


TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION, INC.
HEADQUARTERS: P.O. BOX 33695 DENVER, COLORADO 80233-0695 303-452-6111

August 20, 2020

Mr. Zach Trujillo
 Environmental Protection Specialist
 Colorado Division of Reclamation, Mining & Safety
 Department of Natural Resources
 1313 Sherman Street, Room 215
 Denver, CO 80203

RE: Colowyo Coal Company L.P.
Permit No. C-1981-019
Minor Revision No. 222
Adequacy Response

Dear Mr. Trujillo,

Tri-State Generation and Transmission Association Inc. (Tri-State), is the parent company to Axial Basin Coal Company, which is the general partner to Colowyo Coal Company L.P. (Colowyo). Tri-State received your adequacy letter dated August 19, 2020 and is providing the response below on behalf of Colowyo.

1. *When reviewing the proposed changes and pagination shift due to the inclusion of the Streeter Fire in Volume 1, Rule 4, Section 4.12, the flow of remaining sections and pages after what has been provided with MR-222 does not remain consistent with what the Division currently has in its approved PAP for the Colowyo Mine. To ensure consistency with both permits of the Division and the Colowyo Mine, please provide the additional sections after Section 4.15.6 (provided with MR-222).*

Response: As discussed between Mr. Tony Tennyson and yourself on the telephone on August 19, 2020, Section 4.12 through Section 4.30.2 in Volume 1 are being provided to ensure correct pagination in Division's version of the approved Colowyo Mine permit as requested.

Included in this minor revision is a change of index sheet to ease incorporation of this minor revision into the permit document. If you should have any additional questions or concerns, please feel free to contact Tony Tennyson at (970) 824-1232 at your convenience.

Sincerely,

DocuSigned by:

Daniel Casiraro

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Daniel J. Casiraro
 Senior Manager
 Environmental Services



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DJC:TT:der

Enclosure

cc: Chris Gilbreath (via email)
Tony Tennyson (via email)
Angela Aalbers (via email)
File: C. F. 1.1.1.205 - G471-11.3(21)d

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CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **August 19, 2020**

Revision Description: **MR-222 Streeter Fire**

Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
1	Pages 4-33 to 4-77 (45 pages)	Pages 4-33 to 4-77 (45 pages)	A narrative on the Streeter Fire has been inserted into Section 4.12. This caused a pagination shift through the rest of the section.
2A			No Change
2B			No Change
2C			No Change
2D			No Change
2E			No Change
3			No Change
4			No Change
5A			No Change
5B			No Change
6			No Change
7			No Change
8			No Change
9			No Change
10			No Change
12			No Change
13			No Change
14			No Change
15			No Change
16			No Change
15			No Change
17			No Change
18A			No Change
18B			No Change

CHANGE SHEET FOR PERMIT REVISIONS, TECHNICAL REVISION, AND MINOR REVISIONS

Mine Company Name: Colowyo Coal Company

Permit Number: **C-1981-019**

Date: **August 19, 2020**

Revision Description: **MR-222 Streeter Fire**

Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
18C			No Change
18D			No Change
19			No Change
20			No Change
21			No Change
22			No Change

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the expansion of the Axial Basin Substation are not associated with Colowyo's mining activities, and will not be required to be permitted nor bonded for in accordance with Rule 3.02.1(2).

In 2018, approximately 22 acres within Colowyo's permit boundary (outside of the disturbance boundary) was affected by the wild land fire caused by a lightning strike. The location of the fire is shown on Figure 4.12-6. The area that was burned is mostly comprised of pinyon juniper and low-density sagebrush. Because the fire was not related to Colowyo's mining activities, Colowyo, as the surface landowner will reseed or managed the post-fire area, as it deems appropriate.

In 2019, the surface landowner replaced a culvert under the Taylor Creek Access Road (please see Map 25C for location of the road) to support long-term access up the Taylor Creek drainage. Minimal ground disturbance was associated with replacing the culvert. Since the activity is related to the surface landowner, it is not permitted and bonded for in accordance with Rule 3.02.1(2).

In 2019, approximately 13.5 acres within Colowyo's permit boundary (outside of the disturbance boundary) adjacent to the Collom Haul Road was affected by the wild land fire caused by highwinds slapping power lines together. The location of the fire is shown on Figure 4.12-7. The area that was burned is mostly comprised of sagebrush. Because the fire was not related to Colowyo's mining activities, Colowyo, as the surface landowner will reseed or managed the post-fire area, as it deems appropriate.

Tri-State Generation and Transmission Association, Inc. owns and operates a 138kV power line that traverses through the east portion of the permit boundary. The 138kV line runs north to south through the reclaimed East Pit, and just east of the reclaimed Section 16 Pit. To ensure access to all pole locations along the power line for maintenance and emergency repairs, Tri-State will be improving existing ranch roads and/or constructing new roads to access their power line within the permit boundary. Most of this activity will take place south of the reclaimed East Pit and outside of Colowyo's ground disturbance and reclamation areas. Nonetheless, some of these access locations will traverse across Phase III released areas (Section 16 reclamation areas) and reclaimed areas including reclamation units EP056 and EP060 (please see annual reclamation report maps for the location of these reclamation units). For the approximate alignment for this access road please see Map 22A. Since these ground disturbing activities are not related to Colowyo's mining activities, the roads will not be permitted and bonded for in accordance with Rule 3.02.1(2).

In July of 2020, a wild land fire (named the Streeter Fire) started burning within Colowyo's permit boundary (outside of the disturbance boundary) north of the lower segment of the Streeter Ditch and Streeter Pond. The fire continued to burn north outside of Colowyo's permit boundary. The area that was burned within the permit boundary is mostly comprised of pinyon junipers and sagebrush. Because the fire was not related to Colowyo's mining activities, Colowyo, as the mine operator is not responsible for starting the fire nor managing the areas burned post fire. The surface landowners impacted by the fire will manage the post-fire area, as they deem appropriate.

4.13 CONTEMPORANEOUS RECLAMATION

All reclamation activities, including but not limited to backfilling, grading, topsoil, replacement and revegetation, will be carried out as contemporaneously as practicable with mining operations. Implementation of the reclamation plan, as described in Section 2.05.4, will assure that each step in the reclamation process is completed in a timely manner.

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Because of the multi-seam nature of the mining operation described in Section 2.05, backfilling and grading cannot be completed within 180 days following the coal removal. Backfilling and grading will be completed in variance of the 180 day requirement in a manner previously approved and described below, and in Sections 2.05 and 4.14.1. A series of benches will be necessary in the operation to recover the lower coal seams, and an additional series of benches will be necessary to dump the shovel/truck overburden material in a configuration that achieves the topography shown on the post-mining Topography Map (Map 19). When multi-seams are mined, backfilling and rough grading cannot begin until the lower-most seam is mined. See Spoil Grading Map (Map 29), which shows the time frames in which grading will occur.

Topsoil will be removed prior to the mining disturbance according to the timetable established on the Topsoil Handling – South Map (Map 28). As can be observed from this map, the initial topsoil removed at the operation must be stockpiled; however, as the operation progresses, topsoil can be immediately redistributed rather than stockpiled.

Revegetation will commence as soon as the topsoil has been redistributed and prepared for seeding as described in Section 2.05.4. The area will be seeded with the seed mixture described in Section 2.05.4 as quickly as possible.

4.14 BACKFILLING AND GRADING

4.14.1 General Requirements

The mining operations of Colowyo will not employ the use of contour mining methods.

The following sample of calculations show that Colowyo does not have thin or thick overburden as defined in Subsection 4.14.4 or Subsection 4.14.5. These calculations represent the approximate conditions found in the field and show that there is always more than enough overburden to reestablish the original elevation. As explained in the 1983 Annual Report, Colowyo currently uses an average 20% swell factor for planning purposes. Dragline swell is estimated to be 23%, and truck/shovel swell is estimated to be 17%. Approximately 45% of the overburden is removed by dragline, and 55% by truck/shovel. Since all mining at Colowyo was conducted by truck/shovel methods through 1979, the life-of-mine swell factor has continued to increase.

Example: 363 feet overburden, 47 feet coal, (these conditions are found along the western edge of the pit in 1988), 20% swell factor

$$\frac{363 \text{ feet} + 20\% \text{ swell}}{363 \text{ feet} + 47 \text{ feet}} = \frac{\text{final thickness}}{\text{initial thickness}} = 1.06$$

Example: 356 feet overburden, 49 feet coal (these conditions are found along the western edge of the pit in (1988), 20% swell factor

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$$\frac{356 \text{ feet} + 20\% \text{ swell}}{363 \text{ feet} + 49 \text{ feet}} = \frac{\text{final thickness}}{\text{initial thickness}} = 1.05$$

The original permit application utilized at 17% swell factor to project the anticipated postmining topography.

During the initial permit review process the anticipated swell factor was subsequently revised to 23% to allow for sufficient pit development. At that time, excess swell was anticipated to raise the elevation of the postmining topography by about 5.3 feet, compared to the premining topography. As explained above, in 1984, as part of the 1983 Annual Report, Colowyo further refined its estimates based on measurements to date, and currently uses an overall 20% swell factor for estimating purposes. As indicated in the Annual Reports, the stripping accomplished by draglines can vary from 40% to 45% and from 55% to 60% for truck/shovel. Swell factor will continue to be monitored and the postmining topography adjusted, if necessary. Any adjustments will be minor, will be done gradually and will not affect the reclamation plan or postmining land use. Particularly, drainage channel gradients will not be changed; an entire drainage channel elevation could possibly be revised, but the gradient would remain as designed. If a change would be necessary, the dump plan elevations would be revised as appropriate.

The mining plan, as described in Section 2.05.3, was a soundly designed and engineered open pit mining plan, which maximized coal conservation and recovery while minimizing adverse environmental impacts. Because of the multi-seam mining configuration used by Colowyo, an exemption from the 180 day or four spoil ridge limitation was and still is necessary. The mining plan was designed as a continuously moving open pit operation with the mine advancing approximately parallel to the dip of the numerous coal seams. The mining operation progressed from a southward direction with shovels/trucks/ proceeding along the entire length of the mining area uncovering the upper coal seams and the draglines uncovering the lower coal seams. With the numerous benches used in an open pit operation, the mine area was opened for some time, and backfill and grading operations are occurring now in the West Pit.

As the mining operations remove coal seams (In the southward progression), the mining area must be left open until such time as the lower-most coal seam can be recovered. With the mining configuration, the time differences between mining the upper-most seam versus the lower-most seam will obviously be greater than 180 days. As the operation advances, backfilling will be as contemporaneous as practical but not so as to interfere with removal of the lower-most coal seam. Colowyo will rough backfill and grade as shown on the Spoil Grading Map (Map 29) by methodically and actively dumping and backfilling overburden in the West and East pits very close to final contour so that minimal work will be needed to complete final re-grade of these areas in the future. All disturbed areas will be returned to the approximate original contour by grading and backfilling with the use of a dragline, trucks, dozers, scrapers and dozers assisting a dragline. Additional detail of the backfilling and grading for the mining operation is set forth in the discussion under Sections 2.05.3 and 2.05.4.

The area to be mined will be restored to a topography approximating premining grades. The out slopes of the completed fill in Streeter Draw and areas backfilled, as necessary, will utilize terraces and/or contour furrows for erosion control and stability. These terraces and contour

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furrows will be constructed according to the requirements outlined in Section 2.06.2. Where applicable, Colowyo will retain all overburden and spoil on the solid portion of existing benches. The final graded slopes will not exceed the approximate original premining slope grade as shown on the Postmining Topography Map (Map 19). Postmining surface drainage channels will be located to minimize erosion and to minimize slippage.

The final pit highwalls will be eliminated in Section 16 by backfilling X seam overburden materials from the West Pit mining area to achieve the final topography. Rehandle of the X seam overburden will occur concurrently with the advance of the multiple-seam advance during the 2003-2010 period. Also, as mining advances into the final pit, the working area on the pit spoil side will decrease to a point where insufficient spoil room below the proposed postmining contours is available. When that point is reached, material will be temporarily placed above the proposed postmining topography. When the final pass of the West Pit is mined out, this temporarily-placed spoil will be rehandled concurrently with Section 16 virgin and rehandle material to fill and slope the pit to the configuration shown on Map 19 (Postmining Topography). Because the area will be redisturbed by the rehandle activities, that portion of the north end of Section 16 that is above final grade will not be topsoiled or otherwise reclaimed until final reclamation.

Final reclamation of the East Pit will take place via the sequence shown on Map 29 (Spoil Grading – South Area) with the reclamation blocks advancing from east to west or from the topographic bottom to the topographic top of the mining areas. Just as in the West Pit, all disturbed areas will be returned to approximate original contour by grading and backfilling with the use of draglines, trucks, dozers, scrapers and dozers assisting a dragline. As reclamation of the East Pit progresses, all non-reclaimed areas will be contained so that any residual runoff from these areas will be isolated within the remainder of the East Pit. All methods of erosion control and stability such as contour ditches, contour furrows, internal ditches and internal sumps will be established on an as-needed basis to ensure the integrity of the Prospect Pond and the surrounding areas include the final East Pit Ditch. Closure of the East Pit is dependent on the final reclamation and closure of the West Pit as the western most portion of the East Pit will tie-in with the West Pit in this area.

A haulroad corridor from the Administration/Shop area to the South Taylor Pit will remain in place until final reclamation is completed in that area. The corridor is sufficient in width to provide a material balance as the corridor is regraded to the post mine topography. The administration/shop/facilities area will be the last area to be reclaimed. A light duty road intended for post mining use may be left as a postmining feature in this corridor with land owner consent.

In addition, Colowyo controls additional coal reserves west and south of Section 9 and 16, outside of Permit C-81-019, that may be considered for future mine expansion. It is possible that the final plans for Section 16 and Section 9 could change to provide for such expansion, with any plan changes being addressed through an appropriate permit revision.

4.14.2 General Grading Requirements

The final graded slopes at the mining operation will not exceed the approximate original premining slope grade as shown on the Postmining Topography Map (Map 19). Colowyo will retain all

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overburden and spoil material on solid portions of existing or new benches. The final highwall at the operation will be eliminated by backfilling overburden into the final pit area.

