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

October 27, 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
Technical Revision No. 143
Reclamation Plan & Tall Shrub Field Trials

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). Therefore, Tri-State on behalf of Colowyo technical revision 143 (TR-143) to Permit No. C-1981-019.

TR-143 proposes tall shrub field trials within the West and East Pit reclamation areas to study tall shrub establishment at the Colowyo Mine. TR-143 also revises the reclamation plan to be a clear, more concise plan. Further, it revises the reclamation plan to include a proposal to revise the woody plant density revegetation success criteria. It also proposes to remove the mine wide shrub standard and replace it with a percentage of low/high density shrub areas for each bond release evaluation package.

Also included in this technical revision are a proposed public notice, and a change of index sheet to ease incorporation of this technical 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
B70D69F114324DE...

Daniel J. Casiraro
Senior Manager
Environmental Services

DJC:TT:der

Enclosure

cc: Jennifer Maiolo (BLM-LSFO)
Chris Gilbreath (via email)
Tony Tennyson (via email)
Angela Aalbers (via email)
File: C. F. 1.1.2.127 - G471-11.3(21)d

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

Mine Company Name: **Colowyo Coal Company**
Permit Number: **C-1981-019**
Date: **October 27, 2020**
Revision Description: **TR-143 Reclamation Plan**

Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
1	TOC pages iv and v (2 pages)	TOC pages iv and v (2 pages)	Volume 1 Table of Contents has been updated.
1	TOC pages vii and viii (2 pages)	TOC pages vii and viii (2 pages)	List of Tables and List of Figures have been updated.
1	Tables Page 115 through 117 (3 pages)	Tables Page 115 through 117 (3 pages)	Tables 2.05-7 through 2.05-9 have new table names and have been reordered.
1	Figures Page 37 (1 page)	Figures Page 37 (1 page)	Figure 4.15-1 has been updated.
1	Pages 2.05-16 through 2.05-49 (33 pages)	Pages 2.05-16 through 2.05-37 (21 pages)	Sections 2.05.4 and 2.05.5 have been updated.
1	Pages 4-38 through 4-77 (39 pages)	Pages 4-38 through 4-56 (18 pages)	Section 4.15 has been updated, which caused a change in pagination throughout the Rule 4 section.
2A			No Change
2B			No Change
2C			No Change
2D			No Change
2E			No Change
3			No Change
4			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	South Talor/Lower Wilson - ii (1 page)	South Talor/Lower Wilson - ii (1 page)	Volume 12 Table of Contents has been updated.
12	Rule 2, Page 74 through Rule 2, Page 90 (17 pages)	Rule 2, Page 74 through Rule 2, Page 89 (16 pages)	Sections 2.05.4(1) through 2.05.4(2)(e) have been updated.

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

Mine Company Name: **Colowyo Coal Company** Permit Number: **C-1981-019**

Date: **October 27, 2020** Revision Description: **TR-143 Reclamation Plan**

Volume Number	Page, Map or other Permit Entry to be REMOVED	Page, Map or other Permit Entry to be ADDED	Description of Change
13			No Change
14			No Change
15	Table of Contents pages ii though iv (3 pages)	Table of Contents pages ii though iv (3 pages)	Volume 15 Table of Contents has been updated.
15	Rule 2, Page 85 through Rule 2, Page 132 (48 pages)	Rule 2, Page 85 through Rule 2, Page 114 (30 pages)	Section 2.05.4(1) through 2.05.4(2)(e) have been updated. This caused a pagination shift throughout the rest of the section.
15	Rule 4, Page 18 through Rule 4, Page 38 (20 pages)	Rule 4, Page 18 through Rule 4, Page 23 (6 pages)	Sections 4.14.2, 4.15, and 4.16 have been updated.
16			No Change
17			No Change
18A			No Change
18B			No Change
18C			No Change
18D			No Change
19			No Change
20			No Change
21			No Change
22			No Change

Contents

Table 2.05-7 Grazingland Seed Mixture

App.	Species	Synonym	Common Name	Origin	Life Form	Seeds/ lb.	Rec. PLS lbs. / acre	Avg. seeds / sq. foot
Drilled	*Agropyron dasystachyum*	*Elymus lanceolatus ssp. lanceolatus*	Thickspike Wheatgrass	N	Grass	154,000	1.25	4.4
	Agropyron smithii	*Pascopyrum smithii*	Western Wheatgrass	N	Grass	110,000	1.50	3.8
	Agropyron spicatum inerme	*Pseudoroegneria spicata ssp. inerme*	Beardless Bluebunch Wheatgrass	N	Grass	117,000	2.00	5.4
	Agropyron trachycaulum	*Elymus trachycaulus ssp. trachycaulus*	Slender Wheatgrass	N	Grass	159,000	0.75	2.7
	Bromus marginatus	*Bromopsis marginatus*	Mountain Brome	N	Grass	90,000	1.00	2.1
	Elymus cinereus	*Leymus cinereus*	Great Basin Wildrye	N	Grass	130,000	0.50	1.5
	Stipa viridula (New Taxon to CCC)	*Nassella viridula*	Green Needlegrass	N	Grass	181,000	0.75	3.1
	Astragalus cicer		Cicer Milkvetch	I	Forb	145,000	0.30	1.0
	Linum lewisii		Lewis Flax	N	Forb	293,000	0.25	1.7
	Atriplex canescens		Fourwing Saltbush	N	Shrub	52,000	1.60	1.9
	Symphoricarpos rotundifoliius		Mountain Snowberry	N	Shrub	75,000	0.75	1.3
						Subtotal =	**10.65**	**28.87**
Broadcast	*Festuca saximontana*		Rocky Mountain Fescue	N	Grass	680,000	0.50	7.8
	Achillea millifolium		Western Yarrow	N	Forb	2,770,000	0.10	6.4
	Penstemon strictus		Rocky Mountain Penstemon	N	Forb	592,000	0.25	3.4
	Artemisa tridentata vaseyana		Mountain Big Sagebrush	N	Shrub	2,500,000	0.50	28.7
						Subtotal =	**1.35**	**46.26**
Grass PLS/ Seeds/ft² Subtotal = 8.25/30.8		**Forb PLS/ Seeds/ft² Subtotal =0.9/12.44**	**Shrub PLS/ Seeds/ft² Subtotal = 2.85/31.9**			**Total**	**12.00**	**75.13**
Note: Where desirable to draw Elk away from particular locations, *Elymus cinereus* may be substitued with Orchard Grass (sought by Elk) at the quantity indicated below (i.e. 0.5 lb of Elci replaced by 0.5 lb of Dagl). Furthermore, this substitution should not occur on more than approximately 25% of the acreage targeting the grazingland land use, and it would be most beneficial to be placed in or near draw bottoms. If at some future point it is desirable to substitute for a species other than Elci, or on more than 25% of the grazingland acreage, permission will first be gained from CDRMS.								
	Dactylis glomerata		Orchard Grass	I	Grass	654,000	0.50	7.51

Seed Mix Comments

1) The correct sagebrush seed (*Artemisia vaseyana – pauciflora*) from sources as close as possible to the Axial Basin will be requested from seed suppliers along with tag verification. A stipulation will be added to bid documentation to require the successful supplier(s) to verify sage subspecies and collection location and elevation.

Table 2.05-8 Wildlife Habitat Seed Mixture

Table 2.05-9

Reclamation Seed Mixture - Sagebrush Steppe (Sage Grouse Brooding Habitat) Targeted Areas - Colowyo Mine - 2008

App.	Species	Synonym	Common Name	Origin	Life Form	Seeds/ lb.	Rec. PLS lbs. / acre	Avg. seeds / sq. foot
Drilled or Broadcast * (w/ Trillion or similar)	*Agropyron spicatum inerme*	*Pseudoroegneria spicata ssp. inerme*	Beardless Bluebunch Wheatgrass	N	Grass	117,000	0.50	1.3
	Agropyron trachycaulum	*Elymus trachycaulus ssp. trachycaulus*	Slender Wheatgrass	N	Grass	159,000	0.20	0.7
	Bromus marginatus	*Bromopsis marginatus*	Mountain Brome	N	Grass	90,000	0.30	0.6
	Elymus cinereus	*Leymus cinereus*	Great Basin Wildrye	N	Grass	130,000	0.20	0.6
	Stipa viridula (New Taxon to CCC)	*Nassella viridula*	Green Needlegrass	N	Grass	181,000	0.20	0.8
	Artemisia ludoviciana		Louisiana Sagewort	N	Forb	33,600	0.50	0.4
	Astragalus cicer		Cicer Milkvetch	I	Forb	145,000	0.30	1.0
	Linum lewisii		Lewis Flax	N	Forb	293,000	0.20	1.3
	Atriplex canescens		Fourwing Saltbush	N	Shrub	52,000	1.25	1.5
	Purshia tridentata		Bitterbrush	N	Shrub	15,000	3.00	1.0
	Rosa woodsii		Wood's Rose	N	Shrub	45,300	0.50	0.5
	Symphoricarpos rotundifoliius		Mountain Snowberry	N	Shrub	75,000	1.00	1.7
						Subtotal =	**8.15**	**11.62**
Broadcast * (w/ Trillion or similar)	*Poa ampla*		Big Bluegrass	N	Grass	882,000	0.20	4.0
	Festuca saximontana		Rocky Mountain Fescue	N	Grass	680,000	0.20	3.1
	Achillea millifolium		Western Yarrow	N	Forb	2,770,000	0.10	6.4
	Penstemon palmeri		Palmer Penstemon	N	Forb	610,000	0.10	1.4
	Penstemon strictus		Rocky Mountain Penstemon	N	Forb	592,000	0.20	2.7
	Artemisia cana		Silver Sagebrush	N	Shrub	850,000	0.75	14.6
	Artemisa tridentata vaseyana		Mountain Big Sagebrush	N	Shrub	2,500,000	2.00	114.8
	Chrysothamnus nauseosus		Rubber Rabbitbrush	N	Shrub	400,000	0.30	2.8
						Subtotal =	**3.85**	**149.82**
Grass PLS/ Seeds/ft^2 Subtotal = 1.8/11.29	**Forb PLS/ Seeds/ft^2 Subtotal =1.4/13.21**	**Shrub PLS/ Seeds/ft^2 Subtotal = 8.8/136.94**				**Total**	**12.00**	**161.44**

*** The application techniques indicated here should be implemented as follows at the discretion of the reclamation coordinator. 1) If a seed drill is to be used, only those species under that subheading should be drilled. Those species under the broadcast heading should be broadcast by one of two methods. If a standard rotary seed spreader is utilized to "spray" seed across the ground, then a very light harrowing should follow (e.g., light tine method). Under this scenario, a single pass procedure could occur if the rotary spreader is attached to the seed drill and the seed drill also pulls a light tine harrow. If the second broadcast method is utilized (such as use of a Truax "Trillion" seeder that "dribbles" seed between cultipacker wheels), a second pass with different equipment would be necessary. However, a third scenario would also be a very effective means to plant seed. Under this last scenario, all seed would be broadcast with the use of equipment such as the Truax "Trillion" seeder. This would be a single pass protocol and NO harrowing should be utilized. This last method is preferred.**

Seed Mix Comments

1) The correct sagebrush seed (*Artemisia vaseyana – pauciflora*) from sources as close as possible to the Axial Basin will be requested from seed suppliers along with tag verification. A stipulation will be added to bid documentation to require the successful supplier(s) to verify sage subspecies and collection location and elevation.

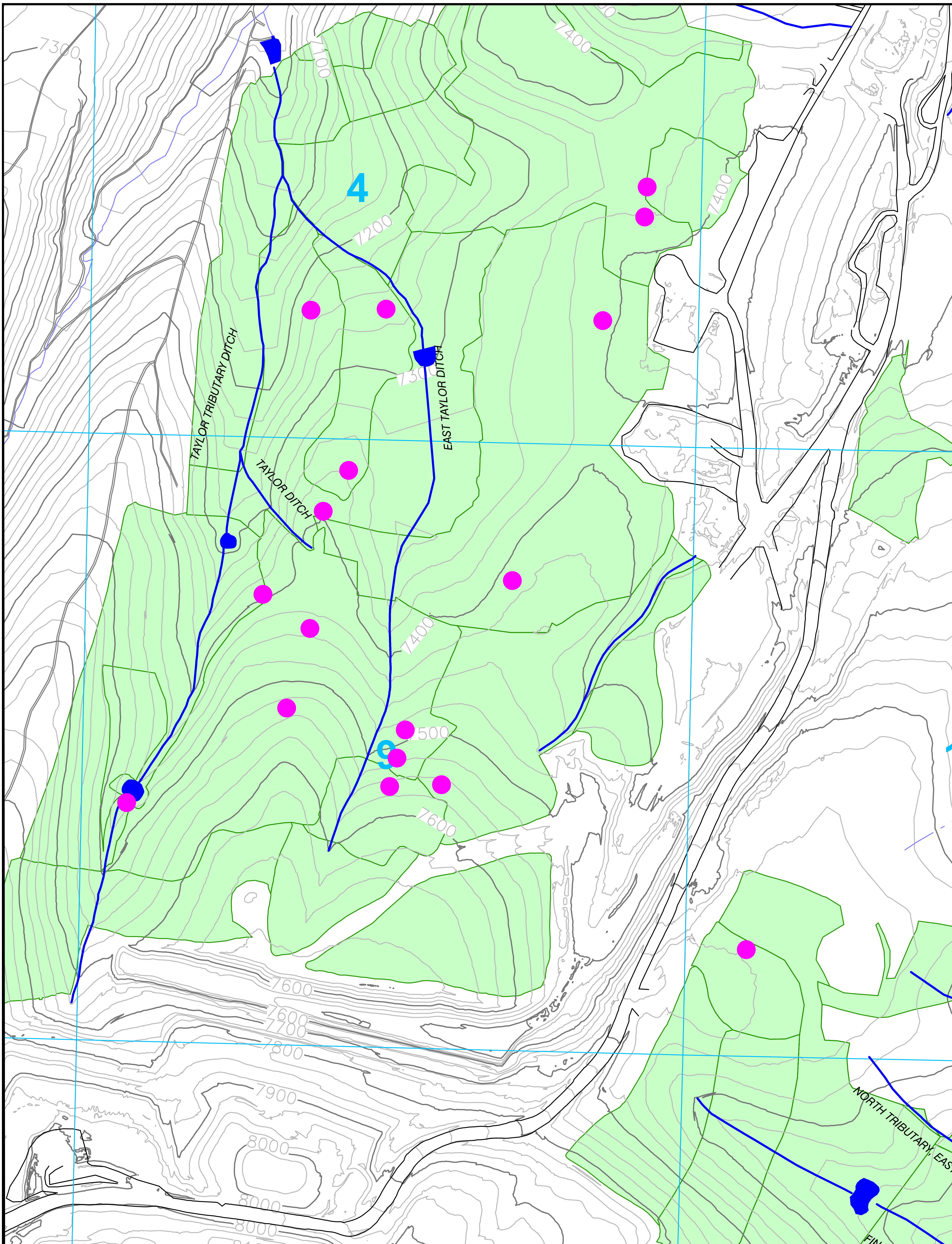
Table 2.05-9 List of Contingency Seed Mixture Substitutions

Table 2.05-8 *

Reclamation Seed Mixture - List of Contingency Substitutions for Tables 2.05-7 & 9 - Colowyo Mine - 2008

Prior-ity	Species	Synonym	Common Name	Origin	Life Form	Seeds/ lb.	Rec. PLS lbs. / acre	Avg. seeds / sq. foot
2	*Agropyron spicatum*	*Pseudoroegneria spicata ssp spicata*	Bluebunch wheatgrass	N	Grass	140,000	0.5 - 2.0	1.3 - 5.4
1	*Bromus ciliatus*	*Bromopsis ciliatus*	Nodding Brome	N	Grass	80,000	0.3 - 1.0	0.6 - 1.8
4	*Festuca idahoensis*		Idaho Fescue	N	Grass	450,000	0.2 - 0.5	2.1 - 5.2
5	*Oryzopsis hymenoides*	*Achnatherum hymenoides*	Indian Ricegrass (needs sandy soi	N	Grass	141,000	0.50	1.6
3	*Poa sandbergii*		Sandberg Bluegrass	N	Grass	925,000	0.20	4.2
2	*Helianthelia uniflora*		Oneflower Sunflower	N	Forb	103,000	0.30	0.7
1	*Heliomeris multiflora*		Goldeneye	N	Forb	1,055,000	0.30	7.3
3	*Sanguisorba minor*		Small Burnet	I	Forb	55,000	0.25	0.3
4	*Vicia americana*		American Vetch	N	Forb	33,000	0.30	0.2
1	*Artemisia cana*		Silver Sagebrush	N	Shrub	850,000	0.50	9.8
2	*Chrysothamnus viscidiflorus*		Douglas Rabbitbrush	N	Shrub	782,000	0.30	5.4
4	*Rhus trilobata*		Skunkbrush Sumac	N	Shrub	20,300	0.50	0.2
3	*Symphoricarpos rotundifolius*		Snowberry	N	Shrub	75,000	0.75 - 1.0	1.3 - 1.7

* Should one or more of the species in Table 2.05-7 be unavailable or proven ineffective, then substitutes from this list will be selected in the priority stated. They will be placed in the seed mix at the rate specified in the priority stated. They will be placed in the seed mix at the rate specified for the unavailable/unsuitable species or as appropriate. If more than one species of a given lifeform cannot be obtained or is otherwise unsuitable, then the first and second priorities in the substitute list will be used. Colowyo can also choose to increase a seeding rate of an approved species if a corresponding substitute is not available rather than choose a substitute from Table 2.05-9. Colowyo will obtain prior verbal approval from the CDRMS.



LEGEND

PERMANENT CHANNELS (CONSTRUCTED TO DATE)

SECTION LINE

ROAD

APPROXIMATE TALL SHRUB TEST PLOT LOCATION

RECLAMATION AREA

500' 0 500' 1000'

CONTOUR INTERVAL 25 FT.
TOPO DATE JUNE 2020

N
W E
S

Tall Shrub Test Plot Locations

COLOWYO COAL COMPANY

SCALE: 1" = 800'
DATE: 10/27/20
DRWG. BY: Tony
APPROVED BY: AA
DRWG NO.

Figure 4.15-1

No.	REVISION	DATE	BY	CHK

The topography following mining and reclamation activities is shown on the Postmining Topography Map (Map 19). Cross sections relating the premining and postmining topographic configurations are presented as the Premining and Postmining Cross Section Maps (Maps 20 and 20A).

Coal Handling Structures

Map 1 Surface ownership shows pre-mining contours and Map 19A Postmining Topography Gossard Area shows post-mining contours of the loadout. All facilities not to be included as part of the post-mining land use will be removed (see Section 2.05.5). After the facilities are removed, the land will be regraded to blend with the existing undisturbed topography, retopsoiled and revegetated in accordance with Section 2.05.4.

The detailed description of the various coal crushing, handling and loadout facilities for the Colowyo operation is found under the Mine Facilities Section in 2.05.3. The location of the coal processing facilities is found on the Existing Structures - North Map (Map 21), the Existing Structures - South Map (Map 22) and the Existing Structures- Lower Wilson/South Taylor Map (Map 22A).

Coal Processing Waste and Non-Coal Processing Waste

Not applicable. Colowyo uses dry crushing facility for coal preparation; no coal processing waste, as defined in Rule 1.04 “DEFINITIONS”, is produced from any part of the mining operations.

Underground Development Waste

Not applicable. Colowyo is not conducting an underground operation.

Return of Coal Processing Waste to Abandon Workings

Not applicable. No coal processing waste as defined in Rule 1.04 “DEFINITIONS”, is produced from any part of the Colowyo mining operations.

2.05.4 Reclamation Plan

The objective of the reclamation plan is to stabilize the soil, maintain hydrologic function, re-establish appropriate vegetation, and to restore the approximate original contour of the mined area. Ultimately, the areas being mined will be returned to an appropriate and productive post-mining land use, with watersheds having their approximate pre-mining character. In general, the long term appearance and beneficial uses of the mined area will be similar to that which would have been encountered prior to mining activity.

The principal basis of Colowyo’s reclamation plan is to rebuild a post mine landscape that mimics the natural terrain features, accounting for local slope aspects, steepness, and topographic features. By incorporating variation in the terrain, the reclamation system will encourage the establishment, sucession, and persistence of mixed native vegetation communities. These efforts will facilitate the estbalishment of reclaimed plant communities that meet the designated post mining land use of rangeland, with the subcomponents of grazingland and wildlife habitat. Please see Section 2.05.5 for a detailed description of the post mine land uses at Colowyo.

Areas designated as grazingland for the post mining land use will aim to establish vegetation communities comprised of species primarily selected for palatability and production, with incidental wildlife habitat. The reclamation seed mixes utilized in grazingland targeted areas are designed to establish highly productive stands of native perrennial grasses to support grazing and forage, yet the mixes contain forbs and shrubs to also provide additional benefits for incidental wildlife use. Topsoil replacement depths in grazingland areas vary based on slope, which will encourage species diversity and mimic soil development processes in native soil systems.

Areas designated for wildlife habitat as the post mining land use will aim to establish a sagebrush steppe vegetation community. The reclamation seed mix utilized in sagebrush steppe targeted areas is designed to encourage sagebrush establishment by decreasing perennial grass competition through decreasing the number of grass species and seed numbers, and also incorporating only bunchgrasses (as opposed to sod-forming grasses), with a significant increase in the total amount and relative proportion of sagebrush seed. Reclamation techniques that will encourage the deposition and entrapment of blowing snow (to increase spring soil moisture) are also employed in sagebrush steppe targeted areas, to provide a competitive advantage to sagebrush over perennial grasses. These techniques include taking advantage of site-specific opportunities for the development of convex and concave surfaces along with the potential development of small berms along the contour and approximately perpendicular to prevailing winds. Topsoil replacement depths in sagebrush steppe targeted areas will be reduced relative to other areas, also to decrease competition from grasses.

The reclamation timetable and associated acreages for the various aspects of the mining operation are provided on Table 2.03-1.

Backfill and Grading Plan

As discussed in detail in Section 2.05.3, the mining method implemented by Colowyo is referred to as open-pit multiple seam/single seam dragline mining. The overburden material from the initial boxcut area was deposited in a permanent valley fill. As mining progresses, overburden material from each successive cut is backfilled into the previously mined out area. This cycle was repeated for the entire mining area. Because an open-pit mining technique is used, the regrading and backfilling of the spoil material is as contemporaneous as possible behind the mined-out area to facilitate proper leveling of the overburden material.

The backfilled mining areas are graded to establish the approximate original contour and to blend in with the undisturbed areas outside the mining limits. Additional information on the backfilling and regrading plan are discussed further in Section 2.05.3 and Section 4.14.

Final grading before topsoil placement will be conducted in a manner that minimizes erosion and provides a surface for the topsoil that minimizes slippage. If spoil compaction is a problem, the spoil will be ripped with a dozer to minimize compaction, assure stability, and minimize slippage after topsoil replacement. Where possible, development of concave landforms (to encourage snow entrapment) will be developed.

Where necessary, the overburden surface will be roughened by ripping or discing etc., to ensure a bond between the topsoil and spoil to reduce slippage. To date there is no evidence of topsoil slippage on reclaimed areas. A few small tension cracks resulting from settling of fill along tie in locations with highwall have occurred in a few areas. However these areas within a year or two after reclamation, soon stabilize and begin to fill in.

The final post mine surfaces are shown on Map 19, 19A, and 19B. Appropriate cross sections that show the anticipated final surface configuration of the reclaimed area, in conjunction with the existing pre-mining topography are shown Maps 20B.

Topsoil Redistribution Plan

As discussed in Section 2.05.3, prior to any mining-related disturbances, all available topsoil will be removed from the site to be disturbed, and will be redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable described herein. The topsoil redistrubtion plan is also broken into three distinct timeframes which are pre-2005, 2005 to 2009, and post-2010. Each plan is described in more detail below.

Pre-2005 and 2005-2009 Topsoil Redistribution Plan

Prior to 2005, essentially all reclamation units were covered with an average of 18 inches of topsoil. From 2005 through 2009, reclamation areas received an approximate average of 8 inches of topsoil. Most of these reclamation areas have been Phase III released to date, and the remaining units on schedule for a near future Phase III bond release application.

Post-2010 Topsoil Redistribution Plan

Variable topsoil replacement depth has been utilized at Colowyo since 2010. Post-2010 topsoil replacement is directly tied to the post mine land uses presented in Section 2.05.5, targeting two rangeland components consisting of grazingland and wildlife habitiat (sagebrush steppe).

In grazingland targeted areas (areas with slopes greater than 10%), topsoil will be redistributed utilizing variable replacement depths. Thinner topsoil (approximately six inches) will be replaced on ridge tops, and topsoil replacement depth will gradually thicken moving down the slopes toward the drainage bottoms. This gradation in topsoil depth on slopes recreates native edaphic conditions and mimics soil development on local landforms. Lower-lying areas (relative to the surrounding landscape), such as natural swales, depressions, and subtle drainageways that tend to catch more snow will also receive deeper topsoil replacement depths. These areas should store greater quantities of moisture, which will increase overall productivity, while providing enhanced opportunities for growth and development of the mountain shrub and snowberry communities (seed is a component of the grazingland seed mix). Even in areas where these shrub species do not initially germinate, the deeper soils systems with increased water holding capacity and altered hydrologic function of localized areas with increased snow capture will mimic the native conditions for mountain shrub and snowberry communities, setting the foundation for succession to progress in these areas over long-term time horizons.

In wildlife habitat (sagebrush steppe) targeted areas (flatter areas with less than 10% slopes), topsoil replacement depth will target an average of four inches, with a more uniform application depth to encourage proper seeding depth and conditions for sagebrush establishment. To encourage snow capture and increase spring soil moisture, reclamation techniques will attempt to take advantage of site-specific opportunities for the development of convex and concave surfaces along with the potential development of small berms along the contour and approximately perpendicular to prevailing winds.

General Topsoil Handling Procedures

Colowyo will ensure proper topsoil resource management through various quality assurance and control procedures. Procedures utilized to account for topsoil volumes include an annual analysis of the topsoil balance, accounting for volumes in stockpiles, current and following year's reclamation areas, the total disturbance area, and the results of topsoil stripping activities each year. Detailed soil maps for the permit area assist operations and guide management in preparation and scheduling for topsoil salvage activities. Topsoil resources are generally segregated by area (East Pit, West Pit, Section 16, South Taylor Area, facilities, Gossard Loadout, etc.), to ensure that these resources are reapplied to the general areas from which they came.

During topsoil removal in advancement of the mining operations, dozers will be utilized to pile up the topsoil so it can be loaded and hauled to stockpile or immediately to a reclamation area. Scrapers may also be employed for topsoil removal as deemed appropraiote. Topsoil salvage is guided by the existing soil maps and resources available to Colowyo personnel. Topsoil salvage is avoided during times of soil saturation, as a best management practice to avoid overly compacting the soil.

Topsoil stockpiles are revegetated as soon as is practicable to prevent losses from wind and water erosion. Stockpiles are seeded with a mix of native reclamation species to stabilize the stockpile. All stockpiles are properly labeled as topsoil to avoid mishandling, and detailed as-built information is collected to accurately calculate stockpile volumes as a quality control procedure. All topsoil stockpiles are protected with a ditch and berm around their perimeter to conserve the resource.

