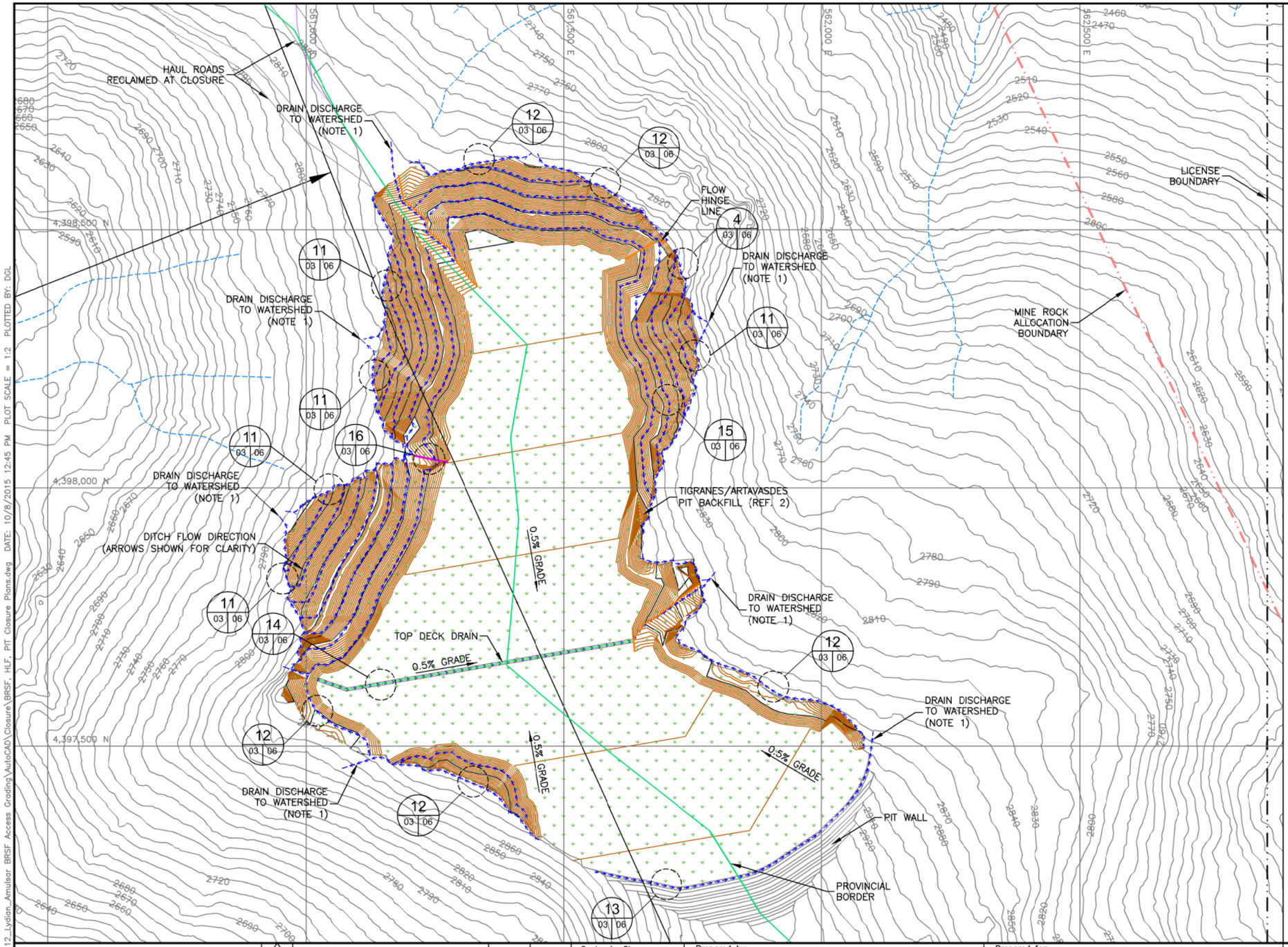
Prepared by: GRE Global Resource Engineering