Small depressions of a holding capacity slightly greater than one cubic yard of water may be used to create a moist micro climate to aid in shrub establishment. See Section 2.05.4, Planting and Seedings Methods for further information regarding these small depressions. Also, several stock watering ponds will be constructed to compliment the postmining land use. Providing a supply of water is an integral part of the grazing postmining land use. Colowyo will not be mining on any slopes above 20° as shown on the Premining Topography Map (Map 18).

Final grading before topsoil placement will be conducted in a manner that minimizes erosion and provides a surface for the topsoil that minimizes slippage. Final grading will be accomplished so that overall grades will not exceed 1v:3h. The plan for backfilling and grading is shown graphically on the Spoil Grading Map (Map 29).

4.14.3 Covering Coal and Acid and Toxic Forming Materials

Colowyo will not have any exposed coal seams remaining at the end of mining and reclamation. Colowyo does not have any acid forming materials at the mine. For discussion on acid- and toxic-forming materials, refer to Section 2.04.6. For disposal of noncoal wastes or materials constituting a fire hazard, refer to Section 4.11.4.

4.14.4 Thin Overburden

Colowyo does not have a thin overburden situation as explained in Section 4.14.1.

4.14.5 Thick Overburden

Colowyo does not have a thick overburden situation as explained in Section 4.14.1.

4.14.6 Regrading or Stabilizing Rills and Gullies

The implementation of soil stabilizing practices outlined under Section 4.15.4 will lessen the possibility that erosion can become a serious problem. Colowyo plans to continue using surface manipulation techniques such as chisel plowing to reduce compaction and contour ditches/furrows to minimize overland flow over any long, uninterrupted slope. These methods have been shown to be highly successful in controlling erosion at Colowyo.

Rills and gullies which form in areas that have been regraded and topsoiled and which either (1) disrupt the approved postmining land use or the reestablishment of the vegetative covers or (2) cause or contribute to a violation of water quality standards for receiving streams will be identified during the spring of each year. Regraded and topsoiled areas will be visually inspected and rills and gullies identify. Colowyo will submit a report which provides a general description of the identified rills and gullies, activities undertaken to remediate these areas, time frames of repair, a description of any re-topsoiling and re-seeding activities, and a map identifying the problem areas

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on a scale of 1-inch equals 500-feet. This report will be submitted annually no later than June 15 of each year.

As rill or gully features are identified for remediation Colowyo will utilize appropriate manpower and equipment depending on the ground conditions and the extent of the erosion. This shall include but is not limited to small track dozers, blades, and small rubber tired farm tractors. Repairs will take place within three months of the visual inspections being completed. If ground conditions are such where soil conditions are not favorable, repair will commence as soon as ground conditions allow equipment to access the area without creating additional disturbance. As soon as any repair takes place the area shall be seeded with the appropriate seed mixture. Generally, remediation work will commence when soil conditions are suitable each year.

During repair of any rill or gully Colowyo will first identify and salvage any topsoil that may have been repositioned by erosion. This topsoil will be salvaged, stockpile in a location that is easily accessible by equipment making repairs, and re-applied after the repair of a rill or gully is complete. Once repairs are complete, topsoil will be re-applied to the disturbed area and re-seeded to the appropriate seed mixture. Colowyo is committed to preserving the topsoil resources and utilizing it appropriately through approved reclamation practices.

Remediated areas will be monitored for one year following repair, and should the area appear to be stabilized monitoring will be discontinued for that area. Areas that continue to exhibit unstable conditions will be remediated again and monitored for another year.

4.15 REVEGETATION REQUIREMENTS

4.15.1 General Requirements

Colowyo will establish on all affected land within the mine plan area a diverse, effective and permanent vegetative cover of the same seasonal variety as that native to the area. On lands revegetated prior to 2008 the vegetative cover will be comprised of native and introduced species that are desirable and necessary to achieve the approved postmining land use as required under Section 4.15.2. The original seed mixture to be planted is shown in Section 2.05 on Table 7, Reclamation Seed Mixture. On lands revegetated in 2008 and thereafter, the vegetative cover will be comprised of native species that are desirable and necessary to achieve the approved postmining land uses as required under Section 4.15.2 (with modest exceptions). However, additional seed mixtures, revegetation metrics, and bond release protocols designed to target specific post-mining land use components are presented within the context of this section (4.15) as well as the reclamation plan, Section 2.05.

Remaining discussions under this section (4.15) will refer to “pre-2008” versus “post-2008” revegetation plans, efforts, specifications, and bond release protocols. Pre-2008 refers to revegetation activities performed prior to April, 2008). Post-2008 refers to revegetation activities occurring during or after April, 2008.

The details of the revegetation plan are discussed in Section 2.05.4.

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4.15.1(4) Vegetation Monitoring

The monitoring plan to evaluate the success of shrub conducive efforts including direct seeding of sagebrush, natural reinvasion by sagebrush, as well as herbaceous vegetation success is as follows:

1. To facilitate identification, sampling of herbaceous vegetation will take place during the peak of the growing season when the vegetation reaches the mature stages. This period of time is generally from late June to late August.
2. Unlike sampling for bond release purposes, sampling will not be required to meet statistical adequacy.
3. During the first growing season of a reseeded area, a visual determination of seeded and volunteer species will be performed. From this information, any apparent revegetation issues will be determined for the seeded species, and unsatisfactory stands of any component can be identified for corrective action. In addition to this visual evaluation, a semi-quantitative procedure will be implemented to evaluate seedling emergence. This procedure involves unbiased placement of several small quadrat frames at multiple locations across the reclaimed unit and counting the number of emergent plants by life form within each quadrat. Conversion to the number of emergents per square foot facilitates an assessment of the eventual success of the seeding effort.

During the second and fourth growing season of a reseeded area, herbaceous cover and woody plant density information will be gathered. This information will be gathered at the species level and will reflect the effectiveness of the seed mixture and volunteer species. Colowyo will also monitor areas seven years old and every third year thereafter (year 10, 13, etc.) to assess their status toward approaching the maturity necessary for bond release testing. Seven year and older monitoring will also utilize ground cover and density sampling, but will include a modest current annual production sampling effort to facilitate evaluation of progress toward meeting this variable and to allow a determination of carrying capacity should a program of livestock grazing be implemented. After 7 years of growth and where practicality dictates, revegetation units may be combined into logical management units for sampling / monitoring purposes, rather than remaining autonomous. Monitoring will cease following Phase III bond release.

4. The data and an assessment of the monitoring results will be submitted in the Annual Reclamation Report. A map will be included to delineate the reclaimed areas being sampled each year. The Annual Reclamation Report will also provide details regarding restricted interseeding or other mitigative measures implemented as a result of the vegetative monitoring program.

4.15.2 Use of Introduced Species

For pre-2008 revegetation, (especially pre-2002 revegetation) an examination of the seed mixture approved for the reclamation of rangeland indicates that Colowyo included some introduced

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species in the mixture for which regulatory approval was obtained. Introduced species included in the seed mixture were:

- (1) Intermediate Wheatgrass (*Agropyron intermedium*)
- (2) Siberian Wheatgrass (*Agropyron sibericum*)
- (3) Pubescent Wheatgrass (*Agropyron trichophorum*)
- (4) Smooth Brome (*Bromus inermus*)
- (5) Orchard Grass (*Dactylus glomerata*)
- (6) Vinall Russian Wildrye (*Elymus junceus*)
- (7) Durar Hard Fescue (*Festuca ovina duriscula*) (Actually Native)
- (8) Timothy (*Phleum pratense*)
- (9) Kentucky Bluegrass (*Poa pratensis*) (Naturalized Taxon)
- (10) Lutana Cicer Milkvetch (*Astragalus cicer*)
- (11) Blue Flax (*Linum lewisii*) (Actually Native)
- (12) Alfalfa (*Medicago sativa*)

Of the 31 species approved, 21 species are native. On a seed weight basis, 65% of the seeds to be planted are native species seed.

The introduced species were included in the mixture because they were thought to be necessary to control erosion and because they provide forage for wildlife and livestock on the reclaimed area. The research at Colowyo by the Colorado State University (CSU) Agronomy Department has documented the superiority of the introduced species for revegetation purposes compared with other species under similar conditions. The CSU study and two progress reports are set forth in Exhibit 10, Vegetation Information. None of the introduced species are poisonous or noxious. For further discussion of the value of introduced species for obtaining the desired post-mining vegetative community of the same seasonal variety and lifeform of the pre-mined area, refer to Section 2.05.

For post-2008 revegetation, the seed mix is comprised entirely of native species with the specific exceptions described below. Introduced species would only be utilized in four possible circumstances. The first would be reclaimed areas exhibiting a post-mining land use of pastureland (specifically targeting domestic livestock grazing and/or haying operations). The second would be in small areas potentially susceptible to excessive erosion where at the discretion of Colowyo's reclamation coordinator, introduced species would provide the necessary protection. (Prior to use of aggressive taxa to combat areas that are highly susceptible to erosion, an MR or TR (as appropriate) will be obtained from CDRMS to address such circumstances.) The third possible circumstance would be the inclusion of orchard grass at elevated densities in certain locations designed to encourage elk away from other sites. (It has been documented that elk specifically seek this species for consumption.) The fourth circumstance would be inclusion of modest quantities of small burnett or nitrogen fixing legumes such as cicer milkvetch or alfalfa as supplemental forage for deer, elk, and livestock. In addition, cicer milkvetch has proven to be an excellent "habitat" plant for insects that are very important to foraging sage grouse chicks during the brooding period.

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4.15.3 Seeding and Planting

The seeding and planting of the disturbed area will be conducted during the first normal period for favorable planting conditions after final preparation for seeding or planting. The planting period and other revegetation metrics for Colowyo are set forth in Section 2.05.4.

4.15.4 Mulching and Other Soil Stabilizing Practices

As addressed in Section 2.05.4, Colowyo currently does not mulch, chisel plow, or terrace, because sufficient surface roughness survives the topsoil laydown process to maintain the appropriate roughness for modeled sediment control conditions. When necessary, chisel plowing, disking, terracing and/or contour furrows could/would be utilized to stabilize, reduce compaction and increase the moisture retention of graded topsoiled areas. Chisel plowing is the most preferred method of initiating surface roughness at Colowyo, beyond the roughness created through topsoil laydown activities. Areas less than 10% slope at Colowyo have been identified as potentially targeted areas for the Sagebrush Steppe land use and will essentially require a smooth seedbed surface. If these Sagebrush Steppe areas occur in large patches in the future and encompass long sweeping slopes, moderate contour furrows will be established to mitigate any future sheet flow and loss of the topsoil resource. Efforts will be made to establish reclamation blocks along the contour of slopes in order to eliminate the loss of the topsoil resource onto spoil areas. All other areas targeted for the grazingland land use will generally be on slopes greater than 10% and depending on the size of each reclamation unit will need to be chisel plowed (or ripped with a dozer) at a minimum if topsoil laydown activities do not produce sufficient surface roughness to limit the excessive formation of rills on first and second year reclamation blocks by “normal” seasonal runoff events. Contour furrows will be created with regular frequency on slopes greater than 20% and less frequently on areas between 10% and 20% slopes depending on the length of the slope and the size of individual reclamation blocks as determined by topsoil laydown progression in any given year or series of years. Past reclamation efforts undertaken in the East Pit provide a general context to the likely construction frequency of contour furrows in the West Pit and Section 16 reclamation areas. The steeper slopes in the South Taylor area will likely require the construction of contour furrows at a greater frequency than previously mined areas. As indicated under “Mulching Techniques” in Section 2.05.4, use of mulch would be considered a last resort, but is certainly an erosion control metric that may be utilized (where deemed necessary) for long south-facing slopes such as in South Taylor. Spoil will be graded to minimize long, uninterrupted slopes. Replacement of topsoil will be followed by chisel plowing and contour furrowing (when necessary).

The use of these soil stabilizing practices on areas currently undergoing reclamation at Colowyo has been very effective in controlling surface runoff, thereby preventing surface erosion and gullies. The efficacy of these mechanical techniques will continue to be closely monitored as changes to the reclamation program are initiated.

4.15.5 Grazing

All the lands reclaimed by Colowyo will not be grazed by livestock for a period of at least three years after seeding or planting and will be managed to promote the postmining land use.

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Grazing by livestock will not commence until Colowyo has demonstrated to the satisfaction of the Division that the vegetation on the reclaimed surface is adequately established and can be expected to withstand grazing pressures. Any grazing studies undertaken by Colowyo will not preclude or interfere with postmining vegetation sampling as required in section 4.15.8.

4.15.6 Field Trials

Aspen and Tall Shrub Establishment Areas

As a result of negotiations with CPW and DRMS, Colowyo has committed to implementing three field trials. Based upon initial estimates of disturbance to aspen and tall shrub habitats in the South Taylor area, a determination was made that the establishment of 20 acres of aspen habitat and 20 acres of tall shrub habitat (combination of thin and thick topsoil locations) be established in the South Taylor reclamation area (mining disturbance area). As a result of subsequent changes to the mine plan, approximately (7% or 14 acres) of the aspen and (41% or 347 acres) of the tall shrub habitat previously targeted for disturbance will no longer be affected. A reduced area of (18.5) acres of aspen and (12.0) acres of tall shrubs will now be pursued at Colowyo. The field trials are meant to provide information to Colowyo, DRMS and the CPW about the appropriate expectations for success/failure of establishing these habitat types at Colowyo in the context of a ten year bond clock and also to provide some baseline information that can be used to modify practices and the plant materials used to meet the current expectations (acres of each habitat type identified above). Another potential use of the information provided by these trials may be to provide Colowyo with an avenue for relief of the aspen and tall shrub establishment area expectations for South Taylor should efforts prove to be unsuccessful despite the incorporation of best management practices.

The standard interim revegetation monitoring techniques and practices (performed by a third party) applied to the other reclamation areas at Colowyo will be utilized annually to measure progress of the trials through and beyond 2016, when Colowyo, DRMS and CPW will revisit the expectations for further larger scale establishment of these habitat types once reclamation activities begin in earnest in the South Taylor area (currently expected post 2017). All data will be captured, collated and presented as part of the Annual Reclamation Report provided to DRMS. Alternative methods for complying with the aspen and tall shrub establishment areas may be negotiated with CPW after the 2013 growing season should initial 2011 planting and potential subsequent 2012 re-seeding/replanting efforts prove unsuccessful.