When topsoil is to be reapplied following stockpiling, topsoil is normally loaded from stockpile with loaders and trucks, and then hauled to the backfill reclamation areas, where it is dumped and graded for final placement. Topsoil hauled in trucks will be dumped strategically to minimize handling and disturbance, and then pushed out with dozers and/or scrapers until spread to the appropriate locations and depths. Reapplied topsoil will be graded in a manner that maintains surface roughness to help minimize sheet flow and erosion while also creating microtopography to assist vegetative diversity on the reclamation. On steeper slopes (typically greater than 10% slope) Colowyo will also employ the use of contour furrows and cross ripping following topsoil laydown to create slope breaks and increase surface roughness on otherwise long and straight slopes.

At the discreation of Colowyo, native soil, collected from the local ecosystems, will be used to inoculate reclamation areas with beneficial mycorrhizae. Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis.

<u>Revegetation Plan</u>
Following the topsoiling of an area, Colowyo will reseed the topsoiled area as soon as is practicable in accordance with the targeted post mining land use as described in Section 2.05.5. Seeding is targeted to occur during in the fall, prior to the first snowfall event (typically mid to late October).

Colowyo typically uses a rangeleand drill to complete seeding on both targeted post mine land uses. However, Colwoyo also has the ability to utilize a Truax (Trillon) drill if deemed necessary. At times, broadcast seeding may be required on steeper areas, wet areas, very rocky areas, or simply on areas that were missed by the other seeding equipment. If seeding cannot be completed prior to seasonal snowfall, broadcast seeding may occur in the spring as soon as ground conditions allow. Broadcast seeding of the sagebrush steppe areas may also be seeded directly into snowbanks if winter or spring conditions allow. When broadcasting is utilized and ground conditions allow, a very light tine harrow or similar equipment may be dragged behind the seeder to facilitate improved soil to seed contact.

<u>Seed Mixes</u>
Two seed mixes are utilized at Colowyo, with each mix designed to facilitate revegetation meeting the designated post mining land use of rangeland, subcomponents of grazingland and wildlife habitat (sagebrush steppe). The mixes have been adapted over time in response to changing regulatory requirements, and thorough evaluations of quantitative emergence and dominance data from reclaimed and released reclamation areas. The mixes represent the seasonal varieties and lifeforms present in the pre-mine area, and are comprised almost entirely of native species. The lone introduced taxon included in both seed mixes (cicer milkvetch), which provides excellent forage for wildlife and livestock, is very successful on Colowyo's existing reclamation, and is an excellent species for providing necessary habitat requisites for a variety of insects that in turn are especially important to other wildlife.

Grazingland Seed Mixture
The reclamation seed mixture for post mine areas targeting grazingland is presented on Table 2.05-7. The grazingland seed mixture contains sufficient diversity for ecological stability, erosion control for steeper slopes, and will meet the goals of the designated post mining land use. The seed mixture contains a variety of grasses, forbs and shrub species well adapted to the soil and moisture conditions found at Colowyo. The seed mixture includes species capable of occupying the anticipated micro-habitats encountered in the reclaimed areas. This seed mixture will be quickly effective for erosion control in young reclamation, while also facilitating the desired post-mining vegetative community with the same seasonal varieties and lifeforms of the pre-mined area.

The species and seeding rates indicated on this grazingland mix have been adapted from an analyses of the success of past mixes, and the resulting emergence and dominance data within previously successful revegetated areas.

Wildlife Habitat Seed Mixture
The reclamation seed mixture for areas targeting wildlife habitate (sagebrush steppe) is presented in Table 2.05-8. The sagebrush steppe seed mixture also contains sufficient diversity for ecological stability. This mixture contains a variety of grasses, forbs and shrub species well adapted to the soil and moisture conditions found at Colowyo and should provide both the structural diversity and life form diversity necessary for the designated sagebrush steppe wildlife habitat. The seed mixture includes species capable of occupying the anticipated micro-habitats encountered in the reclaimed areas and contains sufficient sagebrush seed to hopefully encourage at least some emergence each year, and occasional substantial emergence when climatic conditions are favorable.

Similar to the seed mixture for grassland areas, the species and seeding rates indicated on this sagebrush steppe mix resulted from in-depth analyses of past mixes and the resulting emergence and dominance within successful revegetated areas at Colowyo. Furthermore, it is anticipated that the reduced competition from grasses, especially sod-forming species such as thickspike wheatgrass, will result in elevated diversity and better performance from slower growing species.

Although not yet identified as an issue on Colowyo's reclamation, because the amount of grasses (and all sod-formers) has been substantially reduced for this sagebrush steppe mix, it is possible that on occasion, grass emergence may not be satisfactory for erosion control or life form diversity. If this scenario occurs in the future, a supplemental inter-seeding with the grassland mix may be utilized to increase the grass and forb component of the specific area. This activity is allowed under Rule 4.15.7 (5)(g).

Contingency Seed Substitutions
Table 2.05-9 provide a list of contingency species for Table 2.05-7 and Table 2.05-8, should certain taxa be unavailable or unwarranted in any given year.

Fencing

Where Colowyo deems appropriate, smaller areas within a larger areas seeded to wildlife habitat may be fenced to encourage shrub development and to limit browsing by local wildlife.

Mulching Techniques

Mulching techniques are not currently employed at Colowyo, except in rare instances. During the initial permitting processes, Colowyo proposed that on slopes flatter than 4h:lv that rather than utilize a hay mulch, a stubble mulch or no mulch be used on reclaimed areas. The use of mulch on these relatively flat slopes was demonstrated to be of no value towards reclamation at the Colowyo site. The application of mulch was identified to produced problems with delayed germination on the reclaimed areas, rather than solving an assumed erosion problem, which is addressed through other methods.

Mulches tend to shade the soil, thus slowing the rise in soil temperature needed for germination of seeds. At Colowyo, the higher elevation and typical late spring snows result in cooler spring temperatures and delayed soil thawing. By eliminating the use of mulch, the soil temperature is increased earlier in the spring, thus enabling the seeds to germinate earlier when soil moisture conditions are optimum, immediately following snowmelt. Earlier growth also results in further root development by the plants, aiding survival through the dry and hot summer months.

Without the use of a mulch, erosion control has been maintained with surface manipulation methods such as contour furrows, drainage benches and permanent drainage channels. The initial reclamation at Colowyo that began in 1978 is indisputable evidence that the methods used at Colowyo have proven highly successful in controlling erosion on slopes as steep as 3h:lv until vegetative cover has established. Where deemed necessary by Colowyo (e.g., sagebrush steppe targeted areas, south-facing slopes, high wind areas, etc.), mulching techniques (or other practices such as chisel plowing, or discing on the contour) will be reinstated as necessary.

Irrigation

No irrigation is planned for areas to be seeded.

Pest and Disease Control

Noxious plants, as defined in Section 1.04, will be managed in accordance with the following section – “Weed Management Plan”. If insects become a problem to the point where they endanger the successful establishment of the seeded vegetation on the reclaimed area, they will also be controlled using methods suggested by the Colorado State University Extension Service. All herbicides and pesticides utilized will be those that are approved by the appropriate state and federal governmental agencies responsible for the approval and distribution of such agents.

Weed Management Plan

A listing of Colorado’s noxious weeds (A, B, and C lists) as well as an indication of Rio Blanco and Moffat Counties’ listed taxa are indicated on Table 2.05-10 along with an indication of those taxa that have been observed on or near the Colowyo mine. As indicated on this table, there are no “A” list taxa known from the area. “A” list taxa must be eradicated. To the contrary, there are seven (7) “B” list (must be managed) taxa known from the environs of the Colowyo Mine as well as three (3) “C” list (management may be required by local governments) species. Of these 10 species, common mullein and poison hemlock from the “C” list, and Russian olive from the “B” list are not overly problematic and will normally not require attention. In fact the Russian olive was purposefully planted in the reclamation. If “infestations” of common mullein or poison hemlock evolve, they will be treated in the same manner as the more problematic species.

The remaining seven species: hoary cress, musk thistle, Canada thistle, bull thistle, houndstongue, black henbane, and downy brome (cheatgrass) will be the primary focus of the program and will likely receive attention as appropriate at the Colowyo mine. In addition, continued monitoring of reclamation will focus on identification of any new noxious weeds.

For the most part, noxious weeds observed on or near Colowyo reclamation do not achieve “infestation” levels. By infestation, Colowyo means: 1) relative cover contribution of one noxious weed species or a combination of noxious weed species exceeding three percent in a revegetated stand; or 2) a "patch" of any listed species in which the noxious weed component exceeds 25% relative cover and occupies an area larger than 100 square feet on any disturbed area. Rather, noxious weeds tend to occur as scattered individuals or small pockets of individuals. This distribution suggests that spot control will be the only effective procedure that can be utilized.

To manage these seven noxious weed species populations, Colowyo will either perform itself, or contract out, annual weed control activities. Weed control will typically involve herbicide application at the appropriate rates and during the appropriate life stages (as possible) to effect control. Spot applications will be preferred over "blanket" applications to prevent loss of desirable reclaimed taxa such as seeded forbs and shrubs, however, blanket application may be necessary if any infestation areas are observed.

All Colowyo staff remain vigilant for pockets of noxious weeds in the reclamation. If larger concentrations are observed, they will be mapped, recorded with GPS, or other means of identification to facilitate control by weed spraying crews. Both the weed spraying crew and the revegetation monitoring crews will be especially important in this regard.

In addition to revegetated areas, vigilance will be maintained for other locations conducive to noxious weed populations. Such areas include: riparian areas, topsoil piles, major traffic areas, road cuts and fill slopes, ditches, pond embankments, non-use areas, etc.

Weed control measures may include mowing, discing (conventional cultivation), burning, grazing, or applying an approved herbicide. Weedy annual species (such as pennycress) with a single season life cycle provide initial site stabilization and moisture conservation in newly seeded reclamation sites; as such they will not be specifically targeted for control. Historically, seedings on reclaimed sites have greatly out competed annual weed infestations within three or four growing seasons.

Specific control measures will be selected by evaluating the location, growth characteristics and vulnerability of each weed. Management efforts will begin after proper planning and evaluation are performed. Proper use of chemicals applied during weed control is ensured by oversight of weed spraying activities by individual(s) certified by the State of Colorado to handle and apply herbicides.

Measures for Determining Success of Revegetation

Measures for determining successful revegetation are outlined in Section 4.15.

Soil Testing Plan

From conception to the mid-1990's, Colowyo tested for topsoil fertility. In order to assure that the reapplied topsoil would support the proposed post-mining land use of rangeland, a soil sampling program wase implemented. Soil samples were taken randomly over each retopsoiled area and were analyzed for nitrate-nitrogen, phosphorus, and potassium. Historical results indicated adequate nutrient value to support post-mining revegetation.

Colowyo has demonstrated through numerous years of monitoring that topsoil fertility is not a concern at the mine; this is mainly due to the nutrient rich soil that is commonly present throughout the region. As a result, Colowyo has suspended the soil testing program requirements, until such time as Colowyo determines that the soil fertility adversely affects the reclamation and/or the post-mining land use.

As needed, other soil amendments could be considered for addition to the reclaimed areas to support reclamation efforts.

Acid-Forming and Toxic-Forming Materials

No significant acid-forming materials exist within the overburden soil or coal seams to be mined. Therefore, Colowyo will not undertake special handling procedures as described in Section 2:05.3. A detailed description of the chemical characteristics of soils and overburden materials is presented under Sections 2.04.6 and 2.04.9.

For a detailed description of the special handling of spoil material and sampling programs, refer to the Production Methods and Equipment Segment of this section.

Flammable liquids, such as oil and fuel, will be protected from spilling into other areas by earthen, concrete or HDPE lined structures surrounding each storage facility. A spill containment control plan has been developed to protect against spills.

All major equipment on the mine site will be equipped with portable fire extinguishers or automatic fire suppression systems. The water truck used for dust suppression at the mine site could also be used to control most fires.

Sealing of Exploration and Mine Holes

Exploration and mine holes which remain open for use as a water supply well or for use as a groundwater monitoring well will be completed with casing or piezometers at sufficient height above the land surface to prevent drainage of surface water or entrance of foreign material into the well, and will be fitted with caps to prevent the introduction of objects other than monitoring and sampling equipment. When the groundwater monitoring wells are no longer needed or required for any purpose, each well will be eliminated by plugging with concrete to the surface and removal of the associated surface structure.

Plugging procedures utilized for exploration drill holes that will not be mined through during the current Permit term are as follows:

1. Drill holes drilled deeper than the stripping limit (450-500 feet) will be plugged by pumping cement or heavy solids bentonite Plug Gel or chips through the drill stem from the bottom up to within 3 feet of the ground surface.
2. Drill holes shallower than stripping limits (450-500 feet) may be plugged with the ready-mix concrete method instead the method in #1 to within 3 feet of the ground surface.

3. Drill holes with no water or coal zones may be plugged by backfilling with cuttings, and placing a plug ten feet below the ground surface to support a cement plug or bentonite chips to within 3 feet of the ground surface.

For safety considerations, exploration drill holes that will eventually be mined through during normal mining activites need only be covered with wood, plastic or other such material or otherwise bermed to prevent access until mining operations mine through each hole.

Those holes completed in aquifers will be sealed entirely with cement or other suitable sealant to within 3 feet of the ground surface.

Where possible, the sealed holes will be marked. At times reclamation operations will cover up the sealed drill holes and marking of holes will not be possible.

Within 60 days of the abandonment of a drill hole, approved drilling program or when requested by the Division, the following information will be submitted:

a) Location of drill hole as plotted accurately on a topographic map.
b) Depth of drill hole.
c) Surface elevation of drill hole.
d) Intervals where water was encountered during drilling activities.
e) Diameter of drill hole
f) Type of amount of cement or other sealant used.
g) Name of drilling contractor and license number of rig.
h) How the hole was worked.

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.

<u>Water and Air Quality Control Techniques</u>

Steps to be taken to comply with the Clean Water Act and other applicable water quality laws and regulations and health and safety standards include a comprehensive drainage and sediment control plan described in Section 2.05.3 and Sections 4.05.1 through 4.05.18. With respect to compliance with the Clean Water Act, Colowyo has a discharge permit from the Colorado State Department of Health under the National Pollutant and Discharge Elimination System (NPDES). Compliance with this permit will serve to effect compliance with the Clean Water Act and the Colorado Water Quality Control Act. A copy of this submittal is presented in Exhibit 7, Hydrology Information.

Colowyo, likewise, operates under several emission permits from the Colorado Department of Health, Air Pollution Control Division. Fugitive dust control measures will be employed as an integral part of the mining and reclamation operations.

Colowyo conducts air quality monitoring at the site in accordance with the requirements of emission permits approved by the Colorado Air Pollution Control Division. A copy of all applicable emission permits has been included in Exhibit 8 of the application.

Details of pollution control measures are discussed in section 2.05.6.

2.05.5 Post-mining Land Uses

The implementation of the reclamation plan as described in Section 2.05.4 will restore the disturbed land to the pre-mining use of rangeland, with two targeted subcomponents of grazingland and wildlife habitat (sagebrush steppe). Replacement of grazingland will be facilitated by targeting revegetation efforts toward primarily grassland communities. Because grasslands are effective for erosion control, this post mine land use will be implemented on those lands with slopes greater than 10%. Replacement of wildlife habitat will be facilitated by targeting revegetation efforts toward the re-establishment of a sagebrush steppe community. Because early-seral sagebrush steppe is less able to preclude erosion, it will be limited to those lands with slopes less than 10%.

The post mining land use of rangeland for the reclaimed area has been designed to match the pre-mining land uses found in the area. Specifically, Colowyo will reclaim the mined areas to a rangeland condition capable of supporting both domestic livestock and wildlife. One of the objectives of the reclamation plan will be to provide grazing for livestock, and the other objective will be to restore and improve habitats for deer, elk, and sage grouse.

Comments from the Bureau of Land Management and the State of Colorado approving the post mining land use are provided in Exhibit 1, Documents and Leases.

The observation of hundreds of deer and elk consistently utilizing reclaimed areas at Colowyo confirm success in meeting these goals. It is generally recognized that the herbaceous communities of grasses and forbs found on older reclaimed mining areas and other similar areas in northwest Colorado have in fact attracted these important wildlife species from surrounding native rangelands. Therefore, even though the grassland targeted areas are designed for livestock grazing, they exhibit a considerable component of wildlife habitat benefits as well.

Shrubs will also be replaced through seeding techniques to meet applicable regulatory requirements as described in Section 4.15.8. The post-mining land use is graphically shown on the Post-mining Topography Map (Map 19).

To support the proposed post-mining land use, small water impoundments (stock ponds) will be constructed to encourage an even distribution of grazing animals over the reclaimed site and to enhance the areas for wildlife. These small structures will also replace the existing water rights associated with the stock ponds that existed pre-mining. If necessary, Colowyo will submit designs for these small impoundments to the Division prior to their construction.

Also, to provide access in the area for ranching purposes, the access road from Highway 13 will be left in place after mining is complete, and a number of "ranch roads" will be provided on the reclaimed area to approximate the roads that were in the area before mining. The access road will be narrowed from 26 to 12 feet, the asphalt removed, sideslopes reduced to 4:1 and the sides revegetated.

The consideration of rangeland as a post-mining land use is identical to the discussion in Section 2.04.3. The limitations on changing to an alternative land use are fully discussed in that Section.

2.05.6 Mitigation of Surface Mining Operation Impacts

Air Pollution Control Plan

Colowyo maintains fugitive dust control measures as an integral part of all mining and reclamation activities. Presently, Colowyo operates under numerous Emission Permits issued from the Colorado Department of Health, Air Pollution Control Division, as more particularly described in Section 2.03.10. Copies of all applicable emission permits issued by the Colorado Department of Health are available onsite and can be reviewed by request. Colowyo conducts air quality monitoring at the site in accordance with the requirements of the emission permits.

The principal fugitive dust control practices employed by Colowyo are as follows:

Roads

Colowyo employs a dust suppression program for in pit roads and other unpaved roads which primarily involves periodic watering. Mine water trucks run periodically as needed over the roads wetting down any dusty conditions. During the dryer months of the year, the water trucks will wet down the roads which are being utilized a minimum of two or three times per shift. If determined to be necessary as an addition to periodic watering, a chemical dust suppression agent may be used during the dry months on the primary in pit roads. To this date, however, chemical stabilization of the unpaved in pit roads has not been successful for more than a short period of time due to changing weather conditions and the use of heavy haulage trucks.

Colowyo has surfaced “in-pit” roads with gravel or crushed rock; however, no roads in the pit area will be paved with asphalt. Asphalt could not sustain the enormous weights of the haulage equipment currently in use. Likewise, crawler equipment would rip the asphalt surface causing an extremely hazardous condition for all equipment and personnel. All roads in the mining operation will be constantly maintained by a motor grader, scraper, or rubber tired dozer to remove any coal, rock, or any other debris. Smooth and clean road surfaces are essential for not only minimizing dust, but also for allowing efficient, safe and economic use of haulage equipment.

The haul roads have been paved with asphalt to provide for emission control. The paved roads include approximately five miles of road from State Highway 13to the main office building, the road from the main office building to the Gossard coal loadout, and the road from the shop facility to the Gossard coal loadout.

A strict speed control will be implemented for all roads to control dust and to provide for safe operation of the equipment.

Most haul road embankment slopes and adjacent areas have been mechanically stabilized and seeded with a mixture shown in Table 7, Reclamation Seed Mixture. Mechanical stabilization has consisted of furrowing, chiseling, "cat tracking" and mulch, depending on accessibility to the slopes.

No travel of unauthorized vehicles will be allowed on anything other than established roads. All overburden haulage equipment will be restricted only to appropriate roads.

Colowyo does not plan to cover any of the haul trucks because the roundtrip between the coal crushing facility and the active mining area will be relatively short, and the loaded trucks will be moving slowly. Also, care will be taken by the front-end loader or shovel operators not to overfill any of the haul trucks so as to cause excessive fugitive dust.

Coal Crushing Facility

Coal will be hauled from the various mining areas in haulage trucks to the primary crusher facility as shown on the Existing Structures - South Map (Map 22). Following primary crushing, the coal is hauled to the Gossard Loadout facility, as shown on the Existing Structures - North Map (Map 21).

The coal crushing and conveying operations at the primary crusher and the Gossard Loadout have been equipped with a water spraying system at all coal transfer points. A four-sided enclosure-bas-been installed on the truck dump at the primary crusher to prevent excessive dust emissions. The secondary crusher at the Gossard Loadout has a bag house to control coal dust emissions. A stacking tube with metal doors is also used to minimize coal dust emissions at the 100,000 ton crushed coal stockpile. The air quality control measures at the coal crushing handling and loadout facilities have been approved by the Colorado Department of Health, Air Pollution Control Division.

Colowyo maintains several areas for coal storage near the shop facilities and also near the Gossard Loadout. Inactive storage piles have been sloped and compacted to prevent wind erosion and spontaneous combustion. If coal dust becomes troublesome in the active coal storage piles, a mobile water truck with a high pressure pump and nozzle is available for dust suppression.
No thermal dryers are used in the coal crushing and handling facilities.

Disturbance

Colowyo, in as much as practical, minimizes the area of land disturbed at any one time. Topsoil is removed only to the extent necessary to accommodate the mining operations. Through the mine plan, the rehandling of both topsoil and overburden is kept to a minimum. Reclamation of disturbed areas will commence as contemporaneously as possible.

As necessary, mobile water truck will be assigned to work in topsoil or overburden removal operations to keep any dusty conditions under control. Planting of special windbreak vegetation in the permit area is not planned.

Blasting

Sequential blasting is utilized as a standard practice to reduce the amount of unconfined particulate matter produced.

Complete blasting information is set forth in Section 2.05.3 and Sections 4.08.1 through 4.08.6.

Fish and Wildlife Plan

Prior to and during the early years of mining, Colowyo implemented wildlife management and range management programs to offset the potential impacts of mining on wildlife and to improve the rangeland in surrounding areas which had deteriorated after years of overgrazing. Other protection measures were also implemented to minimize any possible effects of the increased mining activity.

Also, during the early stages of pre-planning for the mining operation, Colowyo adopted a policy to return the land to a condition capable of supporting the diverse wildlife populations that the area currently supports. The assumption in the late 1970s was that shrub reestablishment would play a key role in wildlife habitat mitigation. These early efforts were unique in that revegetation with shrub species, especially native shrub species, had never been an integral part of pre-mine planning in the West. Virtually no information was available and very little was known about the growth requirements of native species. To reach these early objectives, Colowyo implemented revegetation and wildlife habitat use studies designed to determine the feasibility and techniques of revegetating disturbed areas with native shrub vegetation adapted to northwest Colorado. However, after decades of experience, it has become obvious that reestablishment of shrubs on the reclaimed area is not critical to encourage wildlife use such as by elk.

For example, in recent years it has been observed that elk herds of between 200 and 400 animals utilize the reclaimed grasslands of the mine as foraging habitat. These numbers increase to between 2000 and 4000 animals during the hunting season and then slowly drop off as the snow depths increase and the elk herds migrate to lower elevations. The animals return in the Spring for the early green-up. This occurs for at least three reasons: 1) elk are primarily grazers (grass consumers) by nature, 2) there is abundant, high quality grass on the reclaimed areas especially in comparison to surrounding country which exhibits very little if any grassland acreage and relatively low grass production in shrublands, and 3) elk have learned that harassments (such as hunting) are minimized on mining areas (refuge effect) which allows them to forage in relative peace. Likewise, mule deer populations have been observed on reclaimed grasslands at elevated densities (40-60 animals on a daily basis during the Spring, Summer, and Fall periods). Similarly, 15-20 pronghorn utilize the reclamation on a daily basis during the Spring and early Summer periods.

Following the winter, it has been observed in early spring that forage utilization on the reclamation often ranges between 70 and 90 percent, especially near water sources. In fact, utilization is often so elevated that both elk and mule deer turn to the few unfenced shrubs that have been established about the reclaimed area and cause extensive hedging damage. Over the years it has been observed that such hedging eventually leads to the death of most of these over-utilized shrubs.

Because of the dependence on these areas, and the shrub populations, efforts by Colowyo (as indicated in the previous portions of Section 2.05) have continued to improve reclamation techniques. As discussed in this revision, new and significant strides are being taken to re-establish sagebrush steppe communities as well as grassland areas. Many of these new measures will benefit not only the large game animal segment of the wildlife community, but also other components such as sage grouse and sharp-tailed grouse populations that are dependent on sagebrush and other woody species for forage and cover.

Impacts of Mining Operations on Wildlife Resources Within the Mine Plan Area

Several short term negative impacts to wildlife are to be expected in the permit area. Removal of vegetation communities and habitats will be the most direct impact, resulting in a reduction of forage and cover. Non-mobile species will be destroyed in localized areas as vegetation and topsoil are removed. Mobile species will be temporarily displaced until mined areas are reclaimed. As the mine progresses, some changes in topography will occur through the removing of vegetation, rock outcroppings, draws, etc. which form natural shelters.

Disturbance of soils will affect soil profiles, micro-climate, and other soil properties.

The backfilling and grading as required in Section 4.14.2 will assure that topographic features and drainage patterns will be returned to approximate original contour.

Wildlife species inhabiting the permit area that have the most potential for being affected include deer, elk, sage grouse, and raptors. However, experience to date has shown that all of these species have adapted to the presence of the Colowyo operation, resulting in minimal direct impact. Most of the mitigation measures, protection measures, and habitat improvement techniques are directed toward this wildlife group.

Range and Wildlife Management Programs

Data collected during pre-mine studies during 1974 - 1976 indicated overuse by cattle, deer, and elk. A majority of the browse species (serviceberry, oak, snowberry, bitterbrush, sage, chokecherry) showed overutilization to varying degrees. (It has been evident both past and present that many of the shrubs are in a decadent condition.)

The results of past poor range management practices and heavy browse use have been a reduction in growth with less available forage. In addition, species such as oak and serviceberry have grown taller, with palatable growth being limited to a height which can be reached only by the largest animals.

As oak and serviceberry have grown taller, large windbreaks have been created. In the winter, these areas hold the snow, which becomes deep enough to limit all access by deer and elk. Thirty years of observations on the permit area have shown that winter use of the mountain shrub type by elk and deer is highly dependent on snow depth and severity of winter weather conditions. The use of serviceberry has been limited to shrubs near the edges of the stands where less snow buildup occurs. Depending on snow depth, elk and deer populations tend to concentrate on south facing hill slope areas where snow depth is minimal.

Colowyo began fencing the boundaries of the Federal lease during the fall of 1976. The fencing was completed during the summer of 1977. At this time all cattle were removed from the lease area. The fencing was completed as part of an overall grazing management program to improve the rangeland after several years of over-grazing. In 1991, Colowyo constructed a similar fence to provide a boundary for the areas added to the Permit and to exclude grazing in this area.

Disturbed Areas

Disturbed acreage has been kept to a minimum in the permit area by proper planning for the location of mine support facilities, haul roads, and pit advance. The mining methods, as discussed in Section 2.05.3, allow for a minimum amount of disturbance on an annual basis (less than 100 acres per pit), when compared to strictly one or two seam mines with similar production levels which disturb several hundred acres annually per pit. Topsoil and vegetation are removed during the summer and fall months to allow for only enough disturbance to facilitate mining advance through June of the following year.

