RECLAMATION PLAN

DEQ Exhibit 5

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RECLAMATION PLAN
for
KEYHOLE STATE PROJECT PERMIT TO MINE

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INTRODUCTION

Black Hills Bentonite, L.L.C. (BHB) has prepared this reclamation plan for the Keyhole State Project Permit to Mine in order to meet the mining permit amendment application requirements of the Wyoming Department of Environmental Quality - Land Quality Division (WDEQ/LQD).

1.0 POST MINING LAND USES

Lands affected by BHB's bentonite mining activities on the Keyhole State Project will be reclaimed in order to re-establish the pre-mining land uses which consist of livestock grazing and wildlife habitat.

2.0 CONTOURING PLAN FOR AFFECTED LANDS

2.1 Surface Configuration and Post-Mining Land Uses

After the bentonite is removed from a pit, and as the mining sequence progresses, the open pit is backfilled and contoured in order to blend in with the surrounding topography and to restore the area to the approximate original contour (AOC). Restoring the pre-mining topography to AOC will ensure that the reclaimed lands are compatible with the post-mining land uses.

2.2 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 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 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 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 on the Post Mining Reclamation Contour Map Exhibit RP-1.

2.3 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 and adjacent watersheds. 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 permit area, diversion ditches may be constructed using the blade on a Caterpillar 140 motor grader or a Caterpillar D8R/D8T 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.

All erosion and sediment control will meet the WDEQ-Water Quality Division WYPDES-MMGP.

2.4 Re-Establishment of Drainages

No perennial, intermittent streams, or ephemeral channels will be disturbed by the mining activities. If any of these streams or channels have to be disturbed during mining activities because of surface runoff, they 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.

2.5 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 will not remain as final reclamation features. All overburden will be backfilled into the final pit in the multiple cut, direct backfill sequence in order to ensure that post-mining slopes will approximate the pre-mining slopes 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 dozer equipped with three ripper shanks.

4.0 TOPSOIL REPLACEMENT AND HANDLING

4.1 Methods of Topsoil Replacement

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 amendment 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 (see *Appendix D7, Soils*). 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* for recommended topsoil salvage depths and locations of areas where no topsoil is available for salvage due to bentonite outcrops, past pre-mining law areas, or other limiting factors such as chemical or physical properties.

4.5 Soil Amendments

No soil amendments will be used on the permit 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 on the permit area, as reported in *Appendix D7, Soils*, 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 de-compact 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 Laird/United States Forest Service (USFS) Design Rangeland Drill with a twelve-inch row spacing. The seed will be planted approximately one-half inch in depth, at a rate of twenty-five 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 Keyhole State Project.

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 Laird/United States Forest Service (USFS) Design Rangeland Drill with a twelve-inch row spacing. 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 Laird/United States Forest Service (USFS) Design Rangeland 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

Whenever possible or economically feasible, locally sourced and/or collected seed will be used in the seed mixture.

5.4 Temporary Seed Mixtures

No temporary seed mixtures will be used for the Keyhole State Project.

5.5 Woody Species Transplants

Transplanting of woody species (trees) on the amendment area will not be conducted. Very few woody species exist on the pre-mining landscape of the Keyhole State Project.

5.6 Post-Mining Husbandry Practices

No post-mining husbandry practices will be conducted for the Keyhole State Project.

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 in the permit area, prior to construction, BHB will consult with the surface owner and/or grazing lessee in order to determine the locations and types of fences to be constructed.

5.8 Control of Noxious Weeds

Per WDEQ/LQD Rules & Regulations, Chapter 3, 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 Keyhole State Project which have been classified as bentonite outcrop, shale outcrop, or bentonite badlands in *Appendix D-8, 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, shale outcrop, or bentonite badlands, 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. Theses areas are denoted as barren areas on Exhibit RP-1

6.2 Extended Reference Areas

BHB will use extended reference areas (ERA) or comparison areas, as described by WDEQ/LQD Guideline No. 2, March 1986 for the purpose of evaluating post-mining reclamation success of affected lands on the amendment 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, March, 1986.