1) Colowyo agrees to establish one small (one acre) aspen establishment area on associated disturbance in an area where the original lithology has been previously disturbed. The location of this area will be in the immediate proximity of the South Taylor X coal pod as portrayed below and on Map 28. The location for this trial represents elevation and aspect characteristics that are very similar to the aspen areas disturbed in the South Taylor area. Slope characteristics are more moderate than the native areas disturbed, but for purposes of implementing and monitoring this trial it was determined essential that access and stability of the test location be manageable. Actual results from the trial should yield information that can be used to apply additional stability and/or sediment control measures on larger areas if this attempt is successful. The specific implementation plan of the site is as follows:

- a) The area will be regraded in accordance with PMT requirements.

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- b) The area will be tested for overburden suitability as per requirements.
- c) At least 48 inches of topsoil will be placed to replicate common topsoil depth conditions in the surrounding area in stands of this nature. Once the topsoil has been placed, it will be cross-rippled with a dozer or by other appropriate means to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt and root development.
- d) The entire trial area will be seeded with the modified Sagebrush Steppe Mix as seen below. Weedguard fabric or its equivalent will be placed in rows (at intervals of approximately 22 feet) and will be used to severely reduce competition between the containerized plantings and annual weeds and grasses. Please see the “Expected Field Implementation Plan for Aspen/Tall Shrub Field Trials” illustration below.
- e) Commercially available 2-3 foot containerized aspen stock will be used for planting purposes from the most similar source elevation available in the area. Based on the volume of containerized plants included in the trial (550), and the expectations of success, a number of (300) live aspen plants within the trial during 2016 will be considered a successful demonstration of Colowyo’s ability to proceed further with additional plantings. Supplemental planting of aspen will be initiated in year 2012 should survival of the 2011 plantings be less than 350 stems/acre. Alternative methods for demonstrating compliance with the establishment of aspen habitat in South Taylor will be initiated with the Colorado Division of Wildlife during 2013, should failure of this trial continue.
- f) Aspen will be placed through the weed barrier by hand (or by mechanical means if practical and economically feasible) as per best practices with regards to depth, etc. Proper planting holes are important in transplant survival. Holes should be two to three times wider than the root ball. If the soil is clay and the sides of the hole become glazed during digging, the sides of the hole should be roughened with a spade. Holes should be prewatered before planting in dry soils. This prevents initial postplant water from migrating away from the root ball. Every effort will be made to plant at the same depth that the tree or shrub was growing in its previous location. Damaged roots will be clean-cut with a sharp blade prior to planting. If any circling or kinked roots are discovered during the transplanting procedure, they will be severed to prevent future girdling of the plant. Every effort will be made to orient the tree or shrub in the same direction, relative to the sun, as it was facing in the previous location. Plantings will be performed in the fall by properly trained personnel. Aspen planting densities will be one plant every four linear feet within a row.
- g) Colowyo will place contour furrows immediately above approximately every third fabric row (approximately every 66 feet). The trial will exhibit alternating bands of modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet wide), modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet), modified Sagebrush Steppe mix (approximately 12 feet), contour furrow (approximately 5 feet). This pattern should allow for specific emphasis on containerized plantings establishment while minimizing the risk of excessive erosion during the period of early establishment of the trial area.
- h) An “elk proof” exclusionary fence will be erected around the perimeter of the entire trial area to protect it from ungulates.
- i) As this area will not be receiving supplemental watering, in the event of stand failure the area will revert back to sagebrush steppe for purposes of Phase III bond release in the future, with the exception that the requirement for 50% of the required 375 shrubs in this

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area be big sagebrush (Section 4.15.8), this requirement will reasonably be dropped, due to the reduction in sagebrush seed included in the mix applied.

2) Colowyo agrees to establish one small (one acre) tall shrub establishment site that displays a thicker topsoil condition. The location of this area will be in the immediate proximity of the South Taylor X coal pod as portrayed below and on Map 28. The location for this trial represents elevation and aspect characteristics that are very similar to the Tall Shrub areas disturbed in the South Taylor area. Slope characteristics are more moderate than the areas disturbed, but for purposes of implementing and monitoring this trial it was determined essential that access and stability of the test location be manageable. Actual results from the trial should yield information that can be used to apply additional stability and/or sediment control measures on larger areas if this attempt is successful.

- a) The area will be regraded in accordance with PMT requirements.
- b) The area will be tested for overburden suitability as per requirements.
- c) At least 48 inches of topsoil will be placed to replicate common topsoil depth conditions in the surrounding area in stands of this nature. Once the topsoil has been placed, it will be cross-ripped with a dozer or by other appropriate means to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt and root development.
- d) The Sagebrush Steppe mix has been modified to reduce the volume of “low shrubs” in favor of tall shrub components of the mix. The grasses currently included in the mix were also reduced to minimize competition, while still providing some soil stabilization function. The entire trial area will be seeded with the modified Sagebrush Steppe Mix as seen below. In the event individual components of the mix are unavailable, guidance from the Division will be sought prior to implementation of the trial. Weedguard fabric or it’s equivalent will be placed in rows (at intervals of approximately 22 feet) and will be used to severely reduce competition between the containerized plantings and annual weeds and grasses. Please see the “Expected Field Implementation Plan for Aspen/Tall Shrub Field Trials” illustration below.
- e) Containerized 2-3 foot serviceberry and chokecherry plants will utilized from the most similar source elevation available in the region. Based on the volume of containerized plants included in the trial (550), and the expectations of success, a combined number of (300) serviceberry and chokecherry plants within the trial during 2016 (from seed and live plantings) will be considered a successful demonstration of Coloywo’s ability to proceed further with additional plantings. Supplemental planting of serviceberry and chokecherry will be initiated in year 2012 should survival of the 2011 plantings be less than 350 stems/acre. Alternative methods for demonstrating compliance with the establishment of Tall Shrub habitat in South Taylor will be initiated with the Colorado Division of Wildlife during 2013, should failure of this trial continue.
- f) Containerized serviceberry and chokecherry plants will be placed through the weed barrier by hand (or by mechanical means if practical and economically feasible) as per best practices with regards to depth, etc. Proper planting holes are important in transplant survival. Holes should be two to three times wider than the root ball. If the soil is clay and the sides of the hole become glazed during digging, the sides of the hole should be roughened with a spade. Holes should be prewatered before planting in dry soils. This prevents initial postplant water from migrating away from the root ball. Every effort will be made to plant at the same depth that the tree or shrub was growing in its previous

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location. Damaged roots will be clean-cut with a sharp blade prior to planting. If any circling or kinked roots are discovered during the transplanting procedure, they will be severed to prevent future girdling of the plant. Every effort will be made to orient the tree or shrub in the same direction, relative to the sun, as it was facing in the previous location. Plantings will be performed in the fall by properly trained personnel. Serviceberry and chokecherry planting densities will be one plant every four linear feet (1/2 serviceberry, 1/2 chokecherry) within a row.

g) Colowyo will place contour furrows immediately above approximately every third fabric row (approximately every 66 feet). The trial will exhibit alternating bands of modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet wide), modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet), modified Sagebrush Steppe mix (approximately 12 feet) contour furrow (approximately 5 feet). This pattern should allow for specific emphasis on containerized plantings establishment while minimizing the risk of excessive erosion during the period of early establishment of the trial area.

h) An “elk proof” exclusionary fence will be erected around the perimeter of entire trial area to protect it from ungulates.

i) In the event of stand failure the area will revert back to sagebrush steppe for purposes of Phase III bond release in the future, with the exception that the requirement for 50% of the required 375 shrubs in this area be big sagebrush (Section 4.15.8), this requirement will reasonably be dropped, due to the reduction in sagebrush seed included in the mix applied.

3) Colowyo agrees to establish one small (one acre) tall shrub establishment site with thin topsoil conditions. The location of this area will be in the immediate proximity of the South Taylor X coal pod as portrayed below and on Map 28. The location for this trial represents elevation and aspect characteristics that are very similar to the majority of the tall shrub areas disturbed in the South Taylor area. Slope characteristics are more moderate than the areas disturbed, but for purposes of implementing and monitoring this trial it was determined essential that access and stability of the test location be manageable. Actual results from the trial should yield information that can be used to apply additional stability and/or sediment control measures on larger areas if this attempt is successful.

a) The area will be regraded in accordance with PMT requirements. Additional ripping of the overburden material will be conducted by a dozer to a depth of approximately four feet to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt and root development. Overburden with a significant coarse fragment component is desirable.

b) The area will be tested for overburden suitability as per requirements.

c) An approximate average of four inches of topsoil will be placed to replicate common topsoil depth conditions in the surrounding area in stands of this nature. Once the topsoil has been placed, it will be roughened with a disc (pulled by a dozer or other appropriate machine) to ensure the material is in a loose, rough condition to encourage infiltration of rain/snowmelt and root development.

d) The Sagebrush Steppe mix has been modified to reduce the volume of “low shrubs” in favor of tall shrub components of the mix. The grasses currently included in the mix were reduced to minimize competition, while still providing some soil stabilization function. The entire trial area will be seeded with the modified Sagebrush Steppe Mix as seen below.

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In the event individual components of the mix are unavailable, guidance from the Division will be sought prior to implementation of the trial. Weedguard fabric or it's equivalent will be placed in rows (at intervals of approximately 22 feet) and will be used to severely reduce competition between the containerized plantings and annual weeds and grasses. Please see the "Expected Field Implementation Plan for Aspen/Tall Shrub Field Trials" illustration below.

e) Containerized 2-3 foot serviceberry and mahogany plants will utilized from the most similar source elevation available in the region available. Based on the volume of containerized plants included in the trial (550), and the expectations of success, a combined number of (300) serviceberry and mahogany plants within the trial during 2016 (from seed and live plantings) will be considered a successful demonstration of Coloywo's ability to proceed further with additional plantings. Supplemental planting of serviceberry and mahogany will be initiated in year 2012 should survival of the 2011 plantings be less than 350 stems/acre. Alternative methods for demonstrating compliance with the establishment of Tall Shrub habitat in South Taylor will be initiated with the CPW during 2013, should failure of this trial continue.

f) Containerized serviceberry and mountain mahogany plants will be placed through the weed barrier by hand (or by mechanical means if practical and economically feasible) as per best practices with regards to depth, etc. Proper planting holes are important in transplant survival. Holes should be two to three times wider than the root ball. If the soil is clay and the sides of the hole become glazed during digging, the sides of the hole should be roughened with a spade. Holes should be prewatered before planting in dry soils. This prevents initial postplant water from migrating away from the root ball. Every effort will be made to plant at the same depth that the tree or shrub was growing in its previous location. Damaged roots will be clean-cut with a sharp blade prior to planting. If any circling or kinked roots are discovered during the transplanting procedure, they will be severed to prevent future girdling of the plant. Every effort will be made to orient the tree or shrub in the same direction, relative to the sun, as it was facing in the previous location. Plantings will be performed in the fall by properly trained personnel. Serviceberry and mountain mahogany planting densities will be one plant every four linear feet (1/2 serviceberry, 1/2 mahogany) within a row.

g) Colowyo will place contour furrows immediately above approximately every third fabric row (approximately every 66 feet). The trial will exhibit alternating bands of modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet wide), modified Sagebrush Steppe mix (approximately 17 feet), fabric/containerized plantings (4-5 feet), modified Sagebrush Steppe mix (approximately 12 feet) contour furrow (approximately 5 feet). This pattern should allow for specific emphasis on containerized plantings establishment while minimizing the risk of excessive erosion during the period of early establishment of the trial area.

h) An "elk proof" exclusionary fence will be erected around the perimeter of the entire trial area to protect it from ungulates.

i) In the event of stand failure the area will revert back to sagebrush steppe for purposes of Phase III bond release in the future, with the exception that the requirement for 50% of the required 375 shrubs in this area be big sagebrush (Section 4.15.8), this requirement will reasonably be dropped, due to the reduction in sagebrush seed included in the mix applied.

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ASPEN/TALL SHRUB ESTABLISHMENT GENERAL LOCATION



ASPEN & TALL SHRUB FIELD TRIALS MODIFIED SAGEBRUSH STEPPE MIX

Preferred application method is with a Trillion or similar seeder. Species that are problematic for drill seeding will be broadcast.

