Savage and Savage ***Environmental***

practical solutions for environmental issues

4610 Haystack Drive **970 674 8080 telephone**
Windsor, Colorado 80550 **savageandsavage@earthlink.net**

November 8, 2022

Leigh Simmons, Environmental Protection Specialist
Colorado Division of Reclamation, Mining & Safety
1313 Sherman Street, Room 215
Denver, Colorado 80203

Re: SL-17 Application for Phase III Bond Release, West Elk Mine (CDRMS file C-1980-007)

Mr. Simmons:

Attached is the Phase III final bond and liability release application for selected areas of the Mountain Coal Company, LLC West Elk Mine (CDRMS file C-1980-007) east of Somerset in Gunnison and Delta Counties, Colorado.

This application seeks final bond and liability release for successful Phase III reclamation at the mine site under CRS 34-33-125(9)(c) and Rule 3.03. Copies of the required notifications, application information, certification, and public notice are attached for review. The public notice will be published in the *Delta County Independent* commencing November 16, 2022. As soon as publication is complete a proof of publication will be e-mailed to you. When all the certified mail receipts have been returned to us, copies will be forwarded to you.

If any additional materials are required, or if there are any questions regarding the information presented, please contact me or Nicki Poulos at Mountain Coal.

Sincerely,

Michael S. Savage
Principal

enclosure: West Elk Mine Phase III bond release application (SL-17)

c: Nicki Poulos, Mountain Coal Company, LLC
Gunnison County Planning Office

MOUNTAIN COAL COMPANY, LLC
WEST ELK MINE
CDRMS FILE C-1980-007
PHASE III BOND RELEASE APPLICATION (SL-17)

Date of Request: November 15, 2022

Permittee: Mountain Coal Company, LLC (MCC)

Permit Number: C-1980-007

Initial Permit Approval Date: July 1981

Mine Name: West Elk Mine

Bond Release Phase Requested: Phase III

Acreage:
Current Permit Area: ± 19,854.9 acres
Maximum Area Disturbed: ± 554.53 acres
Area Sought for Release: ± 9.25 acres

Bonding Company: Indemnity National Insurance Company

Bond Number: N-7004698

Amount of Bond Release Requested: MCC is requesting the remaining 15% of the applicable reclamation bond amount for Phase III bond release areas. This amount has been preliminarily calculated to be $29,416.08 based on CDRMS methods employed previously for the West Elk Mine bond releases.

Total Bond Amount Currently Held: $15,000,000.00

Current Actual Bond Liability Amount (as of June 24, 2022)**:** $11,756,466.23

The amount requested for release will be based on the amount determined to apply to the reclaimed surface disturbance, drill holes, sites, and roads. When the bond amount applicable to the reclamation is determined, MCC requests the remaining amount of the applicable bond value for areas where Phase III bond release is sought in accordance with CDRMS Rule 3.03.1(2)(b). The amount released will be the difference between the value of the applicable bond amount and that amount previously released for Phases I and II for the reclaimed areas where Phase III bond release is now requested under SL-17.

Based on the CDRMS method for calculating reclamation bond to be released for Phase III, the amount requested for release is $29,416.08.

Legal Description of the Area Requested for Bond Release: The following table, West Elk Mine Phase III (2nd Year) Eligible Areas: 2022 presents the locations or sites to be considered for bond release under this application. The reclaimed areas requesting bond release are located within the current permit area and are found within Sections 14, 22, 23, 26, and 27, T13S, R90 W, all within the 6th Prime Meridian, Gunnison County, Colorado.

WEST ELK MINE PHASE III (2nd Year) ELIGIBLE AREAS: 2022

Site Name/Number	Area	Acres	Year Reclaimed	% of Total
Road to 24HG2E5XC, 4-5XC, 3XC	Sylvester Gulch	1.57	2007	17.0%
1-21-38, 2-21-37, 3-21-36, 4-21-32	W. Bench	1.23	2008	13.3%
24-06 & 24-07 & road	W. Bench Rd.	0.94	2006	10.2%
19-04 & 19-05 & shared spur road	W. Bench	0.91	2008	9.8%
24HG2E5XC, 24HG1E4-5XC, 24HG1E3XC	Sylvester Gulch	0.90	2007	9.7%
17-08A&B	Saddle Rd.	0.82	2006	8.9%
20-01A (and Exploration Hole AAA)	W. Bench	0.69	2007	7.5%
15-05	Saddle Rd.	0.62	2004	6.7%
20-31	W. Bench	0.58	2008	6.3%
22-04	W. Bench Rd.	0.52	2007	5.6%
15-06	Sylvester Gl. Rd.	0.24	2004	2.6%
23HG1E3XC, 23HG3E3XC	Shaft Cyn Rd.	0.13	2007	1.4%
24-09	Shaft Cyn Rd.	0.10	2008	1.1%
Total Phase III Eligible (2nd year) Reclaimed Sites		9.25		100.0%

Map: Figure 1. (MCC Reclamation) contained in the mining and reclamation plan permit document identifies the areas requested for bond and liability release.

Dates of Reclamation Work: Reclamation work was completed in the areas requested for release between 2004 and 2008 by MCC. Documentation of reclamation work is included within the permit document and CDRMS files.

Description of Bond Release Amount Request: This bond release application requests release of bond and liability for successfully establishing vegetation supporting the post-mining land use, meeting the approved success standards for vegetation cover, herbaceous production, and species composition and completing all required reclamation for the reclamation areas identified in this bond release request.

The areas requested for release are in conformance with the approved post-mining land use(s) which have been implemented. All mining related disturbance has been reclaimed in accordance with the approved reclamation permit.

Protection of the Hydrologic Balance: Annual Hydrology Reports (AHR) have been submitted annually for the mine and the information within the AHR's has demonstrated the continued protection of the hydrologic balance at the mine site and off-site. Self-monitoring of the sediment control system has been continual, and where regular inspections have revealed concerns with protection of the hydrologic balance, protection measures have been implemented and maintained.

Notice to Parties Identified in Rule 3.03.2(1): Potentially affected parties, Gunnison and Delta Counties, and governmental agencies as specified in CDRMS Rule 3.03.2(1) were

noticed of the bond release application, and copies of those certified mail notices and proof of receipt are appended. A copy of the letter to Gunnison County requesting retention of the public copy of the bond release application is appended.

Newspaper Public Notice: A copy of the newspaper public notice to be published in the Delta County Independent is attached. A copy of the proof of publication will be forwarded for inclusion when received.

Achievement of Revegetation Success

Comparison of the reclaimed areas values for total vegetation cover, total herbaceous production, and species composition with the applicable revegetation success criteria indicates whether revegetation has been successful and compliant with requirements for Phase III bond release. CDRMS Rule 3.03.1(2) provides for release of bond, "when the permittee has successfully completed all surface coal mining operations in accordance with this approved reclamation plan…" The tables below allow the comparison of the parameter values from the 2019 and 2022 sampling at the reclamation areas with the revegetation criteria to be achieved.

The reports, 2019 Vegetation Report Phase III Bond Release Eligible Areas: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road, Mountain Coal Company, LLC West Elk Mine, Somerset, Colorado and 2022 Vegetation Report Phase III Bond Release Eligible Areas: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road, Mountain Coal Company, LLC West Elk Mine, Somerset, Colorado document achievement of the applicable revegetation bond release criteria for reclaimed areas and are included in this application.

A summary of the applicable revegetation success criteria and sampled values for 2019 and 2022 for Phase III bond release at the West Elk Mine follows.

Phase III Bond Release Reclaimed and Revegetated Areas Reclamation Success: Total Vegetation Cover (2019 and 2022)

Demonstration of revegetation success at the West Elk Mine for Phase III bond release requires that the total vegetation cover at the eligible reclaimed areas meets or exceeds the value of the total vegetation cover success criterion established from historic record sampling. The revegetation total cover success criterion is 53.04 percent.