Prepared for: Lydian International

HLF CLOSURE DRAIN PLAN

A REVISION

Project:	Project No.:	DRAWING
AMULSAR	15–2012	02
Location: CENTRAL ARMENIA	Date: 10/2015	



LEGEND

- EXISTING GROUND TOPOGRAPHY CONTOURS (REF. 1)
- SPANKADRYAN–KECHUT TUNNEL BUFFER ZONE – 3km ON EITHER SIDE OF TUNNEL ALIGNMENT
- PIT BACKFILL 1m CONTOURS (REF. 2)
- FINAL VEGETATIVE CLOSURE COVER
- PROJECT LICENSE BOUNDARY
- EXISTING UNPAVED ROAD
- EXISTING DRAINAGE
- TOP DECK DRAIN
- DOWN DRAIN
- FLOW LINE
- FLOW HINGE LINE

NOTES

1. STORM WATER DISCHARGE TO BE MONITORED FOR WATER QUALITY BY OWNER AS REQUIRED.

REFERENCES

1. 1m CONTOUR INTERVAL TOPOGRAPHY FOR THE BRSF SITE RECEIVED FROM LYDIAN ON 30 JUN. 2015.
2. PIT BACKFILL GRADING RECEIVED FROM MINE DEVELOPMENT ASSOCIATES ON 10 OCT 2015.

N W E S

80 0 80 160 320

SCALE IN METERS
CONTOUR INTERVAL: 10m

Rev	Description	By	Date
A	ISSUED FOR REVIEW	GRE	10/2015

REFERENCE | REVISIONS

Scale: As Shown
Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

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Prepared by: GRE Global Resource Engineering

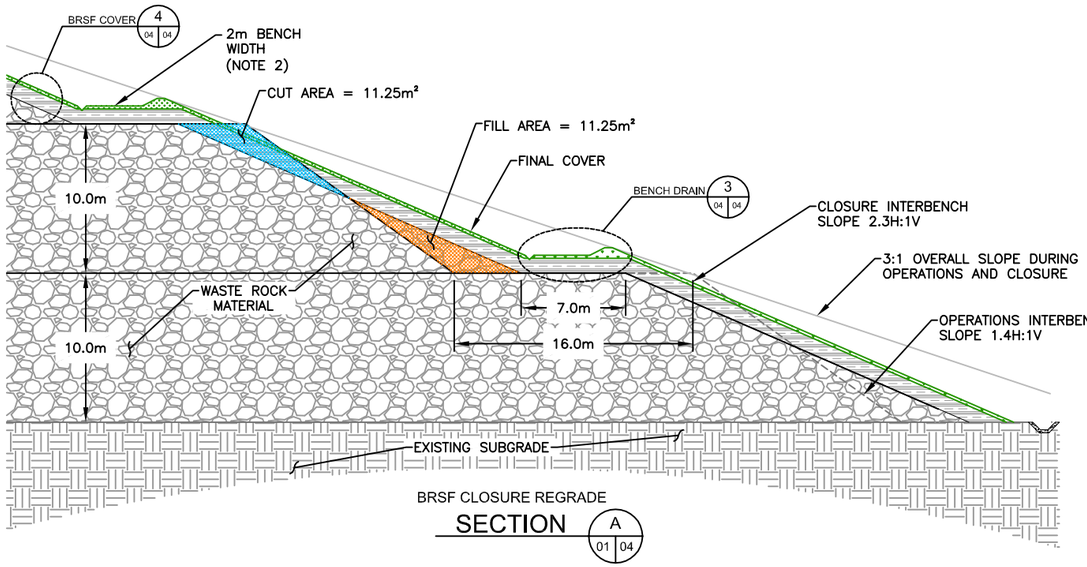
Prepared for: LYDIAN INTERNATIONAL

PIT CLOSURE DRAINAGE PLAN

A REVISION

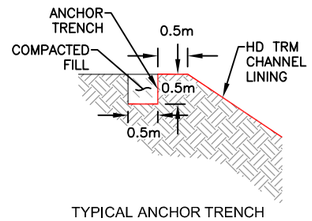
Project:	Project No.:	DRAWING
AMULSAR	15–2012	03
Location: CENTRAL ARMENIA	Date: 10/2015	