Habitat Improvement Program

Prior to start-up of mining, Colowyo initiated a big game habitat improvement program in January 1976. The purpose of this on-going program was to increase range carrying capacity by increasing available browse and increased access to herbaceous species. Another objective of the program was to provide increased forage on selected undisturbed areas on and adjacent to the mine site to draw wildlife away from newly reclaimed areas until the vegetation became established. A third benefit was to improve enough habitat prior to and during mining in order to offset the temporary loss of habitat from mining.

The technique for habitat improvement involved using a rubber tired or tracked dozer during the winter months, preferably when there was minimal snow cover and the ground was frozen, to shear off the dormant shrubs a few inches above ground level.

The shrubs tended to shear or break off easily when the ground was frozen leaving the root systems undisturbed. During the following spring, vigorous new growth from root sprouting occurred, and easy access was provided for deer and elk. This technique has had the additional effect of allowing grasses and forbs to establish stands that will compete with the shrubs, thus prolonging heights useable by wildlife. Approximately 30 acres of overmature decadent shrubs, i.e., serviceberry, oak, and chokecherry was “brushed” on an annual basis through 1986.

Although no specific data has been collected on these areas, general observations have shown that the areas are heavily utilized by both deer and elk. On all of the areas, any new shrub sprouting is kept down to a height of only a few inches. The one-acre plot that was cleared of vegetation and fenced in 1977 for testing by the Meeker Environmental Plant Center can be used as a good comparison of the differences between browsed and unbrowsed areas that have had similar treatments. Several of the unbrowsed shrubs that have grown up from root sprouting in the Plant

Center plot have attained heights of up to four feet in just a few years. Over a five-year period, we feel the cumulative effects of improving 50-75 acres per year for deer and elk use has been increasingly successful in meeting the objectives of increasing available forage and drawing wildlife away from reclaimed areas.

This wildlife mitigation program is considered a success and was discontinued at permit renewal as reclaimed areas are now attracting a large population of local wildlife populations. Also, suitable areas within the permit for this mitigation had been increasingly difficult to find. Much of the habitat suitable for improvement had already received treatment.

Sagegrouse Mitigation

In a preliminary findings document dated December 11, 1981, the Division requested additional information on sagegrouse use of the Colowyo permit area and a description of habitat mitigation measures. Colowyo submitted the following response, dated May 25, 1982, which satisfied the remaining concerns of the Division.

Sagegrouse Mitigation

I. Ongoing Mitigation Offsetting Current Loss of Sagegrouse Habitat Due to Mining.

Prior to 1976 due to the prior landowners' grazing practices, the rangeland both within the permit area and surrounding areas was in an overgrazed condition.

After 1976 the following changes in the management of the land, then owned by Colowyo, took place which indirectly increased the sagegrouse nesting and brood rearing capacity of the overall area. This increased carrying capacity of the sagegrouse habitat provides the mitigation for any displaced sagegrouse population during mining.

1. From 1976 until 1979 all livestock grazing was stopped in order to allow the range to rest and to return to a more productive state. The immediate benefit to sagegrouse was the increased production of herbaceous vegetation which, along with insects, is an important component to the sagegrouse brood population diet. A secondary benefit was the end of any nest trampling and end of disturbance and heavy grazing around watering areas due to livestock grazing.

2. During 1976 a fence was constructed around the Federal coal lease which eliminated all further livestock grazing in this area. Since 1976 to the present, sagegrouse have continued to benefit as described as #1 above.

3. All other areas outside of the lease fence (approximately 6,000 acres) have been grazed since 1979 at 60% of carrying capacity. This rate would allow for an increased sagegrouse brood population over that which the area supported in an overgrazed condition.

4. Since 1976, numerous areas of thick, decadent stands of the mountain shrub vegetation within and adjacent to the lease area have been cleared of brush as part of the big game mitigation program. As a result of the brushing, the production of succulent herbaceous vegetation has increased, offering more forage for the sage grouse brood population.

   The above changes in Management practices of the rangeland around the Colowyo mining area contribute to the increased capability of supporting any displaced sage grouse nesting and brooding population. No additional treatments to mitigate for a displaced sage grouse population are in effect, nor would other methods likely be as effective.

II. <u>Post-mining Mitigation for Sagegrouse</u>

As stated in the Permit Application, sage grouse use of the area to be mined is for nesting and brood rearing purposes.

According to information contained within the Bureau of Land Management Technical Note #330, "Habitat Requirements and Management Recommendations for Sage Grouse," the most important factor for nesting habitat in the sagebrush vegetation type is sagebrush. Within this vegetative community, the majority of sage grouse nests occur under sagebrush. It is assumed that within the mountain shrub vegetative community, sage grouse nest would be found under the mountain shrub components as well as sagebrush.

The most important factor for brooding habitat is the availability of the appropriate foods for the chicks. Also, during the later summer months of brood rearing, the availability of water becomes important.

Within the pre-mine vegetative community, the nesting cover component is assumed to be sagebrush as well as other elements of the mountain shrub community.

Within the post-mining vegetative community, seeded shrubs will supply the necessary requirements for nesting cover.

Within the literature no specific location of nests seem to be indicated other than a preference for less dense and shorter shrubs which seem to indicate a need for quick escape should the hen be flushed unexpectedly. The density and structures of the shrub component within the post-mine community should provide the diversity of cover and density suited to sagegrouse nesting.

Within the pre-mine vegetative community, insects and succulent vegetation provide the majority of the food for the developing chicks. As these food sources mature and dry, the grouse will move to areas still supporting succulent vegetation. These sites include springs, seeps, drainage bottoms and water impoundments. During the late summer and fall months, the important food plants dry up on the upland slopes and the grouse will tend to remain closer to available watering areas where some succulent vegetation is still available. Many of the grouse are then observed in the alfalfa and irrigated meadowlands on areas around the mining area.

Within the post-mine vegetative community, the food component for brood rearing will be provided by insects and succulent vegetation on reclaimed areas early in chick development. Later into the summer months, as food sources dry up on the upland slopes, food will be available near water impoundments and drainage bottoms being returned to the post-mining topography. The literature indicates no optimum distance between nesting sites and food sources. Evidently, the location of nesting sites are independent of food sources, rather, the nesting locations are based on available cover, and the grouse movements are tied to the availability of succulent vegetation.

For the most part, the mitigation measures indicated above had the desired impact of improving conditions for sage grouse on undisturbed areas under Colowyo control. To the contrary, original reclamation plan measures did not result in a sagebrush component consistent with the original projections in many areas of the mine, especially the old reclaimed units that were revegetated with “introduced” pasture grasses. Beginning in the late 1990s and as evident in revegetated units that have been seeded since then, the sagebrush component of reclamation has improved substantially, but is still not up to original expectations. Therefore, substantial changes to the reclamation plan have been introduced in this submittal to hopefully, make another quantum leap forward in the ability to establish sagebrush steppe communities. Many changes in techniques have been proffered including variable topsoil depths, significantly increased amounts of the appropriate sagebrush seed, proper planting techniques to encourage sagebrush, etc. Given success of these techniques elsewhere in the mining industry, the potential is strong that the original projections for sagebrush establishment at Colowyo will be realized from this point forward.

Additional Mitigation Measures

The pre-planning for a minimum amount of annual disturbance, the establishment of herbaceous species, the replacement of native shrub species, and habitat improvement techniques are the most important areas for minimizing impacts to wildlife, several other protection measures are in effect.

Electric power lines located in the permit area will be constructed in accordance with the requirements of Section 4.18 to minimize potential electrical hazards to large raptors.

Vehicle use within the permit area is limited to the active mining area and the various support facilities. Off-road vehicle use is kept to a minimum and is usually only authorized for surveying, environmental data collection and monitoring, security, etc. Travel by foot, which causes much more disturbance to wildlife than vehicle traffic, is highly unlikely outside active mining areas.

Hunting with firearms inside Colowyo’s permit boundary is allowed and is strictly managed by Colowyo.

Speed limits in the mine area are limited to reduce the likelihood of collisions between vehicles and wildlife. Colowyo employees are fully aware of the possibility of encountering wildlife on and -around the mine site and take special care to avoid these species.

In summary after several years of mining at Colowyo, the question is no longer whether coal mining at Colowyo has had an adverse impact on local wildlife populations. The population of deer and elk in the vicinity of Colowyo is reaching record levels. There is little doubt that wildlife populations are drawn to the reclaimed areas because of the availability of quality herbaceous vegetation. The immediate vicinity around Colowyo has become well known as a wildlife refuge, particularly during big game seasons.

The issue now is how can Colowyo assist CPW in efforts to control wildlife populations to a level that can be supported by adjacent ranges. To do so, in 1990 we have entered into a cooperative effort with the CPW to establish a "Ranching For Wildlife" area located south of Hayden. Colowyo has also cooperated with the CPW in allowing public hunters access to company properties in Axial Basin Ranch to increase harvest of local cow elk populations.

The concern for wildlife mitigation has clearly evolved from a concern for the impact of mining on the wildlife population to a concern for involving Colowyo in managing increasing populations especially for big game animals, particularly elk. As one of the large landowners in the region, Colowyo will continue to work with the CPW to assist where possible to manage local big game populations.

With regard to sage grouse populations, Colowyo believes that the new revegetation metrics presented within this submittal will more completely address the concern for negative impacts to area populations and brooding habitat. As this new reclamation technology progresses and adapts into the future, it is anticipated that sage grouse use of reclaimed lands will return to pre-mining levels, or perhaps return to elevated levels as has been experienced at certain Wyoming mining operations.

Related to this mitigation and emphasis on wildlife populations, focus must be maintained on the fact that Colowyo is the landowner on the overwhelming majority of disturbed acreage. Were it not for the need for permitting of coal mining operations, and the desire to be a responsible steward of the land, the company could select to manage lands in a manner similar to other Western ranching operations that emphasize red meat production from livestock with little concern for the needs of wildlife.

Protection of Hydrologic Balance and Water Quality

Based on the data, other references available and reclamation plans previously presented in this section, the Colowyo Mine will not adversely affect the hydrologic balance or water quality of the adjacent areas.

The Colowyo Coal Company intends to use all practical methods to maintain the hydrologic balance and water quality in its present state and may improve the surface water characteristics as a result of reclamation procedures. The focus of this discussion will center on the permit area as it is the area of mining disturbance.

The hydrologic balance, previously discussed, will be protected through a number of procedures designed to mitigate any potential impact from mining. Temporary and permanent diversions will route runoff away from disturbed areas to minimize erosion and sediment loss. Temporary channels are designed to safely pass the runoff from a 10-year, 24-hour precipitation event and, where necessary, will be constructed using bank stabilization methods including energy dissipators, sediment traps, and dug outs or a combination of these methods. Drainage culverts will also use energy dissipators at the outlets if necessary so that runoff will not cause additional erosion and subsequently increased total suspended solids (TSS) levels. Detention ponds will be used to detain runoff water from the disturbed areas to allow the TSS to settle out and to attain acceptable concentrations for other parameters consistent with the requirements of the NPDES Permit. Any Small Area Exemptions (SAE's) employed will be designed to minimize contributions of TSS to the hydrologic balance.

Infiltration and percolation of precipitation in the mine area may be enhanced by the reclamation techniques of contour furrowing on hillsides and the continued excellent revegetation success at Colowyo. Infiltration rates for the pre-mined and post-mine condition of the land were presented earlier. Striffler and Rhodes (1981) showed through field measurements, using an intense rainfall simulation, that infiltration capacities of the mulched and revegetated areas were much greater than the pre-mine estimates. Runoff from the revegetated and contour-furrowed areas has been minor to date, as documented by Colowyo Mine personnel. Flows from Streeter Gulch will be moderated with the detention pond.

Moderated flows will continue to pass through the historic drainages. Recharge of the limited groundwater systems in the mine will not be inhibited and may be enhanced through the use of the above techniques.

Groundwater protection, per se, is not necessary in the permit area as essentially no continuous groundwater system exists. Perched aquifers of limited nature will be impacted only in the mine area property. This water will be evaporated. The quantity of groundwater is minimal as evidenced by the lack of water in test holes and the dry active pit.

Protection of water quality will also be maintained at the present variable limits through the use of the reclamation procedures listed above. Groundwater will not be affected as the supplies are minimal. Surface water will not be significantly impacted in the mine area. An ongoing monitoring program is maintained by the Colowyo Coal Company to verify the conclusions in the permit application. Sampling stations are maintained and samples collected in accordance with the water monitoring plan approved by the Division. Refer to the annual reclamation reports for results of the sampling program.

Flow volumes in the Goodspring Creek Alluvial Valley Floor may be impacted by the Colowyo Mine through exercise of water rights. However, the impact is expected to be minimal as the water rights used are owned by the Colowyo Coal Company and are not an integral part of any ranching or farming operation. The Colowyo Augmentation Plan will mitigate the effects on any other water rights and will provide for flows downstream of the affected area. Quality of water in Good Spring Creek will not be affected by the exercise of the water rights.

As discussed under Hydrologic Balance-Permit Area, changes in flow volumes caused by mining and reclamation operations will be less than the accuracy range of present day flow measuring equipment.

In summary, the Colowyo Mine will not significantly affect the hydrologic balance or water quality of the general area or the permit area and the affect to the hydrologic balance within the permit area will be insignificant. Temporary increases in TDS and associated common ions are expected to affect quality in backfilled spoils within the permit area. Refer to annual reports for additional information regarding hydrologic monitoring.

Protection of Public Parks and Historical Places

No public parks are located within the permit or adjacent areas; therefore, no public parks will be affected by the proposed mining operations. Likewise, the proposed mining operations will not effect any places included on or eligible for listing in the National Register of Historical Places.

Because no public parks or historic places, included on or eligible for listing on the National Register of Historical Places, will be adversely affected, this Section of the regulations is not applicable to this permit application.

Surface Mining Near Underground Mining

No surface mining activities within the permit area will be conducted within 500 feet of an underground mine. Map 31, Red Wing Mine provides additional information.

Previous underground mining has taken place in the vicinity of the Colowyo operation; this previous mining is discussed in Sections 2.04.3 and 2.04.4

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 lands within the mining area an appropriate post mining vegetation community. Please see Section 2.05.4 for a detailed description of the reclamation plan and Section 2.05.5 for a description of the post mine land use targets that will be implemented to achieve revegetation success. Outlined in this section are the revegetation metrics that will be used to demonstrate successful reclamation has been achieved that supports the post mining land use of rangeland with the two corresponding subcomponents of grazingland and wildlife habitat.

4.15.1(4) Vegetation Monitoring

The monitoring plan will evaluate the success of shrub and herbaceous vegetation establishment, and track progress toward achieving reclamation goals in the following manner:

1. Sampling of herbaceous vegetation will take place during the peak of the growing season when the vegetation reaches the mature stages and is most easily identified. This period of time is generally from late June to late August.

2. Unlike sampling for bond release purposes, sampling is for informational purposes and will not be required to meet statistical adequacy.

3. During the second and fourth growing seasons, herbaceous cover and woody plant density information will be gathered to the species level, and will consider the effectiveness of the seed mixture and volunteer species. Seven year and older monitoring will utilize ground cover and density sampling, and will include a modest current annual production sampling.

4. The data and an assessment of the monitoring results for that year will be submitted in the Annual Reclamation Report.

4.15.2 Use of Introduced Species

For pre-2008 revegetation (especially pre-2002 revegetation), the rangeland seed mixture used at that time included some introduced species, including Intermediate Wheatgrass (*Agropyron intermedium*), Siberian Wheatgrass (*Agropyron sibericum*), Pubescent Wheatgrass (*Agropyron trichophorum*), Smooth Brome (*Bromus inermus*), Orchard Grass (*Dactylus glomerata*), Vinall Russian Wildrye (*Elymus junceus*), Durar Hard Fescue (*Festuca ovina duriscula*), Timothy (*Phleum pratense*), Kentucky Bluegrass (*Poa pratensis*), Lutana Cicer Milkvetch (*Astragalus cicer*) and Alfalfa (*Medicago sativa*).

Of the thirty-one species in the pre-2008 seed mixtures, twenty-one species were native, which on a seed-weight basis accounts for 65% of the planted seeds. Studies and experience have demonstrates some beneficial uses for introduced species considering erosion control and forage for livestock and wildlife, but are no longer a component of the desired post-mining vegetation communities.

For post-2008 revegetation, the seed mixes (please see Tables 2.05.4-7 through 2.05.4-9) are comprised entirely of native species, except with the inclusion of modest quantities of small burnett or nitrogen fixing legumes such as cicer milkvetch or alfalfa as supplemental forage for wildlife.

4.15.3 Seeding and Planting

Please refer to the reclamation plan found 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 experience demonstrates sufficient surface roughness survives the topsoil laydown process to maintain favorable seed-bed conditions. If conditions warrant additional topsoil manipulation, Colowyo will utilize an appropriate practice specific to the circumstance. Best management practices, such as minimizing topsoil handling and manipulation, ripping along the contour, disking, or cross ripping will be implemented and are further discussed in Section 2.05.4.

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.

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

As a result of previous consultations with CPW and DRMS, Colowyo implemented three field trials. The field trials were meant to provide information to the appropriate expectations for success/failure of establishing these habitat types at Colowyo in the context of a ten-year bond clock, to provide some baseline information that can be used to modify practices, and the plant materials used to meet the current expectations.

The study was comprised of three test scenarios designed to explore different species and habitat requisites necessary for tall shrub survival. The first treatment was to establish an overstory of quaking aspen (*Populus tremuloides*) trees that are planted into deep topsoil (48 inches). The second treatment was serviceberry (*Amelanchier alnifolia*) and chokecherry (*Prunus virginiana*) shrubs planted into deep topsoil (48 inches). The third and final treatment was serviceberry and mountain mahogany (*Cercocarpus montanus*) shrubs planted into shallow topsoil (4 inches). The aspen trees and/or tall shrubs were planted in ten-220-foot long rows per treatment, for a total of 550 plants per treatment. The initial planting consisted of 550 quaking aspen tubelings in the first treatment, 276 serviceberry and 274 chokecherry tubelings in the second treatment, and 276 serviceberry and 274 mountain mahogany tubelings in the third treatment.

The status of each tree or shrub was evaluated in 2012 through 2016. Trees and shrubs that "were observed to be dead" during the evaluation effort in August 2012 needed to be replaced (one-time replacement). Replacement of dead plants occurred in November 2012. During the final evaluation in 2016, no quaking aspen trees in Treatment 1 were observed to be alive. In Treatment 2, no serviceberry and 42 individuals of the chokecherry (15%) were observed to be alive in 2016. In Treatment 3, 143 individuals of the serviceberry (52%) and 147 individuals of the mountain mahogany (54%) were observed to be alive in 2016. The unfavorable results of the aspen and tall shrub trials (documented in annual reporting to the Division) have prompted Colowyo to undertake additional efforts as outlined below.

As a result of these unsuccessful test plots, Colowyo intends to design and implement new field trials which draw upon success at Trapper and Seneca IIW. Cedar Creek Associates, Inc. (Cedar Creek) has conducted a literature review to support Colowyo in achieving revegetation success criteria pertaining to tall shrub establishment. This literature review aimed to optimize success at Colowyo by synthesizing the successes and challenges of other efforts both at Colowyo and in the region.

Based on these findings, Colowyo identified areas of snow accumulation during the winter (November 2019 – February 2020). These seventeen test areas are scattered throughout recently reclaimed areas in East and West Pit and will be implemented in a manner to optimize successful tall shrub establishment. Please see Figure 4.15-1 for approximate tall shrub test plot locations. For the most part, these are small (~0.1 acres) areas which accumulate snow in the winter months and as a result improve seasonal plant available water through snow-capture. Final siting of the tall shrub test plots will be based on additional snow drift data yet to be acquired.

The first step will be to create some topsoil mounding for additional structure for preceipation retention. The test areas will then be planted wtih containerized Planting / tubelings as establishing tall shrubs from seed was not successful at either Colowyo or Trapper. Since the test sites are located in upland areas the following species will be considered for planting:

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)
- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos sp.*)

The planting of tubelings will not occur in the middle of winter or summer and will not exceed one tubeling per ten square feet. Fencing will be used to decrease herbivory, which will likely be crucial, at least during the first few years while tall shrubs are establishing. Native soil, collected from the local ecosystems exhibiting tall shrubs, will be used to inoculate the test sites with beneficial mycorrhizae. Mycorrhizae are symbiotic relationships that form between fungi and plants. The fungi colonize the root system of a host plant, providing increased water and nutrient absorption capabilities while the plant provides the fungus with carbohydrates formed from photosynthesis. Weed guard fabric will also be placed around the tubelings to assist in limiting competition for moisture from other species.

Colowyo will monitor the survival of planted tall shrubs annually for three years following planting. The primary purpose of this approach to test plots is to identify areas that already exhibit favorable conditions to establish tall shrubs, rather than try to replicate those conditions.

4.15.7 Determining Revegetation Success: General Requirements and Standards

Three reference areas have been selected to represent the three major vegetative communities to be disturbed, sagebrush, mountain shrub, and aspen. The locations of these reference areas are shown on Map 4. Detailed vegetative sampling was performed on these reference areas 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 premined area. The parameters compared were herbaceous cover and herbaceous production. Revegetation success will be determined by comparisons of weighted averages between reference areas and revegetated areas in accordance with Rule 4.15.7(4) (b).

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 revegetation metrics described in Section 4.15.8 below. Sampling methodologies and statistical testing utilized for bond release evaluations are described in Section 4.15.11.

To summarize, there are three reference areas, the Mountain Shrub reference area, Sagebrush reference area, and Collom Aspen reference area that are utilized to evaluate revegetation success at Colowyo. The comparison between the reclamation area and the reference area will occur as follows:

- West and East Pit Reclamation Areas
    - Reclaimed areas shall be compared to weighted parameters from the Mountain Shrub reference area (55% weight) and the Sagebrush reference area (45% weight) in accordance with Rule 4.15.7(4)(b).
- South Taylor Pit Reclamation Areas
    - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (52% weight), the Sagebrush reference area (25% weight), and the Collom Aspen reference area (23% weight) in accordance with Rule 4.15.7(4)(b).
- Collom Reclamation Areas
    - Areas reclaimed to grazing land shall be compared to weighted parameters from the Mountain Shrub reference area (39% weight), the Sagebrush reference area (47% weight), and the Grassland reference area (14% weight) in accordance with Rule 4.15.7(4)(b).

4.15.8 Revegetation Success Criteria

Colowyo will meet the requirements to ensure that the post-mining vegetation will be adequate for final bond release. As described in Section 4.15.7, Colowyo will utilize the reference areas for comparisons between reclaimed areas and appropriate native reference areas for the variables of ground cover and production. For the variables of woody plant density and species diversity, Colowyo shall compare revegetated areas 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.

<u>Herbaceous Cover</u>
For revegetation targeting (and achieving) the rangeland land use subcomponents of grazingland and wildlife habitat, 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 described in Rule 4.15.8 (3) (a).

<u>Herbaceous Production</u>
For revegetation targeting the rangeland land use subcomponents of grazingland and wildlife habitat, 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 described in Rule 4.15.8 (4).

Woody Plant Density
Where shrubs establish to form wildlife habitat, they will be segregated into low and high-density areas, each with a separate woody plant density success criterion. On high-density areas (areas of shrub concentration), the standard shall be 375 live plants per acre. At least one-half of these totals shall be sagebrush species. In low-density areas, the standard shall be 200 plants per acre. Furthermore, Colowyo will establish wildlife habitat areas, comprised of both low and high-density areas, on approximately 20% of the acres in each bond release evaluation, with at least 50% of those acres representing high-density areas. The grazingland acres will not be subject to woody plant density standards.

Tall Shrubs and Aspens
For the South Taylor reclamation areas, as part of the revegetation success criteria for those areas, Colowyo will establish 18.5 acres of aspens and 12.0 acres of tall shrubs. This will be accomplished through large singular plots or various small plots that add up the acres noted previously. Tall shrubs plots will consist of, but may not contain all, of the following species to be considered successful.

- Alderleaf Mountain Mahogany (*Cercocarpus montanus*)
- Chokecherry (*Padus virginiana* ssp. *melanocarpa*)
- Skunkbrush sumac (*Rhus trilobata*)
- Saskatoon serviceberry (*Amelanchier alnifolia*)
- Snowberry (*Symphoricarpos sp.*)

For the Collom reclamation areas, at the request of CPW, Colowyo will incorporate approximately 750 small size exclosures into Collom reclamation areas on 150 acres at a density of approximately five exclosures per acre to meet their expectations for establishing tall shrub species.

Diversity
The revegetation objective for diversity will be to establish 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 post-mining vegetative community to insure that the post-mining land use as addressed in Section 2.05.5.

4.15.9 Revegetation Success Criteria: Cropland

Colowyo does not impact any cropland areas; therefore, the requirements of this rule 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 rule are not applicable to Colowyo.

4.15.11 Revegetation Sampling Methods and Statistical Demonstrations for Revegetation Success Revegetation

During monitoring of revegetated units, developing shrub patches will be identified and as necessary delineated 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 low or high density areas depending on apparent density of developing shrub populations.

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 seedings 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 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.

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 m^2.)

<u>Determination of Ground Cover</u>
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;

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 $^1/_2$ m^2 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 current annual herbaceous vegetation within the vertical boundaries of the frame will be clipped and bagged separately by life form as follows:

Perennial Grass	*Perennial Forb*
Annual Grass	*Annual Forb*
Subshrub	*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 or 15 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.

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.

<u>Sample Adequacy Determination</u>
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 has been obtained in accordance with Rule 4.15.11 (2). Woody plant density success comparisons can be obtained utilizing Rule 4.15.11(2) or Rule 4.15.11 (3). For woody plant density adequacy determinations utilizing Rule 4.15.11 (2)(a), the estimate is to within 15% of the true mean. Where sampling is for managerial (monitoring) information, adequacy is not necessary and is calculated for informational purposes only.

<u>Success Evaluation</u>
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). 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 in accordance with Rule 4.15.11(2)(a). If a statistically adequate sample cannot be obtained, a “reverse-null” hypothesis test may be employed as detailed in 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 success criteria outline in Section 4.15.8, a standard-null hypothesis *t*-test may be used in accordance with Rule 4.15.11(2)(b).

If adequacy for woody plant density cannot be achieved utilizing the formulation in Rule 4.15.11 (2)(a), additional sample adequacy and success evaluation options are described under Rule 4.15.11(3).

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 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.

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.

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.

Upon completion of the hole, cuttings from the drill hole will be placed in the drill hole and the site reclaimed. Some holes maybe 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. Se 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.

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.

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 outslopes.

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 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).

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

TABLE OF CONTENTS

Public Notice of Blasting Schedule

Colowyo will annually publish a blasting schedule similar to the one set forth in Volume 1, Section 2.05 Figure 1.

Disposal of Excess Spoil

Colowyo constructed two separate “valley fills” which are called the East Taylor Fill and the West Taylor Fill. These fills were necessary due to the early operation of the South Taylor mining area; overburden needed to be placed into the fills so that sufficient working area could be developed prior to the placement of subsequent overburden into the mined-out areas.

Detailed geotechnical investigations were completed for both the East Taylor Fill and the West Taylor Fill. A report of the investigations can be found in Exhibit 21 Item 1. Construction plans for the fills, addressing the requirements of Rule 4.09, Disposal of Excess Spoil, can also be found in Section 4.09 and Exhibit 23B. Locations of the East Taylor Fill and West Taylor Fill can be found in Exhibit 23B and on Map 23A.