Reclamation Success: Total Vegetation Cover (2019 and 2022)

	2019 Reclaimed Areas	2022 Reclaimed Areas
$\mathbf{X_{bar}}$	63.43%	67.47%
S	8.90%	5.78%
Number of samples	21	15
Number of samples for sample adequacy	3	1

Based on the results of the 2019 and 2022 quantitative sampling, the reclamation areas exceeded the revegetation total live vegetation cover success criterion of 53.04 percent, thereby meeting the revegetation success criterion and supporting the post-mining land use.

Phase III Bond Release Reclaimed and Revegetated Areas Reclamation Success: Total Herbaceous Production (2019 and 2022)

Demonstration of herbaceous production revegetation success at the West Elk Mine for Phase III bond release requires that the total herbaceous production at the eligible reclaimed areas meets or exceeds the value of the total herbaceous production success criterion of 180.38 g/m^2. The table below compares the vegetation cover values from the 2019 and 2022 sampling.

Reclamation Success: 2019 and 2022 Total Herbaceous Production Results

	2019 Reclaimed Areas	2022 Reclaimed Areas
X_{bar}	217.13 g/m^2	227.67 g/m^2
S	42.43 g/m^2	60.60 g/m^2
Number of samples	22	19
Number of samples for sample adequacy	7	13

Based on the results of the quantitative sampling, the reclamation areas exceeded the revegetation total herbaceous success criteria of 180.38 g/m^2 percent, thereby meeting the revegetation success criteria and supporting the post-mining land use.

Phase III Bond Release Reclaimed and Revegetated Areas Reclamation Success: Species Composition (2019 and 2022)

The West Elk Mine permit document specifies that to meet the requirements of the revegetation success criterion for species composition, species composition on any applicable reclaimed areas will be successful when there are at least three perennial species of which two are cool season perennial grasses and one is a cool season perennial forb with no one component of the above three species comprising greater than 40% relative cover nor less than 3% relative cover. In 2019 the reclaimed areas exceeded the success criterion with four perennial cool season graminoids, four cool season forbs, and one woody species. The 2022 reclaimed areas exceeded the species composition requirement with five perennial cool season graminoids and one perennial cool season forb.

Reclamation Success: Species Composition (2019 and 2022)

	Success Standard	2019 Reclaimed Areas	2022 Reclaimed Areas
Total Perennial Species* (>3% rel. cover)	3	9	6
Cool Season Grasses*	2	4	5
Cool Season Forbs*	1	4	1
Woody Plants	0	1	0
Relative Importance (3%<x<40%)	All Species	All Species	All Species

* Numbers reflect only those species meeting the relative importance percentage limitation and does not include any prohibited species

The reclaimed areas exceeded the requirements for species composition, thereby meeting the revegetation success criterion and supporting the post-mining land use.

Reclaimed Areas Revegetation Conclusions

Vegetation Cover

Mean reclaimed area total vegetation cover for 2019 and 2022 (63.43 and 67.47% respectively) exceeded the revegetation success standard for total vegetation cover (53.04%), thereby meeting the revegetation success criterion and supporting the post-mining land use.

These results indicate the establishment of a predominantly perennial, native vegetation community at the reclaimed areas, with total vegetation cover greater than that of the revegetation success criteria.

Herbaceous Production

Mean reclaimed area total herbaceous production for 2019 and 2022 (217.13 g/m^2 and 227.67 g/m^2 respectively) exceeded the revegetation success standard for total herbaceous production (180.38 g/m^2), thereby meeting the revegetation success criterion and supporting the post-mining land use.

Species Composition

The reclaimed areas exceeded the required number of perennial cool season grass and forbs/shrubs in both 2019 and 2022, thereby meeting the post-mining land use requirements.

PHASE III BOND RELEASE ATTACHMENTS:

NOTARIZED STATEMENT OF COMPLIANCE
NOTICES TO POTENTIALLY AFFECTED PARTIES
NEWSPAPER PUBLIC NOTICE
2019 AND 2022 PHASE III REVEGETATION STUDIES

NOTARIZED STATEMENT OF COMPLIANCE

In accordance in Colorado Division of Reclamation, Mining and Safety Rule 3.03.2.1(e), I hereby certify that to the best of my knowledge and belief, all applicable reclamation activities for which Phase III bond release is being sought at the Mountain Coal Company, LLC West Elk Mine (CDRMS Permit # C-1980-007), have been accomplished in accordance with the requirements of the Act (CRS 34-33-101 *et seq*), the applicable rules pursuant to the Act and the approved reclamation program as detailed and approved in the mining and reclamation permit, C-1980-007.

Signed _____ Date 11/07/22

Mountain Coal Company, LLC

State of Colorado

Subscribed and sworn to (or affirmed) before me at SOMERSET (city),

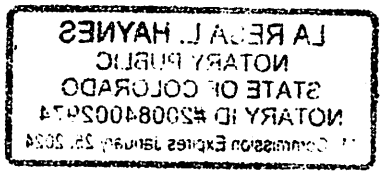
by WESTON NORRIS (signer's name)

on 11-7-22 (date). SEAL

LaResa L. Haynes
Notary Public's Signature

LA RESA L. HAYNES
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID #20084002974
My Commission Expires January 25, 2024

My Commission Expires: 1-25-2024


LA RESA L. HAYNES
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID #20084002974
My Commission Expires January 25, 2024

Savage and Savage *Environmental*

practical solutions for environmental concerns

4610 Haystack Drive **970. 674. 8080 telephone**
Windsor, Colorado 80550 **savageandsavage@earthlink.net**

November 7, 2022

Mr. Levi Broyles, District Ranger
USDA Forest Service
Paonia Ranger District
P.O. Box 1030
Paonia, Colorado 81428

Re: Notice of Application for Phase III Final Bond Release of Selected Areas at the Mountain Coal Company, LLC West Elk Mine (CDRMS file C-1980-007)

Dear Mr. Broyles:

Mountain Coal Company, LLC (MCC) is applying for a Phase III final liability and bond release for portions of the West Elk Mine (Colorado Division of Reclamation, Mining, and Safety permit C-1980-007) in accordance with the approved reclamation plan. The subject of the bond release is a release from liability and reclamation bond for areas where it has been demonstrated that MCC has successfully completed all reclamation obligations and successfully met the final revegetation success criteria.

The application for bond release includes reclaimed sites located within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road areas of the mine site encompassing approximately 9.25 acres. The reclaimed areas requesting bond release are located within the current permit area and are found within Sections 14, 22, 23, 26, and 27, T13S, R90W; all within the 6th Prime Meridian, Gunnison County, Colorado. The mine permit area entrance is located approximately two miles east of Somerset, Colorado, and is accessed from Colorado Highway 133.

As required by Colorado law, whenever bond release is requested, all interested or affected parties with a valid legal interest must be notified and afforded the opportunity to comment or request an informal conference on the bond release in accordance with Rule 3.03.3 of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining.

This letter will serve to notify you that MCC is requesting Phase III final liability and bond release in the amount of approximately $29,416.08 of the total calculated current reclamation bond liability amount of $11,756,466.23. A copy of the entire bond release

application submitted to the Colorado Division of Reclamation, Mining, and Safety will be on file with the Division in Denver, Colorado at 1313 Sherman Street, Room 215 (telephone 303.866.3567), and the Gunnison County Planning Office, 221 N. Wisconsin, Suite C, Gunnison, Colorado 81230 during the review period. All information pertinent to the bond release request is presented within this application.

If you have any questions, comments, or concerns regarding the request for bond release, please contact the Colorado Division of Reclamation, Mining, and Safety, 1313 Sherman Street, Room 215, Denver, CO 80203 (telephone 303.866.3567).

Additionally, if I can answer any questions or concerns, please call me at the above number.

