STATE OF COLORADO

Ebert - DNR, Jared <jared.ebert@state.co.us>

Climax closure cost model

Andrew Hardy <Andrew.Hardy@ajax-ltd.com> Wed, Dec 12, 2018 at 12:04 PM
To: "Ebert - DNR, Jared" <jared.ebert@state.co.us>
Cc: "Lazuk, Raymond" <rlazuk@fmi.com>, "Kelts, Diana" <dkelts@fmi.com>

Good afternoon, Jared.

On behalf of the Climax Mine, please find attached a selection of documents for you to review which will be pertinent to our discussion on Monday.

We have reviewed your version of the Climax closure costs and offer some brief explanations which may shed some light on our approaches and derivations of certain unit rates in our estimate. In so doing, we have added comments (listed as 15 “notes”) to our Reclamation Cost Estimate narrative and cross-referenced these to your cost comparison spreadsheet.

As discussed with you during a couple of recent phone calls, we have decided that we would like to pursue a closure cost which extends through the next 5 years of operation (end of 2023), for which the site’s reclamation maps have been modified and are attached. The corresponding closure costs for this interim mine plan approach to closure cost estimating are not being provided at this time, however, since they will depend on your approval of this approach and all 15 discussion items included herein.

Finally, we have not been able to make contact with Ms. Barbara Coria as you suggested in your email of October 29, so if she is available on Monday too that would be great.

We look forward to a productive exchange of ideas on Monday. Once again, thank you for supporting this important effort.

Best regards,

Andrew

Andrew Hardy, PE

AJAX Ltd

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Begin forwarded message:

From: "Ebert - DNR, Jared" <jared.ebert@state.co.us>
Date: November 26, 2018 at 11:49:49 AM HST
To: "Lazuk, Raymond" <rlazuk@fmi.com>
Cc: Andrew Hardy <Andrew.Hardy@ajax-ltd.com>
Subject: Re: Climax closure cost model

Hello Ray,

Monday December 17th will work for us. Would 1pm work for you guys?

Thanks,

Jared

On Mon, Nov 26, 2018 at 1:54 PM Lazuk, Raymond <rlazuk@fmi.com> wrote:

> Hi Jared,
>
> Our consultant Ajax has reviewed your cost model and, in general, we agree with many of your changes. However, there are handful of items in your cost model that we would like to discuss further with you/DRMS. As I mentioned to you over the phone we would like to have this discussion via WebEx (teleconference with graphics-sharing capability), during which, we would review several of your cost assumptions in more detail and present Climax-specific information that we believe may be more representative for purposes of estimating closure costs. Please let us know if you and your team would be available on the following dates for a WebEx:
>
> Tuesday, December 11 (afternoon only)
>
> Monday - Thursday, December 17-20
>
> We hope to have an agenda to you as well as a spreadsheet/table with information regarding the items we wish to discuss in more detail by the end of next week.
>
> Thanks,
>
> - Ray
>
> Raymond Lazuk
>
> Environmental Manager
>
> Climax Mine
>
> Hwy 91 – Fremont Pass

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4 attachments

2018 Update-Reclamation Plan_Draft_121218.pdf
199K

ComparisonCosts_DRMS_16Nov2018_Climax_11Dec2018.xlsx
28K

Clx RCE FIG 1 - Site Map - Rev. 1.pdf
3972K

Clx RCE FIG 2 - Mine Mill Map - Rev. 1.pdf
1417K

Climax Molybdenum Company – Climax Mine, CO
Permit M-1977-493
2016 Reclamation Cost Estimate Update
(revised August 2018)
(partial revision December 2018)

Table of Contents

1 General Reclamation Update (updated)

There are many areas of the Climax property that have been disturbed during the past approximately 100 years of mining activities. This reclamation plan for the Climax Mine continues to outline specific reclamation strategies for all existing and anticipated new disturbances towards a focus of long term water management and treatment. NOTE 1 - This update uses the interim 5-year mine plan as its basis (end of 2023).

This partial update to the Climax reclamation cost estimate approved by DRMS as AM-06 (2011) has been developed in response to DRMS's recent submittal (DRMS 2018) of its equivalent CIRCES model of the Climax proposed 5-year revision submitted in 2016. This partial update focuses on the more significant differences between the Climax 2016 model (as revised in August 2018) and the DRMS 2018 model as a starting point for constructive discussions prior to Climax submitting its final revision which will be comprehensive across all facilities. The following key elements have been evaluated for the facilities so noted in the table of contents and below:

- 2023 life of mine (LOM) facility limits for the North 40 OSF, McNulty OSF and Mayflower TSF.
- Review of select unit rates published by RSMeans (2018).
- Review of production (correction) factors utilized by both parties from the Caterpillar Handbook (2018) and RSMeans.
- Discussion of the basis for select unit rates and closure approaches in the Climax cost model.
- Reference to certain key information provided in recent Technical Revisions (TRs) to the Climax permit.
- Discussion of the basis for the increased allocations for some Indirect Costs now being applied by DRMS.
- Specific comparisons, provided for discussion purposes, for closure approaches and costs being used for the following facilities:
    - McNulty OSF.
    - Tenmile TSF.
    - Tenmile Tunnel.
    - Mayflower TSF.
    - East Side Channel.
    - Revegetation.
    - Buffer Zone.
    - Hydrologic Protection.
    - Demolition.
    - Indirect Costs, Salvage Credits and Repurposing.

Following DRMS's official review and response to these discussion topics, Climax will complete its reclamation cost update as a final submittal.

2 Site Specific Reclamation Planning

As specified in the permit amendment AM-06, specific reclamation strategies have been outlined for all areas of the mine. This narrative describes reclamation plans for all areas including the Open Pit, the 4 tailing dams, the 2 Overburden Storage Facilities (OSFs), and the 3 Tailing Storage Facilities (TSFs). It also refers to the long-term strategy for site-wide water management and demolition of structures upon cessation of mining. Attached Figures 1 and 2 have been utilized as the basis for the proposed final reclamation design and illustrate the final facility layout with respect to post-mine land use. Since the approval of AM-06, four key Technical Revisions (TRs) have been approved, TR-21, -22, -24 and -25 for which closure components have been referenced herein as part of this reclamation cost update.

