

RECLAMATION PLAN
for
PERMIT TO MINE NO. 248C – MURPHY CREEK UPDATE AREA

1.0 POST MINING LAND USES

Lands affected by BHB's bentonite mining activities on the update area will be reclaimed to the pre-mining land use of livestock grazing and wildlife habitat.

2.0 CONTOURING PLAN FOR AFFECTED LANDS

2.1 Blending Affected Lands with Adjacent Topography

Post mining slopes will be graded to 4H:1V or flatter, with a straight slope profile, unless the pre-mine slopes were steeper. In those cases, post-mining slopes will approximate the pre-mining slopes in terms of magnitude, aspect and shape. Generally, there is enough "swell" in the volume of overburden being replaced to compensate for the overall volume of the bentonite which was removed from the pit.

In general, most pits are completely backfilled and rough graded in order to establish approximate original contours (AOC) and the required slope angles utilizing Caterpillar 627G push-pull scrapers. In certain circumstances, both the Caterpillar 627G push-pull scrapers and the Caterpillar D8R/D8T/D9 dozers are utilized to backfill, grade and contour a pit in order to create the final surface configuration. At times, overburden may be placed in the pit and against the highwall utilizing the scrapers, to a point where the pit is not completely backfilled. This would create a partially backfilled pit with a section of the highwall remaining above the backfilled overburden. Caterpillar D8R/D8T/D9 dozers would then be used to push overburden from above and behind the remaining highwall, into the pit area, thus completing the backfilling of the pit. A schematic diagram of this backfill scenario is illustrated in Figure MP-4 of the Mine Plan.

2.2 Control of Erosion and Sedimentation

During the reclamation phase, run-off from lands undergoing reclamation activities will be minimized and controlled in order to reduce or eliminate sediment-loading onto undisturbed lands. This can be achieved by diverting storm water flows generated by significant rainfall events or rapid snow melt away from and around disturbed areas associated with the reclamation activities. Diversion ditches may be constructed to divert water away from reclamation areas. Given the small size of the affected watersheds in the update area, diversion ditches may be constructed using the blade on a Caterpillar 140 motor grader or a Caterpillar D8R/D8T/D9 dozer. The diversion ditch will be cut to create a ditch which is triangular in shape and a minimum of 1.5 feet deep with 2:1 side slopes. Soil derived from the ditch cut will be "thrown" to the down slope side of the ditches, in essence creating a berm that will provide additional protection of the reclamation area. In the event that down-cutting or erosion should develop in the interceptor ditches or diversions, straw bales, straw logs, rock check dams or other erosion control features may be installed

to control down-cutting of the ditch or channel bottom. As a part of reclamation, all interceptor ditches will be graded out and contoured to blend into the surrounding topography, topsoiled and seeded.

2.3 Re-Establishment of Drainages

No perennial or intermittent streams will be disturbed by the mining activities. Only ephemeral channels which infrequently carry water in direct response to a significant rainfall event or the rapid melting of a significant accumulation of snow will be affected by mining activities. These channels will be re-established during the reclamation phase. Reconstruction of the drainages will be accomplished using Caterpillar 627G push-pull scrapers and/or Caterpillar 140 motor graders to construct flat-bottomed swales that meander as much as possible and are at least as long as the native channels.

2.4 Acceptable Slope Conditions

Post mining slopes will be graded to 4H:1V or flatter, with a straight slope profile, unless the pre-mine slopes were steeper. In those cases, post-mining slopes will approximate the pre-mining slopes in terms of magnitude, aspect and shape.

Out-of-pit overburden stockpiles or portions of these stockpiles which may remain as a final reclamation feature will be graded and contoured to blend with the existing topography. All slopes will be reduced to 4H:1V or less. Overburden stockpiles which will remain as a permanent reclamation feature will be oriented in the same direction as nearby topographic features and will approximate the pre-mining topography in terms of magnitude, aspect and shape.

3.0 SURFACE PREPARATION FOR TOPSOIL REPLACEMENT

Backfilled overburden will be graded and smoothed prior to applying topsoil in order to facilitate a uniform application of topsoil. Areas where backfilled overburden is compacted due to repeated traffic by scrapers or other equipment will be ripped using the rear scarifier on a Caterpillar 140 motor grader, or with a D8T/D8R/D9 dozer equipped with three ripper shanks.

4.0 TOPSOIL REPLACEMENT AND HANDLING

4.1 Methods of Topsoil Replacement

Topsoil will be applied primarily with Caterpillar 627G push-pull scrapers. In areas which are too steep to safely operate scrapers, Caterpillar D8R/D8T/D9 bulldozers may be used to spread topsoil. Topsoil will be re-applied to approximately the original depth which existed on each area prior to removal.