Sincerely,

Michael S. Savage
Principal

CERTIFIED MAIL # 7021 2720 0002 5069 7640
RETURN RECEIPT REQUESTED

c: Leigh Simmons, CDRMS, Denver
Nicki Poulos, Mountain Coal Company, LLC

Savage and Savage ***Environmental***

practical solutions for environmental concerns

4610 Haystack Drive **970. 674. 8080 telephone**
Windsor, Colorado 80550 **savageandsavage@earthlink.net**

November 7, 2022

Ark Land Company
c/o Mountain Coal Company, LLC
5174 Highway 133
Somerset, Colorado 81434

Re: Notice of Application for Phase III Bond Release of Selected Areas of the Mountain Coal Company, LLC West Elk Mine (CDRMS file C-1980-007)

Dear Ark Land Company:

Mountain Coal Company, LLC (MCC) is applying for a Phase III final liability and bond release for portions of the West Elk Mine (Colorado Division of Reclamation, Mining, and Safety permit C-1980-007) in accordance with the approved reclamation plan. The subject of the bond release is a release from liability and reclamation bond for areas where it has been demonstrated that MCC has successfully completed all reclamation obligations and successfully met the final revegetation success criteria.

The application for bond release includes reclaimed sites located within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road areas of the mine site encompassing approximately 9.25 acres. The reclaimed areas requesting bond release are located within the current permit area and are found within Sections 14, 22, 23, 26, and 27, T13S, R90W; all within the 6th Prime Meridian, Gunnison County, Colorado. The mine permit area entrance is located approximately two miles east of Somerset, Colorado, and is accessed from Colorado Highway 133.

As required by Colorado law, whenever bond release is requested, all interested or affected parties with a valid legal interest must be notified and afforded the opportunity to comment or request an informal conference on the bond release in accordance with Rule 3.03.3 of the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining.

This letter will serve to notify you that MCC is requesting Phase III final liability and bond release in the amount of approximately $29,416.08 of the total calculated current reclamation bond liability amount of $11,756,466.23. A copy of the entire bond release application submitted to the Colorado Division of Reclamation, Mining, and Safety will

be on file with the Division in Denver, Colorado at 1313 Sherman Street, Room 215 (telephone 303.866.3567), and the Gunnison County Planning Office, 221 N. Wisconsin, Suite C, Gunnison, Colorado 81230 during the review period. All information pertinent to the bond release request is presented within this application.

If you have any questions, comments, or concerns regarding the request for bond release, please contact the Colorado Division of Reclamation, Mining, and Safety, 1313 Sherman Street, Room 215, Denver, CO 80203 (telephone 303.866.3567).

Additionally, if I can answer any questions or concerns, please call me at the above number.

Sincerely,

Michael S. Savage
Principal

CERTIFIED MAIL # 7021 2720 0002 5069 7657
RETURN RECEIPT REQUESTED

c: Leigh Simmons, CDRMS, Denver
Nicki Poulos, Mountain Coal Company, LLC

Savage and Savage *Environmental*

practical solutions for environmental issues

4610 Haystack Drive **970 674 8080 telephone**
Windsor, Colorado 80550 **savageandsavage@earthlink.net**

November 8, 2022

Gunnison County Planning Office
221 N. Wisconsin St.
Gunnison, Colorado 81230

Re: Phase III Bond Release Application (SL-17), Mountain Coal Company, LLC, West Elk Mine, (CDRMS file C-1980-007)

Dear Gunnison County Planning:

Please retain the enclosed bond release application for the West Elk Mine on file for public review in accordance with your normal procedures. If you have any questions, please contact me at the above number. Thank you.

Sincerely,

Michael S. Savage
Principal

Enclosure: Mountain Coal Company, LLC Phase III Bond Release Application (SL-17)

c: Leigh Simmons, CDRMS
Nicki Poulos, Mountain Coal Company, LLC

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

ARK LAND COMPANY
C/O MOUNTAIN COAL CO.
5174 HIGHWAY 133
SOMERSET, CO 81434

9590 9402 6975 1225 1459 15

2. Article Number *(Transfer from service label)*

7021 2720 0002 5069 7534

PS Form 3811, July 2020 PSN 7530-02-000-9053 — Domestic Return Receipt

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X [signature] ☐ Agent ☒ Addressee

B. Received by *(Printed Name)*: M Lehman

C. Date of Delivery: 9/1/22

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type

- ☒ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☒ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

LEVI BROYLES
USDA FOREST SERVICE
PAONIA RANGER STATION
PO BOX 1030
PAONIA, CO 81428

9590 9402 6975 1225 1455 40

2. Article Number *(Transfer from service label)*

7021 2720 0002 5069 7527

PS Form 3811, July 2020 PSN 7530-02-000-9053 — Domestic Return Receipt

COMPLETE THIS SECTION ON DELIVERY

A. Signature

X [signature] ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*: Levi Broyles

C. Date of Delivery: 9/7/22

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type

- ☒ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☒ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
- ☐ Priority Mail Express®
- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

Public Notice

Mountain Coal Company, LLC (MCC), 5174 Highway 133, Somerset, CO 81434, (970) 929-5015, has filed a Phase III Final Bond Release Request to MCC's Mining and Reclamation Permit No. C-1980-007 with the Colorado Mined Land Reclamation Board (Board), under the provisions of the Colorado Surface Coal Mining Reclamation Act of 1979. The permit was originally issued by the Board in July 1981, and subsequently renewed every five years with the last renewal issued September 2020. The State of Colorado holds a surety reclamation bond in the amount of $15,000,000.00 that exceeds the current reclamation liability of $11,756,466.23.

MCC's approved permit area is located in Gunnison and Delta Counties east of the town of Somerset and south of the North Fork of the Gunnison River. MCC's current permit area is included within areas found on the Somerset and Minnesota Pass USGS 7.5 minute quadrangle maps and contains lands in Sections 9-11, 13-36 in T13S, R90W of the 6th PM, Sections 23-26, T13S, R91W of the 6th Prime Meridian, and Sections 1-5, 8-12, 14-16, and 21-23, T14S, R91W of the 6th Prime Meridian of Gunnison and Delta Counties, Colorado. The current permit area contains approximately 19,854.9 acres.

MCC is requesting a Phase III final liability and bond release for reclaimed methane vent boreholes (MVBs) and associated roads and surface disturbance. These reclaimed areas comprise approximately 9.25 acres of private and public land, within portions of the mine permit area that include Sections 14, 22, 23, 26, and 27, T13S, R90W of the 6th Prime Meridian, Gunnison County, Colorado. The MVB's and associated disturbances were necessary for prior coal mining operations. MCC is requesting a release of $29,416.08 which represents the remainder of the reclamation bond applicable to sites proposed for Phase III bond release, as allowed by Colorado Statute and Rule 3.03. This amount will be verified by the State of Colorado. MCC has successfully completed all reclamation obligations and met the final revegetation success criteria for the reclaimed areas that are the subject of this bond release request.

Reclamation of the sites for which Phase III bond release is being requested was completed between 2004 and 2008. Reclamation included proper plugging and sealing of MVBs, followed by backfilling and regrading of surface disturbance, with subsequent replacement of topsoil and implementation of sediment control measures. The areas proposed for bond release have been revegetated using the methods and plant species consistent with the requirements of the landowners and the approved mining and reclamation permit.

A copy of the bond release application is available for review at the Colorado Division of Reclamation, Mining and Safety (CDRMS), 1313 Sherman Street, Room 215 Denver, CO 80203, (303) 866-3567, and the Gunnison County Planning Office, 221 N. Wisconsin St., Gunnison, CO 81230. All information pertinent to the bond release request is presented within this application. Comments or objections concerning the application should be directed to the CDRMS at the above address not later than 30 days after the last date of publication of this notice (published four times consecutively) in order to be considered.

Published in the Delta County Independent November 16, 23, 30, and December 7, 2022.

2019 Vegetation Report
Phase III Bond Release Eligible Areas:
West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road
Mountain Coal Company, LLC
West Elk Mine
Somerset, Colorado

Prepared by:

Savage and Savage, Inc.
4610 Haystack Drive
Windsor, Colorado 80550
970.674.8080

November 2019

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LIST OF TABLES

APPENDIX

EXECUTIVE SUMMARY

Quantitative vegetation sampling of reclaimed and revegetated sites within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas, eligible for first year's sampling for Phase III bond release at Mountain Coal Company, LLC's (MCC) West Elk Mine, was conducted in June 2019. Vegetation cover by plant species, total herbaceous production, and species composition data were collected. Comparisons were made between total vegetation cover means, total herbaceous production means, and species composition results from the sampled reclamation areas and the final revegetation success criteria from the Colorado Division of Reclamation, Mining and Safety (CDRMS) permit document. The 2019 total mean vegetation cover in the reclamation areas sampled (63.43%) exceeded the final revegetation cover success criterion of 53.04 percent. Total mean herbaceous production this year in the reclamation areas (217.13 g/m^2) exceeded the total herbaceous production revegetation success criterion of 180.38 g/m^2. Relative cover data from the reclamation areas sampled showed that the reclaimed areas exceeded the species composition final success criterion with four perennial cool season graminoids, four perennial cool season forbs, and one woody shrub species present in this year's sampling.