2.1 Storke Complex

Most of the Storke Complex has already been reclaimed. Thus, the only remaining work includes hauling and spreading approximately 5,000 cy of biosolids from the Robinson Staging Area to cover 10 acres of remaining disturbance at about 4-inches thick.

The AM-06 cost for this project area included reclamation of a potential OSF on Ceresco Ridge. This OSF is no longer planned (per TR-22) so the cost for its reclamation including the construction of a seepage collection system at its toe has been eliminated.

2.2 Open Pit

The open pit will not be revegetated due to accessibility and safety concerns. The final slopes will likely remain at an angle of repose (approximately 1.5H:1V). Weathering, raveling, and ice action will cause natural reshaping of the benches and highwalls over time which will soften visual impacts. Administrative controls will be maintained to control public access via approximately 40 “No Trespassing” signs which will be installed approximately every 300 feet around the perimeter, where access is reasonable.

On the margins of the pit, where slopes are less steep, some revegetation may be possible (per DRMS requirement). In these cases, up to an estimated 27,000 cy of topsoil will be hauled from the McNulty OSF topsoil stockpiles to the open pit periphery and revegetated with the upland seed mixture.

The AM-06 cost for this project area included the installation of a 2,800 lf pipeline as part of a pit dewatering system. Climax will construct a pit dewatering system as part of production operations and it will remain in place after mining ceases (per TR-24), therefore the post mining cost for this item has been eliminated.

2.3 Mine Mill Complex (updated)

The Mine Mill Complex area will be regraded and reclaimed. Based on a new 5-year mine plan, footprints for the North 40 and McNulty OSFs have been revised. As such, approximately 182 acres will be regraded in the Mine Mill Complex at year end 2023 for a total of 293,627 cy. This area will then be covered with a minimum of 12 inches of biosolids or topsoil and revegetated with the upland seed mixture. Biosolids will be hauled from the Robinson biosolids staging area or topsoil will be hauled from the McNulty OSF topsoil stockpiles. Demolition costs for the structures in the Mine Mill Complex are addressed in sections 2.23, 2.24 and 2.25; revegetation costs are addressed in section 2.18.

2.4 North 40 OSF (updated)

The lower portions of the North 40 OSF may be reclaimed concurrently with production, but final reclamation will not be completed until the OSF is no longer required for production or reclamation operations. Final regrading of the OSF will be no steeper than 2H:1V interbench (per TR-22) with some areas considerably less steep, for a total of approximately 645,333 cy.

Subsoil and topsoil to be salvaged from the ultimate footprint of the McNulty OSF will be stockpiled to the immediate north of the North 40 OSF. As such, approximately 200 acres will be covered at the North 40 OSF at year end 2023 for a total of 322,667 cy of topsoil and/or biosolids which will be hauled and placed over the regraded surface for a total of 12 inches of growth medium to be revegetated with the upland standard seed mixture.

2.5 McNulty OSF (updated)

Some portions of the McNulty OSF may be reclaimed concurrently with production, but final reclamation will not be completed until the OSF is no longer required for production or reclamation operations. Final regrading of the OSF will be no steeper than 2H:1V interbench (per TR-22) with some areas considerably less steep, for a total of approximately 1,239,040 cy.

Subsoil and topsoil to be salvaged from the ultimate footprint of the McNulty OSF will be stockpiled around its perimeter. As such, approximately 384 acres will be covered at the McNulty OSF at year end 2023 for a total of 619,520 cy of topsoil and/or biosolids which will be hauled and placed over the regraded surface for a total of 12 inches of growth medium to be revegetated with the upland standard seed mixture. After topsoil placement, the lower portion of the OSF (below 11,800 feet) will be seeded with the upland standard seed mixture and higher areas will be seeded with the alpine seed mixture. TR-25 illustrates the final configuration for the stormwater controls on the OSF to be constructed during the reclamation project. These include down drains and perimeter diversion channels.

NOTE 2 - *In Task E04, DRMS includes a cost to construct 29,550 lf of perimeter diversion channels. However, as the closure cost worksheet implies, mine operations will need to extend diversion channels as the dump expands, and, as such, the construction of new perimeter diversion channels will not be required since these must be maintained at all times during operation of the facility.*

2.6 Tenmile TSF (updated)

Tenmile TSF will be reclaimed when it is no longer required for production operations. As approved for Robinson TSF in TR-13, Tenmile TSF will be reclaimed with a combination of dry and wet covers. The majority of the surface will be capped, but a pond is expected to remain over approximately 25% of the top surface (or just over 113 acres).

The dry cover area will be capped with a minimum of 12 inches of cover material (likely 6 inches of biosolids or topsoil over 6 inches of subsoil) over 340.5 acres for a total of approximately 549,000 cy. The wet cover area will be capped with a multi-layer system likely to include a geogrid layer similar to that used on the Robinson TSF wet cover area followed by a minimum of 36 inches of cover material (6 inches of biosolids or topsoil over 30 inches of subsoil) over 113.5 acres for a total of approximately 549,000 cy. The area will be seeded with the hydric seed mixture.

NOTE 3 - *In Task F01, DRMS utilizes a unit rate of $5.13/sy for geogrid installation. However, the RSMeans reference 32 32 2313 7255 is for the installation of a geogrid layer in a constructed retaining wall which is not applicable in this instance. Climax has extensive experience installing geogrid layers for both constructing MSE retaining walls (SDP 2006, Coarse Ore Dome 2011) and for stabilization of soft tailing foundation layers (Robinson TSF 2005), and the unit rate for the former is typically up to 3 times higher than for the simpler tailing reclamation application.*

NOTE 4 - *In Tasks F02 and F04, DRMS utilizes an altitude adjustment factor of 0.6 for an articulated Caterpillar 740 haul truck, citing the Caterpillar Handbook as a source for this value. Climax has over 2 decades of experience utilizing articulated 35- and 40-ton haul trucks on its earthmoving projects and rarely sees these equipment units perform at lower efficiencies despite the high elevation location of the mine.*

2.7 Tenmile Tunnel (updated)

The Tenmile Tunnel will be sealed upon cessation of mining with concrete bulkheads and slurry backfill since it will no longer be required as part of the site's water management and treatment system. The costs have not changed since the AM-06 update other than an increase for a computational error in a previous cost model.