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

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, intermittent streams, or ephemeral channels will be disturbed by the mining activities. If any of these streams or channels have to be disturbed during mining activities because of surface runoff, they 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 Keyhole State Project. As mining

8.0 RECLAMATION SCHEDULE

Mining on the Keyhole State Project will be conducted in a multiple-cut, direct-backfill sequence. As the excavation of each pit progresses through the sequence, overburden removed from each advancing pit is directly placed (direct-backfill) in the previous open pit. Mining in this sequence allows for reclamation to begin concurrently with each new pit being developed in the advancing sequence. Section 4.1 and Section 4.5 of the Mine Plan provide additional information on the mining and reclamation sequence and 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.

9.0 RECLAMATION COST ESTIMATES AND BONDING

9.1 Reclamation Cost Estimates & Production Rates

BHB utilizes WDEQ/LQD Guideline 12A costs for overburden and topsoil replacement, and WDEQ/LQD Guideline 12A for final grading on the permit area. Reclamation costs for tillage are based on BHB costs using a John Deere 7800 series four-wheel drive tractor. These costs and production rates are presented below:

Cost of Overburden & Topsoil Replacement Using Caterpillar 637G Push-Pull Scrapers

$0.497 per BCY assuming 500 foot distance, 0% grade, 4% rolling resistance

Cost of Final Grading Using a Caterpillar 16M Grader

$57.676 per acre per Guideline 12A

Production Rates & Operating Costs for Tillage & Seeding - John Deere 7810 Tractor

Hourly Operating Costs for Disking Topsoil with John Deere 7810 Tractor

	Cost/Hour
Tractor Owning & Operating Cost	$25.00
Disk Owning & Operating Cost	$ 6.00
Operator	$15.00
Supervision	$ 2.50
Supervisor Transportation	$ 0.47
Total	$48.97

Production Rates & Costs for Disking Topsoil with John Deere 7810 Tractor

Speed (MPH, 2nd Gear)	2.5
Width of Disc per Pass	12 feet

Feet Per Mile	5,280
Square Feet Per Acre	43,560
Operating Efficiency Factor	90%
(2.5 MPH) × (5,280') × (12')	158,400 ft²/hr.
(158,400 ft²/hour) ÷ (43,560 ft²/acre)	3.6 acres/hour
(3.6 acres/hour) × (0.90 efficiency factor)	3.2 acres/hour
Cost per acre for disking with JD7810 tractor (\$48.97/hour) ÷ (3.2 acres/hour)	\$15.30/acre

Total seeding cost per acre	\$423.676/ acre*

*(Grading Topsoil @ \$57.676/acre) + (Disking @ \$16.00/acre) + (Seed/Application @ \$350.00/acre)

9.2 Contingency Costs

Total contingency cost for the amendment area is thirty-one percent based on the contingency factor found in Guideline 12A, pg. 9.

9.3 Reclamation Bond

The total reclamation liability for the Keyhole State Project Permit to Mine application is recalculated and updated on an annual basis. Bonding for the first two years of proposed activities on the permit area are included in Table RP-2 of this reclamation plan.

Table RP-1 Permanent Seed Mixture

Western wheatgrass (Rosanna)	4.00
Thickspike wheatgrass (Critana)	2.00
Prairie junegrass	1.00
Indian ricegrass (Nezpar)	2.00
Green needlegrass (Lodorm)	2.00
Sandberg bluegrass	0.50
Blue grama	0.50
Common yarrow	0.50
Cicer milkvetch	0.50
Wyoming big sagebrush	0.50
Rubber rabbitbrush	0.50
Black greasewood	0.50
Total	14.5

Table RP-2 Reclamation Bonding – First Two Years of Activity

Reclamation Bond Estimate

The following reclamation costs and bonding estimates are based on the first two years of proposed mining activities on permit area:

Overburden Replacement: 445,863 cubic yards @ $0.691/cubic yard (Table MP-1)	=	$308,091.32
Topsoil Replacement: 52,745 cubic yards @ $0.497/cubic yard (Table MP-1)	=	$ 26,214.31
Grading & Contouring: 13.1 acres @ $57.676/acre (Table MP-1)	=	$ 755.56
Seeding: 12.8 acres @ $500.00 per acre (Table MP-1)	=	$ 6,400.00
Subtotal	=	$341,461.19
31% Contingency Costs	=	$ 105,852.97
Total Reclamation Liability	**=**	**$447,314.16**