Species Name	Common Name	Origin	Life Form	Rec. PLS lbs / acre
<i>Agropyron spicatum inerme</i>	Beardless Bluebunch Wheatgrass	N	Grass	0.50
<i>Agropyron trachycaulum</i>	Slender Wheatgrass	N	Grass	0.20
<i>Bromus marginatus</i>	Mountain Brome	N	Grass	0.30
<i>Elymus cinereus</i>	Great Basin Wildrye	N	Grass	0.20
<i>Stipa viridula</i>	Green Needlegrass	N	Grass	0.20
<i>Poa ampla</i>	Big Bluegrass	N	Grass	0.20
<i>Festuca saximontana</i>	Rocky Mountain Fescue	N	Grass	0.20
Grass Subtotal =				1.80
<i>Artemesia ludoviciana</i>	Louisiana Sagewort	N	Forb	0.50
<i>Vicia americanus</i>	American Vetch	N	Forb	0.30
<i>Linium lewisii</i>	Lewis Flax	N	Forb	0.20
<i>Achillea millifolium</i>	Western Yarrow	N	Forb	0.10
<i>Penstemon palmeri</i>	Palmer Penstemon	N	Forb	0.10
<i>Penstemon strictus</i>	Rocky Mountain Penstemon	N	Forb	0.20
Forb Subtotal =				1.40
<i>Pursia tridentata</i>	Bitterbrush	N	Shrub	1.50
<i>Rosa woodsii</i>	Wood's Rose	N	Shrub	0.50
<i>Symphoricarpos rotundifolius</i>	Mountain Snowberry	N	Shrub	1.50
<i>Artemesia tridentata vaseyana</i>	Mountain Big Sagebrush	N	Shrub	0.25
<i>Chrysothamnus nauseosus</i>	Rubber Rabbitbrush	N	Shrub	0.15
<i>Amelanchier utahensis</i>	Utah Serviceberry	N	Shrub	1.20
<i>Amelanchier alnifolia</i>	Saskatoon Serviceberry	N	Shrub	1.20
<i>Prunus virginiana melanocarpa</i>	Chokecherry	N	Shrub	1.20
<i>Acer glabrum</i>	Rocky Mountain Maple	N	Shrub	1.20
<i>Cercocarpus ledifolius</i>	Curlleaf Mountain Mahogany	N	Shrub	1.20
<i>Cercocarpus montanus</i>	True Mountain Mahogany	N	Shrub	1.20
Shrub Subtotal =				11.10
Complete Mix Total =				14.30
NOTE: ACTUAL IMPLEMENTED MIX MAY VARY BASED ON AVAILABILITY OF SPECIES LISTED. CDRMS WILL BE PROVIDED WITH AN AMENDED MIX FOR REVIEW AND APPROVAL SHOULD ANY CHANGES BE REQUIRED PRIOR TO IMPLEMENTATION OF THE TRIALS				

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EXPECTED FIELD IMPLEMENTATION PLAN FOR ASPEN/TALL SHRUB FIELD TRIALS

	220 ft.	ELK FENCE SURROUNDING ENTIRE AREA
		TALL SHRUB - THIN TOPSOIL 4"
		DASHED LINES REPRESENT INDIVIDUAL FABRIC/CONTAINER ROWS
220 ft.		1 CONTAINER EVERY 4 LINEAR FEET - 220 ft. ROWS - 55 PLANTS PER ROW - 10 ROWS = 550 PLANTS/ACRE
		TALL SHRUB - THICK TOPSOIL 48"
		DASHED LINES REPRESENT INDIVIDUAL FABRIC/CONTAINER ROWS
220 ft.		1 CONTAINER EVERY 4 LINEAR FEET - 220 ft. ROWS - 55 PLANTS PER ROW - 10 ROWS = 550 PLANTS/ACRE
		ASPEN - THICK TOPSOIL 48"
		DASHED LINES REPRESENT INDIVIDUAL FABRIC/CONTAINER ROWS
220 ft.		1 CONTAINER EVERY 4 LINEAR FEET - 220 ft. ROWS - 55 PLANTS PER ROW - 10 ROWS = 550 PLANTS/ACRE
		IMPLEMENTATION PROGRESSION:
		ENTIRE AREA SEEDED WITH MODIFIED SAGEBRUSH STEPPE MIX, FABRIC PLACED, CONTAINERS PLANTED, FURROWS
		CREATED IMMEDIATELY ABOVE EVERY THIRD FABRIC ROW, FENCED. TRIALS WILL BE IMPLEMENTED FALL 2011

4.15.7 Determining Revegetation Success: General Requirements and Standards

During the summer of 1980, two reference areas were selected to represent the two major vegetative communities to be disturbed, sagebrush and mountain shrub. The locations of these reference areas are shown on the Vegetation map (Map 4) and Regional Vegetation map (Map 3). An additional reference area was established in 2018, the Collom Aspen reference area, and the location of it is shown on Map 4. Extensive, detailed vegetative sampling was performed, duplicating the methodologies as described in Section 2.04.10.

The reference areas were sampled for herbaceous cover, herbaceous production and woody plant density. Species diversity was determined utilizing herbaceous cover data from the premining inventory of the sagebrush, mountain shrub, and aspen communities. The reference areas are each approximately seven acres in size.

Statistical tests were performed on the vegetative data from the reference areas to prove that they were comparable to the premixed area. The parameters compared were herbaceous cover and herbaceous production.

Sample size adequacy tests were performed on both the premine and reference area data to insure that representative cover and production data had been obtained at the 80% level of confidence.

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Where necessary, the mean, variance and number of observations for the premine and reference area data were used to perform t-tests on the cover and production data to insure that there were no significant differences, at the 90% level of confidence, between the sets of cover data and production data.

A copy of the transect data summaries for cover, production and woody plant density can be found in Exhibit 10, Vegetation Information.

During the summer of 1980, when the reference areas were chosen, the final mine plan had not been completed and, the sagebrush reference area was inadvertently located within the area to be mined. Since the reference area is to remain undisturbed during the life of the mining- operation to insure that reclamation success criteria can be measured after final reclamation, another suitable sagebrush reference area was chosen.

Since the initial sagebrush reference area had been shown to be statistically comparable to the premine sagebrush community, Colowyo located another sagebrush reference area which was statistically comparable to the existing reference area. This new (1981) reference area was intensively sampled for herbaceous cover and production, using the same sampling methodologies and statistical tests that were used to compare the present reference area to the premine area. On August 21, 1981 Colowyo submitted revised vegetative data summarizing the results of the selection of an alternative sagebrush reference area.

Both the new (1981) sagebrush reference area and old sagebrush reference area were intensively sampled for herbaceous cover and production using the same methodologies and statistical tests as used on all previous vegetative sampling programs with the following two exceptions. For the purpose of sample adequacy, the 90% confidence level has been attained for cover and production, whereas, in the past the 80% confidence level had been attained. For production sampling, a larger 60cm. x 60cm. frame was used rather than the 30cm. x 60cm. frame used to gather baseline production data for the original permit application. The use of a larger frame reduced the sampling variance, thus reducing the numbers of samples needed to achieve sample adequacy.

In 2018, Colowyo submitted information to revise the Danforth Hills aspen reference area (1984) to the Collom Aspen reference area (2005). The Danforth Hills aspen reference area did not comply with Rules 4.15.7(3)(b)(ii) and Rule 4.15.7(3)(d) as it is on BLM private surface. Colowyo cannot control nor manage the reference area in a manner consistent with the approved post mine land use throughout the bond liability period (Rule 3.02.3). However, Colowyo does fully control the Collom Aspen reference area, as it lies on Colowyo deeded surface, and is representative of the soils, slopes, and vegetation within the permit area. Please see Exhibit 10, Item 6 for a statistical demonstration that the Collom Aspen reference area an appropriate reference area. Further, the Collom Aspen reference area has been approved to be used to evaluate revegetation success for the Collom Pit reclamation units, which will be very comparable to the reclamation units in the South Taylor Pit.

For the locations of the (1981) Sagebrush Reference Area and (1980) Mountain Shrub Reference Area please see Map 3, and for the (2005) Aspen Reference Area, refer to Map 4.

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Currently the reference areas are located in an area where grazing can be managed in accordance with the approved postmining land use.

Comparisons of weighted averages between reference areas and revegetated areas under Subsection 4.15.7(4) (b) and Subsection 4.15.11 may be utilized to determine revegetation success. Similar methodologies and statistical tests used to compare premine and reference areas will be used to compare reference areas and revegetated areas. For weighted comparisons of original permit area revegetation (grazinglands), reclaimed area data will be compared against 55% Mountain Shrub Reference Area and 45% Sagebrush Reference Area data. However, some comparisons may be made directly against a single reference area (e.g., Sagebrush Reference Area). In this regard, any sagebrush steppe community that evolves in the reclaimed area will be directly compared against the 1981 sagebrush reference area. For weighted comparisons of South Taylor revegetation, reclaimed area data will be compared against 52% of the 1980 Mountain Shrub Reference Area, 25% of the 1981 Sagebrush Reference Area, and 23% of the 2005 Collom Aspen Reference Area.

For demonstration of revegetation success, vegetation cover, herbaceous production, and in certain circumstances woody plant density will be sampled to statistical adequacy (where necessary), and compared to the approved standard or reference area mean. The Division has completed a comprehensive bond release guideline (1995) that provides a good overview of recommended sampling approaches, statistical adequacy formulas and statistical tests. Furthermore, new regulations promulgated 9/14/05 under Section 4.15.11 detail new allowable approaches for vegetation sampling and testing. Colowyo will utilize procedures recommended in the new regulations, guideline, or other procedures that are as effective as the Division's recommendations. Before Colowyo begins a vegetation sampling program for bond release, the Division will be consulted to confirm sampling approaches and statistical testing. A base level or initial protocol is detailed under Section 4.15.11 below.

As indicated in Rule 4.15.7 (5) the 10-year liability period will begin following the last year of augmented seeding, fertilization, irrigation, or related revegetation work. To facilitate bond release, revegetation success criteria must be met for two of the last four years of the liability period excepting that sampling for final success determination cannot occur prior to year 9 of this period. The liability period will be re-initiated for augmentation work excepting work associated with normal management activities as defined under Rule 4.15.7 (5) (a-g). This allows the liability period to remain unchanged for such revegetation metrics as “interseeding” (4.15.7 (5)(g)) of additional grasses and forbs into a stand targeting shrubs to increase cover values of these life forms.

To summarize the use of reference areas in this testing process, the following will occur. There are three reference areas that will be utilized for testing against reclamation success. These reference areas are: 1980 Mountain Shrub reference area, 1981 Sagebrush reference area, and 2005 Collom Aspen reference area. All lands reclaimed prior to 2008 and grazinglands (grasslands) reclaimed post-2008 on the original permit, East Pit, West Pit, and South Taylor areas, shall be compared to weighted parameters from the 1980 Mountain Shrub reference area (55% weight) and the 1981 Sagebrush reference area (45% weight) in accordance with 4.15.7(4)(b). All post-2008

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lands on the original permit area that evolve into a Sagebrush Steppe community* will be directly compared to the 1981 Sagebrush reference area.

In the South Taylor reclamation areas, grazinglands (grasslands) shall be compared to weighted parameters from the 1980 Mountain Shrub reference area (52% weight), the 1981 Sagebrush reference area (25% weight), and the 2005 Collom Aspen reference area (23% weight) in accordance with 4.15.7(4)(b). Any reclamation units deonted as South Taylor reclamation areas that evolve into a Sagebrush Steppe community* will be directly compared to the 1981 Sagebrush reference.

4.15.8 Revegetation Success Criteria

Colowyo will meet the requirements of this Subsection to insure that the post-mining vegetation will be adequate for final bond release. As delineated under Subsections 4.15.7 and 2.05.4, Colowyo will utilize established reference areas (see Section 4.15.7 above) for the purpose of comparing vegetation information between the reclaimed area and the undisturbed area for the variables of ground cover and production. For the variables of woody plant density and species diversity, Colowyo shall compare revegetated area parameters against defined standards detailed later in this section. Data to be used in these comparisons must be from statistically adequate sampling (where necessary) as indicated in Rule 4.15.11. In instances where grazingland targeted reclamation areas exhibit the characteristics of the sagebrush steppe areas and can meet the release standards for core or ecotonal sagebrush steppe, Colowyo will seek release and credit for the creation of those areas towards fulfillment of the minimum habitat development requirement post-2008 (450 acres). In the unlikely but not impossible event that areas targeted for sagebrush steppe display community characteristics that will not meet the sagebrush steppe area release criteria but do for the grazing land criteria, Colowyo will designate those acres as grazing land. Colowyo will have to specifically designate the location of both grazing land and sagebrush steppe areas prior to the initiation of phase III bond release data collection. For descriptive purposes, “evolved” sagebrush steppe areas refer to lands originally seeded to grazing land that exhibit sufficient community characteristics of the sagebrush steppe community to be fully released as either core or ecotonal areas. Areas defined as “targeted” sagebrush steppe are by definition the areas originally seeded to the sagebrush steppe plant community that exhibit the characteristics of that community and meet either the core or ecotonal requirement for full release.

Herbaceous Cover

For both Pre-2008 and Post-2008 revegetation targeting (and achieving) the rangeland land use subcomponent of grazing land, herbaceous cover of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous cover as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. As allowed under the rules promulgated on 9/14/05, these comparisons may utilize one of three methods detailed under Rule 4.15.11 (2) [(a), (b) or (c)]. Also as allowed by Rule 4.15.7 (4), either weighted-average or individual protocols will be

* Areas that evolve into a sagebrush steppe community cannot be determined with certainty until several years following seeding, emergence, and maturation of shrubs. Emergence of this community may occur in both areas where sagebrush steppe is targeted as well as those grassland targeted areas that receive significant sagebrush seed. Any sagebrush steppe that evolves in either of these areas will be delineated with GPS techniques, sampled accordingly, and tested against the 1981 Sagebrush RA.

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followed depending on the resulting community that evolves (see Section 4.15.7 above). For grassland testing the weighted average approach (Rule 4.15.7 (4) (b)) will be utilized where reference area data and revegetated area data are “weighted” (each combined into single values for comparison) based on the proportional acreage of pre-mine communities within the disturbance area footprint. Testing will then follow procedures detailed under Rule 4.15.11 (2) with preference being given first to subsection (a) [direct comparison], second to subsection (c) [reverse-null testing], and third subsection (b) [classic *t*-test].

For “targeted” Post-2008 sagebrush steppe revegetation (targeting the rangeland land use subcomponent of wildlife habitat), herbaceous cover will be considered adequate for final bond release if it is not less than 70%* of the sagebrush reference area’s herbaceous cover with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. If necessary, a reverse-null hypothesis testing procedure may be utilized in accordance with procedures detailed in Rule 4.15.11 (2) (c). As allowed under Rule 4.15.8 (3) (ii), relaxation of the herbaceous cover standard for areas targeting wildlife habitat post-mining land uses is designed to compensate for revegetation techniques (prescribed ecological reclamation approach) that must discourage grasses to encourage shrubs in the post-revegetated community. For “evolved” post-2008 sagebrush steppe revegetation, the grazingland cover standard will be maintained.

A higher percentage of herbaceous cover is not practical or desirable for the following reasons:

1. It is well documented that in mined-land reclamation the establishment of shrubs to reach bond release levels has proven to be very difficult. Perhaps the most detrimental condition affecting shrub establishment is the competition from herbaceous vegetation. At a minimum herbaceous cover, levels should be less than the premining condition. If the herbaceous levels to be obtained were set higher than the premining condition, the ability to achieve bond release levels for shrubs would be most adversely affected. Higher levels of herbaceous cover would adversely compete against woody vegetation and hinder its successful establishment.
2. In mined-land reclamation, it is important to have adequate herbaceous cover to provide for erosion control. The reference areas at Colowyo indicate herbaceous cover values of 41.8% and 30.17% for the mountain shrub and sage reference areas, respectively.