LOCATION: Z:\Projects\15-2012_Lydian_Amulsar BRSF Access Grading\AutoCAD\Closure\BRSF, HLF, PIT Closure Plans.dwg DATE: 10/8/2015 12:45 PM PLOT SCALE = 1:2 PLOTTED BY: DGL



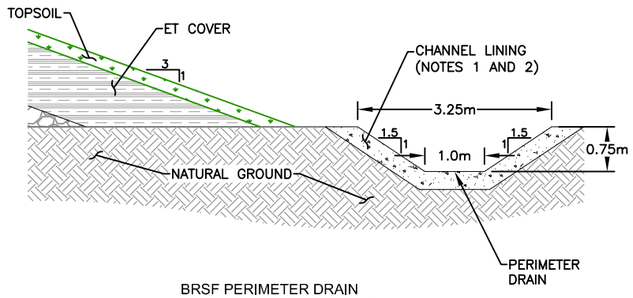
BRSF CLOSURE REGRADE

SECTION A 01 04



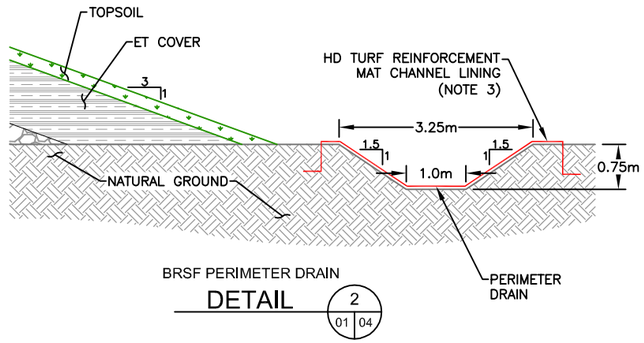
TYPICAL ANCHOR TRENCH

DETAIL 0 04 04



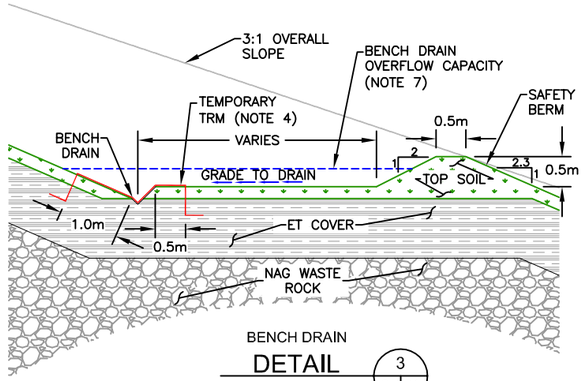
BRSF PERIMETER DRAIN

DETAIL 1 01 04



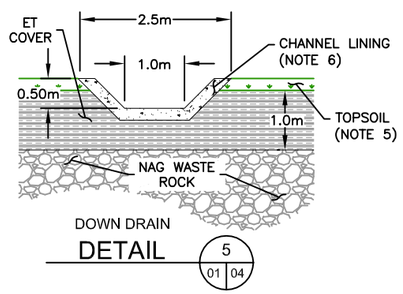
BRSF PERIMETER DRAIN

DETAIL 2 01 04



BENCH DRAIN

DETAIL 3 04 04



DOWN DRAIN

DETAIL 5 01 04

NOTES

1. DIVERSION CHANNEL SEGMENTS STEEPER THAN 1.5% AND UP TO 8% IN NON-ROCK FOUNDATION MATERIAL SHALL BE LINED WITH RIPRAP. RIPRAP AND BEDDING DESIGN TO BE PROVIDED IN DETAILED DESIGN.
2. VERY STEEP DIVERSION CHANNEL SEGMENTS GREATER THAN 8%, SHALL BE LINED WITH ARTICULATED CONCRETE BLOCKS OR SIMILAR REVETMENT.