2.05.4 (1) Reclamation Plan

Please see Volume 1 Section 2.05.4 for a detail description of the reclamation plan that will be used in the South Taylor area.

2.05.4 (2)(a) Reclamation Timetable

The sequence for reclamation following the mining process is shown on Map 29. Final reclamation of the South Taylor pit will be delayed, due to the shape, size and depth of the pit; which will result in leaving the majority of the spoil backfilling process until final pit closure. The majority of the spoil will be stacked in the initial boxcut area and associated valley fill areas, allowing adequate space to perform mining operations in a geotechnically safe environment. Although the final reclamation of the South Taylor will be delayed due to the mining operations in the pit, Colowyo is committed to reclamation in accordance with Rule 4.13 and will perform reclamation activities as contemporaneously as practicable with the South Taylor mining operations. With the limitation of areas available for reclamation prior to final pit backfill, Colowyo will reclaim as many areas as allowed by the mine plan as shown on Map 29, prior to final pit closure. The South Taylor pit reached a steady state operation in 2013; whereas all spoil material produced in the advancing cut is backfilled into the previously mined areas. In general, it is anticipated that the vast majority of reclamation activities in the South Taylor pit area will begin in the lower elevation areas and progress upslope to the highest elevation areas. This is a matter of practical necessity due to the operational constraints encountered in the area which were also reflected in the hydrological modeling found in Exhibit 7, Item 20. Major departures from this premise will result in the need to revisit the adequacy of the sediment control structures designed and submitted as part of this permit.

2.05.4 (2)(b) Reclamation Costs

The estimate of the cost of reclamation of the operations required to be covered by the performance bond is found under Rule 3.

2.05.4 (2)(c) Backfilling Plan

As the mining progresses to the west, overburden material from each successive cut will be backfilled into the previously mined out area and the additional spoil will continue to buildup in previously mined areas. This cycle will be repeated for the entire mining area. Due to shape, size and depth of the South Taylor pit results in leaving the majority of the spoil backfilling process until final pit closure. As a result, Colowyo has been granted a variance for a delay in contemporaneous reclamation based on Rule 4.14.1(1)(d) which states that "Rough backfilling and grading shall be completed within 180 days following coal removal and shall not be more than four spoil ridges behind the pit being worked.". The mining techniques utilizing dragline and truck/shovel operation are shown in detail on Mining Range Diagram (Map 24B), and show the approximate distance between topsoil removal and replacement. Premining topography is presented on Map 18A and the postmining topography is shown on Map 19B. Map 20B provides cross-sections of the premining and postmining topography. Map 28 presents the topsoil handling movements and the timing of stripping activities. Map 29 shows the spoil grading sequence timing of reclamation activities.

The backfilled mining areas will be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits (Map 19B). Colowyo will grade all final slopes so that overall grades do not exceed 33% (Map 20B). Additional information on the backfilling and regrading plan are discussed further in Volume 1, Section 2.05.4.

2.05.4 (2)(d) Topsoil Salvage and Replacement

Please see Volume 1, Section 2.05.4 for a discussion on topsoil salvage and replacement for the South Taylor mining area.

2.05.4 (2) (e) Reclamation Revegetation

Revegetation techniques described in Volume 1, Section 2.05.4 will be employed at the South Taylor mining area.

2.05.4(f-h) Disposal, Mine Openings, Water and Air Control

These topics are discussed in Volume 1, Section 2.05.6. There will be no substantive changes to the approaches already employed for these topics.

2.05.5 Post-Mining Land Uses

Please refer to Volume 1 Section 2.05.5 for a discussion of the post-mining land uses for the South Taylor area.

2.05.6 Mitigation of Impacts of Mining Operations

2.05.6 (1) Air Pollution Control Plan

Air quality will be protected in accordance with the procedures outlined in Volume 1 and Exhibit 15 in Volume 5B.

2.05.6 (2) Fish and Wildlife Plan

Procedures specified in the Volume 1, Section 2.05.6 will be followed by Colowyo to ensure minimal impacts to fish and wildlife in the South Taylor mining areas. At the conclusion of the mining activities, disturbed lands will be restored in accordance with the reclamation plan.

2.05.6 (3)(a) Protection of the Hydrologic Balance

Surface Water

Surface water will be protected in the mining areas as described in Section 2.05.3(4) . Protection includes the use of diversion ditches to route surface water around the mining impact areas and sediment ponds downstream of the mining impact areas.

Current surface water rights will not be impacted by mining operations at Lower Wilson or South Taylor. There is no expected long-term measurable impact to the quantity of surface water in Wilson, Taylor, or Good Spring creeks or any of their tributaries. Surface water amounts that will be used in mining operations will be within the water rights owned by Colowyo.

Surface water quality of the three creeks is calculated to only be marginally impacted by mining activities. This marginal impact, described in the Probable Hydrologic Consequences section (Section 2.05.6 (3)(b)(iii)), will be due to meteoric water being captured in and evaporated from the mine pit during operations, and meteoric water contacting an increased surface area of soil in the vadose zone and thereby theoretically increasing the mass of dissolved solids entering the groundwater. These dissolved solids in groundwater will eventually enter the surface water system, with a theoretical increase in dissolved solids in the surface water. This increase is calculated to be small enough to have no impact on the current or projected surface water uses in Wilson, Taylor, or Good Spring creek drainages.

Groundwater

Groundwater in the vicinity of the Lower Wilson and South Taylor mining areas is restricted to perched aquifers of limited extent within bedrock of the Williams Fork Formation, the Trout Creek aquifer (a bedrock aquifer of regional extent), and valley fill deposits as described in Section 2.04.7. The Williams Fork Formation aquifers have no beneficial use owing to their limited extent and minimal production. The Trout Creek Sandstone is a sandstone unit underlying most of the permit area and extending across much of northwestern Colorado. It contains water of useable quantity and quality as demonstrated by beneficial wells near the permit area. The Trout Creek Sandstone is beneath the mining impact areas and is separated from these impacts by clay and claystone layers within the Williams Fork Formation (see Section 2.04.5 and 2.04.6). A borehole intersecting the Trout Creek (84-B-TC - NW¼, NE¼, Sec. 19, T3N, R93W) was installed between the Lower Wilson and South Taylor mining areas. The Trout Creek formation was dry at this location, since the sandstone in this area outcrops to the west and is above any recharge source. With the dip of the strata to the north and east, the Trout Creek Sandstone, and overlying strata, do not become saturated until (1) the strata dips below the valley floor and (2) the elevation of the appropriate strata equals the elevation of surface water in Wilson and Good Spring Creek. Based on this information, mining is anticipated to have no impact on the Trout Creek aquifer. Groundwater in the shallow valley fill of Good Spring Creek is calculated to be marginally impacted by surface mining activities at South Taylor as described in the Probable Hydrologic Consequences. There are no registered beneficial-use wells in the Colorado Division of Water Resources well database within several miles, down gradient of the mining impact areas (Map 11B).

2.05.6 (3)(b)(i & ii) Hydrologic Controls

Surface water and groundwater drainage from the mining areas will be controlled as described in Section 2.05.3(4) and Section 4.05.Surface water flow will be diverted around the mining operations and into sediment ponds. Stormwater that enters the mining operations and water that occurs on the mining operations will be allowed to evaporate or infiltrate, or will be routed into these surface structures.

2.05.6 (3)(b)(iii) Probable Hydrologic Consequences

Rule 2.05.6(3)(b)(iii) requires determination of probable hydrologic consequences for the mining operations. This rule indicates that these consequences must be defined for both the permit area and adjacent areas, for quantity and quality of surface and ground waters. Baseline conditions must be established, and possible impacts from the activities must be anticipated.

Summary of the Probable Hydrologic Consequences – South Taylor Pit

The anticipated probable hydrologic consequences of mining coal in the South Taylor area are:

Springs near the South Taylor Pit might experience increased and/or decreased flow.
The South Taylor pit will eliminate several seeps and springs.

- Dewatering of the pit is not anticipated.
- Hydraulic transmissivity within the backfilled pit will be higher than the adjacent unmined areas.
- Base flow in Good Spring Creek will be reduced by up to 7% during and for 45 years after mining.
- Total dissolved solids in the base flow of Good Spring Creek will increase by 1.6% to 13.5% for several hundred years after mining has been completed, with sulfate the dominant increasing ion.
- Base flows of Taylor Creek will not be reduced, and peak flow of Taylor Creek will be reduced 2% by the South Taylor pit.
- No other statistically significant changes to surface water quality or quantity are anticipated.

These consequences are discussed in the following subsections.

Potential Impacts to Springs and Seeps

Springs in the Colowyo Mine area result from three general sources: 1) typified by a relatively deep soil accumulation immediately upslope and shallow bedrock downslope of the point of discharge, 2) discharge within valley bottom deposits, and 3) from sheer bedrock faces on hillsides (CDM 1985b). The first two of these sources may mask or contribute to bedrock sources of the springs. The seeps and low volume springs flow generally in response to snowpack accumulation and subsequent melting resulting in seasonal flows. A total of 8 springs, which maintained flow for the month of July, contribute to base flows in the receiving streams adjacent to South Taylor, and were determined as a critical component of the hydrologic balance. Seeps and springs relevant to this permit revision are shown on Map 10.

The majority of the springs, with bedrock sources, appear to be contact springs. A contact spring results from the infiltration of water from the surface to a porous zone (such as sandstone) above a horizontal hydrologic barrier (such as shale) where the water preferentially flows along the contact to the exposure. This type of spring is common in areas where alternating sequences of lithologies exist that exhibit differential hydraulic conductivities, such as the Williams Fork Formation.

Springs that have a potential to be impacted by mining activities include 3-93-17-142, 3-93-17-432 (Taylor Creek), WFS-1 and -1A, WFS-2, WFS-4, WFS-5, and WFS-7 (West Fork Good Spring Creek), and GSCS-1 (Good Spring Creek). Springs that will be eliminated by the South Taylor pit include 3-93-20-212 and 3-93-17-432 (Taylor Creek), 3-93-20-213, and 3-93-20-214 (West Fork Good Spring Creek). The FW source is an artesian well completed in the Trout Creek Sandstone that flows through a cracked wellhead and not a natural water discharge point. Table 2.05.6-1 lists the springs found in the vicinity of the South Taylor mining area. The locations of the investigated springs and seeps are presented on Map 10.

The elevations of the springs were compared to the elevation of the confined groundwater of the Williams Fork Formation in well 84-0-OB. The water level in this well was 7,054 feet above mean sea level in October 1984 (CDM 1985a). Of the base flow springs, GSCS-1, WFS-2, and WFS-2A are below this elevation and may result from confined groundwater recharge from the Williams Fork Formation.

Data collected for the springs contributing to the base flow of the surface water system and that have a potential to be impacted by mining are summarized in Table 2.05.6-2. During peak flow, typically April or May, seven springs contribute a combined approximately 130 gallons per minute (gpm) [equivalent to 0.3 cubic feet per second (cfs)] into the West Fork Good Spring Creek. About 20 gpm (0.04 cfs) is contributed during base flow periods.

Potential Impacts to Bedrock Groundwater Quantity

No impacts are anticipated to the quantity of groundwater in the Williams Fork Formation or the Trout Creek Sandstone of the Iles Formation. Drilling and mining by Colowyo in the area identified very limited perched water, and no saturated conditions, in the Williams Fork Formation. In the Williams Fork Formation, the low permeability and depositional nature of the strata restrict the ability of the bedrock to store and transmit water. There are no continuous non-coal beds in the Danforth Hills. Groundwater movement is mainly controlled by fractures of varying orientation.

The Williams Fork Formation is not a significant water supply source in the Danforth Hills. It is not used as a source of water where the alluvial and surface waters are accessible. Where wells yield water, the water quality in the Williams Fork Formation is generally good. Very few registered wells for domestic, agricultural, or industrial purposes are completed in the Williams Fork Formation in the vicinity of the South Taylor pit. Drilling by Colowyo and other parties encountered no significant water in the South Taylor pit area in the litholgic sequence which is planned to mined. This is based on the drilling and geophysical logs.

It should be noted that the current East and West Pits at the Colowyo Mine do not intersect any significant aquifers. Perched aquifers have been encountered which drain rapidly. Once drained, they do not produce any significant water to the current pits. Since the South Taylor pit is higher in elevation than the two current pits, and also up dip of the current pits, no significant aquifers should be encountered in this pit.

The Trout Creek Sandstone aquifer is separated from the lowest coal seam (G8) to be mined by approximately 590 feet in the South Taylor pit area. Between this coal seam and the Trout Creek Sandstone is a mudstone/shale, sandstone, siltstone, and coal sequence of the Williams Fork Formation. About 165 feet above the Trout Creek Sandstone, a two-foot thick smectite clay layer (known as the Km bed) exists that is found throughout the Danforth Hills area. This layer has low permeability and therefore would be an additional impediment to downward or upward groundwater flow.

To determine the potential for the operations to encounter substantial groundwater and thus to require dewatering, elevations of groundwater and the depth of the pits were compared. The elevation of the potentiometric surface in well 84-0-OB was 7,054 feet above mean sea level (AMSL) in October 1984

(CDM 1985a). This well was completed in the sandstone in the above the I_3 seam of the Williams Fork Formation (as correlated by Colowyo). The lowest projected depth of the South Taylor pit is approximately 7,320 feet AMSL. The Trout Creek Sandstone aquifer has a potentiometric elevation of between 7,050 and 7,100 feet AMSL beneath the South Taylor mining area (CDM, 1985a). This indicates that the pit bottom is above the saturated bedrock.

Since the base of the pit will be above the elevations of the potentiometric surfaces in bedrock and alluvial aquifers, no impacts to the quantity of groundwater available in the Williams Fork Formation or the Trout Creek Sandstone are anticipated.

Pit Inflow and Pit Surface Water Recharge Impacts

The minor springs located on the hill slopes adjacent to the South Taylor Pit (Map 10), which flow four months of the year or less, are the springs likely to experience diminished flow. Springs 3-93-20-212 and 3-93-17-142, -143, -144, and -432 (South Taylor) and 3-93-20-213, -214, and -215 (West Fork Good Spring Creek) are located within the pit boundary and will be eliminated by the pit. Taylor Creek would potentially lose about 20 gpm of its peak flow (0.04 cfs), which is about 2% of its 1.9 cfs peak flow. The West Fork Good Spring Creek would potentially lose about 5 gpm (0.01 cfs) of its peak flow which is 0.5% of its 2.1 cfs peak flow. Since these springs only flow seasonally, neither creek would lose any base flow by the elimination of these springs.

The South Taylor pit is likely to be within the watersheds for these springs: GSCS-1, WFS-1, WFS-2, WFS-4, WFS-5 and 5A, and WFS-7 and 7A, and 3-93-29-234. These springs collectively contribute about 20 gpm to the base flow and about 130 gpm to the peak flow of Good Spring Creek, the majority of this flow originating in the WFS-2 complex. This is equivalent to 0.04 cfs contribution to the base flow and about 0.3 cfs contributed to the peak flow. The WFS-2 spring complex is located in the bottom of the drainage and therefore is likely to obtain most of its water from areas outside of the South Taylor pit area.

If all the contributions from these springs were terminated by South Taylor mining, the West Fork Good Spring Creek would lose 0.04 cfs of its base flow, and about 0.3 cfs of its peak flow. This amounts to a calculated loss of about 5% of the base flow of 0.85 cfs and about 3% of the peak flow of 11 cfs (as measured at NUGSC). However, since much of the recharge is from undisturbed areas outside of the South Taylor pit, the probable reduction is likely to be less than half of this amount and not expected to be measurable or statistically significant. Once the mining has been completed and the pit has been saturated, the contributions to surface water from springs originating from infiltration into the South Taylor pit would return to normal.

South Taylor Pit Hydrology – The South Taylor pit will have a reclaimed surface area of approximately 1004 acres and a pit bottom that inclines predominantly towards the Good Spring Creek drainage (Figure 2.05.6-1). Assuming resaturation would raise a pit aquifer level to 7,500 feet AMSL (the elevation of the lowest point on the southeastern pit boundary) and considering the pit topography, the volume of materials that must be resaturated is calculated to be 6.92×10^8 cubic feet (ft^3). Assuming 20% effective porosity, 1.38×10^8 ft^3 of water (3,178 acre-feet) must infiltrate from the surface and from the Williams Fork Formation to fill the pit to this level.

Prior to flow from a pit, resaturation of the materials in the pit must occur. The time necessary for the resaturation of the backfilled pit can be estimated by utilizing the volume of the pit, the infiltration rate, and the porosity of the materials within the pit. Published infiltration rates for the area are 0.5 inches per year (Rice, 1979) and 3 inches per year (Williams & Clark, 1992), for an average value of 1.8 inches per year. Calculated inflows, in the above equations, indicate an inflow rate 92 gpm (approximately 150 acre-feet/year from 1.8 inches infiltration over 1,000 acres) from infiltration due to precipitation. (No other water is expected to flow into the reclaimed pit materials since the South Taylor Pit is on a topographic and structural high). The volume of water needed to fill the reclaimed pit divided by the infiltration rate equals the time to fill the pit to form an aquifer necessary for sufficient outflow. The result of this calculation is approximately 45 years for pit resaturation to the elevation of the lowest point of the pit boundary where water could be discharged. This assumes no water infiltrates into the undisturbed Williams Fork Formation on the limits of the reclaimed pit, and the entire pit fill becomes saturated. It is possible that the pit fill will be anisotropic and heterogeneous in a way that can allow a pit spring to form prior to complete saturation of the pit fill. It is also possible that most or all of the pit water will enter the Williams Fork Formation (see discussion below) thereby reducing the time to reach saturation or preventing the full thickness from becoming saturated.

Groundwater from the reclaimed South Taylor pit will eventually discharge into Good Spring Creek at the drainage that is above the Sturgeon Flume (the unnamed tributary to West Fork Good Spring Creek in Section 21). This would result in a pit spoil spring and/or discharge through colluvial and shallow bedrock groundwater infiltration. This water would likely have the same characteristics as the water in the Streeter Fill well or the Streeter pond or in similar spoil springs (Williams and Clark, 1994). Analytical data for these sampling points are summarized on Table 2.04.7-31.

If all of the water that infiltrates into the pit discharges into Good Spring Creek, then 150 acre-feet per year or 92 gallons per minute (0.21 cfs) of pit spoil water will enter the Good Spring Creek drainage. This is more flow than originates from the potentially-impacted springs, which have an average annual flow of 77 gpm.

The alluvial aquifer associated with Good Spring Creek has a high transmissivity and is unconfined. Possible impacts to this aquifer would be associated with the infiltration of water from the pit and water quality deviations caused by infiltration of runoff water.

The preferential flowpath of bedrock groundwater from the reclaimed pits would tend to be down-dip through and between the different strata of the Williams Fork Formation. The discharge would be to springs and, thus, some groundwater could eventually recharge the alluvial material of Good Spring Creek.

Transmissivity of the Williams Fork Formation is presented in Section 2.04.7. Measured and published transmissivities of the upper Williams Fork Formation average about 50 square feet per day (ft^2/d). The average hydraulic conductivity of the formation is about 1 foot per day (ft/d). The values utilized to calculate these averages are presented in Table 2.04.7-26 and are from published data (Robson and Stewart, 1990; tables 5 and 6; upper member Williams Fork Formation).

A rectangular infiltration area in the undisturbed pit highwall of 133 feet long by 133 feet high could transmit all of the estimated 92 gpm (approximately 150 acre-feet) of annual recharge from the reclaimed pit. This is calculated as follows:

Annual seepage from the pit = (133 ft high)(133 ft long)(1 ft/d) = 17,710 ft^3/d = 150 ac-ft/yr.

With approximately 400,000 square feet of buried highwall, all of the meteoric water infiltrating into the reclaimed pit that contacts the pit wall is expected to enter the strata of the Williams Fork Formation. Most of this water is expected to eventually contribute to seeps and springs tributary to Good Spring Creek. This suggests that it is possible that a reclaimed pit aquifer (if it develops) will flow entirely into the undisturbed strata, and that there will be no or limited discharge into the surficial alluvium/colluvium from the reclaimed pit. Whether the pit aquifer discharges into the bedrock of the Williams Fork

Formation or into surface colluvium, it will eventually contribute to the alluvial aquifer and springs tributary to Good Spring Creek.

To evaluate the possible effects of infiltration from the pit areas, a velocity calculation for average groundwater flow can be performed. The calculation is based upon the parameters determined for the Williams Fork Formation as discussed above.

Seepage velocity (v_s), the true velocity representing the rate the groundwater flows through the pore spaces can be calculated utilizing the following formula (Fetter 2001):

$$v_s = Kdh/n_e dl$$

where:

- K is the hydraulic conductivity,
- dh is the vertical difference in groundwater elevations between two points, and
- n_e is the effective porosity, and dl is the distance between the two points.

Although the strata between the pit and the creek are discontinuous, the elevation difference between the pit aquifer and Good Spring Creek (500 feet) and the horizontal distance between the edge of the pit and Good Spring Creek (3000 feet) will be used. The gradient would approximate the dip of the lithology in the area. Assuming an effective porosity of 0.15, with an average hydraulic conductivity of 1 ft/d for the Williams Fork Formation, then:

$$v_s = (1 \text{ ft/d}) (500 \text{ ft}) / (0.15) (3,000 \text{ ft})$$

$$v_s = 1.11 \text{ ft/d}$$

The average groundwater velocity of outflow from the South Taylor pit is calculated to be 1.11 ft/d, with the flow presumed to be predominantly in a southeasterly direction following the dip of the southeast dipping leg of the small anticline (refer to Map 7A). Thus, the first pit outflow through the bedrock strata would take about 2700 days or about 7 years to flow from the pit to the creek.

Potential Surface Water Quantity Impacts

As described above, diminishment of flow into Good Spring Creek appears to be probable during and for a period after mining and reclamation of the South Taylor pit is finished. The reduction can be estimated by assuming no meteoric water infiltrating into the reclaimed pit will reach the creek from a pit aquifer for approximately 45 years after the end of operations (the time to saturate the pit - see above) or that springs located downgradient from the mine will cease flowing during and for a time after mining.

The area of the South Taylor pit is approximately 1,000 acres. Assuming that 1.8 inches of precipitation infiltrates, the pit will receive approximately 150 ac-ft per year, or 92 gpm or 0.21 cfs of recharge from infiltration as shown in the preceding paragraphs. Much of this infiltration may eventually surface at springs, likely in West Fork Good Spring Creek.

The actual resultant spring discharge will likely vary from high flow to low flow periods by an order of magnitude, as measured in the surface water features. Thus, the discharge of groundwater originating as pit infiltration used in the following calculations is assumed to range from 0.06 to 0.6 cfs, which gives a geometric mean of approximately 0.21 cfs (calculated infiltration rate from above).

Assuming that 0.06 cfs enters Good Spring Creek during low flow and 0.6 cfs enters Good Spring Creek during peak flow, the pit contribution would be approximately 7% of the base flow and 5% of the peak flow to Good Spring Creek at the NUGSC measuring point or about 3% of both base and peak flows at the LGSC measuring point. This is a maximum value, since the calculated contribution from the pit spoil aquifer is greater than the average measured flow from the potentially affected springs. Thus, the probable reduction in flow will be up to 7% of base flow for 45 years after mining ceases.

Potential Surface Water Quality Impacts

Potential impacts to the surface water quality from the South Taylor pit operations are considered here. The water quality would be impacted by meteoric water that enters the hydrologic cycle being impacted by contact with the overburden fill. To estimate the impact to surface water quality, existing geochemical and flow data for Good Spring Creek were modified by changing the flow entering from the pit (described above) to have water quality similar to that found in the Streeter Well (completed in backfill in the Streeter Fill) and Streeter Pond discharge. The Streeter Well is located in the Streeter Fill of the existing East Pit, and would appear to represent water quality in direct contact with Colowyo Mine spoils. The Streeter Pond accepts primarily groundwater from the Streeter Fill.

Assumptions used include:

1. All pit groundwater will have chemistry similar to Streeter Pond, Streeter Well, or published pit spoil geochemistry
2. All pit groundwater will eventually enter the Good Spring Creek surface water regime
3. The quantity of water entering Good Spring Creek would match assumptions in the *Potenital Surface Water Quantity Impacts* section.

The South Taylor Pit will likely have geochemical characteristics similar to the water quality in the Streeter Well, the Streeter Pond, and other spoil pit aquifers (Williams and Clark, 1994), since the lithology is relatively homogenous across the area.

The TDS in the Streeter Well is 3,750 milligrams per liter (mg/L), and TDS in pit spoil wells nearby average 3,400 mg/L (Williams and Clark, 1994). TDS concentrations in the Streeter Pond averaged 1,786 mg/L in 2005 and TDS concentrations in aquifers immediately downgradient from nearby pit spoils averaged 1,796 mg/L (Table 2.04.7-31). Wells located a half mile downgradient from pit spoil averaged 900 mg/L (Williams and Clark, 1994).

An estimate of TDS loading from backfilled spoils discharge into Good Spring Creek was developed based on a simple mass balancing based on the projected increased TDS of the water contributing to Good Spring Creek. Calculated impacts of this groundwater into the alluvial and surface water flow regime at Good Spring Creek are shown here.

A calculated spoil pit maximum discharge estimate of 0.06 cfs enters Good Spring Creek during base flow, and 0.6 cfs enters during peak flow. Therefore, a maximum of 7% of the base flow and 5% of the peak flow to Good Spring Creek at the NUGSC sampling point would be contributed from the pit outflow at steady state. (These percentages are approximately twice what the springs above NUGSC actually contribute to the creek flows.)

To project the potential impact to Good Spring Creek, a weighted TDS loading between the historic low flow at NUGSC (0.85 cfs and 1,050 mg/L TDS) (Table 2.04.7-34) and the projected spoils (0.06 cfs and 3,400 mg/L (worst case) and 1,796 mg/L (likely case) TDS; Table 2.04.7-31) was performed.

Worst case (pit spoil aquifer TDS concentrations):
((0.85 cfs x 1050 mg/L) + (0.06 cfs x 3400 mg/L))/0.92 cfs = 1192 mg/L

Reasonable case (groundwater immediately downgradient from pit spoil):
((0.85 cfs x 1050 mg/L) + (0.06 cfs x 1796 mg/L))/0.92 cfs = 1087 mg/L

Thus, the base flow of Upper Good Spring Creek is calculated to have between 37 and 142 mg/L increase in total dissolved solids, or an increase of between 3.5% and 13.5% caused by the projected contribution from the pit springs. The increase in TDS in the base flow at Lower Good Spring Creek (with the base flow of 1.8 cfs and TDS of 1187 mg/l placed into the above calculations) would be between 20 mg/L and 71 mg/L, or between 1.6% and 6% of TDS increase. Peak flow TDS increases would be less than these values.

Based upon analyses performed by Williams and Clark (1994) at the Seneca II Mine, the dominant anion would most likely be sulfate and that the oxidation of the pyrite would be the main source of TDS in the spoil pit water. Oxidation of minor pyrite in the spoil could produce soluble sulfate at the South Taylor pit, which will be the dominant ion causing the increased TDS. The duration of the elevated TDS can be predicted based upon the oxidation of pyrite in the reclaimed spoils pit aquifer.