Based on the results of the 2019 quantitative vegetation sampling at the eligible reclamation areas, it was concluded that the final bond release and revegetation requirements of CDRMS Rule 3.03.1(2) have been satisfied for total vegetation cover, total herbaceous production, and species composition; and that overall the sampling results demonstrate the establishment of a diverse, effective and permanent vegetation community of the same seasonal variety native to the land disturbed.

1.0 INTRODUCTION

This report presents the results of the 2019 (first year of the required two years) quantitative vegetation sampling in support of a request for Phase III final bond release for eligible reclaimed sites within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas (2019 Reclamation Areas) above the West Elk Mine main facilities (CDRMS permit C-1980-007) owned and operated by MCC. Quantitative vegetative sampling is required by CDRMS whenever a permittee requests a release from liability and/or reclamation bond in Phase III of the bond release process. Vegetation sampling was performed in compliance with the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining Rules 2.04.10 and 4.15 at the time of sampling and current botanical and plant ecological methods. Field sampling for the areas monitored was conducted between June 16 and 21, 2019 by Savage and Savage, Inc. biologists.

The West Elk Mine site is located in Gunnison and Delta Counties, Colorado, approximately 1.8 miles east of Somerset, Colorado and is accessed by Colorado Highway 133. MCC has operated the West Elk Mine since 1981. The reclamation areas sampled this year are located solely in Gunnison County. Reclaimed sites sampled in 2019 were backfilled, graded, topsoiled, and revegetated in accordance with the approved mining and reclamation plan. The reclaimed sites sampled this year were formerly drill sites and access roads constructed for coal exploration and mine ventilation. Reclamation activities took place between 2004 and 2008 for the areas sampled this year, and included plugging of the drill holes, backfilling and regrading the drill sites and roads, replacing topsoil, reseeding and mulching, and installing erosion control materials.

The revegetation standards used to evaluate these areas are those currently in effect under the Colorado Surface Coal Mining Reclamation Act (CRS 34-33-101 *et seq*) and the West Elk Mining and Reclamation Permit (C-1980-007).

2.0 METHODS

2.1 SAMPLING DESIGN

Prior to initiation of fieldwork, the permit document and applicable maps were reviewed to evaluate topography, reclamation timing, seed mixes, revegetation methods, management, and applicable revegetation standards.

The MCC Reclamation Photograph Project 2018 map of the mine site at 1:14,400 scale (1"=1200') and Google Earth® images were used to identify, locate and delineate the eligible reclamation areas and individual reclaimed sites. As the reclaimed sites are irregularly dispersed over reclaimed areas at the mine, and the sites range from 0.1 to 1.6 acres in size, standard methods of gridding the reclaimed areas and generating random sample points were not practical. Further, as the reclaimed areas ranged from 11 to 15 years in age, it was desirable to obtain a representative sampling of the age structure in the sampling.

From the map and aerial images it was determined that the eligible reclamation sites are located in four distinct locations, representing 26 reclaimed drill holes and road segments within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas. The reclaimed sites, their areal extent, and age were entered into a Microsoft Excel® spreadsheet.

The area of each reclaimed site was calculated as a percentage of the total area of reclaimed areas, as was the total area of eligible reclaimed locations within the reclamation area. By selecting an initial number of total samples, locations for sampling by representative area and reclamation year were assigned.

Sample locations within each sample site were randomly determined by use of a 50’x50’ grid representing the reclaimed site. For example, where a reclaimed site was one acre in size, a 50’x50’ grid yielded sixteen potential sample points. Where the reclaimed site was predominantly linear in nature (as was the case with reclaimed access roads), the overall length of the reclaimed site was determined, and sufficient random numbers generated to allow for sample points on a one hundred foot spacing. A sample point within the reclaimed site was then selected using a random numbers table. Sample point locations were located in the field through compass triangulation, GPS, and pacing from known landmarks. Appendix figures illustrate the general location of the reclaimed areas and reclaimed sites.

The following table identifies the grouped reclaimed sites, their area, date of reclamation, and percentage of the total reclaimed area.

WEST ELK MINE PHASE III (1st Year) ELIGIBLE AREAS: 2019

Site Name/Number	Area	Acres	Year Reclaimed	% of Total
Road to 24HG2E5XC, 4-5XC, 3XC	**Sylvester Gulch**	**1.57**	**2007**	17.0%
1-21-38, 2-21-37, 3-21-36, 4-21-32	**W. Bench**	**1.23**	**2008**	13.3%
24-06 & 24-07 & road	**W. Bench Rd.**	**0.94**	**2006**	10.2%
19-04 & 19-05 & shared spur road	**W. Bench**	**0.91**	**2008**	9.8%
24HG2E5XC, 24HG1E4-5XC, 24HG1E3XC	**Sylvester Gulch**	**0.90**	**2007**	9.7%
17-08A&B	**Saddle Rd.**	**0.82**	**2006**	8.9%
20-01A (and Exploration Hole AAA)	**W. Bench**	**0.69**	**2007**	7.5%
15-05	**Saddle Rd.**	**0.62**	**2004**	6.7%
20-31	**W. Bench**	**0.58**	**2008**	6.3%
22-04	**W. Bench Rd.**	**0.52**	**2007**	5.6%
15-06	**Sylvester Gl. Rd.**	**0.24**	**2004**	2.6%
23HG1E3XC, 23HG3E3XC	**Shaft Cyn Rd.**	**0.13**	**2007**	1.4%
24-09	**Shaft Cyn Rd.**	**0.10**	**2008**	1.1%
Total Phase III Eligible (1st year) Reclaimed Sites		**9.25**		100.0%

2.2 FIELD SAMPLING

2.2.1 Timing

Field investigation of the reclaimed areas was undertaken between June 16 and 21, 2019. This time period coincided with anthesis and maximum presence of the majority of plant species found in the reclamation areas to be sampled at the mine site and adjacent native areas. An initial on-site reconnaissance of vegetation progress and development was undertaken on June 3, 2019 to assess vegetation development.

2.2.2 Total Vegetation Cover

Vegetation cover was estimated by the use of the point-intercept method. An ocular point frame (ESCO Associates) was used to minimize instrument error and maximize precision and observer accuracy. Cover transects were 25 meters in length, with two sample data points collected at 1.0 meter intervals along the transect on opposite sides of the transect centerline, 1.5m apart. Transect direction was established randomly through the use of computer generated random directions (0-360°). In no event were transects allowed to extend within ten feet of revegetated area boundaries to minimize impacts from "edge effect."

For statistical purposes, each cover transect (comprising 50 data points) served as a sample unit. Data points recorded the first vertical "hit" on vegetation (above or below the instrument), soil (bare ground), rock, litter, or cryptogamic crust. Subsequent "hits" on vegetation (prior to interception of the ground surface) were also recorded. Cover data were recorded and reported by individual plant species. The first interception was used to calculate total vegetation cover values. Additional interceptions were used to calculate relative cover of individual plant species and lifeforms. The quantitative cover data also provided the basis for calculation of species composition and relative importance.

2.2.3 Total Herbaceous Production

Total herbaceous production was estimated by the harvest method. One herbaceous production plot was located and randomly oriented at the origin of each cover transect. Herbaceous production plots were 0.50 square meters (m^2) in area. All current year above ground live herbaceous plant biomass was clipped within the 0.50 m^2 quadrat. Production material was air dried until weights varied by no more than 0.1g.