Climax's approach for sealing the Tenmile Tunnel involves constructing 4 concrete bulkheads at a cost of approximately $147,000 each and dredging and pumping approximately 39,000 cy of Robinson Lake sludge to backfill the tunnel between the bulkheads at a unit cost of approximately $8/cy. These costs are based upon Climax's experience with similar remediation projects completed at Robinson Lake and in the Tenmile Tunnel between approximately 2005 and 2011.

NOTE 5 - *In Task G01, it appears DRMS's approach is to construct two bulkheads, one at each portal, at a cost of approximately $795,000 each, and a dredge and pump cost of approximately $87,000, for which the closure methodology and source of the costs is not clear.*

2.8 3 Dam

3 Dam was reclaimed in its current configuration during the mid-1990s. However, a slight increase in the height of 3 Dam is continuing as a part of production operations which resumed in 2012. This final dam raise will require reclamation at the completion of dam construction with a nominal 12 inches of growth medium (6 inches of biosolids or topsoil over 6 inches of subsoil) resulting in an import of approximately 15,000 cy of material which will be applied to approximately 9 acres of the dam face. The upland standard seed mixture will be applied to the cover material.

The AM-06 cost for this project area included an incorrect cost basis for the cover thickness which was not consistent with the reclamation plan described in Exhibit E. This update reflects the corrected cost basis and calculation.

2.9 Pond Shop

The Pond Shop itself will be demolished under a different task. However, some basic soil reclamation will still be required at the Pond Shop site. This will include a minor amount of regrading and import of just over 500 cy of topsoil. The upland standard seed mixture will be applied to the cover material.

2.10 Mayflower TSF (updated)

A portion (222 acres) of Mayflower TSF will be reclaimed when it is no longer needed for production and reclamation operations. However, the southwest portion of Mayflower TSF will be used for water treatment as long as it is necessary to provide detention storage for the water treatment system. A detention storage area and several sludge cells will remain on the surface of Mayflower as the operation of the PDWTP continues into the post-closure period.

The eastern portion of the Mayflower TSF will be reclaimed with a dry cover similar to that constructed on the Tenmile TSF. The dry cover area will be capped with a minimum of 12 inches of cover material (likely 6 inches of biosolids or topsoil over 6 inches of subsoil) resulting in an import of approximately 358,160 cy of material for the 5 year mine plan at year end 2023 (tailing elev. 10,685 ft.). Topsoil and subsoil will come from the nearby soil stockpile located just below the Pond Shop. The dry cover will be seeded with the hydric seed mixture.

The AM-06 cost for this project area did not include a general grading task for the dry tailing surface prior to cover placement. This update includes a cost for this line item.

2.11 East Side Channel (updated)

The East Side Channel system diverts un-impacted stormwater run-on along the east side of the affected areas from Camp (Mine Mill Complex) to Tenmile Creek below the Mayflower Acid Building. The work involves the construction of approximately 19,600 lf of lined diversion channel using both a nonwoven geotextile and sized riprap. However, the previous concept in AM-06 for installing pipelines had been reduced to 13,100 lf as approved in TR-21 and TR-22 and associated correspondence.

NOTES 6, 8 - *In Task K01, DRMS utilizes a channel length of 29,300 lf as presented in AM-06 and in Task K02, DRMS utilizes a pipeline length of 27,900 lf as presented in AM-06. In Climax's response letter to the DRMS Adequacy Review of TR-21 (dated May 24, 2012) and Climax's submittal letter to the DRMS for TR-22 (dated May 31, 2012), Climax presented that the lengths for the East Side channel extensions and the East Side Pipeline had been reduced to 19,600 lf and 13,100 lf, respectively. As such, DRMS's channel lengths for the Camp Extension and Robinson Extension should be eliminated from Task K01, and DRMS's pipeline length for Task K02 should be reduced to 13,100 lf.*

NOTE 7 - *Further, DRMS's unit rate of $56.95/cy for "machine placed riprap for slope protection" is taken from RSMeans 3137 1310 0100. Climax's equivalent unit rate of $30.75/cy for channel riprap is based on actual costs of $27.95/cy to construct the East Side Channel (adjacent to Robinson TSF) in 2005, inflated to 2016 values.*

2.12 Mayflower Acid

The Mayflower Acid building itself will remain so no reclamation costs have been included.

2.13 Robinson TSF

Robinson TSF reclamation began in the 1980s and is ongoing. The majority of the surface has been capped with overburden rock, and covered with biosolids or suitable soil material and most of that area has been revegetated. The biosolids production area is on the Robinson TSF and will not be reclaimed until the biosolids program is no longer needed for reclamation on Climax disturbed sites. In addition there are several roads on the surface of the Robinson TSF that are still required for production and reclamation activities. These roads will remain until they are no longer considered necessary. It is currently estimated that approximately 68 acres will need biosolids or topsoil at 4 inches thick (or 36,000 cy). However, portions of that 68 acres will require additional soils cover to eliminate low spots and a thicker cover, so this cost update accounts for a total of 100,000 cy of material.

2.14 1 Dam

Reclamation on 1 Dam is also close to completion. The dam face requires a minimal amount of extra biosolids application (4 inches) over a 65-acre area (35,000 cy) to supplement existing revegetation success.