3. CHANNEL WITH MEDIUM TO HIGH VELOCITY STORMWATER FLOWS AND MODERATE GRADES REQUIRE HEAVY DUTY TURF REINFORCEMENT MAT TO PREVENT SCOUR AND EROSION OF CHANNEL BED AS SPECIFIED BY THE DESIGN ENGINEER DURING DETAILED DESIGN.
4. GRASS-LINED CHANNELS INCLUDE TURF REINFORCEMENT MAT (TRM) TO HELP ESTABLISH VEGETATION. ANCHOR TRM INTO TOPSOIL AS RECOMMENDED BY MANUFACTURER.
5. SOIL SLOPES TO BE HYDROSEEDED TO ESTABLISH GRASS VEGETATION COVER.
6. DOWN DRAINS SHALL BE LINED WITH FLEXIBLE REVETMENT OVER FILL SURFACES.
7. BENCHES INCLUDE 2 METERS OF ACCESS FOR MAINTENANCE. TYPICAL FLOWS WILL BE HANDLED BY THE VEE DITCH WITH THE SAFETY BERM PROVIDING FLOW CAPACITY AND FREEBOARD FOR LARGER STORM EVENTS. BENCHES GRADE TOWARD VEE DITCH FOR DRAINAGE.

REFERENCE	Rev	Description	By	Date
	A	ISSUED FOR REVIEW	GRE	10/2015

REVISIONS

Scale: As Shown

Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

DRAFT
NOT FOR CONSTRUCTION

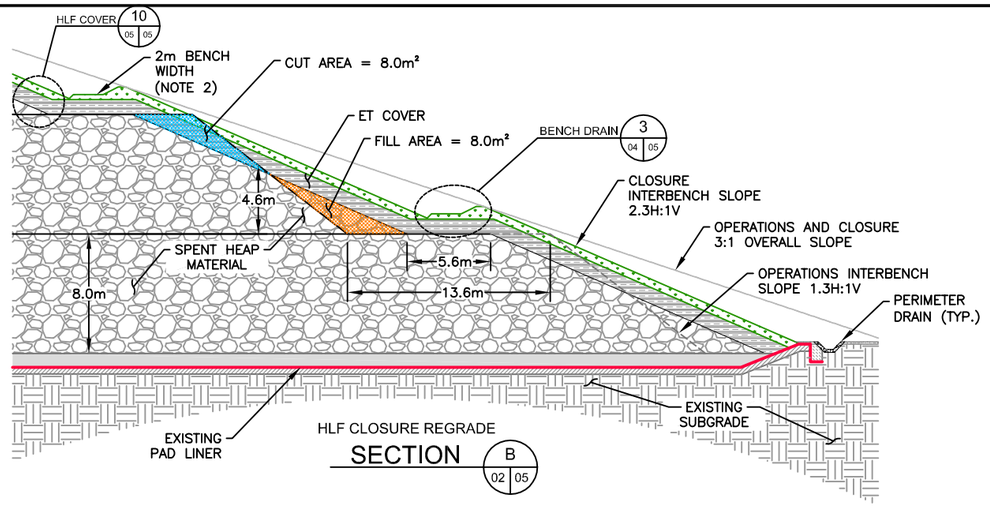
Prepared by: GRE Global Resource Engineering