4.2 Schedule for Topsoil Replacement

Topsoil will be applied to the affected areas as soon as possible, although the replacement schedule for topsoil application is dependent upon the mining and backfilling schedule. If areas are available for the direct application of topsoil, topsoil will be applied during the topsoil removal phase during the

development of a new pit. Topsoil application from stockpiles is generally conducted during the late summer or early fall, immediately prior to the seeding phase.

4.3 Special Soil Reconstruction Procedures and Special Treatments

No special soil reconstruction techniques or procedures will be required or used on the update area. Additionally, no special treatment of topsoil will be conducted.

4.4 Depth of Topsoil Replaced on Affected Lands

Topsoil will be re-applied to approximately the original depth which was removed, except for the Main Access Road. Topsoil depths for the Main Access Road vary from 0 to 24 inches. During reclamation of the Main Access Road, topsoil will be re-applied to an average depth of approximately 12 inches. Also, in certain circumstances, such as the occurrence of isolated pockets of topsoil on bentonite outcrop areas, the topsoil will be applied to those areas where it will be most beneficial in terms of reclamation success. BHB will use its discretion in determining which areas are best suited for topsoil application in these special situations.

Refer to *Appendix D-7, Soils*, the *Supplemental Soil Survey*, and *Addendum D7D* for recommended topsoil salvage depths and locations of areas where no topsoil is available for salvage due to bentonite outcrops or other limiting factors such as chemical or physical properties.

4.5 Soil Amendments

No soil amendments will be used on the update area.

5.0 REVEGETATION PRACTICES

5.1 Topsoil Decompaction and Tillage

In order to reduce the compaction of the topsoil created by passing over it with loaded Caterpillar 627G push-pull scrapers during the topsoil application process, proper tillage of the topsoil is a necessity. Due to the clay content in many of the soil types of the permit area, rubber-tired scrapers can exacerbate soil compaction. This generally results in soil conditions that are detrimental to seedling establishment unless topsoil tillage is conducted.

BHB will utilize a John Deere 7800 or 8000 series four-wheel drive tractor in conjunction with various tillage implements in order to decompact the topsoil and create a suitable seedbed prior to planting the cover crop and/or the permanent seed mixture. Depending on the degree of compaction and the physical characteristics of the soil, BHB may utilize a John Deere V-ripper in the initial phase of tillage, followed by disking with a heavy-duty Wishek disk. In other instances where the soil compaction is not so great, initial tillage may be conducted with a John Deere chisel plow, followed by disking with a heavy-duty Wishek disk. The depth of tillage is carefully controlled and monitored to prevent mixing of the topsoil with the underlying materials. Tillage will be conducted along the topographic contours whenever possible.

5.2 Cover Crops and/or Mulch

In the event that a fall seeding with the permanent seed mixture is not possible due to inclement weather, saturated or frozen soils, or other special circumstances, the area will be seeded with a sterile annual small grain hybrid such as triticale, as soon as possible, in order to protect the topsoil from erosion. The triticale cover crop will be drill seeded using a John Deere 7800 or 8000 series four-wheel drive tractor pulling a Great Plains 1300 Series or NT 1006 No-Till Grain Drill. The seed will be planted approximately one-half inch in depth, at a rate of fifty pounds per acre. After the cover crop has been established, the permanent seed mixture will be directly drill seeded into the standing stubble and biomass. No mulch such as straw or native hay will be applied in conjunction with the reclamation activities conducted on the update area.

5.3 Permanent Seed Mixture

Due to the predominance of cool season species in the permanent seed mixture, planting generally takes place during the months of October, November and December. Seeding is conducted using a John Deere 7800 or 8000 series four-wheel drive tractor pulling a Great Plains 1300 Series or NT 1006 No-Till Grain Drill. The seed will be planted approximately one-quarter to one-half inch in depth. Seeding will be conducted along the topographic contours of the reclaimed area, or perpendicular to the prevailing winds whenever possible.

Due to the difficulties in feeding certain seeds such as sagebrush seed through a conventional grain drill, broadcast seeding may be conducted as well as drill seeding. Sagebrush will be broadcast seeded using a Herd mechanical broadcast seeder mounted on the three-point hitch of the John Deere 7800 or 8000 series tractor. The sagebrush seed may be applied immediately prior to seeding with the Great Plains 1300 Series or NT 1006 No-Till Grain Drill, or the sagebrush seed may be applied on top of snow after the area has been drill seeded.