2.15 Roads

Roads not to be retained for post-mining land use will be reclaimed after they are no longer needed for mining and reclamation purposes. Roads which are not permanent will be regraded as necessary to blend with the adjacent terrain and to meet natural drainage patterns. Following regrading, topsoil will be applied and seed will be spread. The seed mixture used will be appropriate to the elevation of the road. The entrances to reclaimed roads will be blocked by barriers of native rock or earthen berms to prevent vehicular access but allow wildlife access. The following roads are most likely to be reclaimed: switchbacks on Little Bartlett Mountain; access roads at the toes of 1 Dam and 4 Dam; various roads between 3 Dam and Mayflower TSF; various roads northeast and southeast of 5 Dam; and, various roads northwest of Mayflower TSF. Approximately 26,000 cy of subsoil and topsoil will be hauled to some of the road locations for reclamation purposes.

The AM-06 cost for this project area included an incorrect cost basis for the cover thickness which was not consistent with the reclamation plan described in Exhibit E. This update reflects the corrected cost basis and calculation.

2.16 Robinson Lake

Robinson Lake is currently used for process water storage, but it will be reclaimed after it is no longer needed for production operations and converted to a fresh water reservoir. Final reclamation will follow the methods utilized during 2008-2011 by various contractors, including removal of an estimated final 300,000 cy of sediment and sludge to expose a native footprint around the margins of the lake to encourage development of hydric vegetation communities. These areas will also be seeded with the hydric seed mixture.

The AM-06 cost for this project area included some general work items such as mobilization and demobilization, and sediment and erosion control. This update includes these general costs grouped for all areas (see Sections 2.20 and 2.27).

2.17 5 Dam (updated)

5 Dam has been reclaimed in its current configuration. However, an increase in the height of 5 Dam during the course of the current production operations through 2023 will create up to 14 acres of tailing which will require reclamation at the completion of dam construction. A nominal 12 inches of growth medium (6 inches of biosolids or topsoil over 6 inches of subsoil) will be applied to these 14 acres of the dam face for a total of approximately 22,587 cy. The upland standard seed mixture will be applied to the cover material.

The AM-06 cost for this project area included an incorrect cost basis for the cover thickness which was not consistent with the reclamation plan described in Exhibit E. This update reflects the corrected cost basis and calculation.

2.18 Revegetation (updated)

Revegetation activities which meet the approved approach provided in AM-06 will be followed. This cost includes seeding, mulching, and crimping site wide, an area of approximately 2,500 acres or almost 4 square miles.

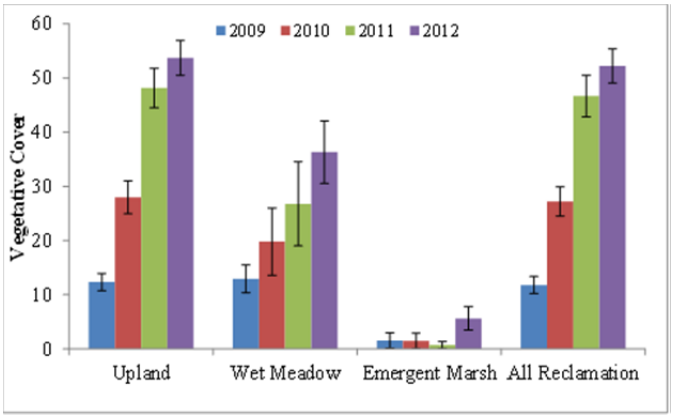
NOTE 9 - *Unit rates:*

Climax unit rates are based on over 2 decades of actual costs for completing successful reclamation projects on thousands of acres. The Climax unit rate for revegetation provided in the 2016 update was a weighted average of $1,010/ac. More recent unit rates for revegetation application (Jones Pit reclamation in 2016) include $250/ac. for drill seeding and $500/ac. for mulching and crimping, plus $282/ac. for the seed mix itself (Western Native Seed, August 2018), for a 2018 updated unit rate of $1,032/ac. The equivalent hydroseed implementation unit rate for 2018 is $2,172/ac.

DRMS cites that its revegetation costs are based on information provided by seed and planting material suppliers, and from RSMeans.

NOTE 9 - *Reseeding/failure rates:*

DRMS has included a cost of approximately $1,000,000 in tasks R01 through R05 for reseeding based on an assumed 50% estimated failure rate. Conversely, Climax has found that reseeding is not typically conducted unless there is no germination at all. Depending on the timing of the seeding and the climatic conditions in the first and second springs and growing seasons, it is Climax's experience that there could be a variety of first-year and second-year responses. The graph below shows the increase in vegetation cover on the Arkansas River Restoration Project from the end of the second growing season to the end of the fifth growing season. This area was first seeded in 2007 using the seed mixture and methods which are included in AM-06. No re-seeding was needed and no additional inputs were made during these first 5 years. Given the short growing season at Climax and the use of an all native subalpine seed mix with a low seeding rate, Climax's strong history in revegetation at 11,000 ft. proves that it takes 3-5 years for the community to develop, with no reseeding required.



2.19 Seal Underground Mine Openings

No. 3 Gallery is currently blocked off to prevent access. Upon cessation of mining operations, it would require further work to prevent long-term access. A 2-feet thick concrete bulkhead is proposed for the No. 3 Gallery closure. Storke Portal currently has ventilation access to the 600 level of the underground workings. Similarly, upon cessation of mining operations, it would require further work to prevent long-term access. A 2-feet thick concrete bulkhead is proposed for the Storke Portal closure. Unit rates for the concrete bulkheads have been updated using RSMeans 2016 references.

The Phillipson Portal will be closed at cessation of mining but since it will be sealed easily with minor use of a bulldozer its cost is considered insignificant.

2.20 Mobilize and Demobilize

Prior reclamation cost estimates included a minimal total cost for total project equipment mobilization and demobilization. For this cost estimate update, we have assumed annual mobilization and demobilization lump sum costs based on historic Climax reclamation projects for a period of four years.

2.21 Buffer Zone (updated)

The Buffer Zone reclamation is a DRMS-required reclamation activity. Climax would like to discuss the basis for this additional 550 acres requiring reclamation at a new assigned cost of approximately $5,000/ac.