Colowyo is located at approximately- 7,300 feet in elevation. The period of highest potential erosion occurs in the springtime during snowmelt. At this time of year, erosion control is provided almost exclusively by herbaceous vegetation. Erosion control by shrub cover is virtually insignificant since the potential erosion occurs from snowmelt rather than raindrop impact. Therefore, if pre-mining levels of herbaceous vegetative cover can be re-established, logically a comparable level of erosion control will be achieved.

The value of 70% has been selected given the following rationale: 1) herbaceous competition must be significantly restricted to facilitate emergence and growth of shrubs as indicated under Rule 4.15.11 (3) (ii); 2) the original value is 90%; 3) a value of 50% seems too low to adequately control erosion; 4) by regulation (4.15.11 (3)(a)) a reduction to 70% is allowed for one of the demonstrations for revegetation success for woody plant density; and 5) 70% of the herbaceous material in a native reference area should be adequate to control erosion on slopes 10% or less.

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3. The ability to achieve adequate levels of herbaceous cover at Colowyo is, without question, quite possible. The vegetative monitoring completed at Colowyo during the last three decades, and summarized in annual reports, indicates that the premining levels of herbaceous cover are easily achieved.

In fact, the vegetative data as summarized in the annual reports indicate that the levels of herbaceous cover on the reclaimed areas may have exceeded the premine condition by 30% to 50%.

The vegetative sampling serves to confirm what can be observed in the field. The revegetation at Colowyo is excellent and there is virtually no evidence of erosion attributable to a lack of cover. In fact, the herbaceous cover existing at Colowyo meets or exceeds the premining condition and is undoubtedly providing significant competition with the woody specie seedlings. There is certainly no evidence that herbaceous cover values on the reclaimed areas should be set higher than the herbaceous cover of the premine areas in order to achieve bond release.

Herbaceous Production

For both Pre-2008 and Post-2008 revegetation (targeting (and achieving) the rangeland land use subcomponent of grazing land), herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 90% of the herbaceous production, as determined from the reference areas with a 90% statistical confidence utilizing a standard students statistical t-test comparison of the means. As allowed under the rules promulgated on 9/14/05, these comparisons may utilize one of three methods detailed under Rule 4.15.11 (2) [(a), (b) or (c)]. As allowed by Rule 4.15.7 (4), either weighted-average or individual protocols will be followed. For grassland testing the weighted average approach (Rule 4.15.7 (4) (b)) will be utilized where reference area data and revegetated area data are “weighted” (each combined into single values for comparison) based on the proportional acreage of pre-mine communities within the disturbance area footprint. Testing will then follow procedures detailed under Rule 4.15.11 (2) with preference being given first to subsection (a) [direct comparison], second to subsection (c) [reverse-null testing], and third subsection (b) [classic *t*-test].

For areas designated as Post-2008 sagebrush steppe revegetation (rangeland land use subcomponent of wildlife habitat), herbaceous production success criteria will be eliminated as a requirement should CDRMS rules change as expected in the near future. In the meantime, for Post-2008 sagebrush steppe revegetation, herbaceous production of the revegetated area will be considered adequate for final bond release if it is not less than 70% of the herbaceous production as determined from the reference areas with a 90% statistical confidence utilizing a standard student’s statistical t-test comparison of the means. If necessary, a reverse-null hypothesis testing procedure may be utilized in accordance with procedures detailed in Rule 4.15.11 (2) (c). As inferred under Rule 4.15.8 (3) (ii), relaxation of the herbaceous production standard for areas targeting wildlife habitat post-mining land uses is designed to compensate for revegetation techniques (prescribed ecological reclamation approach) that must discourage grasses to encourage shrubs in the post-revegetated community. Justifications for reduction to 70% are identical to those presented for cover in the previous section.

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Woody Plant Density – Pre-2008 Revegetation

Cedar Creek Associates, Inc.’s recent in-depth analysis of past “shrub conducive efforts” (report dated April, 2007) attempted by Colowyo on older (pre-2008) reclamation has resulted in the conclusion that such past efforts can largely be considered a failure and techniques such as bare-root or containerized plantings should no longer be attempted. It has become obvious to all parties concerned (including Colowyo, their consultants, the researchers at Colorado State University, the CDRMS, and the CDOW) that reclamation practices utilized historically were far more conducive to establishing herbaceous species at the expense of woody species. (It is for this reason that post-2008 reclamation, using different reclamation techniques will have a different success criterion.)

Furthermore, the continued existence of herbaceous species at elevated densities, along with browsing by big game animals, continues to preclude opportunities for establishment and/or growth of woody species populations. In effect, historic (and expensive) attempts to establish shrub populations into these “dense herbaceous stands” using the best technology available at the time have met with nearly complete failure. Only a few remnant plants and “patches” of shrubs remain in the reclamation, and many of those surviving plants were established from seed in the mix as opposed to seedling planting.

In this regard, all parties (including the CDOW) are in general agreement that older (pre-2008) revegetation at Colowyo’s operations favors the livestock grazing aspect of the approved Rangeland Land Use, and that the woody plant density component of those areas is largely inconsequential for such use. However, it has been noted, that big game use, primarily by elk, of the pre-2008 revegetation has been at substantially elevated levels over the past several years, and occasionally has been shown to be problematic to area CDOW managers (as well as contributing to the impact on shrub establishment. (See Enclosed CDOW letter below, especially the 3rd paragraph.)

Therefore, the woody plant density success criterion within pre-2008 reclamation at Colowyo’s operations shall be 150 live stems per acre on approximately 3% (or more) of the reclaimed surface.

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STATE OF COLORADO

Bill Owens, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER

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Division of Reclamation,
Mining and Safety



August 7, 2006

Colorado Division of Minerals and Geology
Mr. James R. Stark, Environmental Protection Specialist
1313 Sherman Street, Room 215
Denver, CO 80203

Re: CDOW Comments on the Wildlife Impacts and Reclamation Recommendations for Colowyo Coal Mine
Permit Revision Application No. 2 (PR-2)

Dear Mr. Stark:

The Colorado Division of Wildlife (CDOW) is sending this letter in response to your notice of Colowyo Coal Mine's (Mine) request to revise their existing permit boundary to include expanding mining operations into South Taylor Creek and Lower Wilson Creek. According to the notice, the Mine is requesting to add a total of 6,050.1 acres to the existing permit boundary. The CDOW provides the following comments for consideration related to the revision application.

Overall, of all Mine owned/controlled lands in the Danforth Hills, the CDOW believes the proposed permit area is least likely to have significant impacts on local wildlife populations. The proposed site is primarily composed of mountain shrub communities consisting of mostly Gambel's oak, serviceberry, and sagebrush. There is also one main stand of aspen in the upper reach of the east fork of Wilson Creek. The CDOW does recognize this to be important wildlife habitat for elk, mule deer, mountain lions, black bear, and wintering Columbian sharp-tailed grouse, as well as, other wildlife species. Sage grouse, a native species of significant concern to CDOW and a species found in high abundance on Mine lands farther to the west, are not expected to be impacted by this proposed permit area. Additionally, the CDOW does not anticipate major impacts on elk and deer migration corridors or critical winter range from this proposed expansion. This is primarily due to the fact that this site is immediately adjacent to current Mine operations and animals have become accustomed to this disturbance. Also, the fact that most of the proposed permit area lies between 7000 and 8000 feet in elevation, normal snow levels are too deep to allow for wildlife to utilize this site during the critical winter months of December, January, and February.

On July 10, 2006, District Wildlife Manager (DWM) Jon Wangnild toured the site in question and reclamation sites within the existing permit boundary with Mine Environmental Staff. During the tour, DWM Wangnild had an opportunity to discuss the Mine's plans including: proposed phases (by year) of mineral extraction, increased infrastructure development, and intended reclamation design. Reclamation plans were further discussed in great detail. The Mine and DWM Wangnild agreed that completed reclamation within the existing permit may not adequately be providing the desired habitat components for all wildlife species that had historically used the site. It was also obvious that certain wildlife species (elk and pronghorn) were heavily using the site and have done so for some time post reclamation. Therefore, it was agreed that the reclamation practices used in the past certainly provided adequate herbaceous vegetation (primarily grass) to allow for soil stability and ground level cover that certainly benefits many wildlife species adapted to grassland habitat environments. However, the chief vegetative component still missing from the site was a consistent shrub community primarily consisting of Gambel's oak,

DEPARTMENT OF NATURAL RESOURCES, Russell George, Executive Director
WILDLIFE COMMISSION, Jeffrey Crawford, Chair • Tom Burke, Vice Chair • Claire O'Neal, Secretary
Members: Robert Bray • Rick Enstrom • Philin James • Richard Ray • Robert Shremaker • Ken Torres

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serviceberry, and sagebrush. It was also agreed that winter use primarily by elk was a factor negatively affecting shrub recruitment.

During the tour, the Mine and DWM Wangnild discussed the possibility of changing reclamation efforts in the new permit area. Specific changes would ideally be focused on dramatically varying topsoil depths in an effort to mimic natural depths and thus provide more suitable environments for woody species establishment. One example of this would be to create some sites with extremely shallow topsoil designed at reducing grass stand establishment and their resulting competition with shrubs for water and soil nutrients. Another example would be to create other sites with extremely deep topsoil depths. These sites would ideally benefit woody species like aspen and chokecherry.

Another idea discussed during the tour revolves around increasing naturally snow holding capability of the proposed reclaimed sites. The Mine felt this would best be accomplished by increasing contours and topography during reclamation efforts. Ideally, this would provide pockets of greater snow depth thus increasing young shrub protection from elk and deer in the fall, winter, and spring while, at the same time, increasing soil moisture.

The CDOW appreciates the opportunity to provide comments on this proposed permit expansion. The CDOW also appreciates the efforts made by the Mine to include CDOW in the early planning stages of this proposed expansion. The CDOW believes this early planning is the key to promoting good working relations between private industry and the State related to wildlife protection. Please feel free to contact District Wildlife Manager Jon Wangnild at 970-878-6067 should you or your staff have further questions regarding this comment letter. Thank you!

Sincerely,



Ron Velarde
Northwest Regional Wildlife Manager

RV:jw

cc: Bill deVergie, Meeker Area Wildlife Manager
Jon Wangnild, Meeker North District Wildlife Manager
Brad Petch, Meeker Area Wildlife Conservation Biologist
Darby Finley, Meeker Area Terrestrial Biologist
John Bredehoft, Assistant Director-Field Operations

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Woody Plant Density – Post-2008 Revegetation

As alluded to under the cover and production success criteria, a new revegetation plan utilizing a “prescribed ecological reclamation approach” (PERA) has been adopted for the Colowyo operation that will facilitate the creation of wildlife habitat conducive vegetation communities (sagebrush steppe), hence Post-2008 revegetation will be subject to a different set of success criteria for bond release. In this regard, the following discussion lays some of the foundation of the underlying principles of this approach to provide a basis for development of the success standards.

The post-2008 revegetation will specifically target livestock grazing and sage grouse brood rearing habitat. Both of these, in combination, are the two primary components of the Post-mining Rangeland Land Use. Post-2008 areas designed to target livestock grazing (and incidental / unavoidable grazing by elk) will comprise approximately 60% to 80% of the original and South Taylor reclaimed landscapes. These areas will principally occupy more steeply sloping ground (>10%) where the grassland community is necessary to preclude excessive erosion, especially from snowmelt. Based on evaluation of the post-mining topography, the remaining 20% to 40% (estimated) of the reclaimed landscape will afford flat or gently sloping surfaces (<10%) with reduced exposure to erosion. It is on these less exposed more gentle slopes whereby development of wildlife conducive habitats (sagebrush steppe) can be attempted (only on larger blocks of land - e.g., >5 acres) without overly compromising stability. In this regard, sagebrush communities targeting sage grouse brood-rearing habitat will be attempted in earnest on approximately 20% (or more) of the Post-2008 reclaimed landscape, with the goal of achieving success on at least one-half of this acreage or as otherwise agreed upon between Colowyo and CDRMS.

The principal basis of PERA is to rebuild the foundation conditions of target vegetation communities taking into account the appropriate aspects, slopes, and topographic features of the reclaimed landscape. In this manner, targeted communities, as opposed to more simple grasslands will be more strongly encouraged. Potential reclamation techniques to be applied to facilitate the targeting of sagebrush communities include, but are not limited to: 1) taking advantage of site-specific opportunities for development of convex and concave surfaces to encourage snow entrapment; 2) development of small berms along the contour and somewhat perpendicular to prevailing winds, also to encourage snow entrapment; 3) use of native species; 4) severe reduction of grasses in the seed mix; 5) use of only bunch grasses for those taxa planted with sagebrush; 6) sharp increases in the amount of sagebrush seed to be used; 7) extra care to obtain the correct subspecies of sagebrush (*vaseyana-pauciflora*) with a seed source as close as possible to the Axial Basin; 8) extra care to place seed at the ideal time of year (immediately prior to the first major snowfall event; 9) placement of thin layers of topsoil over overburden; 10) possible placement of zero topsoil; 11) possible placement of thin layers of overburden over topsoil; 12) use of specialized seed placement equipment to obtain correct planting depths; 13) use of seedbed preparation equipment and techniques to encourage sagebrush emergence; and 14) interseeding of additional grasses and/or forbs (only where necessary) following a period of 2 – 3 years of growth by shrubs. All of these possible techniques / metrics are designed to diminish the competitive advantage of grasses, at least in the early stages of establishment and growth. The primary “foundation-building” element for this approach is the ability to replace variable topsoil depths and/or quality of soil materials depending on site-specific needs, the discretion of the field construction supervisor, and the capabilities (or lack thereof) of available materials and equipment.