In the event that an area cannot be drill seeded due to steep topography or other special circumstances, hand broadcasting of seed may be attempted.

Species contained in the permanent seed mixture listed in Table RP-1 have been selected based on the following criteria:

- Adaptability to existing soil conditions
- Forage potential and palatability to livestock
- Forage, cover and habitat potential for wildlife
- Pre-mining presence as documented by the vegetation inventory
- Reclamation success proven by previous revegetation efforts
- Contribution to species and structural diversity
- Ability to remain self-sustaining
- Commercial availability

5.4 Temporary Seed Mixtures

No temporary seed mixtures will be used on the update area.

5.5 Woody Species Transplants

Transplanting of woody species (trees) on the update area will not be conducted.

5.6 Post-Mining Husbandry Practices

No post-mining husbandry practices will be conducted on the update area.

5.7 Protection of Seeded Areas

At the discretion of BHB, and based on the grazing intensity occurring on the reclaimed areas, newly seeded areas may require fencing to protect these areas from grazing by livestock. If fencing is required to protect seeded areas on the update area, they will be constructed in order to allow the egress and ingress of wildlife species.

5.8 Control of Noxious Weeds

Per WDEQ/LQD Rules & Regulations, Chapter III, Section 2(d) (ix), in those areas where there were no or very few noxious weeds prior to being affected by mining, BHB will control and minimize the introduction of noxious weeds into the revegetated areas for a period of at least five years after the initial seeding.

6.0 RECLAMATION SUCCESS CRITERIA AND METHODS FOR DETERMINING SUCCESSFUL RECLAMATION

6.1 Reclamation Success Criteria

Reclamation will be determined successful, considered complete, and be eligible for full bond release under the following conditions specified by WDEQ/LQD Rules & Regulations, Chapter 3, Section 2, which states,

"The Administrator shall not release the entire bond of any operator until such time as revegetation is completed, if revegetation is the method of reclamation as specified in the operator's approved reclamation plan. Revegetation shall be deemed to be complete when: (1) the vegetation species of the reclaimed land are self-renewing under natural conditions prevailing at the site; (2) the total vegetation cover of perennial species (excluding noxious weed species) and any species in the approved seed mix is at least equal to the total vegetation cover of perennial species (excluding noxious weed species) on the area before mining; (3) the species diversity and composition are suitable for the approved post-mining land use; and (4) the requirements in (1), (2) and (3) are achieved during one growing season, no earlier than the fifth full growing season on the reclaimed lands. The Administrator shall specify quantitative

methods and procedures for determining whether equal total vegetation cover has been established and procedures for evaluating post-mining species diversity and composition. "

Lands affected by mining and associated activities within the update area which have been classified as bentonite outcrop or shale outcrop in *Appendix D8, Vegetation*, will be reclaimed in such a manner that these lands will exhibit similar pre-mining characteristics. Similar pre-mining characteristics shall include similar surface stability, approximate original contours, and an appearance similar to the pre-mining conditions.

Due to the absence of suitable plant growth material on lands classified as bentonite outcrop and shale outcrop, the establishment of vegetation will not be feasible. Therefore, these lands will be reclaimed by backfilling, grading, and contouring to produce a surface configuration which will be similar to the pre-mining conditions.

6.2 Extended Reference Areas or Comparison Areas

BHB will use extended reference areas (ERA) or comparison areas, as described by WDEQ/LQD Guideline No. 2, November 1997 for the purpose of evaluating post-mining reclamation success of affected lands on the update area. The selection and verification of the representative nature of the ERA or comparison area will be determined by evaluation of the vegetation mapping, pre-mining vegetation data, soils data, topographic and land use information. The location of the ERA or comparison area will be mutually selected on-site by LQD and BHB personnel.

6.3 Methods for Demonstrating and Evaluating Reclamation Success

Reclamation success will be evaluated by collecting quantitative data from the ERA or comparison area and the reclaimed area and directly comparing, by standard statistical procedure, the resulting data from each site. Data will be collected from an adequate sample size from each area. Adequate sample size will be determined using the information presented in WDEQ/LQD Guideline No. 2, Section IV - Estimating Adequate Sample Size, November, 1997.

Each sampling site will be randomly located on each area. Sampling for aerial cover will be done using point intercept sampling techniques which will include percent total cover and percent absolute vegetation cover. Total herbaceous production data will not be collected from the reclaimed area or the ERA or comparison area. Production will be qualitatively judged based on visual comparison and field reconnaissance of the reclaimed lands and the ERA or comparison area. The vegetative cover data collected from the reclaimed area and the ERA or comparison area will also be used to qualitatively judge total herbaceous production.