Saturation indices (SI) were calculated for the average constituent concentrations in well 84-0-OB (Williams Fork Formation well) and the Streeter Well. The SI is used to determine if a mineral will dissolve into or precipitate from solution. A negative SI indicates that the water is undersaturated with respect to the mineral and, if present, the mineral should dissolve. If the SI is positive, the water is supersaturated with respect to the mineral, and the mineral should precipitate from solution. An SI near zero indicates a condition near equilibrium. Table 2.05.6-3 presents the SI for the wells at Colowyo Mine.

The SIs presented in this table are very similar to those determined by Williams and Clark (1994). Calcite and dolomite have positive saturations indices in the sampled wells; therefore, the water is saturated with respect to these minerals and it is not anticipated that an increase in TDS would occur. Sulfate minerals (gypsum and epsomite) have negative SIs; therefore, the water is not saturated with respect to these minerals and increases in TDS would occur if sulfate minerals were present in the spoil. This is consistent with the increase in sulfate in the Streeter Well (1,960 mg/L) as compared to Good Spring Creek (average of 600 mg/L).

The average pyritic sulfur concentration in the spoils is 0.09 percent in borehole 97-15, the only borehole in South Taylor with every interval analyzed for pyritic sulfur. The pyritic sulfur concentrations in boreholes 83-D3-07, -10, -12, and -14 were measured at only selected intervals biased towards high pyrite; the arithmetic mean of these samples is 0.45% pyritic sulfur. Based upon the exhaustion time for 0.20 percent pyrite of 300 years (Williams and Clark 1994), the time of the elevated TDS discharge would be between 150 and 600 years. The actual duration would be reduced in direct proportion to the amount of "piping" that occurs as a result of channel formation within the spoils. This type of flow is documented at other mines, and has reduced the amount of pyrite oxidized in the spoil. Prediction of the amount of piping that will occur is not possible, but assuming that 25 percent of the spoil pile would be bypassed by piping, then the duration of elevated TDS concentrations would be reduced by 25 percent to 110 to 450 years.

Other Potential Impacts

Flooding and stream flow regime do not appear to have been affected by past mining operations or reclamation, nor are they anticipated to be affected by South Taylor mining. Groundwater availability in the area may potentially be enhanced with the storage of water in the reclaimed pit. Colowyo currently owns all water rights within Taylor Creek and owns over 20% of the appropriated amount (10.83 cfs of the total 51.6 cfs available) of water available in Good Spring Creek. Thus, any potential diminishment of flow will be compensated for by reduced use by Colowyo. There is sufficient capacity for Colowyo to reduce their use of adjudicated water to compensate for potential diminishment of flow in the creek, allowing downstream users full access to their water rights.

2.05.6 (4) Protection of Public Parks and Historic Places

No public parks are located within the permit or adjacent areas; therefore no public parks will be affected by the mining operations. Likewise the mining operations will not affect any places listed or eligible for listing in the National Register of Historic Places.

2.05.6 (5-6) Surface Mining near Underground Mining; Subsidence Control

No surface mining activities will be conducted within 500 feet of an underground mine. Therefore, there is no subsidence control plan for operations. The Red Wing Mine, a historic underground mine, exists north of the South Taylor pit and is shown on the existing Map 31.

2.06 PERMIT REQUIREMENTS - SPECIAL MINING CATEGORIES

2.06.1-3 Scope, Experimental Mining, and Mountain Top Removal

There will be no experimental mining practices at the South Taylor or Lower Wilson pits.

2.06.4 Steep Slope Mining

The steep slope mining procedures specified in Rule 2.06.4(2) will not be applicable to the South Taylor Mining Area; however, Colowyo will be requesting a variance from approximate original contour for steep slope mining in accordance with Rule 2.06.5 as outlined in the following section.

2.06.5 Variance from Approximate Original Contour Restoration Requirements

The South Taylor mining area will include non-mountaintop removal steep slope surface coal mining and reclamation operations, where the operation is not to be reclaimed to achieve the approximate original contour as required in Rules 4.14.1-4.14.6 and 4.27.3. Therefore, Colowyo is requesting a variance from approximate original contour in the post-mining topography (PMT). This is due to the fact that steep slopes will not remain steep slopes in the post-mining topography. However, the PMT will reflect the pre-mining topography generally, with drainages and drainage divides remaining in their approximate current locations. Post-mining topography is shown on Map 19B. The PMT was designed by Norwest Corporation based on the Divisionrules for Operations on Steep Slopes as discussed in Section 4.27 of this document.

2.06.5 (2) (a) Post-Mining Land Use

Post-mining land use (agricultural/ rangeland) will be enhanced by the PMT since the reduced slopes will allow an increase in forage, will decrease erosion, and will tend to modulate surface-water runoff. Rangeland is the current and only post-mining use of the land. The written request by Colowyo for this variance is included in the cover letter.

2.06.5 (2) (b) Consultation with Planning Agencies

The land to be mined is owned by Colowyo and the Bureau of Land Management. Therefore, consultation from land-use planning agencies is not applicable.

2.06.5 (2) (c) Alternative Postmining Land Uses

Rangeland is the current and only post-mining use of the land.

2.06.5 (2) (d) Watershed Improvements

The reduced slopes of the PMT will decrease erosion and control surface-water runoff; therefore, reducing the total suspended solids and other pollutants discharged to ground and surface waters from the permit area. The total volume of flows from the permit area will not vary in a way that adversely affects the ecology. Approval from environmental agencies is not applicable.

2.06.5 (2) (e) Owner Approval

The owners of the property within the revision area are Colowyo and the Bureau of Land Management. A letter requesting that the variance from Approximate Original Contour for Steep Slope Mining be granted from BLM is included as Figure 2.06.5-1.

2.06.5 (2) (f) Compliance with Limited Variances

The operations will be completed in compliance with the requirements of limited variances as outlined in Section 4.27.4 of this permit document.

2.06.6 Prime Farmlands

Prime farmlands do not exist within the South Taylor/Lower Wilson permit revision boundary (see Section 2.04.12).

2.06.7 Reclamation Variance

There will be no delay in contemporaneous reclamation due to underground mining activities; therefore, this section is not applicable.

2.06.8 Alluvial Valley Floor (AVF)

General

Both a field investigation and technical evaluation of the Wilson Creek drainage was conducted in accordance with this Section and draft OSM Technical Guideline, "OSM Alluvial Valley Floor Guidelines", dated June 11, 1980. The investigation resulted in no identification of alluvial valley floors in the area to be mined; however, some of the floodplains of Good Spring Creek, West Fork Good Spring Creek, Wilson Creek, lower Taylor Creek, and lower Jubb Creek may conform to the geomorphic criteria of alluvial valley floor (AVF) surface landforms because they are underlain by unconsolidated material of Quaternary Age (Map 11B). None of these floodplains are located in the area to be mined as shown on Map 23A.

The Gossard Loadout is located in an area between Wilson Creek and Taylor Creek near the junction of these two drainages; however, no major subsurface disturbance has occurred in this area that might adversely affect the possible subsurface hydrologic system with regards to potential alluvial valley floors. The actual area to be mined is located well above the flood plain of Wilson, Taylor, and Good Spring Creeks, both topographically and hydrologically. As discussed in Section 2.04.7, the existence of groundwater in the mining area is limited to perched systems that primarily discharge small amounts of water in the canyon walls near the mine on a seasonal basis and in some of the unconsolidated alluvium. Very little water is found in the current active mine; and, based on existing geological and hydrological evidence, the areas to be mined provide no or only minor amounts of recharge to local surface water features. Therefore, the flood plains of Wilson Creek, Good Spring Creek, lower Taylor Creek, and their tributaries will not be directly impacted except at road crossings (discussed elsewhere in the application) and should not be adversely affected by mining operations.

Geomorphic Characteristics

The investigation was initiated by mapping unconsolidated deposits in the general area, using published and unpublished geologic maps and ground reconnaissance. These deposits, their associated stream channels and the general topography of the floodplain areas are shown on Map 10. The watersheds of Good Spring Creek, Wilson Creek, and Taylor Creek are also delineated on Map 10. From field reconnaissance, it was determined that many of the mapped floodplains in the general area are extremely narrow, have been severely down-cut (Wilson and Jubb Creeks), and/or contain too much topographic relief in the form of slopes to be considered capable of being irrigated.

Agricultural Activities

Section 2.04.3 contains a description and map of agricultural activities in the permit and adjacent area. The Land Use Map (Map 17) shows that the historic pre-mining land use of the area has been generally undeveloped rangeland. The description under Section 2.04.3 documents crops in the permit area. Historically, there has not been a developed water supply for agricultural activities to expand upon; however, some limited irrigation is conducted in the floodplains of Good Spring Creek and Wilson Creek.

Flood Irrigation – The areas that are currently or were historically flood irrigated are shown on Map 17, *Land Use*. Irrigation diversion points, irrigation canals, and topography are shown on Map 10. A small area of Wilson Creek above the mine permit boundary is irrigated, and some areas near the Gossard Loadout have historically been irrigated. No irrigation has occurred in West Fork Good Spring Creek.

Subirrigation – The channel fill of the floodplains in the canyon areas is generally comprised of unconsolidated deposits in a clay matrix. The clay soil texture will minimize the transmission of water to or from the overlying stream and root zone. Due to the narrow area in the floodplains, the overall slope of the drainage and expected clay soil, the likelihood of a developed subirrigation in the canyon areas is questionable.

The West Fork Good Spring Creek does not meet the criteria of an AVF based on field reconnaissance. It has areas with flat topography and clayey soil where surface water occasionally accumulates after precipitation. This allows the valley bottom to support lush vegetation without subirrigation. Monitoring wells A-7 and A-8 reveal a water table that is at least 10 feet below ground surface. Based on field and monitoring data, the West Fork Good Spring Creek is not an alluvial valley floor.

The area of Wilson Creek below the Lower Wilson Mine and extending north about four miles is an area that was formerly described as a potential AVF and was mapped as such by some (OSM, 1985). This area was subjected to a flooding and mass-wasting event that downcut the alluvium 20 to 30 feet below the former surface and left two narrow terraces 20 to 30 feet above Wilson Creek on either side of the creek. These terraces are generally no wider than 100 feet and in many places are much narrower than 100 feet. A monitoring well in this section (well MW-95-03) was installed to the base of the alluvium at the mouth of the unnamed drainage holding the Lower Wilson expansion area. This well, installed during the summer of 2005, is 57.34 feet deep and encountered angular "clinkers" and no stream-rounded alluvium. The well had 3 feet of water in August 2005, but contained only a few tenths of a foot of water in September and October 2005. This indicates that the alluvium in the terraces is dry and is not sub-irrigated.

The narrow width and fragmented nature of the minimal flat land, depth to groundwater, and impracticality of irrigating or mechanically farming this stretch of Wilson Creek indicates that it does not qualify as an alluvial valley floor. However, mining will in no way adversely affect the ability to irrigate or farm any agriculture or potential agriculture area, including this area.

Water Quality and Quantity

Since 1974, Colowyo and other private and governmental groups (VTN, BLM, and USGS) have collected samples of water flows and water quality. The results of all this work is summarized in section 2.04.7.

Aerial Photograph Analysis

Aerial photographic coverage of the permit area and adjacent area has been complied by the OSM in Denver, Colorado. The photographs are infrared and show the late summer and fall season differences in vegetative growth between upland and valley floor areas. Good Spring Creek appears in the aerial photographs to possibly be an alluvial valley floor.

Effects on Essential Hydrologic Functions

Based on information accumulated, the effects of mining on any alluvial valley floor which exist in the general area would be minimal. Because of the undefined perched existences and limited amounts of bedrock groundwater in the area to be mined, the planned mining will not directly impact any alluvial valley floor. Any water recharge of the nearby drainages and unconsolidated material from the mine would be negligible in comparison with the overall natural flows of the streams recharged in areas above the operation.

The flood plains of Good Spring Creek, portions of Wilson Creek, and lower Taylor Creek may meet the geomorphic criteria and flood irrigation requirements of an alluvial valley floor. Runoff from the mining operations drains into these floodplains. Therefore, Colowyo has taken and will take appropriate measures to protect surface water. This includes designating stream buffer zones and installing sedimentation ponds on the drainages from disturbed areas feeding into surface water features (see Hydrology maps 10A and 11A). The overall role of the floodplains in collecting, storing, regulating and yielding water for agricultural activities has been unchanged and is anticipated to be unaffected by the mining operations.

The possible alluvial valley floors near the mine impact areas will incur no adverse impact due to mining by Colowyo. Surface water pollution will be controlled by sedimentation ponds, sediment control measures, proper mining and reclamation techniques, and frequent monitoring of discharge water quantity and quality. The hydrologic consequences of mining will not result in disruption of the essential hydrologic functions due to the beneficial effects of water treatment and flood control provided by the sedimentation ponds.

Additional Information

The following excerpt taken from an October 8, 1981 letter from Colowyo to the Division expands further on the alluvium/colluvium issue in the Taylor Creek drainage.

> "In the original permit application submittal, Colowyo had described the soils in the Taylor Creek Drainage (Map 10B) as Quaternary Alluvium. The description was derived from a U. S. Department of Agriculture Service Soils Classification Survey at the series level which identified the Taylor Drainage soil as a (stratified alluvium)."
>
> "On the basis of a September 18, 1981 field reconnaissance by Colowyo personnel together with Dave Craig and Brian Munson of the CMLRD staff, it was agreed that the SCS classification of Taylor Creek as an area of stratified alluvium was and is erroneous particularly as geomorphic criteria required to describe an AVF are absent. As a consequence, the designation of the Taylor Creek Drainage as quaternary alluvium on Map 10B, Regional Hydrology has been deleted. This area should be mapped as colluvium.
>
> "Other examination of the area on September 18, 1981 further confirmed a colluvial classification, in that some unsuccessful irrigation in the area is presumed to have occurred, and such irrigation was practiced on the colluvial slopes adjacent to the bottom of the drainage. No irrigation ditches, however, are extant, and it is apparent that no subirrigation occurs in the area.
>
> "Additionally, insufficient water flows in the Taylor drainage to sustain any flood irrigation. Irrigation apparently began from a ditch known as the Mary C. ditch in 1913 on an undetermined acreage, but was certainly less than 25 acres. The state Division of Water Resources records date back to 1960, and they have no record that this ditch has been used since that time. Years ago small isolated areas such as this could be irrigated economically, and were important to 160 acre size homesteads.
>
> "However, in recent years with larger farms and ranches, larger equipment, and increased labor costs, small isolated areas such as this are seldom irrigated. This is especially the case when the water source is from an ephemeral drainage such as Taylor Creek, and runoff is mostly a function of snow melt and large precipitation events, and varies largely from year to year.
>
> "The revised Map 10B will be submitted when all of the map revisions have been completed. Map 10 will also be revised to show that the area of quaternary alluvium extends to the confluence of Taylor and Wilson Creeks from the north. The labeling of the gauging stations at the confluence of Taylor and Wilson Creeks will also be corrected on the revised Map 10B".

In order to verify the predicted effects of mining activities on groundwater and surface water, Stipulation #1 of the initial Permit required Colowyo to submit a comprehensive water monitoring plan. For further details regarding this plan, refer to Section 4.05.13, Surface and Groundwater Monitoring. Refer to the 1983 - 1989 Annual Reclamation Reports for further details as to the data collected.

2.06.9 Augering and Highwall Mining

In the South Taylor Pit, highwall mining has successfully occurred on the E seam in the northwestern area of the West Taylor Fill and the northeastern extent of the box cut. Please see Map 23A for these locations. Currently, Colowyo is proposing to highwall mine the G7/G8, E, and D2 seams on the low wall and end wall of the South Taylor Pit (see Map 23A). The planned highwall mining sequencing will begin with the G7/G8 seam, and once mining is completed the pit will be backfilled to the E seam. Colowyo plans to highwall mine the E seam then backfill to up to the next seam and highwall mine it accordingly. This sequencing of highwall mining and backfill will adequately mine the full extent of the reserve over time. One additional area has been proposed to be highwall mined on the western perimeter of the South Taylor Pit (see Map 23A); however, at this time additional engineering studies and exploratory drilling evaluations may be needed to fully define the mineable reserve in this area.

Please see Volume 1, Rule 2.06-8 for previously and proposed highwall mining locations in the East and West Pits.

2.06.10-2.06.11 Processing Plants, In-Situ Processing

See original permit for these three sections

2.06.12.1 Coal Refuse Piles

Coal refuse piles do not exist on the Colowyo property. Thus, this section is not applicable.

2.07 – 2.10 VARIOUS

Information required by these sections is included in Volume 1, in other sections of this application, in the cover letter or is not applicable to the South Taylor mining area. Colowyo understands the permitting process employed by the Division and will facilitate that process as requested.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

2.05.4 (1) Reclamation Plan

Please see Volume 1 Section 2.05.4 for a detailed description of the reclamation plan that will be implemented in the Collom area.

2.05.4 (2)(a) Reclamation Timetable

The sequence for reclamation following the mining process is shown on Map 29B (Spoil Grading – Collom). Final reclamation of the Collom Pits will continue through 2033. A large, temporary out of pit stockpile of approximately 168 million cubic yards will be needed during the initial years of mining. As activities progress, a sufficient volume of backfill void will be created, and the Collom Pit should reach a steady state of operation where the advancing overburden face moves southward at the same rate as the advancing backfilling benches. This should occur approximately five years after mining is initiated. At that time, spoil regrading and subsequent reclamation activities will accelerate. The temporary out of pit stockpile is expected to remain in place until the final two years of mining activities. At that time, this material will be needed to fill the final pit void.

2.05.4 (2)(b) Reclamation Costs

The estimate of the cost of reclamation of the operations required to be covered by the performance bond will be found under Rule 3.

2.05.4 (2)(c) Backfilling Plan

Initially a temporary out of pit spoil pile will be created to the north of the Collom Pit and will remain in place until the end of mine life. Then, as mining progresses to the south, overburden material from each successive cut will be backfilled into the previously mined out area and the additional spoil will continue to buildup in previously mined areas. Table 2.05.6-5 presents a mine wide volumetric calculation in support of post mining topography and illustrates that permanent out of pit spoil will not be needed.

The backfilled mining areas will be graded to establish a stable post mine topography that blends into the undisturbed areas outside the mining limits. Please refer to Map 19C. Colowyo will grade all final slopes so that overall grades do not exceed 3H:1 as shown on Map 20C. The final surface as shown on Map 19C will approximate the overall pre-mining character and grades.

Please see Volume 1 Section 2.05.4 for additional information pertaining to backilling operations at Colowyo.

2.05.4 (2)(d) Topsoil Salvage

Prior to any mining-related disturbances in the Collom area, all available topsoil will be removed from the site to be disturbed as discussed in Section 2.05.3, and will be redistributed or stockpiled as necessary to satisfy the needs of the reclamation timetable as described herein.

Topsoil Redistribution Plan

Please see Volume 1 Section 2.05.4 for a detailed discussion on topsoil redistribution plans for the Collom area.

2.05.4 (2)(e) Reclamation Revegetation

Please see Volume 1 Section 2.05.4 for a description of the revegetation process that will be utilized for the Collom area.

2.05.4 (2)(f-h) Disposal, Mine Openings, Water and Air Control

Acid-Forming and Toxic-Forming Materials

No significant acid-forming materials exist within the overburden soil or coal seams to be mined. Therefore, Colowyo will not undertake special handling procedures as described in Section 2:05.3. A detailed description of the chemical characteristics of soils and overburden materials is presented under Sections 2.04.6 and 2.04.9.

For a detailed description of the special handling of spoil material and sampling programs, refer to the Production Methods and Equipment Segment of this section.

Flammable liquids, such as oil and fuel, will be protected from spilling into other areas by earthen, concrete or HDPE lined structures surrounding each storage facility. A spill containment control plan protects against spills and will be available to the Division to review as requested.

All major equipment on the Collom area mine operation will be equipped with portable fire extinguishers or automatic fire suppression systems. The water trucks used for dust suppression at this location could also be used to control most fires.

Sealing of Exploration and In-Pit Mine Drill Holes

Exploration and in-pit mine drill holes which remain open for use as a water supply well or for use as a groundwater monitoring well will be completed following the guidelines of the Colorado Division of Water Resources Water Well Construction Rules (2 CCR402-2, Eff. Date January 1, 2005).When the groundwater monitoring wells are no longer needed or required for any purpose, each well will be eliminated by plugging plugged and/or sealed following the before mention guidelines of the Colorado Duivision of Water Resources.
Plugging procedures utilized for exploration drill holes that will not be mined through during the current Permit term are as follows:

1. Drill holes drilled deeper than the stripping limit (450-500 feet) will be plugged by pumping cement or heavy solids bentonite Plug Gel or chips through the drill stem from the bottom up to within 3 feet of the ground surface.
2. Drill holes shallower than stripping limits (450-500 feet) may be plugged with the ready-mix concrete method instead the method in #1 to within 3 feet of the ground surface.
3. Drill holes with no water or coal zones may be plugged by backfilling with cuttings, and placing a plug ten feet below the ground surface to support a cement plug or bentonite chips to within 3 feet of the ground surface.

For safety considerations, exploration drill holes that will eventually be mined through during the present Permit term need only be covered with wood, plastic or other such material or otherwise bermed to prevent access.

Those holes completed in continuous water bearing zones will be sealed entirely with cement or other suitable sealant to within 3 feet of the ground surface.

Where possible, the sealed holes will be marked. At times reclamation operations will cover up the sealed drill holes and marking of holes will not be possible.

Within 60 days of the abandonment of a drill hole, approved drilling program or when requested by the Division, the following information will be submitted:

a) Location of drill hole as plotted accurately on a topographic map.
b) Depth of drill hole.
c) Surface elevation of drill hole.
d) Intervals where water was encountered during drilling activities.
e) Diameter of drill hole
f) Type of amount of cement or other sealant used.
g) Name of drilling contractor and license number of rig.
h) How the hole was worked.

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.

Water and Air Quality Control Techniques

Steps to be taken to comply with the Clean Water Act and other applicable water quality laws and regulations and health and safety standards include a comprehensive drainage and sediment control plan described in Section 2.05.3 and Sections 4.05.1 through 4.05.18. With respect to compliance with the Clean Water Act, Colowyo has a discharge permit from the Colorado State Department of Health under the National Pollutant and Discharge Elimination System (NPDES) that will include all new discharge structures constructed for the Collom area expansion. Compliance with this permit will serve to effect compliance with the Clean Water Act and the Colorado Water Quality Control Act.

Colowyo, likewise, operates under several emission permits from the Colorado Department of Health, Air Pollution Control Division. Fugitive dust control measures will be employed as an integral part of the mining and reclamation operations.

Colowyo conducts air quality monitoring at the site in accordance with the requirements of emission permits approved by the Colorado Air Pollution Control Division.

Details of pollution control measures are discussed in section 2.05.6.

2.05.5 Post-Mining Land Uses

Historically, the Collom area has been managed utilizing the principles of multiple-use and can be most accurately described as rangeland and wildlife habitat. Map 17 serves to identify both the pre and post-mine land use designations. The land management staff of Colowyo, the BLM and the Colorado State Land Board fully support Colowyo's approach to the re-establishment and enhancement of multiple-use Rangeland with subcompoents of grazing land and wildlife habitat for the Collom aera. Copies of the correspondence confirming these views have been included in this package and are identified as Figures 2.05.5-1, 2.05.5-2 and 2.05.5-3 respectively. Much of the lower portions of the Collom area receive light to moderate grazing pressure primarily from cattle but also some use by sheep herds. These lower elevations also provide seasonal transition (migratory) habitat for big game, but more importantly offer breeding and brooding habitat to indigenous sage grouse and sharp-tailed grouse populations. The higher elevations receive slight to light grazing pressure from cattle, but more typically light to moderate grazing pressure from sheep herds. These higher elevations also provide spring and summer habitat for big game, especially local elk herds (Exhibit 10 Item 6).

The post-mine land uses of rangeland with the subcomponents of grazing lands and wildlife habitat for the reclaimed areas in Collom is identical to the pre-mining land use found in the area. No change in land use is expected in the land use categories. Therefore, the post mine land use will be consistent with the historic land use on lands within the Collom area. Please see Section 2.04.3 for additional information regarding the pre-mine land uses in the Collom area.

2.05.6 Mitigation of Impacts of Mining Operations

2.05.6 (1) Air Pollution Contol Plan

Air quality will be protected in accordance with the procedures outlined in Volume 1, Section 2.05.6. Air quality information including the CDPHE air permits are available onsite and can be reviewed by request.

2.05.6 (2) Fish and Wildlife Plan

Procedures specified in the permit document starting in Volume 1, Section 2.05.6 will be followed by Colowyo to ensure minimal impacts to fish and wildlife in the mining area. At the conclusion of mining activities in the Collom area, disturbed lands will be restored in accordance with the reclamation plan. Colowyo is continuously working with the regulatory community to improve habitat restoration practices and minimize disturbances to fish and wildlife. As discussed, the Collom Mining area should not impact any species currently listed as threatened or endangered. Big game animals endemic to this area utilize habitat regionally and reclamation efforts will not target them specifically as multiple off-site habitat improvement initiatives are on-going in cooperation with CPW to improve big game animal habitat. As impacts to sagegrouse habitat are going to be an area of high interest for the foreseeable future, it is prudent and appropriate to manage reclamation activities to mitigate impacts to this species specifically, if not exclusively. Efforts to increase the diversity and forage productivity of reclamation units in both the existing operation and Collom area should provide a great benefit to all species impacted by by the physical disturbance of mining related activites. Livestock grazing and hunting activities will be reinitiated after full bond release has been granted in the future. These tools will assist in further development of an already diverse reclamation landscape post-mining.

Impacts of Mining Operations on Wildlife Resources Within the Mine Plan Area

Impacts to wildlife in the Collom expansion area can be found in Volume 1, Section 2.05.6

Range and Wildlife Management Programs

Range and wildlife management programs are described in Volume 1, Section 2.05.6.

Disturbed Areas

Please refer to Volume 1, Section 2.05.4 for a further description of disturbed acreages within the permit boundary.

Habitat Improvement Program

Please refer to Volume 1, Section 2.05.4 for detailed information on historical habitat improvement programs previously undertaken at Colowyo Mine.

Many individual habitat improvement initiatives have been completed through the efforts of the CPW and the Morgan Creek Ranching for Wildlife operation. These efforts will be continued into the future. The Collom area reclamation plan (collectively Volume 15, Section 2.05.4 and 4.15 and referenced sections from the existing Coloywo permit) specifically target improved shrub establishment over all future reclamation units and focus on the creation of sagegrouse brood rearing habitat that will improve habitat availability and value for other sagebrush obligate species as well.

Sagegrouse Mitigation

During permitting activites for the South Taylor Mining area, regulatory developments convinced Colowyo, CPW and the Colorado Division of Reclamation, Mining and Safety to target sagegrouse brood rearing habitat for future reclamation planning efforts and overall improvement in shrub establishment on reclaimed lands at Colowyo. The result of these efforts rewrote the existing reclamation plan and performance criteria for bond release This plan was developed specifically to create sagegrouse brood rearing habitat, while promoting improved shrub establishment on all reclamation areas. This effort and focus will continue into the future with Collom expansion area reclamation, as the reclamation plan developed for Collom mirrors the principles and innovations applied to the existing mining area.