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In summary, application of PERA on “shrub-favorable areas” would be based on the community development contributory factors of: 1) soil quantity, quality, and replacement depth; 2) aspect, slope, and landform; 3) documented and expected performance of various floral species; 4) revegetation metrics; and 5) the target post-mining land use. In this manner, reclamation and resultant developing communities will be encouraged to follow a more natural path to maturation and successional progression as opposed to more historically utilized grassland favorable approaches that should only be applied to the remaining 60% to 80% of reclaimed ground (sloping areas). However, there will likely be instances, if not an overall need, to incorporate managerial practices to encourage or protect positive recruitment to the shrub populations. Such management may include the following steps:

- Use of elevated quantities of sagebrush seed within the grassland target areas, and placement of that seed in a manner to encourage sagebrush emergence.
- Use of limited livestock (cattle) grazing to select against grasses and for shrubs and forbs.
- Use of elk-proof fencing to preclude access into large blocks of maturing shrub populations, especially core areas.
- Use of hunting pressure to reduce elk utilization of new reclamation where it can be incorporated in a safe manner given proximity to active mining. Develop special seasons in concert with CDOW for management of “refuge” elk. For obvious reasons, any activity in this regard would have to be designed and approved for implementation in accordance with applicable statutes. Furthermore, approvals from appropriate agencies (CDOW, MSHA, etc.) will be obtained as necessary.
- Use of orchard grass (*Dactylis glomerata*) in key reclamation locations to encourage elk away from maturing shrub populations. It has been documented that this taxon is heavily utilized by foraging elk.
- Implement procedures for micro-habitat development whereby snow catchment is encouraged and shrub heavy mixes can be applied.
- Interseeding of shrubs (as necessary as a normal husbandry practice) within areas not exhibiting satisfactory establishment of shrubs, but still presenting opportunities (micro-niches) for shrubs. Such interseeding would be performed in accordance with Rule 4.15.7(5)(g), and documentation of any such efforts would be provided in the Annual Reclamation Report for that year.

Colowyo’s new reclamation plan includes management and revegetation specifications (e.g., shrub species in the seed mix) for use on the “grassland” targeted areas that will facilitate additional

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shrub establishment when climatic or other conditions are favorable. In this manner, small and/or scattered patches of additional shrub land may be established that will provide improved habitat diversity, especially for sage grouse. However, since this type of reclamation is entirely dependent on the vagaries of nature, dependence upon such techniques cannot be relied upon.

Where shrub lands evolve on these “sagebrush community attempts”, they will be segregated into “core” areas and “ecotonal” areas (as is typically evident in nature), each with a separate woody plant density success criterion. Furthermore, it has been noted repeatedly in the industry that the 10-year bond responsibility period is insufficient for the adequate development of shrub populations. In this regard, flexibility must be built into the success evaluation process (and/or criteria) so that if a positive recruitment rate to the shrub population can be documented on Colowyo revegetation, there would be no need to achieve elevated densities within a modest time frame such as the 10-year responsibility period.

Given these points, the following woody plant density success criteria will be applied to Post-2008 revegetation efforts: On grassland communities (approximately 60% to 80% of reclaimed acreage (>10% slope) targeting the post-mining land use of grazing-land), zero woody plant density will be required. However, if shrub communities evolve in these areas this acreage will count toward the wildlife habitat acreage and be subject to the appropriate standards. On manifested shrub lands (approximately 20% or more of reclaimed acreage targeting the post-mining land use goal of wildlife habitat – sage grouse brooding habitat), the following criteria will be applied depending on shrub land classification. On “core areas” (areas of shrub concentration and comprising no less than one-half the minimum total shrub land acreage), the eventual desirable goal shall be 1000 plants per acre, but the standard shall be 375 live plants per acre. At least one-half of these totals shall be sagebrush species. In “ecotonal areas” the eventual desirable goal shall be 500 plants per acre, but the standard shall be 200 plants per acre. The 375 and 200 plants per acre standards translate to approximately one plant for each 10.4ft. x 10.4ft. or 14.8ft. x 14.8ft. area, respectively. Furthermore, Colowyo makes the commitment to establish sagebrush steppe (comprised of both core and ecotonal areas) on approximately 450 acres of the post-2008 reclamation for the original and South Taylor permit areas, or as otherwise agreed upon between Colowyo and CDRMS. This acreage is based on the following rationale: 1) delineation of all post-2008 post-mining acreage exhibiting slopes 10% or flatter; 2) elimination of all small, isolated, or impractical areas for targeting this community; 3) implementing “banding” (alternating strips of grassland versus shrub land) procedures on large units with long slopes that might otherwise lead to excessive “snowmelt” erosion; and 4) assuming 50% shrub establishment success on the acreage that actually receives shrub conducive metrics.

Issues with the potential long term longevity of fourwing saltbush will require that a maximum proportion of the countable shrubs used to demonstrate conformance with the applicable performance standards be limited to 20%. As an example, should an area demonstrate 375 live shrub plants per acre, 300 of those plants must be something other than fourwing saltbush. Colowyo believes that on-site research partially refutes the data collected at other locations with respect to fourwing saltbush longevity but has compromised in this case given the concerns raised by the Division.

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Diversity

The initial Permit Application addressed Diversity by using the Shannon Weiner Index to measure the distribution of species within the existing premine vegetation community. Over the early years of SMCRA compliance, this procedure was determined to be problematic for this use as a means to evaluate diversity.

Colowyo did not feel comfortable using such a complicated Index, but did so because it was the norm at the time to use this method.

Since the initial Permit Application, CDRMS regulations have been revised to allow for the use of comparisons of species composition based on cover between the reclaimed area and the undisturbed vegetation.

This method of analyzing diversity was applied to the weighted premine herbaceous vegetation cover data originally sampled and summarized in Section 2.04.10 on Table 2, 1980 Herbaceous Cover by Species.

A total of four species with a combined contribution to diversity of 43.4% have been chosen to characterize the premine vegetative community diversity standard.

The vegetative species with their contribution to diversity are as follows:

	<u>Species</u>	<u>% Contribution to Diversity</u>
(1)	<u>Poa pratensis</u>	22.6%
(2)	<u>Agropyron Smithii</u>	10.8%
(3)	<u>Achillea lanulosa</u>	6.7%
(4)	<u>Stipa viridula</u>	3.3%
		43.4%

Although Gallium and Lupinus caudatus rank reasonably well in the diversity (composition) scale, they were not included in the diversity goals for reclamation. Gallium is an annual, while Lupinus caudatus is considered toxic to livestock and is most likely a product of overgrazing. Colowyo is interested in reclaiming with vegetation species with equal or superior utility for the postmining land use when compared with the utility of the naturally occurring premine vegetation. Neither Gallium nor Lupinus provides any utility towards supporting the premine land use.

Three of the species are perennial cool season grasses and one specie is a perennial forb. All of the species are found throughout the premine area on all soil types and moisture regimes. The grass species all provide the qualities for excellent erosion control and livestock use. All four species of vegetation exhibit high utility towards the premine land use.

It is important to note that the species exhibiting the greatest contribution to the premine vegetative diversity is Kentucky Bluegrass, Poa pratensis, which is not considered a native. It exhibits nearly 23% of the composition, over twice that of the next most dominant species, Western Wheatgrass, Agropyron smithii, at nearly 11%.

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Species diversity for the postmine vegetative community will be determined in the same manner as the premine inventory. Cover data will be collected using a point frame placed in an unbiased manner. Overall, postmine data collection methods will be similar to premine data collection methods. Relative cover values (composition) will be determined for each species in the sampled portion of the reclaimed area.

A similar analysis of Harner's January, 1985 Danforth Project data for the baseline evaluation of the South Taylor Area (PR-02) yields a similar level of herbaceous diversity: an average of 3 perennial grasses and 1 perennial forb for the three sampled communities with relative cover values between 3% and 50%. These values are readily observable on the summary table below that lists those taxa that exceed 3% relative cover from each of the study's three vegetation communities.

The Number of Native Perennials with Between 3% and 50% Relative Cover from the Dominant Communities of the So. Taylor Area - Harner, 1985			
Species	Percent Relative Cover / Total No.		
	Sagebrush	Mtn. Shrub	Aspen
<i>Agropyron smithii</i>	5.91		
<i>Agropyron spicatum</i>	5.58		
<i>Agropyron trachycaulum</i>		3.07	
<i>Bromus porteri</i>	3.50	3.33	8.38
<i>Elymus glaucus</i>			7.85
<i>Poa pratensis</i>	9.08	11.87	10.30
Subtotal	4	3	3
<i>Achillea lanulosa</i>			3.49
<i>Lupinus caudatus</i>	5.14		
<i>Osmorhiza occidentalis</i>			6.46
Subtotal	1	0	2
<i>Amelachier utahensis</i>		13.73	
<i>Artemisia tridentata</i>	27.13		
<i>Prunus virginiana</i>			4.89
<i>Quercus gambellii</i>		7.47	
<i>Symphoricarpos oreophilus</i>	12.80	37.07	32.81
Subtotal	2	3	2
TOTAL	7	6	7

Given the aforementioned, the revegetation objective for diversity will be to establish a community on the reclaimed areas that contain the following;

For areas targeting the livestock grazing subcomponent of the Rangeland Land Use (Pre-2008 reclamation):

- a) At least two cool season perennial grasses with between 3% and 50% relative cover (composition).

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- b) All forbs combined with between 1% and 50% relative cover (composition).

For areas targeting the livestock grazing subcomponent of the Rangeland Land Use (Post-2008 reclamation):

- a) At least three native* cool season perennial grasses with between 3% and 50% relative cover (composition), and
- b) At least one perennial forb or shrub with between 2% and 50% relative cover (composition), or
- c) A total of all forbs or all shrubs combined with between 4% and 50% relative cover (composition), or
- d) If five or more native* cool season perennial grass taxa contribute between 3% and 50% composition, the requirement for perennial forbs and shrubs shall be limited to 1% or more relative cover combined.

For areas targeting the wildlife habitat subcomponent of the Rangeland Land Use (Post-2008 reclamation):

At least four native* perennial species, each more than 3% composition, minimum of two of which are grasses and a minimum of one which is a forb, with the following caveat;

If no single forb species exceeds 3% composition, the forb requirement can be met if:

- a) at least two native* perennial forbs combined comprise at least 2% composition, or;
- b) at least four native* perennial forbs combined comprise at least 1% composition.

The dominant species will contribute to the appropriate structure and stability of the postmining vegetative community to insure that the postmining land use as addressed in Section 4.16, Post-mining Land Use, will be sustained.

The seed mixture in Section 2.05 on Table 7, Reclamation Seed Mixture, or MR-59 dated 9/10/02) or other approved seed mixtures contains the desired species to achieve the goal of species diversity in the postmining area. These mixtures contain grasses, forbs and shrubs capable of establishing vegetative communities that are capable of supporting the desired postmining land use.

* The limitation to “native” status will not apply to introduced (and CDRMS approved) taxa specifically planted for an approved use (such as Orchard grass or Cicer milkvetch).

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4.15.9 Revegetation Success Criteria: Cropland

Colowyo does not plan to return any of the mined area for use as cropland; therefore, the requirements of this Subsection are not applicable to Colowyo.

4.15.10 Revegetation Success Criteria: Previously Mined Areas: Areas to be Developed for Industrial or Residential Use

Colowyo does not plan to develop any areas to industrial or residential use; therefore, the requirements of this Subsection are not applicable to Colowyo.

4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation Community Mapping / Stratification

Unless new, CDRMS approved, and superior monitoring and sampling metrics are developed, the following metrics will be implemented at Colowyo to document revegetation progress and success.

During monitoring of revegetated units, developing shrub patches will be identified and as necessary delineated (circumnavigated with a sub-meter GPS unit to document boundaries) to facilitate mapping that in turn will represent the juxtaposition (stratification) of developing communities. As indicated previously, delineated shrub patches will be classified as either “core” areas or “ecotonal” areas depending on apparent density of developing shrub populations. Such stratification is necessary, as success criteria associated with areas of wildlife habitat will be applicable to shrub-dominated communities as opposed to grassland success criteria applicable to remaining revegetation efforts targeting livestock grazing land uses.

Sample Layout

The sample layout protocol for revegetation monitoring and bond release evaluations shall be a systematic procedure designed to better account for the heterogeneous expression of seedlings within reclaimed areas while precluding bias in the sample site selection process. By design, the procedure is initiated randomly, and thereafter, samples are located in a systematic manner, along grid coordinates spaced at fixed distances, e.g. 200 ft. In this manner, “representation” from across the target reclamation unit is “forced” rather than risking the chance that significant pockets are entirely missed, or overemphasized as often occurs with simple random sampling.

Older reclaimed units (e.g., 7+ years) shall receive a minimum of 20 ground cover transects and in monitoring areas – co-located shrub density belts. Production for monitoring purposes shall be collected from a representative five of these 20 sample points. For bond release efforts, production will be collected from a statistically adequate sample as defined below. Monitoring efforts for younger reclaimed units (e.g., 2 to 4 years) shall receive 15 transects and co-located woody density belts (as necessary) but no production sampling. First year units will receive one cluster of five emergent density quadrats spread in a representative manner for approximately every two acres of reclamation. For units 50 acres or larger, a five-quadrat cluster should be collected from every 4 acres of reclamation. With regard to any two-year old or older reclamation unit that is smaller than about 3 acres, the number of samples (for monitoring) shall be limited to five.

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The systematic procedure for sample location in revegetated units shall occur in the following stepwise manner. First, a fixed point of reference (e.g., fence corner) will be selected for the target unit to facilitate location of the systematic grid in the field. Second, a systematic grid of appropriate dimensions will be selected to provide a reasonable number of coordinate intersections (e.g., 5, 15, 20, etc.) that would then be used for the set of sample sites. Third, a scaled representation of the grid will be overlain on a computer-generated map of the target unit extending along north/south and east/west lines. Fourth, the initial placement of this grid will be implemented by selection of two random numbers (an X and Y distance) to be used for locating a systematic coordinate from the fixed point of reference, thereby making the effort unbiased. Fifth, where an excess number of potential sample points (grid intersections) is indicated by overlain maps, the excess may be randomly chosen for elimination. (If later determined that additional samples are needed, the eliminated potential sample sites would be added back in reverse order until enough samples can be collected.) Sixth, using a handheld compass and pacing techniques, or a hand-held GPS, sample points will be located in the field.