Based on the reference area concept, there will be no re-use of pre-mining vegetation data in the evaluation of reclamation success where ERA's or comparison areas have been or will be used. Quantitative vegetation data (percent cover) gathered from the appropriate ERA or comparison area and reclaimed area will be directly compared by standard statistical procedure. Statistical evaluations will follow McDonald et.al. 2003 and the 2006 LQD document titled "Sample Adequacy Calculations and Statistical Procedures for Revegetation Success Evaluation" for comparison of the reclaimed area and comparison area data sets.

Species composition and species diversity present on the reclaimed areas will be qualitatively judged based on the relationship between the species present and the post-mining land use. Species establishment from qualitative and quantitative aspects will be based on the permanent seed mixture. The establishment of these species will be determined through documentation in the quantitative data collected and through qualitative observations using percent cover estimates and qualitative abundance estimates.

The post-mining evaluation process for the determination of full bond release shall also include the construction of a species list and an evaluation of surface stability. The development of a species list for the reclaimed area will provide quantitative data on the total number (diversity) and kinds (composition) of species established from seeding, and the total number and kinds of species established through natural succession. The species list will be compiled by conducting a thorough field reconnaissance of each reclamation unit and recording all plant species observed. This species list and the cover data will provide the basis for demonstrating the quantity and quality of plant species established on the reclaimed lands. This information will be provided for LQD review when bond release is requested. The development of a detailed species list will provide information on the ability of the reclaimed lands to support the post-mining land use and should also provide data on the capability of the vegetation to renew itself. Surface stability (erosion) of the reclamation units will be assessed by field reconnaissance by LQD and BHB personnel present on site.

BHB personnel will make the preliminary decision on the timing of any full bond release request, based in part upon comparison of annual observations of reclamation success and progress. In general, BHB anticipates that 2-3 years of accumulated reclamation may be combined in a single bond release request. In each request package, BHB will also provide a written statement that the reclamation is satisfactory to the surface owner.

7.0 FINAL HYDROLOGIC RESTORATION

No perennial or intermittent streams will be disturbed by the mining activities. Only ephemeral channels which infrequently carry water in direct response to a significant rainfall event or the rapid melting of a significant accumulation of snow will be affected by mining activities. These channels will be re-established during the reclamation phase. Reconstruction of the drainages will be accomplished using Caterpillar 627G push-pull scrapers and/or Caterpillar 140 motor graders to construct flat-bottomed swales that meander as much as possible and are at least as long as the native channels.

All pits will be backfilled, with no depression and allowing for through-drainage. Post-mining slopes will approximate the pre-mining topography in terms of magnitude, aspect and slope. No impoundments are included as final reclamation features in the reclamation plan for the update area. As mining progresses, all secondary access roads and culverts that are no longer needed will be removed and the areas will be graded to achieve pre-mining contours.

8.0 ISOLATION AND CONTROL OF ACID-FORMING, DELETERIOUS MATERIALS, OR NON-EXEMPT RCRA MATERIALS

Overburden suitability and rock characterizations, including the analytical protocols and criteria necessary to identify potential acidic and/or reactive conditions, or the generation of deleterious leachate were evaluated for the update area. Please refer to the *Overburden Section*, for a complete and detailed assessment of the overburden suitability and rock characterizations. BHB has utilized the data presented in the *Overburden Section*, in order to develop overburden handling and overburden replacement plans.

Waste bentonite, which remains on the bentonite stockpile areas after the stockpiled bentonite has been removed for processing, will be disposed of by placing this material at the base of a highwall prior to backfilling. This is done to prevent this highly bentonitic material from being placed directly on the surface prior to the application of topsoil.

No materials or wastes considered non-exempt under the Resources Conservation and Recovery Act (RCRA) will be generated by or during the extraction of the bentonite. Therefore, plans for the isolation and control of non-exempt RCRA waste and materials are not provided.

9.0 DECOMMISSIONING, STABILIZATION AND REMOVAL OF BUILDINGS, STRUCTURES AND SUPPORT FACILITIES

No buildings, processing plants, structures, fueling stations, or other facilities will be constructed in conjunction with mining activities on the update area. The bentonite produced from the update area will be transported to existing bentonite processing plants located in Casper, Wyoming for processing, sale, and shipment to customers.