As stated previously, Colowyo will focus on sagebrush steppe establishment as a function of sagegrouse habitat creation. Sagebrush obltigate species will also benefit from these efforts as a result. Again, please refer to Map 44 for the location of (potentially impacted) pre-mine sagegrouse lek areas and stockponds that will add value for sagegrouse habitat.

The reclamation plan focus, reclamation seed mixes, bond release criteria, interim revegetation monitoring program and pre-planning of disturbance to avoidance high value habitat (leks) where practical, was initiated in large part to specificically mitigate potential impacts to area sagegrouse populations from mining activity. Consideration was given to all endemic wildlife populations during the creation of the reclamation plan and seed mixes in order to balance multiple uses among different wildlife species, not only on the sagebrush steppe areas, but areas targeted for grassland as well. Justification for the use of specific plant materials for the sagebrush steppe and grassland areas may be found under Section 2.05.4.

Electric power lines located in the permit area will be constructed in accordance with the requirements of Section 4.18 to minimize potential electrical hazards to large raptors.

Vehicle use within the Collom area will be limited to the active mining area and the various support facilities. Off-road vehicle use is kept to a minimum and is usually only authorized for surveying, environmental data collection and monitoring, security, etc. Travel by foot, which causes much more disturbance to wildlife than vehicle traffic, is highly unlikely outside active mining areas.

Speed limits in the mine area will be limited to reduce the likelihood of collisions between vehicles and wildlife. Colowyo employees are fully aware of the possibility of encountering wildlife on and around the current operation and will take special care to avoid these species in the Collom area.

With regard to sage grouse populations, Colowyo believes that the revegetation metrics presented within this submittal address the concern for negative impacts to area populations and brooding habitat. It is anticipated that sage grouse use of reclaimed lands will return to pre-mining levels, or perhaps return to elevated levels as has been experienced at certain Wyoming mining operations.

Additional Mitigation Measures Recommended By CDOW

During the PR-03 permitting process, Colowyo provided the Division with copies of the communications between CPW and Colowyo that identified additional mitigation strategies Colowyo will implemented in order to further offset disturbance in the Collom Expansion Area. The Division received a letter from CPW dated February 15, 2011 regarding wildlife mitigation suggestions based on the disturbance area in the Collom Expansion Area. Colowyo management staff met with CPW staff on April 29, 2011 to discuss the specific mitigation issues raised by CPW's February 15, 2011 letter to the Division. Colowyo subsequently drafted a letter to CPW on May 4, 2011 clarifying points of agreement and providing specific proposals for additional wildlife mitigation measures. CPW responded to Colowyo's May 4, 2011 letter on May 17, 2011 in a letter further refining their recommendations. Colowyo has agreed to accommodate and is specifically identifying the the following recommendations of Colowyo's May 4, 2011 letter to CPW and CPW May 17, 2011 letter to Colowyo that are not already incorporated/required by Colowyo's revised reclamation plan or other process or statute below:

<u>Greater Sage Grouse:</u>

- Colowyo has offered to evaluate current livestock grazing management practices and multiple stakeholder agreements in the Axial Basin and Morgan Creek Ranching for Wildlife areas for identification of additional opportunities to minimize impacts to and enhancement of habitat of Greater Sage Grouse in the area. Input from CDOW will be a helpful component of these evaluations.
- Colowyo will incorporate the utilization of marking flags on perimeter fences in the Collom Expansion area to minimize incidents of Greater Sage Grouse mortality through grouse/fence collisions. CPW provided a letter dated July 30, 2014 which outlines the locations that Colowyo will demarcate fences to minimize Greater Sage Grouse impacts. Please see Figure 2.05.6-3.
- Colowyo will treat NPDES discharge ponds for mosquitos to reduce the potential of West Nile Virus transmission to local grouse populations if this treatment is not specifically precluded by CDPHE regulation of Colowyo's discharge ponds.

During a series of meetings since the approval of PR-03 between CPW, BLM, USFWS, Tri-State, and Colowyo it was determined that there would potentially be direct impacts to approximately 2,133 acres of mapped Preliminary Priority Habitat (PPH) for Greater Sage Grouse (GSG) from the mining plan approved under PR-03. In addition to the direct impacts, consultation with CPW, BLM and USFWS biologists determined that indirect impacts would potentially occur up to 900 meters (2,953 feet) from the edge of disturbance. This distance was determined using several years of monitoring data from the Axial Basin where existing operations have been occurring and a number of years of recorded GSG locations near the existing mining operations obtained through radio telemetry by CPW in cooperation with Colowyo. It was also determined that mining of the Little Collom X Pit (approved under PR-03) would cause a significant impact GSG lek adjacent to the pit. Therefore, Colowyo agreed to relingquish mining of the Little Collom X Pit and redesigned the temporoary overburden spoil pile location to significantly reduce the potential impacts to GSG.

Based on the 900 meter distance, it was determined that there would be 2,180 acres of PPH potentially indirectly impacted. In total, there would be 4,313 acres of PPH potentially impacted both directly and indirectly by the mine plan disturbance under PR-04. To offset both the direct and indirect potential impacts to GSG PPH, Colowyo has agreed reduce the mining plan by not mining the Little Collom X Pit, redesign the temporaory spoil pile and relocate to create a larger buffer from an active GSG lek, and also to implement the following GSG mitigation measures:

- Colowyo will donate a total of 4,543 acres of Colowyo privately owned surface within PPH but outside of the permitted mine boundary in five non-contiguous parcels to CPW. This land will be managed by CPW for the preservation and maintenance of GSG habitat in the Axial Basin in perpetuity. The land donation will become effective and CPW would assume management of these areas prior to any land disturbance activities at the Collom Pit or temporary spoil pile area. A Land Donation Agreement will be signed between Tri-State/Colowyo and CPW, and will include details for the land donation along with a legal description of the area.
- Under the Land Donation Agreement with CPW, Colowyo will transfer all grazing and mineral rights held by Colowyo on those parcels to CPW, as well as the water rights to any stock watering structures located on those parcel
- Construct all sediment control structures outside of the GSG lekking and brook rearing seasons (March 15 – May 15 and May 15 to July 15, respectively.
- Colowyo will make a one-time cash donation of $150,000 to CPW to preserve and protect the GSG and to fund on-going research monitoring of the GSG.

<u>Columbian Sharp-Tail Grouse:</u>

- Mitigation efforts identified for Greater Sage Grouse will also benefit Columbian Sharp-Tail Grouse. No specific mitigation efforts have been requested by CPW beyond the efforts to be undertaken for Greater Sage Grouse, Mule Deer and Elk.

<u>Mule Deer and Elk:</u>

- Colowyo will incorporate CPW recommended guidance for wildlife friendly fencing when construcing new fences in the Collom Expansion Area.
- Colowyo will incorporate supplemental lighting at critical points of the Collom Haul road to the Gossard Loadout in order to improve wildlife visibility and minimize wildlife/vehicle collisions.
- Colowyo will limit highway haul truck speed limits to 50 mph at the locations where the Collom Haul Road to the Gossard Loadout intersects established wildlife travel/migration corridors during periods when wildlife are actively crossing the road to minimize wildlife/vehicle collisions.
- Colowyo will maintain a record of wildlife/vehicle collisions including date, time, location, and species involved in the collisions.
- Colowyo will incorporate plant species that are beneficial for mule deer and elk into the seed mix utilized for conversion of the Gossard Loadout facility area wheat fields to perennial vegetation.
- Colowyo will consider incorporation of a wider shoulder on the East side of the Collom Haul Road in areas that do not increase disturbance of wetlands or incur other inadvertent negative environmental impacts. The West side of the Collom Haul Road already incorporates a wide area for tracked equipment travel that will be maintained free of vegetation or managed to maximize wildlife visibility.
- Colowyo will continue to support additional efforts for habitat enhancement activities in the Axial Basin and Morgan Creek Ranching for Wildlife areas.

2.05.6 (3)(a) Protection of the Hydrologic Balance

Surface Water

Surface water will be protected in the mining areas by stormwater management as described in Section 2.05.3(4) of this permit revision application and in the Stormwater Management Plan portion of the Stormwater Discharge Permit and as shown in Exhibit 7, Item 23. Protection includes the use of diversion ditches to route surface water around the mining impact areas.

Current surface water rights will not be impacted by mining operations at Collom Pit. There is no expected long-term measurable impact to the quantity of surface water in Collom Gulch, Little Collom Gulch, Jubb Creek, or any of their tributaries. Surface water amounts that will be used in mining operations will be within the water rights owned by Colowyo.

Surface water quality of the three creeks is calculated to only be marginally impacted by mining activities. This marginal impact, described in the Probable Hydrologic Consequences section (Section 2.05.6 (3)(b)(iii) below), will be due to meteoric water being captured in and evaporated from the mine pit during operations, and meteoric water contacting an increased surface area of soil in the vadose zone and thereby theoretically increasing the mass of dissolved solids entering shallow groundwater. These dissolved solids in shallow groundwater may eventually enter the surface water system, with a theoretical increase in dissolved solids in the surface water. This increase is calculated to be small enough to have no impact on the current or projected surface water uses in the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages.

Groundwater

Groundwater in the vicinity of the Collom mining areas occurs in perched (unconfined) and confined water bearing zones of limited areal extent within bedrock of the Williams Fork Formation, the Trout Creek Sandstone (a bedrock aquifer of regional extent), and valley-fill aquifers as described in Section 2.04.7. The Williams Fork Formation water beaering zones have no beneficial use owing to their limited extent and minimal water production. Based on studies in the Collom area, the saturated water table/piezometric surface is at approximately 7150 feet. This level means that the area in and around the Collom Pit outline is under static hydrologic conditions with the water level at approximately 7150 feet. Due to this static condition, Colowyo may dewater this zone to allow mining of the coals below this elevation in the northern cut(s) of the pit.

The Trout Creek Sandstone is a sandstone unit underlying most of the permit area and extending across much of northwestern Colorado. It contains water of useable quantity and quality as demonstrated by beneficial-use wells near the permit area. The Trout Creek Sandstone is stratigraphically several hundred feet below the rock units to be mined and is separated from those strata by low-permeability layers within the Williams Fork Formation, particularly the KM layer, a regionally-continuous clay layer (see Section 2.04.5 and 2.04.6). Additionally, the Trout Creek Sandstone was removed by erosion and structural uplifts north and south of the mining area and so is isolated from the regional perspective. Based on this information, mining is anticipated to have no impact on the Trout Creek Sandstone aquifer.

Groundwater in the shallow valley-fill aquifers of the drainages crossing the permit modification area is calculated to be marginally impacted by surface mining activities, as described in the Probable Hydrologic Consequences section.

There are no registered beneficial-use wells other than monitoring wells in the Colorado Division of Water Resources well database within at least one mile downgradient of the mining area (Map 11C). In Section 2.03.4, Identification of Interests, the legal or equitable owners of record of the property to be mined or affected by surface operations and facilities incidental thereto within the Collom permit expansion area are:

Colowyo Coal Company L.P.
State of Colorado
U.S. Bureau of Land Management

No other private individual or group owns or controls any land in the Collom permit expansion area. Thus, any well within the limits of the Collom permit expansion is controlled by Colowyo. This includes the Dudek and Sweeney wells. Table 2.04.7-44 and Map 11C reflect the location and ownership and control status of these wells.

2.05.6 (3)(b)(i & ii) Hydrologic Controls

Rule 2.05.6(3)(b)(iii) requires determination of probable hydrologic consequences for the mining operations. This rule indicates that these consequences must be defined for both the permit area and adjacent areas, for quantity and quality of surface water and groundwater. Baseline conditions must be established, and possible impacts from the activities must be anticipated.

Summary of Probable Hydrologic Consequences

An evaluation was made of potential hydrologic impacts of the Collom mine to determine if the potential impacts are likely to occur and if they would be significant. Based on the assessment of potential impacts, the probable hydrologic consequences of the Collom Project are:

- Two springs mapped within the pit footprint and facilities area will be eliminated by mining. Springs near the Collom pit might experience decreased flows during mining. Three additional springs located in Little Collom Gulch north of the mine and spoil footprint area may have reduced flows as a result of the mine dewatering activities. Significant impacts to other springs are not anticipated.
- Dewatering of the Collom pit is needed to achieve stable pit slopes for safe operating conditions and will cause a drawdown in bedrock groundwater levels in the vicinity of the pit. Groundwater levels are expected to recover after mining but may be at different levels than the pre-mining groundwater. It is unlikely that the groundwater level in the pit backfill will reach a high enough elevation to cause the discharge of spoil backfill groundwater at ground surface in Little Collom Gulch. If this were to occur, it would not have a significant impact on the quantity or quality of surface and subsurface flow in Little Collom Gulch.
- The hydraulic conductivity within the backfilled pit is anticipated to be more uniform and higher than the hydraulic conductivity of the individual geologic units in the adjacent unmined areas. This will result in alternation of the bedrock groundwater flow gradient in the mine footprint area and the immediate area surrounding the footprint. In general, the higher permeability of the spoil backfill will result in a flatter groundwater gradient. Groundwater flow conditions in the areas north of the pit are expected to be similar to the pre-mining groundwater flow conditions after re-saturation of the spoil backfill.
- No other statistically significant changes to surface water and groundwater quality or quantity are anticipated.

The potential impacts that were evaluated and the resulting hydrologic consequences are discussed in the following subsections.

Potential Impacts to Springs and Seeps

Springs in the Colowyo Mine area result from three general sources: 1) typified by a relatively deep soil accumulation immediately upslope and shallow bedrock downslope of the point of discharge, 2) discharge within valley bottom deposits, and 3) from sheer bedrock faces on hillsides (CDM 1985b). The first two of these sources may mask or contribute to bedrock sources of the springs. The seeps and low volume springs flow generally in response to snowpack accumulation and subsequent melting resulting in seasonal flows.

The majority of the springs with bedrock sources appear to be contact springs. A contact spring results from the infiltration of water from the surface to a porous zone (such as sandstone) above a horizontal hydrologic barrier (such as shale) where the water preferentially flows along the contact to the exposure. This type of spring is common in areas where alternating sequences of lithologies exist that exhibit differential hydraulic conductivities, such as the Williams Fork Formation.

Table 2.05.6-4 lists the springs and seeps found in the vicinity of the mining area. The locations of the investigated springs and seeps are presented on Map 10B. Data collected for the springs and seeps were previously summarized in Table 2.04.7-49.

The potential impacts to springs and seeps listed below are evaluated for each of the three surface drainage areas that will be affected by the mine:

- Elimination of springs and seeps
- Changes in flow
- Formation of new springs and seeps

Little Collom Gulch Area

Two springs (SPRLC-01 and SPRLC-02) maintained flow during July and August 2005 in Little Collom Gulch, and produced a total of 0.30 cfs during spring runoff in June 2005, and 0.045 cfs during August 2005 base flow. (Table 2.04.7-49) Spring/seep SPRLC-03 produced a minor flow of 0.009 cfs in December 2004, and produced no measurable flow for any other sampling event. Springs/seeps V11 and V29 produced no measurable flow for any sampling event. All Little Collom Gulch spring and seep flows subsequently infiltrated into the valley fill or were captured by stock ponds. Streamflow monitoring point LLCG located near the mouth of Little Collom Gulch was dry throughout the 18 month sampling period.

Spring SPRLC-01 (V24) is located at an elevation of about 7270 ft in Little Collom Gulch within the pit footprint area and will be eliminated by the mining operations. The bedrock groundwater elevation in this area is about 7150 ft so the source of this spring is probably from perched groundwater. Spring V11 was mapped in the Little Collom Gulch drainage area at an elevation of about 7230 ft in the footprint area of the facilities but had no measurable flow during the 2005 and 2006 monitoring events. It may reflect localized discharge from snowmelt but is not a significant spring. It likely will be eliminated by the facility construction.

Spring SPRLC-02 (V30) is located at an elevation of about 6926 ft in Little Collom Gulch near the toe of the temporary spoil pile and in the area of the southeast of the Section 25Pond. Construction of the sediment pond may affect the discharge zone of this spring. Also, the mine dewatering operations may intercept groundwater that normally discharges at the spring and placement of the temporary spoil may intercept local recharge sources for the spring. As a result, spring flow may decrease during mining operations. Springs SPRLC-03 (V31) and V29 are located at elevations of about 6691 ft and 6845 ft, respectively, in Little Collom Gulch north of the temporary spoil pile and the Section 25 Pond. Similar to SPRLC-02, they may experience reduced flows as a result of the dewatering operations and placement of the temporary spoil over potential recharge areas. Neither of these springs is a significant feature and V29 was dry during the 2005 and 2006 monitoring events.

In Little Collom Gulch, the springs potentially affected by mining operations produced a combined average flow of about 0.16 cfs with a maximum flow of about 0.30 cfs and a minimum flow of about 0.015 cfs during the baseline monitoring period.

As discussed below, there is a slight chance for a spring to develop in Little Collom Gulch during the post-mining period if the pit backfill re-saturates up to the elevation that the northern pit highwall daylights in Little Collom Gulch. This spring would discharge groundwater from the mine backfill material. Further evaluation is provided under the discussion of potential impacts to groundwater.

West Fork Jubb Creek Area

There are no mapped springs in the West Fork of Jubb Creek drainage that will be directly eliminated by the mining activities.

As indicated in Table 2.05.6-4, spring V1 is not a naturally occurring feature. It is a flowing well (Well Permit No 175218) located in the stream valley at about elevation 7170 ft and is completed at a depth of at least 600 ft below ground surface. Based on the data fromavailable drill logs in the area the well is completed in the Trout Creek Sandstone. The Trout Creek Sandstone aquifer will not be affected by mining so the flow in this well would not be impacted.

Springs V10, and V32 are located at elevations 7295 ft and 7600 ft, respectively, along the West Fork of Jubb Creek and on the west side of the stream channel. However, the spring elevations are generally above the bedrock groundwater elevations and are likely sourced locally so impacts from dewatering the bedrock groundwater system are unlikely. Spring V2 is located at about elevation 6860 ft on the west side of the West Fork of Jubb Creek. It is north of the mine area and is likely sourced from local recharge. It is located within the Collom Haul Road corridor and will likely be impacted to some degree during the construction of the road.

Springs V3, V9a and V9b are also located well north of the mine area at elevations 6820 ft, 6895 ft and 6886 ft, respectively, along the east side of the stream channel. These springs are sourced from areas to the east of the stream and are not expected to be impacted by the mining activities. Two springs potentially affected by mining operations (V10, and V32) produced a combined average flow of about 0.013 cfs, a maximum flow of about 0.022 cfs and a minimum flow of about 0.004 cfs during the baseline monitoring period.

It is not expected that new springs will develop in the West Fork of Jubb Creek during the post-mining period.

Collom Gulch Area

There are no mapped springs in the Collom Gulch drainage that will be directly affected by the mining activities.

Springs SPRC-02 (V8), V27, V28 and SPRC-04 (V7) are located at elevations 6807 ft, 6701 ft, 6696 ft and 6601 ft, respectively, along the east side of Collom Gulch north of the mine area. There is a small chance for the flow in these springs to be reduced as a result of the mine dewatering activities intercepting bedrock groundwater flow that may feed the springs. However, they are more likely sourced from local groundwater that will not be affected by mining.

Springs SPRC-03 (V26), V20, V21 and V25 are located at elevations 6753 ft, 7074 ft, 7076 ft and 6785 ft, respectively, along the west side of Collom Gulch. These springs are sourced from areas to the west of

Collom Gulch and are not expected to be impacted by the mining activities. Other springs listed in Table 2.05.6-4 are located up-gradient of the mine and are likely sourced from shallow groundwater and are not expected to be impacted by the mining activities.

In Collom Gulch, the springs potentially affected by mining operations (V27, V28, SPRC-02 and SPRC-04) produced a combined average flow of about 0.057 cfs, a maximum flow of about 0.13 cfs and a minimum flow of about 0.002 cfs during the baseline monitoring period.

It is not expected that new springs will develop in Collom Gulch during the post mining period.

Potential Impacts to Streams

The three streams potentially affected by mining include Little Collom Gulch, the West Fork of Jubb Creek and Collom Gulch. An evaluation of each stream was made for the following potential impacts from mining operations:

- Changes in direct surface runoff to streams from storm flow and snowmelt
- Changes in stream base flow amounts
- Changes in surface water and groundwater interactions
- Effects from discharge of water from settling ponds
- Effects from discharge of excess dewatering well flows

Little Collom Gulch

Little Collom Gulch is an ephemeral stream throughout its entire length, has a drainage area of about 2.9 square miles (WMC, 2005) and flows south to north through the center of the mine footprint. The area of Little Collom Gulch within the pit footprint is about 0.74 square miles and the area within the spoil pile footprint is about 0.59 square miles for a total area of about 1.33 square miles. Thus, the disturbance is about 46% of the total watershed area. Several clean water diversion structures are planned in Little Collom Gulch upstream of the pit to intercept and safely reroute storm flows around the mine area. The water collected in these structures will come from undisturbed areas.

As described in Section 2.04.7 (2) no flow was observed in Little Collom Gulch during any of the sampling events.

The direct surface runoff from 25% of the drainage area of Little Collom Gulch will be intercepted by the pit and will be either lost to evaporation or be utilized for dust control within the pit. The surface runoff from 20% of the drainage area of Little Collom Gulch will be incident upon the out of pit spoil pile. This runoff will be captured by one of the five sediment ponds (See Map 41B) and will either be lost to surficial evaporation or be discharged according to CPDES requirements to Little Collom Gulch or Collom Gulch. Another 8% (0.24 square miles) of the watershed will be disturbed by the facilities area and report ultimately to the Section 25 Pond and will be lost either to evaporation or discharged to Little Collom Gulch. The runoff intercepted by the Little Collom Gulch clean water diversion structures upstream of the mine pit (0.78 square miles of drainage) will be redirected to either Collom Gulch or the West Fork of Jubb Creek and not be impacted by mining activities. Surface water flows in Little Collom Gulch have not been observed so impacts to direct runoff in Little Collom Gulch are expected to be minimal. Since Little Collom Gulch does not normally contribute to the direct surface water runoff in Collom Gulch, the overall effects on the streamflow in Collom Gulch are expected to be insignificant. During the post-mining period, the Little Collom Gulch surface drainage pattern will be re-established to pre-mine density.

There is currently a small amount of recharge to the shallow valley fill groundwater that occurs from precipitation and surface runoff in Little Collom Gulch. This source of recharge will be eliminated during mining by the pit and the spoil pile. There may also be some discharge of perched groundwater from the upper bedrock units to the Little Collom Gulch valley fill that could be affected (e.g., springs SPRLC-01, SPRLC-02). The potential impacts on spring flow are discussed above and impacts to groundwater are discussed in a following section.

There may be periodic releases of water from the Section 25 sediment pond located in Little Collom Gulch near the toe of the spoil pile. This water will be released to Little Collom Gulch and will either infiltrate into the valley fill or contribute to surface flows in Little Collom Gulch. It is possible that some surface flow may make it to Collom Gulch during the higher flow periods.

There are no plans to release any flows from the dewatering system to Little Collom Gulch.

West Fork Jubb Creek

The West Fork of Jubb Creek is an intermittent stream. It joins the East Fork of Jubb Creek to the northeast of the mine area to form Jubb Creek. The total drainage area of Jubb Creek above the USGS gaging station is about 7.53 square miles, including both the East and West Forks (WMC, 2005). The area of the West Fork of Jubb Creek within the pit footprint is about 0.21 square miles and no areas are within the spoil pile footprint. Thus, the mine disturbance affects is less than 3% of the total watershed area of Jubb Creek.

As described in Section 2.04.7 (2), the West Fork of Jubb Creek produced flow from May through August with a peak flow of about 0.30 cfs in June. It remained dry during late summer, fall and winter. As described above, there is flowing well in the West Fork of Jubb Creek at the location mapped as spring V1. This well contributes water to a small stock pond. Water from the pond infiltrates into the stream valley fill deposits and contributes to shallow ground water flow.

The lower portion of Jubb Creek below the confluence of the East and West Forks typically produces flow for much of the year except during the winter months. Based on USGS stream gaging data from 1976 to 1981 on the lower reach of Jubb Creek (WMC, 2005), the annual flow volume is highly variable, ranging from less than 2 to over 300 acre-ft per year with an average of 81 acre-ft per year.

The direct surface runoff from about 3% of the drainage area of the Jubb Creek watershed will be intercepted by the excavation of the Collom Pit. This minor amount of disturbance is not expected to have a significant impact on the amount of direct surface runoff in Jubb Creek.

Collom Gulch

Collom Gulch is an intermittent stream in its upper reaches but generally has perennial flow in its lower reach. It has a drainage area of about 5.05 square miles above its confluence with Little Collom Gulch. The watershed area of Collom Gulch within the pit footprint is about 0.41 square miles and the area within the spoil pile footprint is about 0.39 square miles for a total area of about 0.80 square miles. Thus, the mine disturbance is about 16% of the total watershed area above the Little Collom Gulch confluence.

As described in Section 2.04.7 (2), the lower Collom Gulch monitoring location had a maximum flow of about 3.5 cfs during the spring runoff period with a base flow of between 0.03 and 0.04 cfs during the summer and winter periods, respectively. Based on WMC (2005) the upper portion of Collom Gulch flows during the spring runoff period and this streamflow contributes groundwater recharge to the valley fill along the stream channel. During the summer and winter base flow periods, the upper portion of the stream typically does not flow so stream base flow in the lower reach of Collom Gulch is maintained by discharge of groundwater from the valley fill to the stream.

The direct surface runoff from 8% of the drainage area of Collom Creek above the confluence with Little Collom Gulch will be intercepted by the pit. The direct surface runoff from 8% of the drainage area which is associated with the temporary spoil pile will be routed to the Sidehill Pond and West Pond sediment ponds. It will either be stored for on-site use or discharged using CDPHE criteria to Collom Gulch downstream of the Collom Pit. Therefore, the reduction of the amount of direct surface runoff in Collom Gulch caused by the mine is probably less than 16% and more likely in the range of 8 to 16%.

As described in Section 2.04.7 (2) the upper reach of Collom Gulch is generally intermittent with measured base flow in the range of 0.004 cfs and periods when the stream goes dry. The lower reach of Collom Gulch generally has perennial flow that is maintained during the summer and fall by discharge of groundwater from the valley fill. Most of the groundwater recharge to the valley fill comes from the flow in the upstream reach of Collom Gulch during the spring runoff season, which will not be affected by the mine. Therefore, the impacts of the mine on stream base flow are expected to be insignificant.

Flow in springs SPRC-02, V27, V28 and SPRC-04 may be reduced by mine dewatering operations as described above. These springs make up less than 5 % of the measured surface flows in Collom Gulch so the potential impact of reduced flows on Collom Gulch is not considered significant.

There may be periodic releases of water from the Section 26 Pond located in the Collom Gulch watershed at the toe of the spoil pile. This water will be released to Collom Gulch via a surface channel and will either infiltrate into the valley fill or contribute to surface flows in Collom Gulch, depending on the time of year.

If deemed necessary, water may be discharge to Collom Gulch from the dewatering well systems.

Potential Impacts to Groundwater

Drilling of exploration and monitoring wells by Colowyo and other parties in the Collom pit area as discussed in Section 2.04.7 identified very limited perched water in the shallow coal beds and interburden and saturated conditions in the lower third of the sequence to be mined. There are no continuous non-coal aquifers in the saturated section of the pit to be mined.