Once a selected grid (sample) point is located in the field, sampling metrics will be utilized in a consistent and uniform manner. In this regard, ground cover sampling transects will always be oriented in the direction of the next site to be physically sampled to further limit any potential bias while facilitating sampling efficiency. Depending on logistics, timing, and access points to a target sampling area, the field crew may occasionally layout a set of points along coordinates in one direction and then sample them in reverse order. However, orientation protocol will always be maintained (i.e. in the direction of the next point to be physically sampled). If the boundary of an area is encountered before reaching the full length of a transect, the transect orientation will be turned 90° in the appropriate direction so the transect will be completed within the target unit. In this manner, edge transects will be retained entirely within the target unit by “bouncing” off the boundaries. Production quadrats will always be oriented 90° to the right (clockwise) of the ground cover transect and placed one meter from the starting point so as to avoid any trampled vegetation. Woody plant density belts (for monitoring efforts) will be extended parallel to the ground cover transects for a distance of 50 meters and width of 2 meters. (If the grid distance is less than 50 meters, density belts will be reconfigured to be 4 m X 25 m or similar configuration, but always totaling 100 m².)

Determination of Ground Cover

Ground cover at each sampling site will be determined utilizing the point-intercept methodology. This methodology will be applied as follows: First, a transect 10 meters in length will be extended from the starting point of each sample site toward the direction of the next site to be sampled. Then, at each one-meter interval along the transect, a “laser point bar”, “optical point bar” or 10-point frame will be situated vertically above the ground surface, and a set of 10 readings recorded as to hits on vegetation (by species), litter, rock (>2mm), or bare soil. Hits will be determined at each meter interval as follows:

1. When a laser point bar is used, a battery of 10 specialized lasers situated along the bar at 10-centimeter intervals will be activated and the variable intercepted by each of the narrow (0.02”) focused beams will be recorded;

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2. If an optical point bar is used, intercepts will be recorded based on the item intercepted by fine crosshairs situated within each of 10 optical scopes located at 10-centimeter intervals.
3. If a 10-point frame is used, sharpened pins will be used to determine intercepts at 10-centimeter intervals. Care will be taken to NOT record “side touches” on the pins as this will result in a significant overestimation error.

The following sampling rules should apply during data collection. Intercepts will be recorded for the first (typically highest) current annual (alive during the current growing season) plant part intercepted without regard to underlying intercepts or attachment to a living base except when multiple strata are present. In this circumstance, multiple live hits may be recorded, but only one hit per stratum with the second live hit being recorded separately and not used to calculate total ground cover. Otherwise, the intercept will be litter, rock or bare soil. Rock intercepts are based on a particle size of 2 mm or larger (NRCS definition), otherwise it would be classified as bare soil. To distinguish between current year senescent plant material and litter (including standing dead), the following rule should apply: 1) if the material is gray or faded tan it should be considered litter; and 2) if the material is bright yellow or beige it should be considered current annual (alive) and recorded by species. On occasion, experience with non-conforming taxa may override this rule.

When using laser or optic instruments during windy field conditions, the observer should consistently utilize one of the following techniques for determining a hit: 1) record the first item focused upon that is intercepted by the narrow laser beam or cross-hair; 2) wait a few moments and record the item intercepted for the longest time, or 3) block the wind and record the intercept. When using a pin frame, the observer must wait for the wind to subside.

With regard to gaps in the overstory, the point-intercept procedure naturally corrects for overestimations created by 2-dimensional areal (quadrat) or 1-dimensional linear (line-intercept) techniques. In this regard, the 0-dimensional point is extended along a line-of-sight until it “intercepts” something that is then recorded. Frequently points simply pass through overstory gaps until a lower plant part, litter, rock or bare soil is encountered.

Regardless of instrument, a total of 100 intercepts per transect will be recorded resulting in 1 percent cover per intercept. This methodology and instrumentation (excepting the 10-point frame) facilitates the collection of the most unbiased, repeatable, precise, and cost-effective ground cover data possible. Identification and nomenclature of plant species should follow Weber and Wittman (1996) Colorado Flora: Western Slope or newer text.

Determination of Production

Where production samples are to be collected (7+ year-old units or Bond Release units) current annual herbaceous production will be collected from a $\frac{1}{2}$ m² quadrat frame placed one meter and 90° to the right (clockwise) of the ground cover transect to facilitate avoidance of vegetation trampled by investigators during sample site location. If more production samples are necessary than cover samples (typical case for bond release efforts), orientation protocol will be maintained except that no ground cover data will be collected. From within each quadrat, all above ground

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current annual herbaceous vegetation within the vertical boundaries of the frame will be clipped and bagged separately by life form as follows:

Perennial Grass
Annual Grass
Subshrub

Perennial Forb
Annual Forb
Noxious Weeds (if found)

All production samples will be returned to the lab for drying and weighing. Drying will occur at 105° C until a stable weight is achieved (24 hours). Samples will then be re-weighed to the nearest 0.1 gram.

Determination of Woody Plant Density

Two sampling methods may be employed for monitoring woody plant density within Colowyo's revegetated units. The first method, belt transects, may be employed when the size of the monitoring unit exceeds one to two acres. At each sample site in such areas, a 2-meter wide by 50-meter long belt transect (or alternately 4 x 25 meter transect) should be established parallel to the ground cover transect and in the direction of the next sampling point. All woody plants (shrubs and trees) within each belt will be enumerated by species. Determination of whether or not a plant may be counted is dependent upon the location of its main stem or root collar where it exits the ground surface with regard to belt limits. A total of 5, 15 or 20 belt transects may be sampled for each monitoring unit.

For bond release sampling with belts, sufficient samples must be collected to insure adequacy of the effort (to facilitate valid testing) in accordance with one of the three methods under either Rule 4.15.11 (2), or Rule 4.15.11 (3). Depending on the selected protocol, care must be taken to collect at least the minimum number of samples indicated (15, 30, 40, or 75, depending on the procedure utilized).

The second method, total enumeration, may be employed for monitoring when the size of a unit is less than approximately one to two acres in size. Total enumeration shall be the typical method utilized for bond release purposes unless shrub patches are too large (e.g., greater than 10 to 15 acres) to practically utilize this technique (in which case belts will be utilized). This method involves total counts of woody plant populations as opposed to estimates of mean densities through statistical sampling. Implementation of the total count technique would involve circumscribing the boundaries of a target polygon with hip chain thread or similar visible designation. Once a unit is circumscribed in this manner, a team of two or more biologists walking shoulder-to-shoulder traverse the plot enumerating each plant by species. The person farthest inside the line of observers trails hip chain thread, or other means, to mark their path to prevent missing or double counting specimens on subsequent passes. The distance between observers should be 15 to 20 feet or less depending on the height of grasses and the presence of low growing taxa such as rose or snowberry. Each internal observer should also "zigzag" as the team progresses, occasionally turning to view the area just passed to ensure visual coverage of the entire survey path. Constant communication among crew members precludes double counting or missing of plants located along the margins of observed paths. Results from total enumeration efforts can be compared directly with success criteria without statistical testing.

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Determination of Seedling Emergence

At each emergent density sample point (revegetation monitoring only), five one-square foot quadrats should be blindly tossed to the ground and the number of emergents rooted within the perimeter of each shall be recorded accordingly into one of five classes: perennial grass, perennial forb, shrub, annual grass, or annual forb. Where possible recognizable taxa may be recorded by species. Efforts with 1 – 2 perennial emergents per ft² are considered to be fair, 2-3 perennial emergents per ft² are considered to be good, while 3-4 perennial emergents per ft² are considered very good. Five or more perennial emergents per ft² are considered to be excellent.

Sample Adequacy Determination

Sampling within each monitored unit shall be conducted to a minimum of 5, 15 or 20 samples as necessary. Sampling within each unit under consideration for bond release shall start with a minimum of 15 (reference area) or 20 samples (revegetated area) and continue until a statistically adequate sample (if necessary) has been obtained in accordance with Section 4.15.11 (2) (a). From initial sampling efforts, sample means and standard deviations for total non-overlapping vegetation ground cover, production, and woody plant density will be calculated. For bond release applications, the typical procedure is that sampling continues until an adequate sample, **n_{min}**, has been collected in accordance with the Cochran formula (below) for determining sample adequacy, whereby the population is estimated to within 10% of the true mean (μ) with 90% confidence. For woody plant density, the estimate is to within 15% of the true mean.

When the inequality (**n_{min}** ≤ **n**) is true, sampling is deemed adequate; and **n_{min}** is determined as follows:

$$N_{min} = (t^2 s^2) / (d \bar{x})^2$$

where: **n** = the number of actual samples collected (initial size = 15 or 20)

t^2 = the value from the one-tailed *t* distribution for 90% confidence with **n**-1 degrees of freedom (a value of approximately 1.3);

s^2 = the variance of the estimate as calculated from the initial samples;

d = precision (0.10 for cover and production or 0.15 for woody plant density);

\bar{x} = the mean of the estimate as calculated from the initial samples.

If the initial samples do not provide a suitable estimate of the mean (i.e., the inequality is false), additional samples should be collected until the inequality (**n_{min}** ≤ **n**) becomes true. However, where sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

If reverse-null testing will be utilized to document success, then in accordance with Rule 4.15.11 (2) (c) a minimum of 30 samples must be collected and a demonstration of sample adequacy is not necessary. In this circumstance a two-sample reverse null t-test is mandated along with Satterthwaite approximated degrees of freedom and standard error. However, if an adequate

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sample can be obtained from the reference area, then a less complex one-sample *t*-test may be utilized. With the reverse null test, the smaller the variance (given by extra sampling) the better the chances of passing closely matched parameters.

For certain statistical demonstrations of woody plant density, documentation of sampling adequacy is often problematic, hence Rule 4.15.11 (3) may be used in lieu of Rule 4.15.11 (2). Rule 4.15.11 (3) (a) is a reverse-null approach based on the median and requires a minimum of 30 samples. Rule 4.15.11 (3) (b) allows direct comparison with standards if a statistically adequate sample cannot be demonstrated in accordance with Rule 4.15.11 (2) (a), however, a minimum of 75 samples with a minimum quadrat size of 100 m² is required (equivalent to total enumeration of 1.85 acres). Rule 4.15.11 (3) (c) is a standard-null approach based on determination of a “running mean” and a minimum of 40 samples is required.

Success Evaluation

To summarize, success evaluations involve either a direct or a statistical *t*-test comparison of appropriate parameters for each variable of interest (cover, production, diversity, or woody plant density). For monitoring efforts, comparisons shall be made directly with either the reference area parameters or the permitted standards to facilitate a determination of the progress of revegetation. In the case of ground cover and production, comparisons shall be made against reference area data of the same year. Diversity and woody plant density variables shall be compared against the standards defined above.

For bond release efforts, direct comparisons are made when the revegetated area mean value for a given variable is greater than either 90% of the standard or the reference area mean assuming that a statistically adequate sample has been collected. If a statistically adequate sample cannot be obtained, a “reverse-null” hypothesis test may be employed as detailed in C.R.S. Rule 4.15.11 (2) (c). If an adequate sample is obtained for a particular variable, but the mean is less than 90% of the reference area mean or standard, a “standard-null” hypothesis *t*-test may be employed as detailed in C.R.S. Rule 4.15.11 (2) (b).

For the typically problematic variable of woody plant density, Colorado has implemented three alternate adequacy / success evaluation methods under C.R.S. Rule 4.15.11 (3) that may be utilized in lieu of those detailed under 4.15.11 (2). Until experience dictates which procedure is best (because these are relatively new metrics to the science), it would be prudent to collect a minimum of 75 belt transects (at least 100 m² in size) as indicated in 4.15.11 (3)(b)(i). These data can then be used for the various analyses / comparisons.

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4.16 POSTMINING LAND USE

4.16.1 General

Implementation of the detailed reclamation plan as presented in Section 2.05.5 will result in a landscape and vegetative cover that is equal to or better than the premining condition for rangeland use that currently exists in the area.

4.16.2 Determining Use of Land

The premining land uses for the mine plan and adjacent areas are shown on the Land Use Map (Map 17). The narrative describing the land use of the permit area is presented under Section 2.04.3. The proposed postmining land use will involve the restoration of the premining land use of rangeland, as described in Section 2.05.5.

4.16.3 Prior to Release of Lands from the Permit Area in Accordance with 3.03.1 (2) (c)

The land use of rangeland will be restored in a timely manner as outlined in Section 2.05.4. Implementation of the timetables contained therein will assure a contemporaneous reclamation program. No alternative land uses will be implemented in the reclamation plan set forth under Section 2.05.4.

4.17 AIR RESOURCES PROTECTION

Colowyo employs fugitive dust control measures in all phases of the mining and reclamation activities. The control measures currently used are set forth in detail in Section 2.05.6.

The operations at Colowyo are presently regulated under numerous emission permits issued by the Colorado Department of Health, Air Pollution Control Division. Section 2.03.10 identifies the various permits under which Colowyo currently operates. The permits are set forth in Exhibit 8, Air Quality Information.

4.18 PROTECTION OF FISH, WILDLIFE, AND RELATED ENVIRONMENTAL VALUES

As described in Section 2.04.11, no threatened or endangered species have been identified within the active mining operation. Also, no critical habitat for any species is known to exist. Golden Eagle nesting complexes, which are located within the permit area but outside the area to be mined, are described in Section 2.04.11.

Electric power lines and other transmission facilities in the permit area will be constructed in accordance with the guidelines set forth in the environmental criteria for Electric Transmission System by the United States Department of Interior (USDI) and the United States Department of Agriculture (USDA) 1970. Distribution power lines are to be constructed by guidelines set forth in the Rural Electrification Administration (i.e., Rural Utilities Service) 1979 Bulletin 61-10 and will suffice for Rural Utilities Service's current construction guidelines for raptor-safe power line

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structures. Colowyo's design criteria has been developed in association with the Avian Power Line Interaction Committee's (APLIC) *Suggested Practices for Raptor Protection on Power Lines: "The State of the Art in 1996"* (APLIC 1996). Please refer to the Figure 4.18-1 - Raptor Protection Retrofitting of Existing Power Poles. For structure configurations and retrofitting locations, please refer to Figure 4.18-2 through 4.18-6, and Maps 22A and 22B. The following schedule will be used to update existing power poles with adequate raptor protection in accordance to the guidelines.

As part of Colowyo's Avian Protection Plan effort, EDM examined the distribution structures in July 2002 to identify pole configurations that present a risk to perching raptors and other large birds. EDM also conducted a reconnaissance of the 69kV power lines to record the overall structure configurations and determine if any of these configurations present an electrocution risk to area raptors. Additional transmission and distribution power lines located in and adjacent to the Colowyo Coal Mine are owned and operated by White River Rural Electric Association, Tri-State Generation and Transmission, and Western Area Power Administration. The operation of these lines fall under the jurisdiction of each of these respective utilities and agencies.