2.2.4 Species Composition

Species composition information was derived from quantitative vegetation cover data. Relative cover information provided a basis for evaluation of the importance of each encountered plant species and lifeform, and for comparison to the final revegetation success criterion. The table presenting data summaries for total vegetation cover for each area sampled also contains the relative cover by species and a column depicting the numerical ranking of each species by relative cover.

2.3 SAMPLE NUMBERS/SAMPLE ADEQUACY

For the purposes of this study, total vegetation cover and total herbaceous production sampling were undertaken to sample adequacy with a minimum of fifteen (15) samples for each parameter sampled. Parameter sample adequacy testing occurred at the one-sided 90% confidence level. Comparisons between sample mean parameter values and the revegetation success standard assume that the sample mean value accurately represents the population mean in all cases.

The following formula was used for sample adequacy calculations:

$$\mathbf{n_{min}} = \frac{(t)^2\,(s)^2}{(d\,X_{bar})^2}$$

where: n_{min} = minimum sample size
s = sample standard deviation
t = the Student's t distribution value at the 90% level (one-sided)
d = percent acceptable deviation from the mean (10%)
X_{bar} = sample mean

2.4 STATISTICAL ANALYSIS

Statistical analysis for the revegetation success criteria of total vegetation cover and total herbaceous production is required if the value of the sample mean from the reclamation areas is less than 90 percent of the value of the final revegetation success criterion for total vegetation cover or total herbaceous production. The 2019 reclaimed area sample means for total vegetation cover and total herbaceous production were greater than the corresponding revegetation success criterion; therefore no statistical analysis was required. A statistical analysis is not required for the evaluation of species composition.

2.5 SPECIES IDENTIFICATION AND VERIFICATION

Species identification was accomplished in the field through the use of plant identification keys (Harrington, 1954, Weber, 1990; Whitson, 1987; Zimdahl, 1990, Stubbendieck, *et al*, 1995). In cases where plant identification was inconclusive in the field, voucher specimens were pressed for lab identification, and identification verified by Mr. Tim Hogan and Ms. Dina Clark of the University of Colorado, Boulder Herbarium.

3.0 RESULTS

3.1 QUANTITATIVE EVALUATION: RECLAIMED AREAS

The 2019 Reclamation Areas sampled contain 9.25 acres with 26 distinct drill hole and road segment features located on the West Bench, within Sylvester Gulch, beside the Shaft Canyon Road, and along the Saddle Road within the West Elk Mine permit area. The reclaimed sites range from 0.1 to 1.6 acres in size and ranged in age from 11 to 15 years. The location, size, and age of the reclaimed sites are presented above in the West Elk Mine Phase III (1st Year) Eligible Areas: 2019 table. Specific vegetation information for the reclamation area is contained in Tables 1, 2, and 3.

3.1.1 Total Vegetation Cover

Total mean vegetation cover of the reclaimed areas was 63.43 percent. Graminoids provided 40.48 percent mean vegetation cover (60.84% relative cover), forbs accounted for 20.38 percent mean vegetation cover (34.20% relative cover), and four woody species contributed 2.57 percent mean vegetation cover (4.96 percent relative cover).

The most frequently encountered species was *Agropyron smithii* (western wheatgrass), present in 86 percent of the 21 transects sampled for vegetation cover. *Bromus marginatus* (mountain brome) was encountered in 81 percent of all transects. *Poa pratensis* (Kentucky bluegrass) was present in 62 percent of transects, and *Agropyron dasystachyum* (thickspike wheatgrass) was encountered in 57 percent of all transects. All other species were encountered in fewer than fifty percent of the vegetation cover transects.

Within the reclaimed areas, the perennial cool season native grass *Agropyron smithii* was the dominant species, contributing 15.43 percent total mean vegetation cover, and 23.50 percent relative vegetation cover. *Bromus marginatus* contributed the second highest vegetation cover, with 12.57 percent total mean vegetation cover and 18.67 percent relative cover. *Agropyron dasystachyum* provided 8.29 percent mean vegetation cover and 12.27 percent relative vegetation cover.

Remaining significant species (contributing three or more percent relative cover) included a mix of a graminoid, forbs, and a shrub; including one additional cool season grass, four cool season forbs, and a perennial shrub. *Astragalus cicer* (cicer milkvetch) provided 5.05 percent total mean vegetation cover (10.05 percent relative cover), *Poa pratensis* contributing 3.71 percent total vegetation cover (5.61% relative cover), *Artemisia tridentata* (big sagebrush) providing 2.19 percent mean total vegetation cover (4.44% relative cover), *Aster glaucodes* (aster) accounting for 2.38 percent total cover (3.79 percent relative cover), *Achillea lanulosa* (yarrow) contributing 2.10 percent total mean vegetation cover (3.39 percent relative cover), and *Penstemon linarioides* (prostrate penstemon) providing 1.90 percent total mean vegetation cover and 3.26 percent relative vegetation cover.

Vegetative litter (prior year's growth, dead wood, and other biologic organic material) comprised 24.48 percent ground cover overall within the reclamation areas. Bare soil comprised 10.48 percent of the ground cover. Rock accounted for 1.62 percent of the ground cover sampled. Cryptogams were not encountered during this year's sampling.

3.1.2 Total Herbaceous Production

Mean total herbaceous production within the Reclamation Areas in 2019 was 217.13 g/m^2 (1935 lb/ac).

3.1.3 Species Composition

Cover sampling identified three lifeforms and thirty-seven plant species within the reclamation areas.

The lifeforms included seven species of perennial grass, one annual grass, twenty-one perennial forbs, one biennial forb, three annual forbs, and four perennial woody plants. Of the species encountered on the reclaimed areas, twenty-seven were native and ten were introduced. Perennial species outnumbered annual species by thirty-two to four, with one biennial species. All species were cool season. The woody plants were all perennial and deciduous.

Quantitative vegetation cover sampling this year revealed nine species contributing greater than three percent relative cover. Those species included four perennial grasses, four perennial forbs, and one woody shrub. The species and their relative cover included *Agropyron smithii* (23.50%), *Bromus marginatus* (18.67%), *Agropyron dasystachyum* (12.27%), *Astragalus cicer* (10.05%), *Poa pratensis* (5.61%), *Artemisia tridentata* (4.44%), *Aster glaucodes* (3.79%), *Achillea lanulosa* (3.39%), and *Penstemon linarioides* (3.26%).

Fourteen additional native forb species were encountered in the cover sampling accounting for an additional 10.6 percent relative cover and 37.8 percent of the total number of plant species sampled. Three additional native graminoids provided an additional 0.65 percent relative cover and 8.1 percent of the total number of species encountered. The three additional woody species accounted for 0.52 percent of the relative cover and 8.1 percent of the total number of species.

Fourteen of the native forb species encountered and the four woody species encountered were volunteers (not in the seed mix), accounting for 48.6 percent of all species sampled. This indicates that the reclamation practices employed are favorable for re-establishment of volunteer species from adjacent undisturbed areas.

3.2 COMPARISON OF RECLAIMED AREAS WITH FINAL REVEGETATION SUCCESS CRITERIA

Comparison of the reclaimed areas values for total vegetation cover, total herbaceous production, and species composition with the final revegetation success criteria indicates whether revegetation has been successful and compliant with requirements for Phase III bond release.

CDRMS Rule 3.03.1(2) provides for release of bond, “upon the establishment of vegetation which supports the approved post-mining land use and which meets the approved success standard for cover pursuant to 4.15.8…” The tables below allow the comparison of

the parameter values from this years sampling at the reclamation areas with the final revegetation criteria to be achieved.

Total Vegetation Cover (2019)

Final Total Vegetation Cover Success Criterion: 53.04 % total vegetation cover

	2019 Reclaimed Areas
X_{bar}	63.43%
S	8.90%
Number of samples	21
Number of samples for sample adequacy	3

Based on the results of the 2019 quantitative sampling, the West Elk Mine reclamation areas sampled exceeded the final total cover revegetation success criterion of 53.04 percent, thereby meeting and exceeding the final revegetation success criterion and supporting the post-mining land use.