This subsection provides a discussion of the following potential impacts to groundwater:

- Changes in groundwater levels during mining
- Potential interactions with springs and seeps
- Potential interactions with valley fill aquifers and streams
- Effect on existing groundwater users in the area
- Effect on the Trout Creek Sandstone aquifer
- Effect of mining on the groundwater flow system
- Re-saturation of the pit backfill during the post-mining period

<u>Changes in groundwater levels during mining</u>

The Collom Pit will be excavated to a depth below the groundwater table and dewatering is needed to achieve stable pit slopes and safe mining conditions. Groundwater levels in the bedrock units within the pit footprint and in the immediate vicinity of the pit will be lowered ahead of mining by pumping from dewatering wells.

Colowyo will submit to the Colorado Division of Water Resources (CDWR) dewatering well/system application(s) to install dewatering wells and remove the groundwater to facilitate the mining. The Colowyo permit area is not in a designated groundwater basin as defined by the CDWR.

A dewatering well system is planned to intercept groundwater before it enters the pit and to achieve the depressurization necessary to maintain stable pit slopes. Based on the field work and computer modeling performed by Agapito Associates (2017) and presented in Exhibit 7, Item 22B, dewatering wells will be installed to dewater the rock strata from below the F_{ab} coal seam, with a projected depth to about 100 ft below the bottom of the G_{ab} seam.

The dewatering plan includes 10 or 11 perimeter wells around the initial box cut. The drawdown of the groundwater will be monitored by up to five monitoring holes that will include wire piezometers to acquire data to truth the model.

The dewatering system is designed to include up to 11 dewatering wells, and each well is expected to pump between about 10 to 15 gpm. It is estimated that the dewatering system will not need to be operational until the third year of mining of the Collom Pit.

The groundwater removed during dewatering will be used in the daily operation of the Collom mine. Water produced from the mine dewatering well system will be pumped via pipeline to storage tank located in the facility area. The water will not be used for potable use. A properly permitted commercial well will be drilled, and with a permitted treatment system, be used for potable water.

At times there may be an excess of water produced from the mine dewatering system. The excess water will be discharged to Collom Gulch and the West Fork Jubb Creek with an approve CDPHE permit. It is unknown but may at times equal 300 gpm, divided between both drainages. If each drainage receives 150 gpm at times, then the increase flow to the drainages will be a maximum of 0.3 cfs (effects to surface water on Collom Gulch and West Fork Jubb Creek discussed previously in this section).

AAI (2017) developed a hydrogeological model of the Collom area. This model was calibrated to existing groundwater conditions and the transient response observed during a 30 day pumping test performed by WMC (2005) in the bedrock units that will be mined. Based on the modeling of the groundwater response to mining and dewatering, the groundwater level drawdown from mine dewatering potentially will extend some distance to the south of the mine but is unlikely to extend further than the drainage divide in the southern portion of the Collom area. Drawdown effects may extend laterally in bedrock units below the Collom Creek on the west side of the mine, but are unlikely to affect those below the West Fork of Jubb Creek on the east side of the mine. Groundwater drawdown experienced by strata below the Collom Gulch is unlikely to significantly impact the surface streamflow along Collom Gulch.

During AAI's field visit during summer 2016, the streamflows along different segments of the Collom Gulch were observed to be approximately 2.5 cfs (1,122 gpm) in the East Fork and 5 cfs (2,224 gpm) downstream of the confluence point with the West Fork. The observed flow rates were likely close to the annual peak levels experienced by the stream as a result of snowmelt; however, the flow along Collom Gulch had been reported by WMC (2005) to have reduced to zero at several time periods (notably in wintertime) during their study. Except during those no-flow periods, the surface flow rates along Collom Gulch are significantly higher than the design pumping rate (15-gpm) of each dewatering well and are unlikely to be impacted appreciably by the pit dewatering.

Groundwater levels in the bedrock will recover after mining but may vary from the pre-mining conditions. Potential changes in the final groundwater levels are discussed below in the section on pit backfill re-saturation.

Potential interactions with springs and seeps

The drawdown in groundwater levels caused by the mine dewatering activities may affect springs and seeps that are fed by groundwater discharge. The area where springs and seeps are affected will probably be bounded by the southern extent of the pit footprint to the south, the West Fork of Jubb Creek to the east, Collom Gulch to the west, and one to two miles north of the pit highwall. The springs that are potentially affected by the dewatering operations are discussed in the section on springs and seeps above.

Potential interactions with valley fill and streams

There is some groundwater flow in the valley fill deposits associated with Little Collom Gulch that eventually enters Collom Gulch at the confluence between Little Collom Gulch and Collom Gulch. Recharge to shallow groundwater in the Little Collom Gulch valley fill will be reduced because the recharge area for valley fill groundwater south of the pit highwall will be eliminated during mining. This may result in an approximate 50% reduction in shallow groundwater flow in the Little Collom Gulch during mining.

The amount of groundwater flow in the Little Collom Gulch valley fill is estimated to be about 2,060 ft^3/d (17 ac-ft/yr). This estimate is based on a hydraulic conductivity of the valley fill that averages 33 ft/d (WMC, 2005), a gradient of 0.025 ft/ft, a saturated thickness of valley fill of 25 ft (based on the measurements in valley fill monitoring well MLC-04-1 located near the mouth of Little Collom Gulch), and an estimated lateral extent of the saturated valley fill of 100 ft.

WMC (2006) estimates that the total valley fill groundwater flow is about 18,850 ft^3/d to the north in Collom Gulch below the confluence with Little Collom Gulch. Of this amount, about 12,000 ft^3/d is flowing in valley fill aquifer and an additional 6,900 ft^3/d is groundwater flow that discharges to the stream as base flow. Thus, if the valley fill groundwater inflow from Little Collom Gulch is reduced by 50% from 2,060 to 1,030 ft^3/d, this would only reduce the total groundwater flow out of Collom Gulch by about 5%.

The valley fill groundwater system in the West Fork of Jubb Creek is not anticipated to be affected by mining. The Jubb Creek area disturbed by mining is small, less than 3% of the total watershed area, and most of the recharge to the valley fill groundwater system will come from spring runoff from the higher elevation portions of the watershed. No measureable impacts to stream base flow are anticipated.

Dewatering water entering the valley fill groundwater system will not add asignificant amount to the total system compared with the total amount of groundwater currently in the system.

Potential effect on existing groundwater users in the area

The Collom mine area and the surrounding land is predominantly owned and/or controlled by Colowyo Coal Company and/or its subsidiaries. There are numerous monitoring wells on these lands which are registered by Colowyo as wells under Colorado State Engineer's rules and regulations. Thus, any well within the limits of the Collom permit expansion is owned and controlled by Colowyo and the only impact from any dewatering will be on Colowyo itself. Table 2.04.7-44 and Map 11C reflect the location, ownership and control status of these wells.

The closest known and registered/permitted non-Colowyo owned domestic or commercial wells are located approximately two miles southeast of the initial Collom boxcut area. These wells are located in the SW1/4, Section 7, T.3N., R.93W and are completed below the base of the Williams Fork formation, in the Iles Formation, or in valley fill material along Wilson Creek. This can be verified by comparing the Geology map (Map 7A) with the well location map (Map 11C). Thus, no impacts to these wells from any dewatering activities in the Collom pit are anticipated.

There are no beneficial use wells (other than those owned and/or controlled by Colowyo) within a two mile radius of the northern pit limit of Collom. Therefore, there will be no impact on any non-Colowyo well caused by the mine dewatering operations,

There is a lack of groundwater communication in the vicinity of the Collom pit with any beneficial use well located in Wilson Creek. The KM layer (an aquiclude) precludes any impact of the dewatering on the upgradient wells in Wilson Creek. In addition, the dip of the KM bed and the Trout Creek sandstone top is to the north and any groundwater flow would be down dip away from Wilson Creek. An examination of the cross section illustrated in Exhibit 7 Item 23B, demonstrates that the cone of influence of the dewatering wells on the north side of the Collom Pit will be several miles from Wilson Creek and any of the beneficial use wells near Wilson Creek. With, the cone of influence not extending much past the Collom Pit to the north, the KM layer acting as an aquiclude, and the dip of the KM bed away form Wilson Creek limits any potential impacts of dewatering to any benefical use wells on Wilson Creek.

Potential effect on the Trout Creek Sandstone aquifer

No impacts are anticipated to the quantity of groundwater in the Williams Fork Formation or the Trout Creek Sandstone of the Iles Formation. The Williams Fork Formation is not a significant water supply source in the Danforth Hills. It is not used as a source of water where the valley-fill aquifers and surface waters are accessible.

The Trout Creek Sandstone aquifer is separated from the lowest coal seam to be mined by approximately 400 feet in the Collom pit area. Between this coal seam and the Trout Creek Sandstone is a mudstone/shale, sandstone, siltstone, and coal sequence of the Williams Fork Formation. About 200 feet above the Trout Creek Sandstone, a laterally continuous, smectite clay layer known as the KM bed exists. This layer has very low permeability and, therefore, is an effective barrier to vertical groundwater flow.

No impacts from mining or mine dewatering activities are anticipated to the quantity of groundwater in the Williams Fork Formation or the Trout Creek Sandstone of the Iles Formation.

Potential effect of mining on the groundwater flow system

The bedrock groundwater system intersected by the Collom Pit will be affected by mining and backfilling activities. The existing bedrock groundwater system is highly anisotropic because of the alternating layers in the bedrock that have permeabilities varying over many orders of magnitude. The coal seams generally comprise the higher permeability layers, the sandstones have a lower permeability and the siltstone and mudstone units have a very low permeability. The hydraulic conductivity values of the bedrock units are reported to average about 0.14 ft/d for the coal seams and about 0.006 ft/d for the sandstone units. The hydraulic conductivity value for the mudstone and siltstone units is expected to be less than 0.0001 ft/d (WMC, 2005). Mining will displace these layers within the mine footprint and replace them with a more uniform and isotropic backfill material.

The permeability of the backfill will be higher than the bedrock units and will be more similar the permeability of an valley fill material. The hydraulic conductivity of the backfill is expected to be in the range of 1 to 200 ft/d. The geometric mean value of hydraulic conductivity for valley fill is about 33 ft/d (WMC, 2005) so this value is considered a reasonable estimate of the hydraulic conductivity of the backfill.

The capacity of the backfill to transmit groundwater will be much greater than the capacity of the un-mined bedrock as a result of the higher hydraulic conductivity. This means that the saturated thickness of the spoil backfill necessary to provide the same quantity of groundwater flow under a similar hydraulic gradient will be much less than the saturated thickness of the un-mined bedrock. Thus, it is likely that the groundwater level in most parts of the backfilled pit area will be lower than the current groundwater level in the bedrock. Conceptually, this means that the groundwater levels in bedrock around the backfilled areas up-dip of the highwall will re-adjust to lower groundwater levels in the backfill itself. The exception will be near the north highwall of the pit where the quantity of groundwater flow to the north from the backfill will be limited by the permeability of the bedrock units to the north. In this area, groundwater levels are expected to re-establish to the pre-mining elevation of about 7150 ft or higher.

Re-saturation of the pit backfill during the post-mining period

During mining the Collom pit will be progressively backfilled with spoil material once the initial boxcut is established. The mine advances from north to the south, which is the up-dip direction for the bedrock layers, so as the deeper portions of the pit are backfilled with spoil, water accumulating in the pit can flow down-dip along the pit bottom into the backfill. The mining activity will not cause any decrease in the hydraulic conductivity or transmissivity of the un-mined bedrock units located down-dip (north) of the pit, and the capacity of the bedrock units to transmit groundwater will not diminish. Consequently, the recharge and upgradient inflow entering the pit area will re-enter the bedrock units on the down dip side of the pit. While the highwall dewatering wells to the north of the boxcut are operating, they will collect this seepage. Once they are turned off, the seepage will continue to flow to the north in the bedrock groundwater system in the same way that groundwater flow occurs prior to mining.

Some of the seepage from the pit into the backfill may accumulate against the highwall of the pit since the permeability of the unmined bedrock units is expected to be lower than that of the backfilled spoil material. The amount of water that accumulates will depend on the quantity of water available in the pit and the rate that the bedrock groundwater system recovers after dewatering wells are progressively turned off as mining advances up-dip from north to south. Once wells are turned off, groundwater inflow to the pit backfill may occur from lateral inflow from the bedrock units that are directly intersected by the mine and from limited upward vertical flow from underlying bedrock units.

Once mining is completed the Collom pit will have a reclaimed surface area of approximately 825 acres and a pit bottom that dips predominantly toward the north. The low point in the reclaimed pit surface topography will be at its intersection with Little Collom Gulch at an elevation of approximately 7,300 feet amsl. During the post-mining period, re-saturation of the reclaimed pit backfill will occur from bedrock groundwater inflow from the pit walls, infiltration of direct precipitation on the backfill area, seepage of surface water flowing over the backfill area, and groundwater inflow from the bedrock units underlying the backfilled pit. The groundwater level will recover in the backfill until pre-mine water levels of 7100 to 7150 ft amsl are reached. These elevations would be below the Little Collom Gulch channel elevation of 7,300 ft amsl. Outflow will occur as bedrock groundwater flow in a down-dip direction to the north. Post mining backfill static water levels may be elevated at times above pre-mine levels due to the higher transmissivity of the backfill and infiltration of surface water runoff. It is highly unlikely that backfill water levels would rise sufficiently to reach a level where a spring would emanate into Little Collom Gulch.

The pre-mining bedrock groundwater elevation in the northern portion of the pit is in the range of 7100 to 7150 ft based on WMC (2005). This is likely the minimum groundwater level that will be re-established in the backfill in the northernmost part of the pit. As described above, some re-saturation of the backfill may occur during mining.

The pre-mining rate of groundwater flow from south to north through the bedrock units in the northern part of the pit can be estimated based on the measured transmissivity in the bedrock, the hydraulic gradient and the width of the flow zone, taken to be the east-west distance between the West Fork of Jubb Creek and Collom Gulch. The long-term pumping test reported in WMC (2005) measured a transmissivity in this area of about 15 ft^2/d, with about 10 ft^2/d attributed to the F/G sequence and 5 ft^2/d to the bedrock units above the F_{ab} coal. This transmissivity value represents a saturated thickness of bedrock in the range of 200 ft (from elevation 6950 to 7150 ft). The hydraulic gradient in this area is measured from wells and piezometers to be about 0.04 ft/ft. The width of the zone is about 10,000 ft. This results in a pre-mining groundwater flow rate from south to north at the northern pit highwall of about 50 acre-ft per year.

The hydraulic head in the backfill at the northern wall of the pit should re-establish itself to at least elevation 7150 ft once equilibrium conditions are reached. At this hydraulic head, the post mining rate of groundwater flow from south to north out of the backfill will be about equal to the pre-mining flow rate and the post-mining groundwater flow system down-gradient of the mine will be essentially the same as the pre-mining system.

The time for the pit backfill to re-saturate to the 7150 ft elevation at the north highwall is estimated based on the volume of backfill in the pit up to the 7150 elevation and the estimated recharge rate to the backfill. The bottom of the pit dips upward to the south at about 250 ft vertical distance per 2,000 ft horizontal distance or at slope of about 0.125 ft/ft. The width of the pit is about 4,500 ft. This results in a backfill volume of about 1.44 billion cubic feet. At a 20% porosity in the backfill, the volume of water needed to saturate the backfill up to an elevation of 7150 ft is about 288 million cubic feet or about 6,610 acre ft. At the estimated pre-mining groundwater flow rate through the pit area of 50 ac-ft/yr, this would require about 130 years to re-saturate assuming no flow to the north out of the pit backfill.

The infiltration rate into the mine backfill may be higher than under pre-mining conditions because of the substitution of the highly stratified pre-mine bedrock aquifers with the homogenous backfill aquifer. The pre-mining groundwater recharge rate from infiltration in the Collom area is estimated to range from about 0.11 in/yr in the southern portion of the area to about 1.1 in/yr in the northern areas where bedrock units outcrop (WMC, 2006). The backfill area is expected to cover about 825 acres. If infiltration into the backfill increases to 3 in/yr (about 20% of precipitation) then an additional amount of groundwater recharge will be available to saturate the pit backfill. Under this condition, it is estimated that the total amount of recharge to groundwater would be about 230 ac-ft per year and the time to re-saturate the backfill would decrease to about 30 years, again assuming no outflow of groundwater to the north.

Groundwater will flow down-dip in the bedrock units to the north from the pit backfill as the backfill re-saturates. If it is assumed that the flow rate out of the backfill at the north pit wall is equal to the pre-mining flow rate at this location, then there will be an annual average groundwater flow of about 50 ac-ft per year. At the higher groundwater recharge rate into the backfill of about 230 ac-ft/yr as described above, this would result in a time to re-saturate of about 40 yrs. Lower infiltration rates into the backfill would increase the time to re-saturate the backfill. The estimated range of times to re-saturate the backfill up to the 7150 ft elevation varies from about 30 to 130 years.

Potential for development of springs from pit backfill

If the saturated thickness of the backfilled area of the pit increases as described above, then the groundwater flow rate to the north potentially will be higher than the natural groundwater flow rate because of the higher hydraulic head. This may result in a groundwater elevation in the highwall area of the pit backfill that is higher than the pre-mining groundwater level elevation of about 7150 ft.

Little Collom Gulch intersects the north wall of the pit at about elevation 7300ft. If the water level in the backfill increases to the 7300 ft elevation, then a spring could develop in Little Collom Gulch where it intersects the pit highwall. An evaluation of the time that would be needed to re-saturate the backfill to the elevation and the potential spring flow quantity is made based on the information in WMC (2005, 2006) and the information presented above.

The time re-saturate the backfill up to the 7300 ft elevation will largely depend on the infiltration rate into the backfill. It is expected to be about 40 years for the maximum infiltration rate of 3 in/yr into the backfill considered above.

The likelihood of a spoil spring developing is considered to be low. Based on the estimates described above, an infiltration rate of less than about 2.5 in/yr into the backfill would not result in a saturation level in the backfill high enough to form a spring. It is unlikely that the effective infiltration rate will be greater than 2.5 in/yr. It is more likely to be in the range of 1 to 1.5 in/yr, which is similar to the value of 1.1 in/yr estimated for the upper portion of the watershed in the regional groundwater model (WMC, 2006).

If a spring develops at this location, the flow will likely re-infiltrate into the valley fill in Little Collom Gulch and not flow down the stream channel as a surface flow. There is a significant thickness of unsaturated valley fill in lower portion of Little Collom Gulch. The water level in well MLC-04-01 near the mouth of Little Collom Gulch is at 46 ft below ground surface. Therefore, it is unlikely that a spoil spring would result in surface water flow down Little Collom Gulch.

Potential Impacts to Water Quality

The quality of surface water, springs and seeps and groundwater is described in Sections 2.04.7 (1) and 2.04.7 (2). This section evaluates potential impacts of mining to water quality including:

- Potential effect on stream water quality
- Potential effect on spring and seep water quality
- Potential effect on groundwater quality

Potential effect on stream water quality

As described above, Little Collom Gulch is ephemeral, and showed no evidence of surface flow during 18 months of baseline monitoring. As a result, no water quality samples are available.

There may be periodic releases of water to Little Collom Gulch from the Section 25 pond. Most of the water released from the pond will probably infiltrate into the valley fill in the Gulch and will result in little if any direct surface flow down to the mouth of Little Collom Gulch. Adequate settling time will be provided in the pond to meet Colorado Point Discharge Elimination System (CPDES) permitted discharge criteria. The water quality from any pond discharge is anticipated to be of higher quality than the surface water quality seen in the lower reaches of the streams in the Collom area. No surface water quality impacts to Little Collom Gulch or to Collom Gulch as a result of surface water flow from Little Collom Gulch are anticipated.

Periodic releases of water to Collom Gulch from the Section 26 sediment pond may occur. This section of Collom Gulch is intermittent so some of this discharge may continue down the stream as surface water flow. Adequate settling time will be provided in the pond to meet CPDES permitted discharge criteria. The quality is anticipated to be of higher quality than the surface water quality seen in the lower portions of the streams in the Collom area. Periodic discharge of water may occur from the Little Collom Gulch diversion structures to Collom Gulch and the West Fork of Jubb Creek. This water will be surface runoff from undisturbed areas and will have a good water quality. No surface water quality impacts to Collom Gulch or to the West Fork of Jubb Creek from these potential releases are anticipated.

Any dewatering water entering the surface water system tends to have better water quality than the surface water. This is based on a comparison of the ground water quality from C-04-16B (16B) versus water quality data from Jubb Creek (JC) and Collom Gulch (CG), as detailed in the WMC report, 2005. The water quality sample from 16B was collected after 500,00 gallons of water were pumped from the welland is therefore a good example of the water that would be coming from the dewatering wells with time.

In C-04-16B, the pH is approximately 7.2, while the pH is greater than 7.5 in JC and CG. The total dissolved solids (TDS) are 710 ppm in 16B, while in the CG, the mean was 838 and in JC the mean was 1663. All water samples were high in bicarbonate, while the groundwater from 16B had higher sodium than calcium, while the surface water had higher calcium than sodium. No heavy metals were detected in the 16B water sample while the surface water samples from both streams had low levels of selenium and manganese (approximately 0.10 ppm for both metals). Thus, except for adding excess sodium tho the surface water, all other qualities are better.

Thus, the water quality will be improved for a short distance until it intermixes with any surface water.

Potential effect on spring and seep water quality

Based on data presented in WMC (2005) springs and seeps have variable water quality with TDS concentrations ranging from 390 to 1,780 mg/l. This variable water quality reflects the source waters for the springs. Springs sourced from local infiltration and shallow groundwater will generally have lower TDS concentrations and springs sourced from the deeper bedrock groundwater will have higher TDS concentrations.

No significant impacts to spring and seep water quality are anticipated. Springs lying outside of the mine footprint that are sourced from local infiltration and shallow groundwater will not be affected by mining and no changes in the water quality are expected.

Spring SPRLC-01 lies within the pit footprint and will be eliminated by mining. However, it has a relatively high TDS concentration of 1,720 mg/l which is likely representative of the deeper bedrock groundwater quality. In the unlikely event that a spoil seep develops after the mine backfill re-saturates, the water quality of the spoil groundwater is expected to be similar to that of the deeper bedrock so TDS concentrations will be similar. Springs SPRLC-02 and SPRLC-03 are located north of the pit and spoil pile and their TDS values are in the range of 390 to 770 mg/l, probably reflecting a relatively shallow water source. During mining, potential seepage through the spoil pile up-gradient of the source areas of these springs may result in somewhat higher TDS values. Once mining is completed, the spoil pile will be removed from the Little Collom Gulch drainage as part of the mine reclamation and the Section 25

Pond will be removed following bond release. The source areas for these two springs should be re-established and no long-term changes to water quality at these two springs are expected.

There is some potential that flow from several of the springs and seeps in the West Fork of Jubb Creek and Collom Gulch drainages may be affected while the mine dewatering system is operating. The TDS concentration of the discharge from these springs is generally in the range of 700 to 1,100 mg/l, indicating a shallow or intermediate depth source. Once the mine dewatering system is turned off, groundwater flow eventually should be re-established to pre-mining conditions. It is not anticipated that there will be significant water quality impacts to these springs since they lie well outside of the mine area and are unlikely to be affected by the reclaimed pit.

Potential effect on groundwater quality

The main impact to pre-mining groundwater quality would be caused by flow out of the re-saturated pit backfill. The water quality of the groundwater at the Collom site is summarized in WMC (2005). The bedrock groundwater generally has TDS concentrations of 500 to 1,000 mg/l, a pH between 7.6 to 8.3 and low concentrations of dissolved metals. The valley fill groundwater has TDS concentrations of 400 to 1,500 mg/l, a pH between 7.6 to 8.1 and low dissolved metals concentrations. The springs and seeps, which reflect discharge from groundwater, have TDS concentrations of 390 to 1,780 mg/l, a pH between 7.8 and 8.3 and low dissolved metals concentrations.

With respect to spoil water quality, current water, rock, and soil quality analyses at the Colowyo Mine predominantly show a basic environment with a pH above 7.0. This chemical environment has been present in this area since quality testing was initiated. Some adverse chemical conditions have been identified in the soils and overburden analyses; however, these have been discussed in the application and have been adequately handled by Colowyo in the past.

The mine backfill will be comprised of spoil material that is not geologically or chemically different from the surrounding bedrock units that currently comprise the bedrock groundwater system. The water quality of the groundwater that will be contained in the mine backfill after it re-saturates is expected to be similar to the measured quality of groundwater in the bedrock and valley fill and the water quality of the spring discharges. Since there will be a mixing of various geologic units in the mine backfill, the average groundwater quality in the backfill may reflect the higher end of the measured groundwater quality, in the range of 1,500 mg/l TDS. No significant changes in bedrock or valley fill groundwater quality are anticipated as a result of mining.

The dewatering water quality is better than or equivalent to the valley fill water quality so there will be no impacts on the valley fill water quality, based on the WMC report, 2005. This is based on a comparison of the ground water quality from C-04-16B (16B) versus water quality data from Jubb Creek (JC) and Collom Gulch (CG), as detailed in the WMC report, 2005. The water quality sample from 16B was collected after 500,00 gallons of water were pumped from the welland is therefore a good example of the water that would be coming from the dewatering wells with time.

For valley fill ground water, comparing 16B water quality with the downsteam water quality on JC and CG, all values except for metals are comparable. However, while the valley fill wells did contain low levels of iron, manganese and selenium, these metals were not detected in the sample from 16B.

Other Potential Impacts

Flooding and stream flow regimes in the Colowyo Mine area do not appear to have been affected by past mining operations or reclamation, nor are they anticipated to be affected by the Collom mining.

Groundwater availability in the area may potentially be enhanced with the storage of water in the reclaimed pits. Colowyo owns significant water rights within the affected drainages. Any potential diminishment of flow that impacts other adjudicated water rights will be compensated for by reduced use by Colowyo. There is sufficient capacity for Colowyo to reduce their use of adjudicated water to compensate for potential diminishment of flow, allowing downstream users full access to their water rights.

With respect to alluvial valley floors (AVFs), lower portions of Collom Gulch have been studied prior to and after the release of the 1985 OSM Alluvial Valley Floor (AVF) Reconnaissance map. The reconnaissance by OSM was compiled on 1:100,000-scale maps and was meant to represent a reconnaissance level effort to identify areas which are likely to meet the AVF definition (from Introduction to OSM report accompanying this study). Thus, any areas identified on the OSM maps are potential AVFs. It was recognized in this study that future studies may more conclusively prove or disprove the AVF findings in the report.

Colowyo and other companies in this area performed AVF studies to more conclusively prove or disprove the existence of AVFs in this potential coal mining area of the Danforth Hills. For the Collom area, there have been significant studies to date examining the Collom Gulch area and the potential for an AVF possibly affected by mining activities in the Collom area.

Alluvial sediments are present in the valley bottoms of the Collom Gulch drainages but are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes. This can be seen in the geologic description of the monitoring well (MC-04-02) in the lower portion of Collom Gulch in Section 24, T. 3 N., R. 93 W. The cuttings obtained from the drill hole are predominantly silty clays, with minor amounts of sand and gravel (<25%). Based on depth to groundwater in this drill hole (10 feet below ground surface), it is doubtful that sub irrigation of any plant crop is possible. Further to the north, near the confluence of Collom Gulch and Little Collom Gulch, monitoring well MLC-04-01, has a groundwater level of between 40 and 50 feet below ground surface.