Distribution lines (less than 69 kilovolts {kV}) are of lower voltages than transmission lines and, therefore, have reduced hardware and equipment clearances. Depending on the pole configuration, perching on distribution line poles (particularly by juvenile birds) increases the potential of a bird connecting phase-to-phase or phase-to-ground, which typically results in bird mortalities and often leads to increased power outages. Although most of the 69kV structures examined during the July 2002 field survey were of sufficient clearance for eagles and other raptors, thereby minimizing any electrocution risk, a few 69kV structure configurations were identified that could represent an increased hazard. Two such configurations recorded included Gang Operated Air Brake Switches (GOABS) where the center phase switch was located less than 60 inches from the pole-top ground wire. The second 69kV configuration of concern included structures where the center phase jumper was placed on a crossarm insulator in close proximity to the pole-top ground wire.

Colowyo is responsible for several miles of additional distribution lines on the mine that were not surveyed as part of the July 2002 study. However, these lines are currently de-energized, and the structures are scheduled for long-term removal as the mining operation expands and areas are reclaimed. In addition, a portion of the existing 4160 volt line located along the Taylor Creek drainage traveling south of the Taylor Pump Holding Pond were previously retrofitted to address the potential risk of raptor electrocution.

As described in Section 2.05.6, all disturbed acreage, including roads, has been kept to a minimum by proper planning to reduce impacts to all environmental resources, including impacts on wildlife.

Colowyo's objective of returning the post-mining land use to a rangeland condition capable of supporting the diverse wildlife populations is being approached in several ways. As described in Section 2.04.11, Colowyo initiated efforts to restore wildlife habitats during premine planning and early mining, by conducting an extensive four-year study to assist in determination of the best techniques for revegetating disturbed areas with native species to enhance wildlife habitat.

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A habitat improvement program, as described in Section 2.05.6, was initiated in 1975 to offset temporary habitat loss during mining. As described in Section 2.05.4, the reestablishment of herbaceous species, topographic relief, impoundments and limited reestablishment of a shrub component form the integral elements of the reclamation plan.

To date these efforts have proven successful. Herds of Deer and Elk are regularly seen grazing on the reclaimed areas. Rodent and small game populations have reestablished on the reclaimed areas providing a readily available food source for local raptor populations and other predators.

4.19 PROTECTION OF UNDERGROUND MINING

Colowyo will not conduct coal mining closer than 500 feet to any point of either an active or abandoned underground mine. Underground coal mines have been operated in the past as discussed in Section 2.04.4, but their locations were on the-northern side of Streeter Draw well over 500 feet from present Colowyo mining.

The surface mining activities of Colowyo have been designed so as not to endanger any present or future operations of either surface or underground mining operations. As discussed in Section 2.05.3, Colowyo has engineered its mining plan to maximize recovery of coal by current economical surface mining methods.

4.20 SUBSIDENCE CONTROL

Colowyo is conducting a surface coal mining operation. Therefore, the requirements of 4.20 are not applicable to the Colowyo operation.

4.21 COAL EXPLORATION

4.21.1 Scope

This section sets forth performance standards and design requirements for coal exploration, which substantially disturbs the natural land surface.

4.21.2 General Responsibility of Persons Conducting Coal Exploration

Colowyo will comply with the minimum environmental protection performance standards under this Section as discussed below and in Section 2.02.

Colowyo plans to conduct coal exploration which may affect the natural land surface and during which less than 250 tons of coal will be removed. As stated in Section 2.02, Colowyo will not conduct coal exploration during which more than 250 tons of coal are removed.

4.21.3 Required Documents

As stated in Section 2.02, Colowyo will not conduct coal exploration during which more than 250 tons of coal are removed.

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4.21.4 Performance Standards

No habitats of unique value for fish, wildlife, and other related environmental values and areas were identified in Section 2.05.6(2)(b), which could be affected by coal exploration work.

During any coal exploration, Colowyo will obtain any supportive information that might be necessary for proper mining, reclamation and environmental control.

All vehicular traffic will be limited to established, graded roads at all times, except in cases where limited off road travel will be less damaging to vegetation and the ground surface than the construction of a new road. Travel will be confined to graded surface roads during periods when excessive damage to vegetation or rutting of the land surface could occur.

Any new road to be built for the exploration project will be utilized for less than six months and thus will be constructed as a light use road according to the provisions of Section 4.03.3.

Any existing roads in the area will be altered for exploration purposes only so far as they may be widened or smoothed to accommodate exploration equipment and in accordance with all applicable Federal, State and local requirements. Water bars and ditches will be added where appropriate. All existing roads to be used during the exploration program will be left in the condition that is superior to their pre-exploration condition.

Any drill sites that are no longer needed for exploration or environmental monitoring (such as piezometer wells) will be returned to their approximate original contour promptly after all coal exploration activities are completed.

Topsoil will be removed prior to construction of any drill site when necessary. After the site is recontoured, topsoil will be redistributed over the surface in a manner that will provide for successful reclamation. If any exploration drilling is to be conducted in an area directly ahead of the mining operations where topsoil has been removed, the site will be mined through and reclaimed in accordance with Section 2.05.4.

Revegetation of drill sites and roads will be performed by drill or by broadcast seeding with a variety of native and introduced species during the late fall or early spring to produce a satisfactory vegetative cover capable of stabilizing the soil surface. The affected areas will be seeded according to the mixture described in Section 2.02.

In no case will any ephemeral, intermittent or perennial stream be diverted during the exploration activities. Overland flow will be diverted, if necessary, so that erosion is controlled by ditches, water bars, sedimentation ponds or other methods capable of controlling erosion and minimizing additional contributions of suspended solids in the stream flow outside the exploration area. Such diversions will be done in a manner that complies with all other applicable Federal and State requirements.

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Upon completion of the hole, cuttings from the drill hole will be placed in the drill hole and the site reclaimed. Some holes may be left open and completed with piezometers, if they are needed for ground water monitoring. The requirements of Section 4.07 will be met for each exploration hole. See Section 2.04.4, Sealing of Exploration and Mine Holes, for further information concerning reclamation of exploration holes.

With the exception of possible piezometers to be installed in some of the drill holes for groundwater quality and quantity monitoring, all equipment related to the exploration program will be removed from the exploration area when it is no longer needed for exploration.

During the exploration program, minimization of surface disturbance and prompt reclamation practices will be utilized to eliminate sedimentation problems and any disturbance of the present hydrologic balance. Water bars and ditches will be built wherever needed. In addition, water from drilling operations will be contained on the drill site and allowed to evaporate thus eliminating any off-site disturbance.

As discussed under Section 2.04.6, no acid-forming materials have been found to exist within the mine plan or adjacent area.

A compilation of 1989-1997 Permit Area Coal Resource Confirmation/Exploration/Monitor wells and Transfer of Permit Area Exploration Liability to NOI-X-95-109-05 status can be found in Exhibit 6, Geological Information an Item #5.

Exploration taking place inside and outside of the permit area will be handled through the Notice of Intent (NOI) procedures. See the appropriate NOI for details for each program.

With the approval of Technical revision 50, all exploration holes located within the permit boundary are transferred to NOI X-95-109-5 and are managed under Coal Exploration procedures.

Wells drilled as an integral part of water monitoring plans identified in the PAP (Permit C-81-019) and water supply wells (for mining purposes) are managed under this Permit C-81-019.

4.21.5 Requirements for a Permit

No coal will be removed or extracted by the proposed coal exploration other than occasional spot coring. No coal will be removed or extracted for commercial sale during coal exploration.

4.22 CONCURRENT SURFACE AND UNDERGROUND MINING

Colowyo does not currently plan to have concurrent surface or underground mining activities; therefore, the requirements of this Section are not applicable to this permit application.

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4.23 AUGER AND HIGHWALL MINING

4.23.1 Scope

This Section establishes environmental protection performance standards in addition to those applicable performance standards in Rule 4, to prevent any unnecessary loss of coal reserves and to prevent adverse environmental effects from auger mining incident to surface mining activities.

4.23.3 Performance Standards

4.23.4 Maximize Recoverability of Mineral Reserves

Colowyo maximize recoverability of the mineral resources through highwall mining in the East, West, and Section 16 Pits. Please see Map 23 for the historically mined areas. Also please see Section 4.23.2 in Volume 12 and 15 for additional information pertaining to the South Taylor and Collom Pit.

4.23.5 Undisturbed Areas of Coal Shall Be Left in Unmined Sections

As for the CDRMS Rules (Rules) requirement for leaving undisturbed areas of coal in unmined sections, Colowyo contends that this application of the Rules does not apply since the seams to be highwall mined are being accessed from active surface pits that by this Permit and other applicable sections of the Rules are required to be backfilled and fully reclaimed. Hence should undisturbed barrier areas of coal be left for some future access, these potential portal areas would be inaccessible for future generations because they would be buried under the pit backfill. Additionally and importantly, as discussed above, due to the many geological reasons, there is not economical coal to be recovered from “behind” the areas slated to be highwall mined.

4.23.6 Abandoned or Active Underground Mine Workings

To Colowyo’s knowledge, no abandoned or active underground mine workings have ever existed or currently exist in any of the coal seams in the areas proposed to be highwall mined. No highwall mining will be allowed to take place within 500 feet of any abandoned or active underground mining operation.

4.23.7 Surface Mining Activities and Highwall Mining

The highwall mining shall follow the surface coal mining activities in a contemporaneous manner consistent with the applicable requirements of CDRMS Rule 4. Due to active pit progressions and sequencing of mining (in addition to meeting the Permit requirements for contemporaneous reclamation), it is required that highwall mining occurs timely if not immediately following conclusion of pit mining activities. Also, as described more fully in 2.06.9(2), the need to backfill, i.e., contemporaneously reclaim the pits, is mandatory for Colowyo in order to build the pit floor from which to work from to mine the successively higher (in the geologic column) coal seam. Hence successful highwall mining is in part dependent upon timely and successful contemporaneous reclamation of the pits.

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4.23.8 Prevent Pollution of Surface and Groundwater and to Reduce Fire Hazards

Ground water in the pit or highwall mining holes will not be problematic being that the Colowyo pits are essentially dry (minor perched aquifers with limited seasonal flows) and are located above the first regional aquifer (Trout Creek) by a substantial distance. Ground water flow regimes and the negligible impact that Colowyo's surface mining activities have on ground water as a result of mining these target coal seams/rock interburdens are detailed extensively in Permit Section 2.04.7(1). From this extensive body of data and from experiences to date with mining activities, no toxic forming or acid forming water discharge is anticipated from any of the highwall openings. Should toxic forming or acid forming water discharges be encountered, the opening exhibiting the discharge will be backfilled within 72 hours of completion.

Colowyo will backfill each highwall miner entrance hole within 30 days following coal extraction. All highwall miner entrance holes will be further buried by pit backfill during the normal backfill sequence for the pits to remain in compliance with Rules 4.05.1 and 4.05.2. Ground water hydrologic regimes will be re-established in the backfilled pits with no anticipated detrimental effects from the highwall miner holes.

4.23.9 Division shall prohibit Auger (Highwall Mining) Mining

There is no probable reason to prohibit the highwall mining in light of no anticipated adverse impacts to water quality, fill stability, pit backfilling, increased resource recovery, and highwall mining is designed for zero subsidence to prevent disturbance or damage to powerlines, buildings, or other surface facilities.

4.23.10 Backfill and Grading Requirements

Highwall mining will be conducted in accordance with the backfilling and grading requirements of 4.14.

4.23.11 Highwall Shall be Eliminated

Highwall mining is proposed to occur in areas previously mined with adequate material on hand to backfill the pits with proper static safety factors for stability to the approved postmining topography thereby eliminating all highwalls. Any minimal spoil material generated by the highwall mining operation will be buried at depth in the pit backfill. All coal seams mined will be adequately covered by pit backfilling in conformance with the permitted PMT and reclamation plan. No remnant highwalls will be left at conclusion of the reclamation activities and no spoil material will be place on any outcrops.

4.24 Operations in Alluvial Valley Floors

The field investigation described in Section 2.04.7 and 2.06.8 resulted in no identification of alluvial valley floors in the general area, which would be adversely affected by mining operations. Therefore, no special performance standards for operations in the alluvial valley floors are

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applicable to this mining permit application and no protection or remedial measures are proposed for compliance to this Section.

4.25 Operations on Prime Farmlands

Since a negative determination of prime farmland was arrived at using the eligibility requirements established for prime farmland under Section 2.04.12, these performance standards do not apply to the permit application.

4.26 Mountaintop Removal

No mountaintop removal will be conducted by Colowyo.

4.27 Operations on Steep Slopes

No operations at Colowyo will be conducted on steep slopes as defined in this section.

4.28 Coal Processing Plants and Support Facilities not Located at or Near the Mine Site or not Within the Permit Area for the Mine

Colowyo will not use any coal processing plants or support facilities not located at or near the mine sites therefore, this section is not applicable to the permit application.

4.29 In-Situ Processing

Colowyo will conduct no in-situ processing; therefore, this Section is not applicable to the permit application.

4.30 Cessation of Operations

4.30.1 Temporary

If, for any unforeseeable circumstances, temporary cessation of mining and reclamation operations at the Colowyo operation becomes necessary for a period of thirty (30) days or more, Colowyo will submit to the Division a notice of intention to temporarily cease or abandon mining and reclamation activities. This notice will include a statement of the exact number of acres which will have been affected in the permit area prior to temporary cessation, the accomplished, an identification of back filling, regarding, Revegetation, environmental monitoring, and water treatment activities that will continue during temporary cessation.

4.30.2 Permanent

At the permanent conclusion of surface mining operations, Colowyo will close, backfill, or otherwise permanently reclaim all affected areas. The reclamation plans are set forth in Section 2.05.5. The projected postmining topography is set forth on the Postmining Topography Map (Map 19).

RULE 4 PERFORMANCE STANDARDS

Colowyo will remove any equipment, structures, or other facilities at the conclusion of mining activities and will reclaim the affected land.