Prepared for: Lydian International

BRSF CLOSURE SECTION AND DETAILS

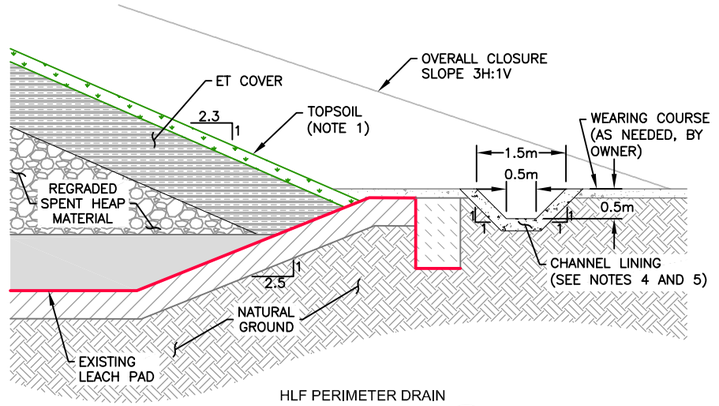
A REVISION

Project:	Project No.:	DRAWING
AMULSAR	15-2012	04
Location: CENTRAL ARMENIA	Date: 10/2015	



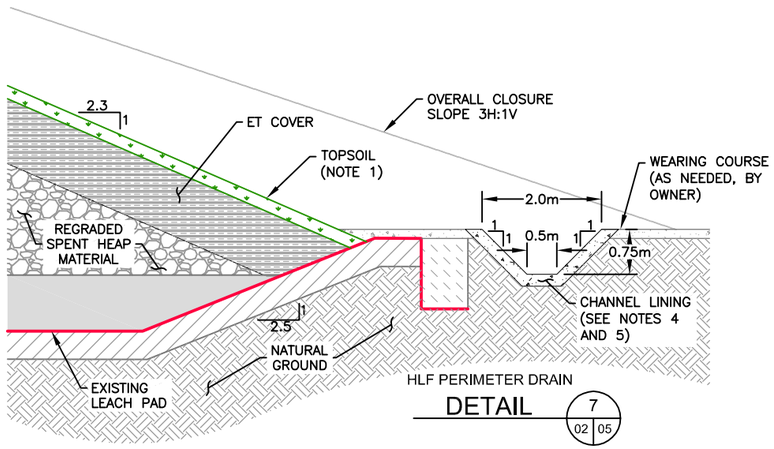
HLF CLOSURE REGRADE

SECTION B (02 05)



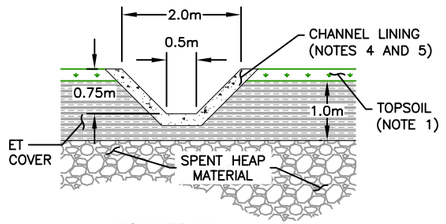
HLF PERIMETER DRAIN

DETAIL 6 (02 05)



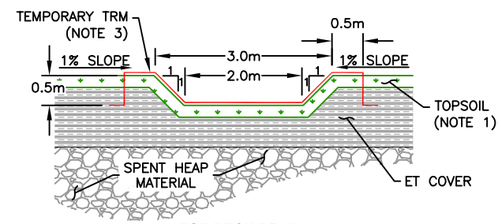
HLF PERIMETER DRAIN

DETAIL 7 (02 05)



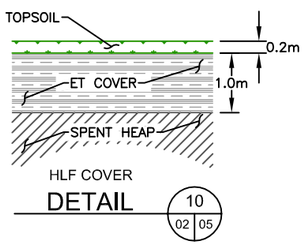
DOWN DRAIN

DETAIL 8 (02 05)



TOP DECK DRAIN

DETAIL 9 (02 05)



HLF COVER

DETAIL 10 (02 05)