NOTE 10 - DRMS's new cost represents an increase of 87% from its previous estimate ($2,609/ac to $4,868/ac). Further, Climax would like to discuss the applicability of a $2.7MM reclamation buffer zone when we are relying on our facility closure designs for reclamation footprints.

2.22 Hydrologic Protection (updated)

Water management and site-wide water treatment will continue at Climax long after the cessation of production operations. The AM-06 reclamation cost estimate for hydrologic protection was updated using current costs from 2013-2016, which are reflective of a successfully operating downstream water treatment facility, the PDWTP. These baseline costs assumed a treatment footprint of approximately 10,000 acre-ft. Similar to the base assumption for the AM-06 approved cost, it is understood that during closure activities the first 5 years of water treatment will be required for an 8,100 acre-ft footprint and a subsequent 3 years of water treatment (post facility reclamations) for an estimated 3,570 acre-ft footprint.

NOTE 11 - *DRMS has developed its cost for Task V01 assuming that 8,100 acre-feet of water will be treated for 10 years. The final Climax update will match this new DRMS requirement as a basis for long-term water treatment costs.*

2.23 Demolition – Former Mine (updated)

Buildings, utilities, processing equipment, and other above-ground structures and materials no longer required during the post-reclamation period will be demolished. In reality, and to the extent possible, the salvageable and recyclable materials obtained from these structures and facilities will be retrieved and sold, or recycled, and so a corresponding direct cost credit will apply against the site's closure cost. This fact has been proven by Climax since the mid-1990s during the decommissioning and demolition of numerous small and large facilities.

Material that is not retrievable or practicably recycled will be disposed of by burial. Buried pipe, wire, etc. will be left in place during reclamation if it does not interfere with regrading activities and is non-toxic or not hazardous. Foundations deeper than 3 feet from the reclaimed surface that will not interfere with regrading activities will also be left in place. In accordance with AM-06, Exhibit E, Section E-11.5.2, concrete floors, walls, equipment pedestals, and foundations which are at or near grade will be pulverized in place and buried as part of the mass regrade (1-ft of spoil cover) and biosolids/topsoil cover placement for the Mine Mill Complex discussed in section 2.3; revegetation is included as part of the site-wide effort in section 2.18.

2.24 Demolition – Linear Facilities (updated)

Several linear facilities at Climax will not be needed following cessation of production operations. These include substations and powerlines, pipelines, and similar historic structures. Again, and to the extent possible, the salvageable and recyclable materials obtained from these structures and facilities will be retrieved and sold, or recycled, and so a corresponding direct cost credit will apply against the site's closure cost.

Material that is not retrievable or practicably recycled will be disposed of by burial. Buried pipe, wire, etc. will be left in place during reclamation if it does not interfere with regrading activities and is non-toxic or

not hazardous. Foundations deeper than 3 feet from the reclaimed surface that will not interfere with regrading activities will also be left in place. In accordance with AM-06, Exhibit E, Section E-11.5.2, concrete floors, walls, equipment pedestals, and foundations which are at or near grade will be pulverized in place and buried as part of the mass regrade (1-ft of spoil cover) and biosolids/topsoil cover placement for the Mine Mill Complex discussed in section 2.3; revegetation is included as part of the site-wide effort in section 2.18.

2.25 Demolition – New Structures (updated)

Several new structures constructed since the restart of production in 2012 will no longer be required during the post-reclamation period and will be demolished. These structures include the Mayflower Coherex Station constructed in 2014, the Supply Canal No. 2 Pipelines constructed in 2012, the Mayflower Flood Bypass Tunnel constructed in 2012-14 (see TR-21), and a portion of the Mill Return Pipeline in Searle Gulch constructed in 2013. Again, and to the extent possible, the salvageable and recyclable materials obtained from these structures and facilities will be retrieved and sold, or recycled, and so a corresponding direct cost credit will apply against the site's closure cost.

Material that is not retrievable or practicably recycled will be disposed of by burial. Buried pipe, wire, etc. will be left in place during reclamation if it does not interfere with regrading activities and is non-toxic or not hazardous. Foundations deeper than 3 feet from the reclaimed surface that will not interfere with regrading activities will also be left in place. In accordance with AM-06, Exhibit E, Section E-11.5.2, concrete floors, walls, equipment pedestals, and foundations which are at or near grade will be pulverized in place and buried as part of the mass regrade (1-ft of spoil cover) and biosolids/topsoil cover placement for the Mine Mill Complex discussed in section 2.3; revegetation is included as part of the site-wide effort in section 2.18.

The 4 Dam Seep Pump Station, Robinson Seep Pump Station, Storke Wastewater Treatment Plant, 5 Shaft Pumping System, and Warren's Pump Station, amongst others, will remain post closure for either continuation of water management. 3 Dam Pump Station is scheduled for demolition on or before 2026 as Mayflower TSF rises.

2.26 Disposal of Reagents

TR-24 Section T-3.5 describes that all chemicals not to be used in the long-term water treatment operations "would be used or removed from the site. Mixed chemicals such as Nokes Reagent and NaCN in solution would be used in the milling process until depletion of the supplies. The distributor [will] be contacted to assume possession of unmixed and uncontaminated chemicals, and the material [will] be transported off-site in the same manner that it was received at the site." Further, TR-28 presents a current list of reagents being used at the mine. Table T-A-1 provides chemical types, specific product names, storage container types and volumes. For the purposes of this cost estimate update, we have generally assumed that 75% of the chemical will be used up, resulting in 25% of the volumes in Table T-A-1 requiring disposal.

2.27 Maintenance and Environmental Control

AM-06 provided for a significant amount of general maintenance and environmental control activity site-wide during the post production 4-year reclamation process. This cost item remains unchanged even though some activities are included on a facility-specific basis for some of the other site reclamation projects.

3 Reclamation Costs

The estimated costs for the reclamation activities include the Direct Costs associated with each of the sites described above and the Indirect Costs as discussed below, most of which are a percentage of Direct Costs as required by DRMS.