Total Herbaceous Production (2019)

Final Total Herbaceous Production Success Criterion: 180.38 g/m^2

	2019 Reclaimed Areas
X_{bar}	217.13 g/m^2
S	42.43 g/m^2
Number of samples	22
Number of samples for sample adequacy	7

Based on the results of the 2019 quantitative vegetation sampling, the West Elk Mine reclaimed areas exceeded the final revegetation total herbaceous production success criterion of 180.38 g/m^2, thereby meeting and exceeding the final revegetation success criterion for total herbaceous production and supporting the post-mining land use.

Species Composition (2019)

The West Elk Mine permit document specifies that to meet the requirements of the final revegetation success criterion for species composition, species composition on any reclaimed area shall be such that there are at least three perennial species of which two are cool season perennial grasses and one is a cool season perennial forb. No one component of the above three species should comprise greater than 40% relative cover nor less than 3% relative cover during a given year's quantitative sampling. The following reflects the number of individual species required by the success standard and the number of individual species encountered in quantitative sampling this year at the West Elk Mine reclamation areas sampled this year.

Species Composition Success Criteria

	Success Standard	2019 Reclaimed Areas
Total Perennial Species* (>3% rel. cover)	3	9
Cool Season Grasses*	2	4
Cool Season Forbs*	1	4
Woody Plants	0	1
Relative Importance (3%<x<40%)	All Species	All Species

*** Numbers reflect only those species meeting the relative importance percentage limitation**

The West Elk Mine reclamation areas sampled in 2019 exceeded the requirements for species composition, thereby meeting the final revegetation success criterion and supporting the post-mining land use.

4.0 DISCUSSION AND CONCLUSIONS

The specified Reclamation Areas were quantitatively sampled in 2019 to evaluate whether they would qualify for CDRMS Phase III bond release during the first year of the two year evaluation period.

4.1 TOTAL VEGETATION COVER

Mean total vegetation cover (63.43%) of the reclamation areas exceeded the final revegetation success criterion for vegetation cover (53.04%). Of the thirty-seven species encountered in cover sampling, thirty-three were perennial or biennial species, accounting for 89.2 percent of all species encountered. Perennial and biennial species provided 98.6 percent of all total relative cover (60.71% graminoids, 32.90% forbs, and 4.96% shrubs). Of the total vegetation cover, native species contributed 81.1 percent of the relative cover (55.10% graminoids, 21.03% forbs, and 4.96% shrubs). These results indicate the establishment of a predominantly perennial, native vegetation community at the reclamation areas, with total vegetation cover greater than that of the final revegetation success criteria.

4.2 TOTAL HERBACEOUS PRODUCTION

Sampled total herbaceous production on the 2019 Reclamation Areas this year (217.13g/m^2) exceeded the final revegetation success criterion for total herbaceous production (180.38 g/m^2).

4.3 SPECIES COMPOSITION

The CDRMS considers species composition of the revegetated and reclaimed areas to be an indicator of successful vegetation establishment and a diverse vegetation community. The species composition standard for the West Elk Mine requires that there be at least three perennial species, of which two are cool season perennial grasses and one is a cool season perennial forb. No one component of the above three species should comprise greater than 40% relative importance nor less than 3% relative importance. Relative importance will be measured by calculating relative cover of the revegetation species.

The Reclamation Areas exceeded the required number of perennial cool season grass species with contributions by *Agropyron smithii*, *Bromus marginatus*, *Agropyron dasystachyum*, and *Poa pratensis*, accounting for between three and forty percent relative cover. The Reclamation Areas exceeded the required number of perennial cool season forb species with representation by *Astragalus cicer*, *Aster glaucodes*, *Achillea lanulosa*, and *Penstemon linarioides* accounting for between three and forty percent relative cover. The perennial native shrub *Artemisia tridentata* also contributed to the species composition of the reclaimed areas.

No pests or diseases were found within the reclaimed areas, nor were there annual or weedy species that would negatively impact the longevity of the reclaimed vegetation community.

5.0 SUMMARY

Quantitative vegetation sampling of the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Phase III eligible reclamation areas revealed that the revegetated areas exceeded the requirements for final revegetation success for total vegetation cover, total herbaceous production, and species composition. Tables 1 and 2 illustrate that the total number of species encountered during sampling is significant and diverse in numbers of species, lifeforms, and seasonal variety.

Based on the results of the 2019 quantitative vegetation sampling at the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas, it was concluded that the requirements of CDRMS Rule 3.03.1(2) for Phase III final bond release have been satisfied for the applicable revegetation success criteria of total vegetation cover, total herbaceous production, and species composition; and that overall the sampling results demonstrate the establishment of a diverse, effective and permanent vegetation community of the same seasonal variety native to the land disturbed.

6.0 LITERATURE CITED

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7.0 TABLES

Table 1. Plant Species List: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2019)

Common Name	Species Name	Lifeform
Graminoids		
Thickspike Wheatgrass	*Agropyron dasystachyum*	P, C, N
Western Wheatgrass	*Agropyron smithii*	P, C, N
Bluebunch Wheatgrass	*Agropyron spicatum*	P, C, N
Slender Wheatgrass	*Agropyron trachycaulum*	P, C, N
Mountain Brome	*Bromus marginatus*	P, C, N
Cheatgrass	*Bromus tectorum*	A, C, I
Arizona Fescue	*Festuca arizonica*	P, C, N
Kentucky Bluegrass	*Poa pratensis*	P, C, I
Forbs		
Yarrow	*Achillea lanulosa*	P, C, N
Wild Onion	*Allium acuminatum*	P, C, N
Aster	*Aster glaucodes*	P, C, N
Cicer Milkvetch	*Astragalus cicer*	P, C, I
Bull Thistle	*Cirsium vulgare*	B, C, I
Field Bindweed	*Convolvulus arvensis*	P, C, I
Fleabane	*Erigeron flagellaris*	P, C, N
Sulfur Buckwheat	*Eriogonum umbellatum*	P, C, N
Little Bedstraw	*Galium septentrionale*	A, C, N
Curlycup Gumweed	*Grindelia squarrosa*	P, C, N
Utah Sweetvetch	*Hedysarum boreale*	P, C, N
Goldeneye	*Heliomeris multiflora*	P, C, N
Pepperweed	*Lepidium perfoliatum*	A, C, I
Lupine	*Lupinus argenteus*	P, C, N
Alfalfa	*Medicago sativa*	P, C, I
Field Mint	*Mentha arvensis*	P, C, N
Forget-Me-Not	*Myosotis scorpioides*	P, C, N
Sainfoin	*Onobrychis viciaefolia*	P, C, I
Beardtongue	*Penstemon virens*	P, C, N
Prostrate Penstemon	*Penstemon linarioides*	P, C, N
Two Lobe Speedwell	*Pocilla biloba*	A, C, I
Dandelion	*Taraxacum officinale*	P, C, I
Meadow Rue	*Thalictrum fendleri*	P, C, N
Golden Banner	*Thermopsis montanus*	P, C, N
Mule's Ears	*Wyethia amplexicaulis*	P, C, N

Table 1. Plant Species List: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2019) continued

Common Name	Species Name	Lifeform
Woody Plants		
Artemisia tridentata	Big Sagebrush	P, D, N
Rosa woodsii	Wood's Rose	P, D, N
Quercus gambelii	Gambel's Oak	P, D, N
Symphoricarpos rotundifolius	Snowberry	P, D, N

Total Graminoids	8
Total Perennial Graminoids	7
Total Annual Graminoids	1
Total Native Graminoids	6
Total Introduced Graminoids	2
Total Cool Season Graminoids	8
Total Warm Season Graminoids	0
Total Forbs	25
Total Perennial Forbs	21
Total Biennial Forbs	1
Total Annual Forbs	3
Total Native Forbs	17
Total Introduced Forbs	8
Total Cool Season Forbs	25
Total Warm Season Forbs	0
Total Woody Plants	4
TOTAL NUMBER OF SPECIES	37

Lifeform abbreviations:

A: annual
B: biennial
P: perennial
C: cool season
W: warm season
N: native
I: introduced
D:deciduous

Note: Only plant species encountered during cover sampling are represented on this list

Table 2. Vegetation Cover: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2019)