NOTES

1. SOIL SLOPES TO BE HYDROSEEDED TO ESTABLISH GRASS VEGETATION COVER.
2. BENCHES INCLUDE 2 METERS OF ACCESS FOR MAINTENANCE. TYPICAL FLOWS WILL BE HANDLED BY THE VEE DITCH WITH THE SAFETY BERM PROVIDING FLOW CAPACITY AND FREEBOARD FOR LARGER STORM EVENTS. BENCHES GRADE TOWARD VEE DITCH FOR DRAINAGE.
3. GRASS-LINED CHANNELS INCLUDE TURF REINFORCEMENT MAT (TRM) TO HELP ESTABLISH VEGETATION. ANCHOR TRM INTO TOPSOIL AS RECOMMENDED BY MANUFACTURER.
4. DIVERSION CHANNEL SEGMENTS STEEPER THAN 1.5% AND UP TO 8% IN NON-ROCK FOUNDATION MATERIAL SHALL BE LINED WITH RIPRAP. RIPRAP AND BEDDING DESIGN TO BE PROVIDED IN DETAILED DESIGN.
5. VERY STEEP DIVERSION CHANNEL SEGMENTS GREATER THAN 8%, SHALL BE LINED WITH ARTICULATED CONCRETE BLOCKS OR SIMILAR REVETMENT.

Rev	Description	By	Date
A	ISSUED FOR REVIEW	GRE	10/2015

REFERENCE

REVISIONS

Scale: As Shown

Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

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NOT FOR CONSTRUCTION

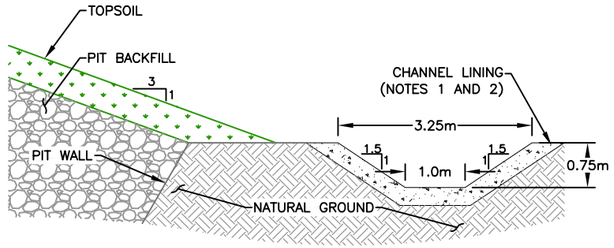
Prepared by: GRE Global Resource Engineering

Prepared for: Lydian International

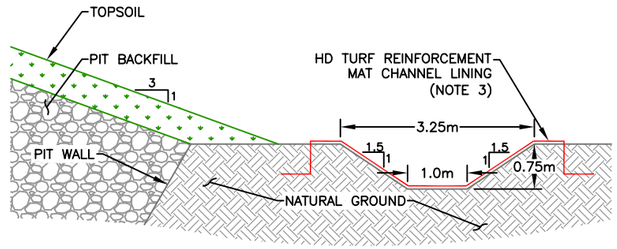
HLF CLOSURE SECTION AND DETAILS

A REVISION

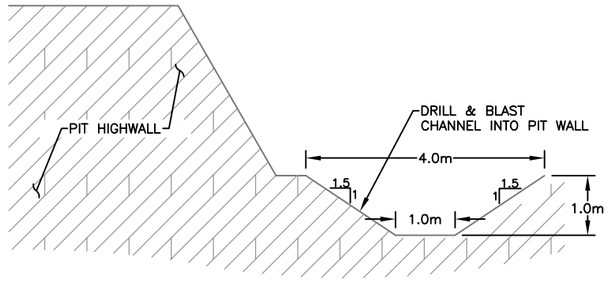
Project: AMULSAR
Project No.: 15-2012
Location: CENTRAL ARMENIA
Date: 10/2015
DRAWING 05



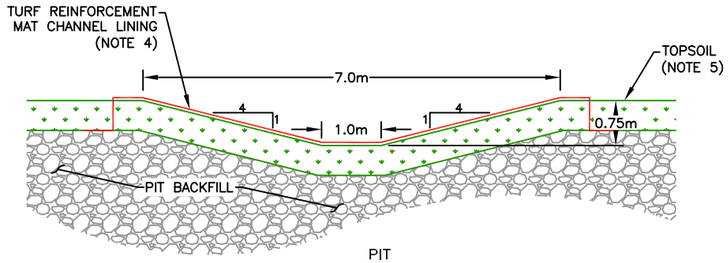
PIT
PERIMETER DRAIN
DETAIL 11 (03 | 06)