10.0 EXPLORATION DRILL HOLE PLUGGING

Exploration drilling consists of shallow auger drilling (< 50 feet) using a four-inch diameter auger drill mounted on a Ford F550 heavy duty four-wheel drive truck. Drill holes will be reclaimed by shoveling the auger cuttings back into the drill hole, completely filling the hole. The drill hole location will be marked with a two-inch by four-inch wooden stake placed in the hole. The area around the drill stake will be hand-seeded with certified weed-free native grass seed (Western wheatgrass) and lightly raked to cover the seed with soil. Each drill hole will be reclaimed immediately and concurrently with the drilling program. No drill holes will remain open and/or un-plugged.

The drill hole plugging and sealing techniques described above meet all the plugging and sealing requirements of the WDEQ/LQD and the BLM.

11.0 POST-CLOSURE MANAGEMENT

BHB defines post-closure as the phase of the project immediately following the completion of reclamation activities, up to the time reclamation success is demonstrated and final bond release is approved by the WDEQ/LQD.

During this period, BHB will periodically monitor and evaluate the reclaimed areas for signs of erosion, off-site sedimentation, seeding failures and noxious weeds. Additionally, these sites will be monitored to ensure that they are not subject to overgrazing. If fences have been constructed to restrict grazing on the reclaimed areas, fences will be periodically examined in order to ensure their structural integrity. If the quality and integrity of the reclamation appears to be jeopardized by erosion, seeding failures, noxious weeds, etc., BHB will implement corrective actions to correct the problem at the first available opportunity.

12.0 RECLAMATION SCHEDULE

Reclamation of disturbed areas will begin as soon as possible, and all attempts will be made to assure that reclamation occurs concurrently with the mining activities. Due to the fact that field-drying of bentonite will occur on the update area, Chapter 13, Section 3(a) (vi), of the WDEQ/LQD Rules & Regulations requires that, *"The time schedule for reclamation shall require that reclamation begin within two years and be completed within four years of the date the land is affected, except where field drying is to take place, in which case reclamation must begin within three years and be completed within five years of the date the land is affected."*

13.0 RECLAMATION COST ESTIMATES AND BONDING

13.1 Reclamation Cost Estimates

BHB has utilized WDEQ/LQD Guideline 12A (Rev. 12/2018) costs for overburden replacement, topsoil replacement, scarification of compacted surfaces and seeding. Contingency fees are also based on Guideline 12A. These costs are presented below.

Cost of Overburden & Topsoil Replacement Using Caterpillar 627G Push-Pull Scrapers

\$.57 per BCY assuming 500 foot distance, 0% grade, 4% rolling resistance

\$.63 per BCY assuming 750 foot distance, 0% grade, 4% rolling resistance

Cost of Final Grading Using a Caterpillar 140 Motor Grader

\$58.05 per acre

Cost of Scarification of Compacted Surfaces using a Caterpillar 140 Motor Grader

\$50.91 per acre

Culvert Removal

\$13.20 per foot

Cost of Seeding

Seed @ \$426.31/acre + Application Cost @ \$100.00/acre = \$526.31/acre per Guideline 12A

Contingency Fees

25.0% per Guideline 12A

13.2 **Reclamation Bond**

The total reclamation liability for Permit to Mine No. 248C is recalculated and updated on an annual basis. Bonding for the first years proposed mining activities on the update area are included in Table RP-2 of this reclamation plan. Based on the calculations presented in the 2018-2019 annual mining report, there is a bond surplus for Permit to Mine No. 248C in the amount of \$3,694,223.00. Therefore, a bond increase for the reclamation of the update area will not be required.

Black Hills Bentonite, L.L.C.
Permit to Mine No. 248C - Murphy Creek Update Area

Table RP-1: Permanent Seed Mixture

Species and Variety	Seeding Rate Pounds of Pure Live Seed per Acre
Western wheatgrass, Rosana	2.00
Bluebunch wheatgrass, P-7	2.00
Crested wheatgrass, CD2	0.75
Thickspike wheatgrass, Bannock	1.50
Alkar Tall wheatgrass	2.00
Alkali sacaton	0.25
Blue grama, Bad River	0.25
Prairie junegrass	0.10
Sandberg bluegrass, High Plains	0.25
Western yarrow	0.10
Cicer milkvetch	1.00
Scarlet globemallow	0.20
Fernleaf biscuitroot	1.50
Purple prairie clover	1.00
Prairie coneflower	0.10
Fourwing saltbush, Wytana	3.00
Wyoming Big sagebrush	2.00
Total Pounds of Pure Live Seed per Acre	18.00