Species Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	overall mean	overall relative cover	overall rank
Graminoids																									
Agropyron dasystachyum	**Thickspike Wheatgrass**	**4**		**14**	**2**			**30**	**40**	**36**	**28**		**6**					**2**	**6**	**4**	**2**		**8.29**	**12.27**	**3**
Agropyron smithii	**Western Wheatgrass**	**34**	**28**	**16**	**28**			**4**	**12**	**12**	**10**		**24**	**12**	**16**	**18**	**30**	**50**	**16**	**6**	**6**	**2**	**15.43**	**23.50**	**1**
Agropyron spicatum	Bluebunch Wheatgrass							2															0.10	0.26	23
Agropyron trachycaulum	Slender Wheatgrass	2																					0.10	0.13	28
Bromus marginatus	**Mountain Brome**	**12**	**4**	**20**	**10**	**12**	**40**	**18**	**8**	**12**	**10**	**60**			**2**			**2**	**14**	**24**	**6**	**10**	**12.57**	**18.67**	**2**
Bromus tectorum	Cheatgrass										2												0.10	0.13	28
Festuca arizonica	Arizona Fescue																					4	0.19	0.26	23
Poa pratensis	**Kentucky Bluegrass**	**6**			**8**	**2**					**8**		**6**	**4**	**4**	**2**	**2**		**6**	**2**	**16**	**12**	**3.71**	**5.61**	**5**
Graminoid Cover																							40.48	60.84	
Forbs																									
Achillea lanulosa	**Yarrow**		**2**	**16**	**4**	**2**								**2**	**4**			**2**	**2**		**8**	**2**	**2.10**	**3.39**	**8**
Allium acuminatum	Wild Onion													4	6								0.48	0.65	16
Aster glaucodes	**Aster**										**2**		**8**	**10**	**12**	**4**	**4**	**2**	**2**			**6**	**2.38**	**3.79**	**7**
Astragalus cicer	**Cicer Milkvetch**					**58**	**30**	**6**							2				**8**		**2**	**2**	**5.05**	**10.05**	**4**
Cirsium vulgare	Bull Thistle														2								0.10	0.13	28
Convolvulus arvensis	Field Bindweed								2		4												0.29	0.39	21
Erigeron flagellaris	Fleabane														2					6	2		0.48	0.65	16
Eriogonum umbellatum	Sulfur Buckwheat				2								12	2		12	2	2		2			1.62	2.35	11
Galium septentrionale	Little Bedstraw																	2					0.10	0.13	28
Grindelia squarrosa	Curlycup Gumweed																				2		0.10	0.13	28
Hedysarum boreale	Utah Sweetvetch		8					4															0.57	0.78	14
Heliomeris multiflora	Goldeneye														4							2	0.29	0.39	21
Lepidium perfoliatum	Pepperweed			2																			0.10	0.13	28
Lupinus argenteus	Lupine		4					2															0.29	0.78	14
Medicago sativa	Alfalfa															6	2						0.38	0.52	19
Mentha arvensis	Field Mint	2																					0.10	0.13	28
Myosotis scorpioides	Forget-Me-Not													2									0.10	0.13	28
Onobrychis viciaefolia	Sainfoin																					2	0.10	0.26	23
Penstemon virens	Beardtongue		6		4	2									4								0.76	1.04	12
Penstemon linarioides	**Prostrate Penstemon**									**6**				**2**					**8**	**4**	**4**	**16**	**1.90**	**3.26**	**9**
Pocilla biloba	Two Lobe Speedwell		4	2	10																		0.76	1.04	12
Taraxacum officinale	Dandelion	2	4									2	2										0.48	0.65	16
Thalictrum fendleri	Meadow Rue	8	2																				0.48	0.65	16
Thermopsis montanus	Golden Banner											2	2			2	18			2	2		1.33	2.48	10
Wyethia amplexicaulis	Mule's Ears													2									0.10	0.26	23
Shrubs																							20.38	34.20	
Artemisia tridentata	**Big Sagebrush**												**10**	**12**	**24**								2.19	**4.44**	**6**
Rosa woodsii	Wood's Rose										2	2											0.19	0.26	23
Quercus gambelii	Gambel's Oak									2													0.10	0.13	28
Symphoricarpos rotundifolius	Snowberry																					2	0.10	0.13	28
Shrub Cover																							2.57	4.96	
Vegetation Cover		70	62	70	68	76	70	66	62	68	66	66	70	52	80	44	58	62	62	50	50	60	63.43	100.00	
																					Std. Dev.		8.90		
																					N min		3		
Litter		26	22	20	12	12	22	26	30	26	32	34	16	8	10	40	32	28	32	36	32	18	24.48		
Bare		4	14	10	20	10	8	4	4	6	2	0	14	34	10	14	10	10	6	14	6	20	10.48		
Rock		0	2	0	0	2	0	4	4	0	0	0	0	6	0	2	0	0	0	0	12	2	1.62		

Note: all data presented in percent (%) cover

Table 3. Total Herbaceous Production: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2019)

	1	2	3	4	5	6	7	8	9	10	11
Total Herbaceous Production	361.4	230.6	183.2	247.6	193.0	264.8	219.8	197.4	243.0	209.0	205.4

	12	13	14	15	16	17	18	19	20	21	22	mean
Total Herbaceous Production	231.2	218.2	170.6	200.6	231.0	199.8	202.6	241.0	195.8	144.4	186.4	217.13

Std Dev.= 42.43
Nmin.= 7

Note: all data presented in grams per square meter

8.0 APPENDIX


2019 West Elk Mine Phase III Eligible Reclamation Sites
133
19-04, 19-05
& Road
20-31
Exploration Hole AAA
20-01A
1-21-38, 2-21-37
3-21-36, 4-21-32
22-04
23HG1E3XC
23HG3E3XC
24HG2E5XC,
24HG1E4-5XC
24HG1E3XC
24-09
24-06, 24-07
& Road
Road to 24HG sites
15-06
15-05
17-08 A&B
N
1 mi
Google Earth
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2022 Vegetation Report
Phase III Bond Release Eligible Areas:
West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road
Mountain Coal Company, LLC
West Elk Mine
Somerset, Colorado

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EXECUTIVE SUMMARY

Quantitative vegetation sampling of reclaimed and revegetated sites within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas, eligible for second year's sampling for Phase III bond release at Mountain Coal Company, LLC's (MCC) West Elk Mine, was conducted in June 2022. Vegetation cover by plant species, total herbaceous production, and species composition data were collected. Comparisons were made between total vegetation cover means, total herbaceous production means, and species composition results from the sampled reclamation areas and the final revegetation success criteria from the Colorado Division of Reclamation, Mining and Safety (CDRMS) permit document. The 2022 total mean vegetation cover in the reclamation areas sampled (67.47%) exceeded the final revegetation cover success criterion of 53.04 percent. Total mean herbaceous production this year in the reclamation areas (227.67 g/m^2) exceeded the total herbaceous production revegetation success criterion of 180.38 g/m^2. Relative cover data from the reclamation areas sampled showed that the reclaimed areas exceeded the species composition final success criterion with five perennial cool season graminoids and one perennial cool season forb present in this year's sampling.

Based on the results of the 2022 quantitative vegetation sampling at the eligible reclamation areas, it was concluded that the final bond release and revegetation requirements of CDRMS Rule 3.03.1(2) have been satisfied for total vegetation cover, total herbaceous production, and species composition; and that overall the sampling results demonstrate the establishment of a diverse, effective and permanent vegetation community of the same seasonal variety native to the land disturbed.

1.0 INTRODUCTION

This report presents the results of the 2022 (second year of the required two years) quantitative vegetation sampling in support of a request for Phase III final bond release for eligible reclaimed sites within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas (2022 Reclamation Areas) above the West Elk Mine main facilities (CDRMS permit C-1980-007) owned and operated by MCC. Quantitative vegetative sampling is required by CDRMS whenever a permittee requests a release from liability and/or reclamation bond in Phase III of the bond release process. Vegetation sampling was performed in compliance with the Regulations of the Colorado Mined Land Reclamation Board for Coal Mining Rules 2.04.10 and 4.15 at the time of sampling and current botanical and plant ecological methods. Field sampling for the areas monitored was conducted between June 20 and 25, 2022 by Savage and Savage, Inc. biologists.