3.1 Indirect Costs (updated)

Approved AM-06 Indirect Cost allocations for Insurances, Bonds, and Contractor Profits are fixed DRMS Direct Cost percentages at 2.02%, 1.05%, and 10%, respectively. The cost for a Job Superintendent was calculated using the labor rates for a period of 4½ years. The Financial Warranty Fee of $500 was a rate fixed by DRMS. The final two Indirect Cost categories for Engineering, Bidding, Contracts and Management, Administration have been set to 2% and 3%, respectively, of the total of Direct Costs, Overhead, and Profit.

DRMS recent increases for certain indirect costs include a Job Superintendent cost of $1,717,257 (or approximately $429,000 per year) and a Reclamation Management and Administration cost allocation increase from 3% to 5%.

3.2 Salvage Credits (updated)

Previously, Climax's reclamation cost update took into account a cost credit for the salvage (scrap value) of ferrous demolition materials. It did not take into account salvage and/or sale of significant other closure items such as chemical reagents, fixed and mobile equipment, and other facility systems. In terms of structure demolition, a significant scrap steel credit is highly likely (similar to that received for the Storke demolition projects of the 1990s and the No. 2 Crusher and No. 5 Crusher demolition projects of 2005-7). Freeport McMoRan and its predecessors have historically paid for the demolition of steel structures via the scrap steel credit received from recyclers for the salvage of materials. This was the case for the demolition of significant structures like the Nos. 2 and 5 Crushers in 2005-7 and for the demolition of the Tailing Distribution House (TDH) in 2017. As proof of the stated steel credit received by Climax for the TDH demolition, the invoice and check according to Settlement # 1021146 dated September 29, 2017 received from Rocky Mountain Recycling was previously submitted (scrap value = $0.04/lb = $19.60/CF). Similarly, online resources indicate that August 2018 scrap value for Colorado is on the order of $0.025/lb = $12.25/CF. However, rather than presenting a profit for the stated demolition projects, we have therefore shown a nominal $0.01/CF for a steel demolition unit rate.

NOTE 12 - *Climax would like to understand how to apply the guidelines provided for steel salvage credits included in Sections 4.12.1 and 4.12.2 of the MLRB's Mineral Rules and Regulations for Hard Rock, Metal, and Designated Mining Operations.*

3.3 Repurposing (new)

The Henderson Mine received credit (no closure costs) associated with the repurposing of several facilities at the mine site. These details were provided in Henderson's approved TR-4.

NOTE 13 - *Similarly, Climax would like to discuss the potential for repurposing of certain facilities in the Mine and Mill Complex in a closure scenario.*

4 Cost Model Instructions

This section describes the system of inputs required by this update to the Climax Mine reclamation cost model.

4.1 General Inputs (updated)

The first six worksheets require direct input of the model's operating assumptions. The majority of the cells which require modification have been shaded in green or yellow. Items which change include, but is not limited to:

- Indirect Cost percentage allocations for Insurances, Bonds, and Contractor Profits which are fixed DRMS Direct Cost percentages at 2.02%, 1.05%, and 10%, respectively.
- NOTE 14 - The cost for a Job Superintendent has been calculated using the labor rates and assuming an onsite presence of 4 years.
- The Consumer Price Index factor is a published value.
- The Financial Warranty Fee of $500 is a rate fixed by DRMS.
- NOTE 15 - The final two Indirect Cost categories for Engineering/Bidding/Contracts and Management/Administration have now been set to 2% and 5%, respectively, of the total of Direct Costs, Overhead, and Profit, in accordance with new DRMS requirements.
- Equipment unit rates are obtained from Colorado Front Range rental companies (generally Caterpillar models) which are compared with current contractor rate sheets obtained from the Climax Mine GSC Department.
- The sources of the update to the Materials List are referenced in the table.
- Demolition unit rates are largely provided from the latest RSMeans' *Heavy Construction Cost Data* book, in this case published in 2016.

4.2 Project Inputs

On the Summary tab, the buttons at the top will automatically create new tabs or outputs, as follows:

- Add a GENERAL worksheet: adds a new worksheet for reclamation of a facility or area.
- Add a DEMOLITION worksheet: adds a new worksheet for demolition of a facility or building.
- GO TO Last Active SHEET: returns the user to the previous active worksheet.
- Create PDF copy: allows the user to select which tabs to print to an Adobe Acrobat file.

On the individual project tabs, the buttons at the top of each sheet will automatically create activities and line items, as follows:

- GO TO "SUMMARY" SHEET: returns the user to the Summary worksheet described above.
- Insert a new task HAUL/LOAD: adds new cost line items for a loader-haul truck fleet combination.
- Insert a new task SPREAD (CUYDS): adds a new cost line item for a motor grader (spreading of cover material).
- Insert a new task GRADING (ACRES): adds a new cost line item for a motor grader (grading of haul routes).
- Insert a new task WATER: adds a new cost line item for a water truck (dust control of haul routes).
- Insert a new task MATERIALS: adds a new line item for materials only.
- Add new equipment to look up: takes the user to the Equipment List tab to add a new piece of equipment.
- Add new material to look up: takes the user to the Materials List tab to add a new material.

At each of these prompts, green shaded cells typically indicate where user input is required. In some cases, a Production Table will automatically be created below the Calculations Table from which calculated data will be pulled back into the reclamation cost line item. However, the Production Table must be modified by the user with consideration for two production categories. First, Figure 1 should be consulted (in AutoCAD format) in order to calculate haulage distances and average road grades, if required. This data should then be taken into consideration for the calculation of haul times between the proposed borrow areas and the reclamation sites. Second, the Caterpillar Handbook, in this case Edition

45 dated January 2015, should be consulted to determine actual production factors for each fleet of equipment generated, including estimates for material swell factors, altitude deration factors (critical at the Climax Mine), average dozer pushes, time trial study methods, equipment operator efficiency ratings, blade correction factors, to name but a few. The green-shaded cells generally require research using the Caterpillar Handbook and sound engineering judgment for reclamation construction projects. Most unshaded cells are either calculated automatically or have been provided with direct input by the user in the Equipment List tab. Finally, the Production Table will indicate an appropriate number of haul units (articulated haul trucks) to be balanced against one loading unit (default for the Climax Mine model is a wheeler loader). This number of haul units should be considered carefully based on reclamation project experience and common sense given the haul distance, road configuration, mine elevation, seasonal impacts, and reasonableness given other site-specific constraints. This haul unit “gut check” should then be modified in the Calculations Table accordingly.