In addition, active erosion in the Collom Gulch channel is causing further incision, which is lowering the unconfined groundwater table found in the valley. The incision in Collom Gulch is at least two feet and in excess of 20 feet in sections before that flow of Collom Gulch exits through the ‘hogback’ and flows onto the Mancos Shale located in the Axial Basin to the north. The incision is also widening due to the down cutting and erosion of the supporting banks during periods of higher flow (normally occurring during the spring). With the low surface water flow rates and the reduced flood frequency, this has reduced the ability of the valley bottoms to support any agricultural use other than rangeland.

Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to groundwater, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch indicate that those drainages do not qualify as alluvial valley floors.

In conclusion, no adverse impact to the water environment downstream of the reclaimed Collom Pit is projected.

2.05.6 (4) Protection of Public Parks and Historic Places

No public parks are located within the permit or adjacent areas; therefore, no public parks will be affected by the mining operations. The mining operations are anticipated to affect specific sites and areas listed or eligible for listing in the National Register of Historic Places. These sites are discussed in further detail in Sec 2.04.4. A treatment plan has been prepared for some of the sites expected to experience impacts from the development of this mine. This treatment plan will identify specific mitigation processes needed to develop in and around these sensitive locations.

2.05.6 (5-6) Surface Mining near Underground Mining; Subsidence Control

No surface mining activities will be conducted within 500 feet of an underground mine. Therefore, there is no subsidence control plan for operations.

2.06 PERMIT REQUIREMENTS - SPECIAL MINING CATEGORIES

2.06.1-3 Scope, Experimental Mining, and Mountain Top Removal

There will be no experimental mining practices at the Collom Pit.

2.06.4 Steep Slope Mining

Colowyo may request a variance for mining and reclamation for steep slope mining as specified in Rules 2.06.4(2) and 4.27.

2.06.5 Variance from Approximate Original Contour Restoration Requirements

The Collom mining area will include non-mountaintop removal steep slope surface coal mining and reclamation operations. Colowyo is not currently requesting a variance from approximate original contour in the post-mining topography (PMT), but maintains the option to pursue this in the future as an amendment to the permit. The PMT as presented reflects the pre-mining topography generally, with drainages and drainage divides remaining in their approximate current locations. Some minor moderation in topography is expected due to limitations associated with reclamation equipment. Post-mining topography is shown on Map 19C. Table 2.05.6-5 presents the mine-wide volumetric calculation in support of the PMT. The PMT is designed based on the Division's rules for Operations on Steep Slopes as discussed in Section 4.27 of this document.

2.06.6 Prime Farmlands

Prime farmlands do not exist within the Collom permit revision boundary (see Section 2.04.12).

2.06.7 Reclamation Variance

There will be no delay in contemporaneous reclamation due to underground mining activities; therefore, this section is not applicable.

2.06.8 Alluvial Valley Floor (AVF)

General

The geologic and hydrologic conditions of the Collom Mine Expansion area have been studied since at least 1980 by Colowyo and other potential interests. These studies have included the examination of the valley bottoms for the possible presence of alluvial valley floors. These studies include the 1985 Office of Surface Mining Reclamation and Enforcement (OSMRE) Alluvial Valley Floor (AVF) Reconnaissance report and map of northwest Colorado. The reconnaissance by OSMRE was compiled on 1:100,000-scale maps and was meant to represent a reconnaissance level effort to identify areas which are likely to meet the AVF definition (from Introduction to OSMRE report). Thus, any area identified on the OSMRE maps is only potential AVFs. It was recognized in the OSMRE study that future studies may more conclusively prove or disprove the AVF findings in the report.

In examining the land of the Collom Mine Expansion area and the surrounding area, the landforms are controlled by two distinct geologic features. One is the Collom syncline/Danforth Hills and the other is the Axial Basin (these have been described previously in section 2.04.6 - Geology Description). The area of the Collom Syncline has sloping topography to the north until the Collom Syncline axis is reached and then a hogback formed by the uplift of the Iles formation is present. Proceeding north, the open area of the Axial Basin is then encountered.

All drainages in the Collom Mine Expansion area form on the southern portion of the Collom syncline/Danforth Hills. These drainages all flow northward toward and cross the Iles formation and then flow into the Axial Basin. The drainages tend to be narrow, confined drainages until the drainages exit to the Axial Basin.

AVF Specific Study-Collom Mine Area

In 2005, Tetra Tech, doing business as Maxim Technologies, conducted a preliminary field investigation and technical evaluation of the Collom permit expansion area located in the Collom syncline area to determine the presence of alluvial valley floors. The drainages examined include Collom Gulch, Little Collom Gulch, and Jubb Creek (including the West Fork of Jubb Creek). The investigation was conducted in accordance with Section 2.06.8 of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining and OSMRE Technical Guideline. The results of the investigation concluded that no alluvial valley floors exist in the areas to be mined. The findings were submitted to CDRMS on September 23, 2005 in a letter, a copy of which is included in Volume 18A, Exhibit 7, Item 22. These findings are also discussed further in appropriate sections below.

The mined area is located within Little Collom Gulch, and the Collom Pit and temporary spoil pil will occupy much of the Little Collom Gulch valley bottom during the mining operation. Portions of the Collom Pit will lie within the adjacent watersheds of Collom Gulch and the West Fork of Jubb Creek, but will not encroach on the valley bottoms (Map 23B). Groundwater in the general area occurs in valley fill material associated with the stream valleys and in the permeable and semi-permeable bedrock strata (CDM, 1985a). As discussed in Section 2.04.7, the existence of groundwater in the permit expansion area is limited to perched systems that primarily discharge small amounts of water in the canyon walls near the mine on a seasonal basis, and in some of the unconsolidated valley fill. Little Collom Gulch is ephemeral, and did not produce any measurable flow during the baseline hydrologic monitoring efforts described in Section 2.04.7. Very little groundwater is found in the current active mine; and, based on existing geological and hydrological evidence, the area to be mined provides no or only minor amounts of recharge to local surface water features.

Geomorphic Characteristics

Tetra Tech's 2005 investigation included mapping unconsolidated valley deposits in the Collom permit expansion area, using published and unpublished geologic maps and ground reconnaissance. The results are shown in Figure 1 of Exhibit 7, Item 24. Much of the mapped valley deposits contained substantial proportions of colluvium and/or sheetwash materials. The source material for the valley fills was primarily erosion and deposition of loess, leading to a loamy soil texture which supports more lush vegetation than adjacent uplands, even absent sub-irrigation.

In addition, valley bottoms within the permit expansion area were very narrow and historically uncultivated. Most floodplains in the area are generally extremely narrow (less than 20 feet), have been severely down-cut, and/or contain too much topographic relief in the form of slopes to be considered capable of being irrigated. Due to downcutting, flooding does not extend beyond the limits of the incised channel.

Flood Irrigation and Agricultural Activities

Section 2.04.3 contains a description and map of agricultural activities in the permit and adjacent area. The Premining and Postmining Land Use Map (Map 17) shows that the historic pre-mining land use of the area has been generally undeveloped rangeland. Exceptions to undeveloped range land in the permit area include the presence of equipment staging areas, small structures, reservoirs, roads, and stream crossings. However, documentation exists indicating several small parcels along the West Fork of Jubb Creek, totaling approximately 24 acres, were historically used for hay production. No evidence of any irrigation for these parcels was found.

Historically, there has not been a developed water supply for agricultural activities in the potentially-affected drainages. In addition, based on field investigations, there is no evidence of historical flood irrigation in the Collom permit expansion area.

Subirrigation

Depths to groundwater in the valley fill materials in the Collom Mine Expansion area have been recorded as between 9 feet below ground surface (bgs) along West Fork Jubb Creek (near a small pond), to greater than 47 feet bgs within Little Collom Gulch. Further information on groundwater occurrence is provided in Section 2.04.7.

The effects of the mass-wasting event of 1983-1984 downcut the valley fill throughout this area as much as 20 to 30 feet below the former surface in some locations. The resulting lowering of the valley fill groundwater table was noted by Tetra Tech as having caused drying of former wetlands and colonization of the land by upland plant species. Remaining wetlands in the valley bottoms are generally associated with springs and seeps issuing from perched water in bedrock along the valley wall. Examination of non-wetland soil profiles next to drainages revealed very few soils with mottles, shallow rooting depth, or other characteristics indicative of subirrigation.

Suitability for Flood Irrigation

Since 1974, Colowyo and other private and governmental groups have collected samples of water flows and water quality in the area. Water of sufficient quality and quantity for seasonal flood irrigation does exist in some areas (WMC 2005). However, the cost to develop such an irrigation system would be prohibitive given the remote location and limited area available for irrigation (Dames and Moore 1980, Walsh 1984). New irrigation projects are very rare in local agricultural practice, and would incorporate sprinkler irrigation rather than inefficient flood irrigation.

Conclusion

Tetra Tech's 2005 report presented the following findings regarding the presence of alluvial valley floors in the Collom permit expansion area:

- Alluvial materials are present in the valley bottoms of the Collom Gulch, Little Collom Gulch, and Jubb Creek drainages, but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes.
- Based on depth to groundwater, subirrigation within these valley bottoms is very limited.
- Active erosion in the stream channels is causing further incision, lowering of the groundwater table, and reduced flood frequency, reducing the ability of the valley bottoms to support any agricultural use other than rangeland.
- Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to ground water, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch, Little Collom Gulch, and West Fork of Jubb Creek of the Collom Mine Expansion area indicate that those drainages do not qualify as alluvial valley floors.

Specific discussion of the Collom Gulch Valley

As noted in the previous text, alluvial materials are present in the valley bottoms of the Collom Gulch drainages but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes. This can be seen in the geologic description of the monitoring well (MC-04-02) in the lower portion of Collom Gulch in Section 24, T. 3 N., R. 93 W. The cuttings obtained from the drill hole are predominantly silty clays, with minor amounts of sand and gravel (<25%).

Based on depth to groundwater in this drill hole (10 feet below ground surface), it is doubtful that subirrigation of any plant crop is possible. Further to the north, near the confluence of Collom Gulch and Little Collom Gulch, monitoring well MLC-04-01 has a ground water level of between 40 and 50 feet below ground water surface.

In addition, active erosion in the Collom Gulch channel is causing further incision, which is lowering the unconfined groundwater table found in the valley. The incision in Collom Gulch is at least two feet and in excess of 20 feet in sections before that flow of Collom Gulch exits through the 'Iles formation hogback' and flows onto the Mancos Shale located in the Axial Basin to the north. The incision is also widening due to the downcutting and erosion of the supporting banks during periods of higher flow (normally occurring during the spring). With the low surface water flow rates and the reduced flood frequency, this has reduced the ability of the valley bottoms to support any agricultural use other than rangeland.

Local and regional agricultural economics are prohibitive to developing irrigation projects within these valley bottoms, and such practices are in decline locally, especially on such a small scale as would be required by the narrow and fragmented nature of irrigable bottomlands within the subject drainages.

The narrow width and fragmented nature of the minimal flat land, depth to ground water, and impracticality of economically irrigating or mechanically farming the valley bottoms within Collom Gulch indicate that these drainages do not qualify as alluvial valley floors.

AVF Studies- Gossard Loadout and surrounding areas

All the streams/creeks that exit the Collom syncline/Iles formation hogback still exhibit the deep downcutting that originates in the Collom Syncline lands. This downcutting is easily visible in all streams/creeks exiting the hogback and continues for several miles downstream. This downcutting was due to the 1983/1984 mass-wasting event discussed above. The two streams that will be affected by the Collom Mine Expansion are Jubb Creek and Wilson Creek, near the Gossard Loadout.

The possibility of any AVF in Jubb Creek was discussed above. As noted, there is no AVF in the Jubb Creek valley north of the hogback. With respect to Wilson Creek, after the creek exits the hogback, a broad valley filled with valley fill materials is encountered. In the area where the Collom haul road crosses from the Collom Pit to the Gossard loadout, Wilson Creek is at least 20 feet deep. The banks show some undercutting and blocks of valley fill material coming off the sides. The vegetation on the land on both sides of the creek in this area is predominantly upland vegetation. The vegetation is old growth due to the size of the brush in this area. The deep valley of the creek and vegetation continues along the length of Wilson Creek to the north of the loadout and for several miles north of the loadout.

Groundwater is this area is at least 20 feet below ground surface (bgs) in the shallow monitoring wells, Gossard Well and MW-95-02. The Gossard Well is located northeast of the Gossard Loadout in the field and MW-95-02 is located on the east bank of Wilson Creek, southwest of the loadout. The historical average depth to water at the Gossard Well is approximately 21 feet (2009 Annual Reclamation Report). Tetra Tech (2005) concluded that such depths to groundwater are too great to allow for agriculturally significant subirrigation. MW-95-02 had a water level of 25.1 feet bgs in November 2016. (Further information on groundwater occurrence is provided in Section 2.04.7).

In September of 2015, four geotechnical holes were drilled on both sides of Wilson Creek where the crossing for the haul road leading from the Collom pit to the loadout is to be located. Groundwater was detected in these geotechnical test hole at approximately 25 feet bgs. There are no visible seeps on the sidewalls of the valley in the crossing area and both upstream and downstream of the crossing area. This new data provides additional information to the conclusion that groundwater in the area is too deep for any subirrigation.

The near surface valley fill materials in the area of the Collom haul road crossing over Wilson Creek were found to be predominantly clay, based on the four geotechnical test holes. The clays do contain minor amounts of gravel, sand and silt and were gray to dark brown in color. The thickness of the clays are at least 10 feet thick and are stiff to hard. The materials present do not appear to meet the definition of alluvial material for alluvial valley floors.

No evidence of flood irrigation was found for the fields surrounding the Gossard loadout. However, some limited flood irrigation was conducted in the floodplain of Wilson Creek, north of and outside the permit boundary (north of County Road 17). The ditch constructed for this irrigation is now heavily overgrown with upland vegetation. The gate for this water diversion sets several feet above the Wilson Creek channel and cannot be reached by current water flow from Wilson Creek. The area of concern surrounding the Gossard Loadout facility was bypassed for flood irrigation historically in order to apply irrigation water downstream to lands outside the current permit boundary.

Irrigation diversion points, irrigation ditches, and topography are shown on Map 10B. These areas are well outside the subject drainages of Collom Gulch, Little Collom Gulch, and Jubb Creek.

Thus, the same conclusions as those previously presented for the creeks in the Collom syncline area may be reached for the area of disturbance for construction of the Collom Haul Road in the vicinity of the Gossard Loadout facility (Map 25E Sheet 1 of 4):

- Alluvial materials are present in the valley bottom of the Gossard Loadout complex, and the lower reaches of the Lower Wilson Creek drainage, but the materials are intermixed with significant fractions of colluvium and sheetwash from adjacent slopes and the mass wasting event experienced in 1983-1984.
- Based on an average depth to groundwater of at least 20 feet , coupled with data from monitoring wells and geotechnical test holes in the Wilson Creek area drilled in 2015,subirrigation within this valley bottom is very limited in extent (outside and north of the permit area) or non-existent. Active erosion in the stream channels is causing further incision and reduced flood frequency, reducing the ability of this valley bottom to support any agricultural use other than rangeland or dryland agriculture. There is no evidence of "modern terracing" in the area that will be disturbed near the Gossard Loadout facilities.
- Local and regional agricultural economics are prohibitive to developing irrigation projects within this valley bottoms, and such practices are in decline locally.
- Historical irrigation activities associated with the "diversion structure and ditch" located on Wilson Creek; divert water around the existing grain fields, under County Road 17, outside the current permit boundary to the fields northeast of County Road 17. This activity is still performed when water is available to the diversion structure as the mass wasting events (1983-1984) limited the function of this system.

Colowyo contends that based on the descriptions and defining characteristics needed to classify an area as a functioning alluvial valley floor, the area to be disturbed that is associated with the Collom Haul Road within the Lower Wilson Drainage does not qualify as an alluvial valley floor. Thus, no material damage assessment, water monitoring program, etc., is required due to the fact the area is not a functional alluvial valley floor. Colowyo does plan to return the area of disturbance to pre-disturbance condition at the cessation of mining activities.

2.06.9 – 2.06.11 Augering, Processing Plants, In-Situ Processing

In the Collom Pit, specifically the endwall and low walls of the box cut, highwall mining will target the X3/X4, B2/B3, C3/C5, D1/D2, E2, F5/F6, F_A/F_B, G8/G9 and G_B seams. Please see Map 23B for the overall extent of the highwall mining plan for the Collom Pit. All seams will be developed in a top-down sequence following the Collom box cut down as it is driven. The planned highwall mining sequencing will begin with the X3/X4 seam, and once mining is completed the highwall mining will continue down to the next available seam in the sequence following right behind pre-strip surface mining operations. For additional detail on the highwall mining technique that will be utilized please see Volume 1, Section 2.06.9.

Please see Volume 1 for Sections 2.06.10 and 2.06.11.

2.06.12.1 Coal Refuse Piles

Coal refuse piles do not exist on the Colowyo property. Thus, this section is not applicable.

2.07 – 2.10 VARIOUS

Information required by these sections is included in Volume 1.

The area to be mined will be restored to a topography approximating pre-mining grades. The slopes of backfilled areas, as necessary, will utilize contour furrows for erosion control and stability. These contour 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 pre-mining slope grade as shown on the Map 19C – Post Mining Topography. Table 2.05.6-5 presents a mine-wide volumetric calculation in support of the Post Mining Topography. Post-mining surface drainage channels will be located to minimize erosion and to minimize slippage.

4.14.2 General Grading Requirements

The final graded slopes at the mining operation will not exceed the approximate original pre-mining slope grade as shown on Map 19C. Colowyo will retain all overburden and spoil material on solid portions of existing or new benches. The final bench at the terminus of the operation will be eliminated by backfilling overburden into the final pit area.

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 lv:3h. The plan for backfilling and grading is shown graphically on the Map 29B.

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 non-coal 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 defined in Section 4.14.4 of the regulations.

4.14.5 Thick Overburden

Colowyo does not have a thick overburden situation as defined in Section 4.14.5 of the regulations.

4.14.6 Re-grading or Stabilizing Rills and Gullies

Please see Section 4.14.6 in Volume 1.

4.15 REVEGETATION REQUIREMENTS

Please refer Volume 1, Section 4.15 for revegetation requirements for the Collom area.

4.16 POSTMINING LAND USE

4.16.1 General

Please refer to Volume 1, Section 4.16.

4.17 AIR RESOURCES PROTECTION

Please see Section 2.05.6 in Volume 1.

4.18 PROTECTION OF FISH, WILDLIFE, AND RELATED VALUES

Current and historical mitigation efforts, protection efforts, and habitat improvement plans are discussed in Colowyo's existing permit and Section 2.05.4. Most of these efforts have been targeted at Greater Sage-Grouse, mule deer, elk, and raptors.

As discussed in Section 2.04.11(4), it is unlikely that any threatened or endangered species occur in the Collom permit expansion area disturbance. No designated critical habitat for any species is known to exist in the permit expansion area. Golden eagles are known to nest in the permit expansion area, but the nests are located outside the area to be mined. No bald eagles are known to nest in or near the permit expansion area. Golden eagle nests and nests used by other raptor species are described in Section 2.04.11. There were eight nests used by raptor species other than golden eagles that were located within the permit expansion area. Two of these nests have recently been active (in 2006 or 2007), and were used by the long-eared owl and Cooper's hawk.

As described in Section 2.04.11(1-3), two Greater Sage-Grouse and two Columbian sharp-tailed grouse lek sites would be impacted by mining disturbances. Based on the survey information captured and discussed previously in this submittal, the impact to the overall grouse populations in the area can reasonably be described as minor. Habitat mitigation measures for sage-grouse populations displaced during mining are discussed in Section 2.04.11(4), 2.05.4, 2.05.6(2). The locations of possible raptor nesting sites within the Collom expansion area disturbance boundary have also been included on the map. Based on the language provided within the Environmental Assessment for securing the Collom Lease Tract COC-68590, Coloywo will relocate these structures to a nearby area not targeted for disturbance. Based on the survey work previously referenced in this submittal, the sites targeted for direct impact by mining are not being heavily utilized by raptors at this time. This Map also identifies the location of habitat enhancement "stockponds" that will facilitate additional opportunities for all wildlife species.

Section 4.18 in Volume 1 discusses electric power line and transmission facility construction guidelines for retrofitting of existing power poles to protect raptors. Colowyo has implemented these raptor protection measures in the Colowyo existing permit area and will also implement them in the Collom permit expansion area. Because many raptor species are predators of the Greater Sage-Grouse and Colombian shap-tailed grouse, specific restorative and enhancement activities are purposefully not being pursued beyond the protective measures described above with respect to electrical structures. Enhancement of raptor habitat in the Collom expansion area would likely lead to a lower probability of successful resumption of grouse activity post-mining.

As described in Section 2.05.6(2) in Volume 1, all disturbed acreage, including roads, have been kept to a minimum by proper planning to reduce impacts to all environmental resources, including impacts on wildlife.

As part of the plan to return the post-mining land use to a rangeland condition capable of supporting the diverse wildlife populations identified in the permit areas, Colowyo initiated efforts to restore wildlife habitats during pre-mine planning and early mining. This was accomplished 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. In addition, Colowyo implemented a habitat improvement program in 1975 to offset temporary habitat loss during mining. The reestablishment of herbaceous species, topographic relief, impoundments and limited reestablishment of a shrub component form the integral elements of the reclamation plan.

Sagebrush steppe reclamation areas specifically target sage-grouse habitat is described in Section 2.05.4.(2)(e). These areas will also serve as enhanced habitat for many other species, including mule deer and elk. Grassland reclamation areas specifically target livestock grazing but the seed mix and reclamation plan focus on ensuring plant species beneficial to wildlife will prosper as well. The nutritional value of both plant communities targeted for establishment on reclaimed lands in the Collom expansion area should be enhanced as compared to pre-mining condition based especially on increased forage availability and diversity (for both livestock and wildlife species).

To date, reclamation efforts at the existing operation 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. Columbian sharp-tailed grouse also use reclaimed grasslands.

Public Land Survey Protection

Colowyo will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during mining operations. Any monuments, corners or accessories that are removed by the mining process, Colowyo will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same locations, using the surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

4.19 PROTECTION OF UNDERGROUND MINING

Colowyo will conduct no 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

All coal exploration activities within the Collom permit revision area will be completed in accordance with the requirements and procedures outlined in the Volume 1.

4.22 CONCURRENT SURFACE AND UNDERGROUND MINING

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

4.23 AUGER AND HIGHWALL MINING

Colowyo does plan to conduct highwall mining activities; therefore, the requirements of this Section will be revised through the technical revision process prior to initiating any highwall mining in the Collom mining area.

4.24 OPERATIONS IN ALLUVIAL VALLEY FLOORS

4.23 AUGER AND HIGHWALL MINING

4.23.1 Scope

Highwall mining allows for the recovery of additional coal resources beyond the final pit highwalls and endwalls. Colowyo's has previously effectively highwall mined in the East, Section 16, West, and South Taylor Pits in the past. Colowyo will utizilied the vast experience gained from previous highwall mining and implement a highwall mining plan in the Collom Pit. Please see Section 2.06.9 and Map 23B for the seams and areas planned to be highwall mined.

From a surface mining perspective, the Collom Pit delineates the maximum recoverable coal resources permitted by this mining permit for Colowyo to mine. Highwall mining in the Collom Pit will allow for for maximum recovery in accordance with Rule 4.23.2(1). Please refer to Sections 2.06.9 in Volume 1 for additional discussion regarding the removal of coal using highwall mining methods.

4.23.2 Performance Standards

4.23.2(1) Undisturbed Areas of Coal Shall be Left in Unmined Sections

As for the rules requirements [Rules 4.23.2(1)(a)-(c)] for leaving undisturbed areas of coal in unmined sections, Colowyo requests a variance from the requirements of this rule for the Collom Pit. Colowyo's highly successful highwall mining methods that will be used in the Collom Pit, will maximize production and ensure no subsidence occurs. Using this particular method of highwall mining by leaving pillars and barriers allows the seams to be mined below each other and still ensures geologic stability once all seams have been mined out. Please see Exhibit 27, Item 6 in Volume 20 for further discussion on the geotechnical design and operational considerations implemented highwall mining the Collom Pit.

4.23.2(2) Abandoned or Active Underground Mine Workings

No abandoned or active underground mine workings have ever existed or currently exist anywhere near the Collom Pit. Therefore, in accordance with Rule 4.23.2(2), no highwall mining activities will occur closer than 500 feet in horizontal distance of any underground mining workings.

4.23.2(3) Contemporaneous Surface and Auger (Highwall) Mining

Highwall mining will follow the surface coal mining activities in a top-down sequence in the Collom Pit. Highwall mining has to occur as contemporaneous as possible behind surface mining to ensure further advancement of the Collom box cut is not hindered by highwall mining operations. When surface mining opens up a large enough area in the Collom Pit, highwall mining will commence shortly thereafter. As the Collom Pit is advanced, highwall mining will follow as soon as is practical, and will be timed appropriately with continued surface mining operations.

4.23.2(4) Prevention of Pollution of Surface and Ground Water and Fire Hazards

Each highwall mining hole will be plugged within 30 days following coal extraction to prevent discharge of water from the hole or access of air to the coal seam inside the highwall miner hole in accordance with Rule 4.23.2(4)(b). Typically, highwall miner holes will be sealed much sooner than 30 days, but to ensure operational flexibly and compliancd with Rule 4.23.4(4) a hole may need to remain open up to 30 days.

Groundwater 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 are detailed extensively in Section 2.04.7(1) and 2.05.6(3)(b)(i & ii). From this body of data and from experiences to date with past highwall 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.

4.23.2(5) Holes Not Need to be Plugged

Colowyo will backfill and plugge each highwall miner entrance hole. As required, this will occur within 30 days following coal extraction. Further, all highwall miner entrance holes will be buried by pit backfill during the normal backfill sequence for the pit to remain in compliance with Rules 4.05.1 and 4.05.2.

4.23.2(6) Division Shall Prohibit Auger (Highwall) 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 power lines, buildings, or other surface facilities.

4.23.2(7) Backfill and Grading Requirements

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

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 present permit application.

4.26 MOUNTAINTOP REMOVAL

Based on the present data, no determination of mountain top removal has been made. When available, the pertinent data will be delivered to the Division for a determination.

4.27 OPERATIONS ON STEEP SLOPES

Mining and reclamation activities for the Collom operation will generally occur on slopes that are less than 20 degrees. On occasion, in limited areas, operations will occur on slopes greater than 20 degrees. In accordance in Rule 4.27.2, operations can occur occasionally on steep slopes and the requirements of Rule 4.27 do not apply. The Collom operations meet this definition.

4.28 FACILITIES NOT LOCATED AT THE MINESITE

All facilities used by Colowyo will be within the current permit boundary. Therefore, this section is not applicable.

4.29 IN SITU PROCESSING

This section is not applicable.

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 that will have been affected in the permit area prior to temporary cessation and an identification of back filling, regrading, 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 post-mining topography is set forth on the Post-mining Topography map (Map 19C).

Colowyo will remove any equipment, structures, or other facilities at the conclusion of mining activities and will reclaim the affected land. Structures that are identified by the landowner to be necessary to conduct post mining activities will be designated at the time of final bond release.