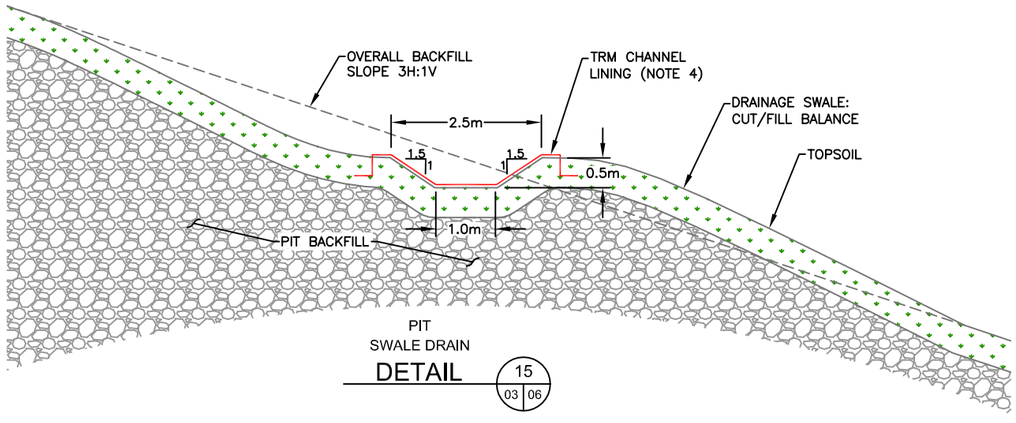
PIT
PERIMETER DRAIN
DETAIL 12 (03 | 06)



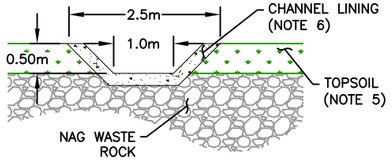
PIT
HIGHWALL DRAIN
DETAIL 13 (03 | 06)



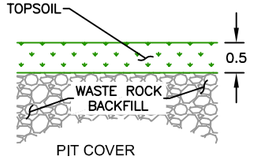
PIT
TOP DECK DRAIN
DETAIL 14 (03 | 06)



PIT
SWALE DRAIN
DETAIL 15 (03 | 06)



DOWN DRAIN
DETAIL 16 (03 | 06)



PIT COVER
DETAIL 17 (03 | 06)

NOTES

1. DIVERSION CHANNEL SEGMENTS STEEPER THAN 1.5% AND UP TO 8% IN NON–ROCK FOUNDATION MATERIAL SHALL BE LINED WITH RIPRAP. RIPRAP AND BEDDING DESIGN TO BE PROVIDED IN DETAILED DESIGN.
2. VERY STEEP DIVERSION CHANNEL SEGMENTS GREATER THAN 8%, SHALL BE LINED WITH ARTICULATED CONCRETE BLOCKS OR SIMILAR REVETMENT.
3. CHANNEL WITH MEDIUM TO HIGH VELOCITY STORMWATER FLOWS AND MODERATE GRADES REQUIRE HEAVY DUTY TURF REINFORCEMENT MAT TO PREVENT SCOUR AND EROSION OF CHANNEL BED AS SPECIFIED BY THE DESIGN ENGINEER DURING DETAILED DESIGN.
4. GRASS–LINED CHANNELS INCLUDE TURF REINFORCEMENT MAT (TRM) TO HELP ESTABLISH VEGETATION. ANCHOR TRM INTO TOPSOIL AS RECOMMENDED BY MANUFACTURER.
5. SOIL SLOPES TO BE HYDROSEEDED TO ESTABLISH GRASS VEGETATION COVER.
6. DOWN DRAINS SHALL BE LINED WITH FLEXIBLE REVETMENT OVER FILL SURFACES.

REFERENCE	Rev	Description	By	Date
	A	ISSUED FOR REVIEW	GRE	10/2015

REVISIONS

Scale: As Shown
Designed by: GRE
Drawn by: GRE
Checked by: JLB
Approved by: JLB

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NOT FOR CONSTRUCTION

Prepared by: GLOBAL RESOURCE ENGINEERING

Prepared for: LYDIAN INTERNATIONAL

PIT CLOSURE DETAILS

A REVISION

Project:	Project No.:	DRAWING
AMULSAR	15–2012	06
Location: CENTRAL ARMENIA	Date: 10/2015	