Figures

1 – Climax Site Reclamation Plan, Final Draft, 12/10/18

2 – Mine & Mill Complex Reclamation Plan, Final Draft, 12/10/18

Model Outputs

TBD

AutoCAD FILE: CLX Site Reclaim.dwg

Pump Station List

1	5-Shaft Pump Station
2	Storke Wastewater Pump Station
3	Arkansas Well (Fresh Water)
4	4 Dam Seepwater Pump Station
5	Robinson Lake Seepwater Pump Station
6	Robinson Lake Pump Station
8	Chalk Mtn. Reservoir Pump Station (Fresh Water)
9	Warren Pump Station
11	Buffehrs Lake Pump Station (Fresh Water)
13	Mayflower Seepwater Pump Station
15	3 Dam Seepwater Pump Station
16	East Fork Pump Station (Eagle Park Res. Co.)
17	PDWTP Barge
18	Millwater Barge
19	PDWTP Return Pump Station

Note: Pump stations 7, 10, 12, and 14 have been decommissioned.

MAYFLOWER ACID PUMP STATION
PDWTP
NORTH GATE ENTRANCE
MILL RETURN PIPELINE
MAYFLOWER FLOOD BYPASS TUNNEL
IRON MASK SLIDE
Tenmile Creek
Tucker Gulch
Property Line Flume (10,300)
Mayflower Tunnel
Return Shaft
Saints Creek
Rubburg Creek
5 Dam
Decant Pipeline Abandoned
Mayflower Gulch
Highway 91
West Interceptor (CMP)
Swamp Canal No. 2
Mayflower Tailing Pond 10,685
Sludge Cells
EXISTING & NEW SUBSTATION
MAYFLOWER COHEREX STATION
Kokomo Creek
EL. 10,685
Mayflower TDL
Union Canal
Mayflower Creek
Property Boundary
SUPPLY CANAL NO. 2 PIPELINE
NORTH PORTAL
TENMILE RISER
TENMILE COHEREX STATION
SOUTH PORTAL
East Sheep Mtn.
Tenmile Tunnel Extension
3 Dam
Gold Hill
POND
SHOP
Clinton Reservoir 11,080
Tenmile Tailing Pond 11,085
Lake Irwin
Upper North Interceptor
Eagle Park Outlet
Eagle Park Reservoir 10,718
Tenmile
2 Dam
2 Dam Pipeline
East Intercepter
ETDL
Clinton Ditch
4 Dam Seepwater Pipeline
Warren Pipeline
1 Dam
Tim's Pond
East Side Channel
TENMILE TDL
Lime Station
McNulty Well
Robinson Lake 10,880
Robinson Pond 11,124
Chalk Mtn. Reservoir 10,925
Chalk Mtn. Intercepter
DSM Intercepter
Buffehrs Pipeline
Fremont Ditch No. 1
McNulty Intercepter
McNulty Gulch
SLUDGE DENSIFICATION PLANT (SDP)
TRUCK WASH
RAW WATER TANK
POTABLE WATER TANK
LUBE OIL BUILDING
MAINTENANCE BUILDING PHASE I
MAINTENANCE BUILDING PHASE II
MILL WATER TANK
McNULTY OSF
Little Bartlett Mtn. (El. 12,938)
Columbine Pipeline (proposed)
Robinson Pipeline Abandoned
Robinson Pipeline Decommissioned
West Gravity Line (decommissioned)
Chalk Lake
Eagle County Lake County
Buffehrs Lake 11,152
Summit County Lake County
PHILLIPSON WAREHOUSE
County Line Vault
NORTH 40 OSF
Bartlett Mtn. (El. 13,555)
COARSE ORE DOME
PRIMARY CRUSHING OFFICE BUILDING
PRIMARY CRUSHER
FORMER CONV. NO. 62 TAKE-UP TOWER
TRANSFER TOWER
SECONDARY CRUSHER BUILDING
PEBBLE CRUSHER BUILDING
BALL STORAGE BUILDING
TRANSFER TOWER
SUBSTATION
BUCKLEY POWDER BUILDING
PRV BUILDING
WASTE STORAGE BUILDING
OTR TRUCK WASH
FLEET FUEL STATION
POTABLE WATER TREATMENT PLANT
Buffehrs/Chalk Pipeline
Camp Drain
Chalk Mtn. (El. 12,017)
Open Pit
SANITARY TREATMENT BUILDING
Arkansas Well Pipeline
Storke Pipeline
SWWPS Pipeline
Ceresco Ridge
Monarch Fault
Storke Portal
No. 5 Shaft
GATE HOUSE
SCALE HOUSE
Arkansas Pond 10,903
Arkansas River
XCEL SUBSTATION
NEW MILL BUILDING
3 MILL BUILDING

LEGEND

- PROPERTY LINE
- COUNTY LINE
- EXISTING TOPOGRAPHY
- EXISTING McNULTY INTERCEPTOR
- McNULTY OSF ALT #2 BOUNDARY (YR 2037)
- MAYFLOWER TSF & McNULTY OSF BOUNDARY (YR 2023)
- N40 OSF BOUNDARY (YR 2023)
- PAVED ROAD
- UNPAVED ROAD
- TRAIL
- NON-INDUSTRIAL DRAINAGE
- FRESH WATER
- ONSITE DRAINAGE
- PROCESS WATER POND
- TENMILE TUNNEL
- PAVED ROAD
- FUTURE RECLAMATION AREA
- STRUCTURE TO REMAIN POST CLOSURE
- STRUCTURE TO BE DEMOLISHED AND AREA RECLAIMED

N

SCALE
1400' 0 1400' 2800'
CONTOUR INTERVAL 10 FT.

REV	DESCRIPTION OF REVISION	BY	DATE
1	FINAL DRAFT	RLM	8/18
0	DRAFT	RLM	11/16

AJAX
PROJECT & CONSTRUCTION MANAGEMENT ENGINEERING, GEOLOGY, SURVEYING

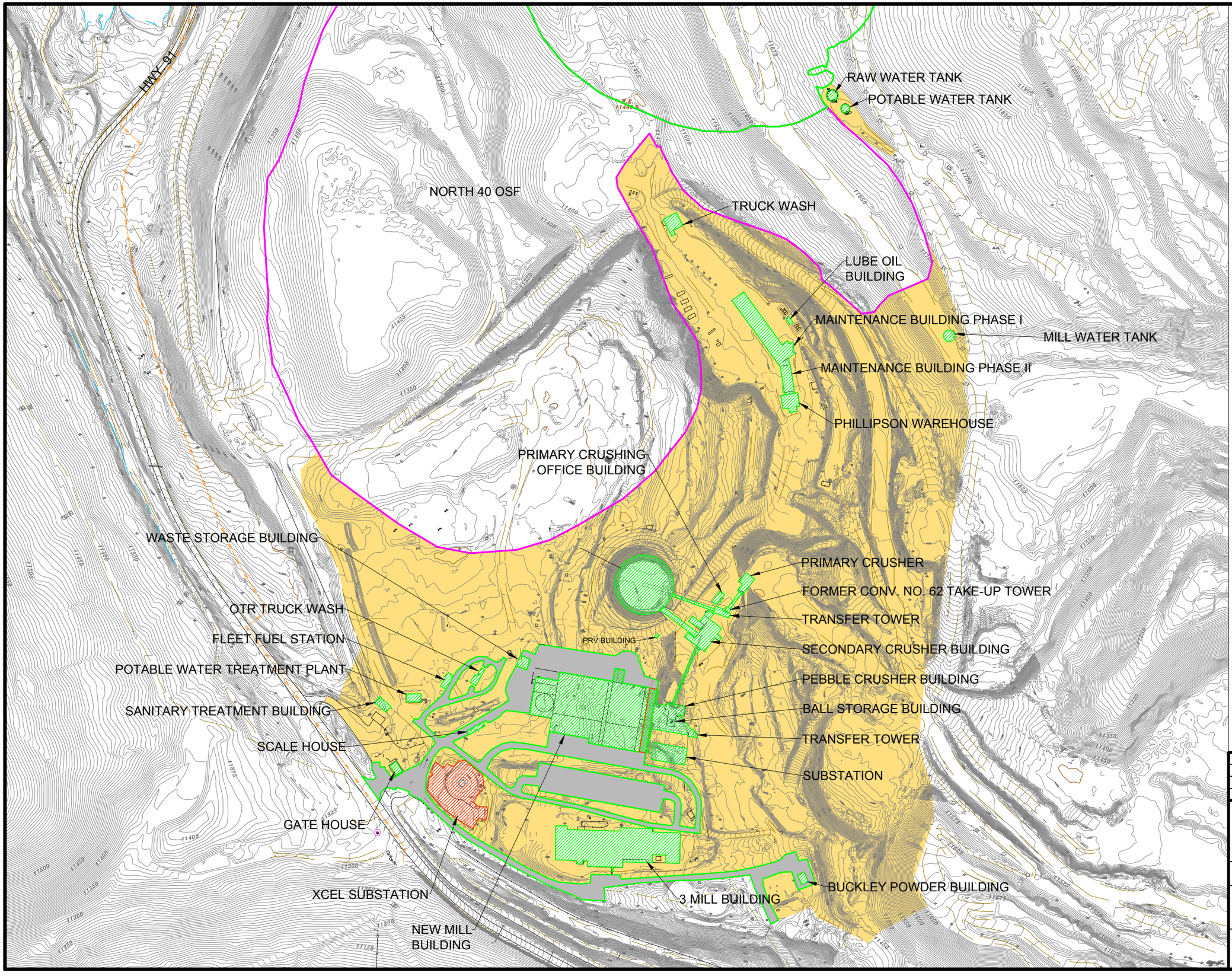
WARNING
0 0.5 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED	VARIOUS
DRAWN	RLM
CHECKED	AJH
REVIEWED	AJH
CLIENT	RL
DATE	12/10/18

Climax Molybdenum
A Freeport-McMoRan Company

CLIMAX SITE RECLAMATION PLAN

REVISION 1
PROJECT NO. 12026
FIGURE: 1
SHEET 1 OF 1



LEGEND

- EXISTING TOPOGRAPHY
- PAVED ROADS
- EXISTING DIRT ROADS
- NORTH 40 OSF BOUNDARY (YR 2023)
- McNULTY OSF BOUNDARY (YR 2023)
- PAVED ROAD TO BE RECLAIMED
- PLANT SITE WASTE AREA TO BE RECLAIMED
- STRUCTURE TO REMAIN POST CLOSURE
- STRUCTURE TO BE DEMOLISHED AND AREA RECLAIMED

N

SCALE

250' 0 250' 500'

CONTOUR INTERVAL 2 FT.

NOTES:

1. BASE TOPOGRAPHY (DATE: 7-20-2016) PROVIDED BY CLIMAX.

REV.	REVISIONS	DATE	CLIENT	DRAWN BY	REVIEWED AND SIGNED BY
1	FINAL DRAFT	12/10/2018	RL	RLM	AJH
0	DRAFT	11/18/2016	RL	RLM	AJH

Climax Molybdenum
A Freeport-McMoRan Company

PROJECT: MINE & MILL COMPLEX

DRAWING TITLE: RECLAMATION PLAN

AJAX PROJECT & CONSTRUCTION MANAGEMENT ENGINEERING, GEOLOGY, SURVEYING

PROJ. NO. 12026

SCALE: 1" = 800'

FIGURE: 2