The West Elk Mine site is located in Gunnison and Delta Counties, Colorado, approximately 1.8 miles east of Somerset, Colorado and is accessed by Colorado Highway 133. MCC has operated the West Elk Mine since 1981. The reclamation areas sampled this year are located solely in Gunnison County. Reclaimed sites sampled in 2022 were backfilled, graded, topsoiled, and revegetated in accordance with the approved mining and reclamation plan. The reclaimed sites sampled this year were formerly drill sites and access roads constructed for coal exploration and mine ventilation. Reclamation activities took place between 2004 and 2008 for the areas sampled this year, and included plugging of the drill holes, backfilling and regrading the drill sites and roads, replacing topsoil, reseeding and mulching, and installing erosion control materials.

The revegetation standards used to evaluate these areas are those currently in effect under the Colorado Surface Coal Mining Reclamation Act (CRS 34-33-101 *et seq*) and the West Elk Mining and Reclamation Permit (C-1980-007).

2.0 METHODS

2.1 SAMPLING DESIGN

Prior to initiation of fieldwork, the permit document and applicable maps were reviewed to evaluate topography, reclamation timing, seed mixes, revegetation methods, management, and applicable revegetation standards.

The MCC Reclamation Photograph Project 2018 map of the mine site at 1:14,400 scale (1"=1200') and Google Earth® images were used to identify, locate and delineate the eligible reclamation areas and individual reclaimed sites. As the reclaimed sites are irregularly dispersed over reclaimed areas at the mine, and the sites range from 0.1 to 1.6 acres in size, standard methods of gridding the reclaimed areas and generating random sample points were not practical. Further, as the reclaimed areas ranged from 14 to 18 years in age, it was desirable to obtain a representative sampling of the age structure in the sampling.

From the map and aerial images it was determined that the eligible reclamation sites are located in four distinct locations, representing 26 reclaimed drill holes and road segments within the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas. The reclaimed sites, their areal extent, and age were entered into a Microsoft Excel® spreadsheet.

The area of each reclaimed site was calculated as a percentage of the total area of reclaimed areas, as was the total area of eligible reclaimed locations within the reclamation area. By selecting an initial number of total samples, locations for sampling by representative area and reclamation year were assigned.

Sample locations within each sample site were randomly determined by use of a 50’x50’ grid representing the reclaimed site. For example, where a reclaimed site was one acre in size, a 50’x50’ grid yielded sixteen potential sample points. Where the reclaimed site was predominantly linear in nature (as was the case with reclaimed access roads), the overall length of the reclaimed site was determined, and sufficient random numbers generated to allow for sample points on a one hundred foot spacing. A sample point within the reclaimed site was then selected using a random numbers table. Sample point locations were located in the field through compass triangulation, GPS, and pacing from known landmarks. Appendix figures illustrate the general location of the reclaimed areas and reclaimed sites.

The following table identifies the grouped reclaimed sites, their area, date of reclamation, and percentage of the total reclaimed area.

WEST ELK MINE PHASE III (2ndYear) ELIGIBLE AREAS: 2022

Site Name/Number	Area	Acres	Year Reclaimed	% of Total
Road to 24HG2E5XC, 4-5XC, 3XC	Sylvester Gulch	1.57	2007	17.0%
1-21-38, 2-21-37, 3-21-36, 4-21-32	W. Bench	1.23	2008	13.3%
24-06 & 24-07 & road	W. Bench Rd.	0.94	2006	10.2%
19-04 & 19-05 & shared spur road	W. Bench	0.91	2008	9.8%
24HG2E5XC, 24HG1E4-5XC, 24HG1E3XC	Sylvester Gulch	0.90	2007	9.7%
17-08A&B	Saddle Rd.	0.82	2006	8.9%
20-01A (and Exploration Hole AAA)	W. Bench	0.69	2007	7.5%
15-05	Saddle Rd.	0.62	2004	6.7%
20-31	W. Bench	0.58	2008	6.3%
22-04	W. Bench Rd.	0.52	2007	5.6%
15-06	Sylvester Gl. Rd.	0.24	2004	2.6%
23HG1E3XC, 23HG3E3XC	Shaft Cyn Rd.	0.13	2007	1.4%
24-09	Shaft Cyn Rd.	0.10	2008	1.1%
Total Phase III Eligible (2nd year) Reclaimed Sites		**9.25**		100.0%

2.2 FIELD SAMPLING

2.2.1 Timing

Field investigation of the reclaimed areas was undertaken between June 20 and 25, 2022. This time period coincided with anthesis and maximum presence of the majority of plant species found in the reclamation areas to be sampled at the mine site and adjacent native areas. An initial on-site reconnaissance of vegetation progress and development was undertaken on June 5 and 6, 2022 to assess vegetation development.

2.2.2 Total Vegetation Cover

Vegetation cover was estimated by the use of the point-intercept method. An ocular point frame (ESCO Associates) was used to minimize instrument error and maximize precision and observer accuracy. Cover transects were 25 meters in length, with two sample data points collected at 1.0 meter intervals along the transect on opposite sides of the transect centerline, 1.5m apart. Transect direction was established randomly through the use of computer generated random directions (0-360°). In no event were transects allowed to extend within ten feet of revegetated area boundaries to minimize impacts from "edge effect."

For statistical purposes, each cover transect (comprising 50 data points) served as a sample unit. Data points recorded the first vertical "hit" on vegetation (above or below the instrument), soil (bare ground), rock, litter, or cryptogamic crust. Subsequent "hits" on vegetation (prior to interception of the ground surface) were also recorded. Cover data were recorded and reported by individual plant species. The first interception was used to calculate total vegetation cover values. Additional interceptions were used to calculate relative cover of individual plant species and lifeforms. The quantitative cover data also provided the basis for calculation of species composition and relative importance.

2.2.3 Total Herbaceous Production

Total herbaceous production was estimated by the harvest method. One herbaceous production plot was located and randomly oriented at the origin of each cover transect. Herbaceous production plots were 0.50 square meters (m^2) in area. All current year above ground live herbaceous plant biomass was clipped within the 0.50 m^2 quadrat. Production material was air dried until weights varied by no more than 0.1g.

2.2.4 Species Composition

Species composition information was derived from quantitative vegetation cover data. Relative cover information provided a basis for evaluation of the importance of each encountered plant species and lifeform, and for comparison to the final revegetation success criterion. The table presenting data summaries for total vegetation cover for each area sampled also contains the relative cover by species and a column depicting the numerical ranking of each species by relative cover.

2.3 SAMPLE NUMBERS/SAMPLE ADEQUACY

For the purposes of this study, total vegetation cover and total herbaceous production sampling were undertaken to sample adequacy with a minimum of fifteen (15) samples for each parameter sampled. Parameter sample adequacy testing occurred at the one-sided 90% confidence level. Comparisons between sample mean parameter values and the revegetation success standard assume that the sample mean value accurately represents the population mean in all cases.

The following formula was used for sample adequacy calculations:

$$\mathbf{n_{min}} = \frac{(t)^2\,(s)^2}{(d\,X_{bar})^2}$$

where:
n_{min} = minimum sample size
s = sample standard deviation
t = the Student's t distribution value at the 90% level (one-sided)
d = percent acceptable deviation from the mean (10%)
X_{bar} = sample mean

2.4 STATISTICAL ANALYSIS

Statistical analysis for the revegetation success criteria of total vegetation cover and total herbaceous production is required if the value of the sample mean from the reclamation areas is less than 90 percent of the value of the final revegetation success criterion for total vegetation cover or total herbaceous production. The 2022 reclaimed area sample means for total vegetation cover and total herbaceous production were greater than the corresponding revegetation success criterion; therefore no statistical analysis was required. A statistical analysis is not required for the evaluation of species composition.

2.5 SPECIES IDENTIFICATION AND VERIFICATION

Species identification was accomplished in the field through the use of plant identification keys (Harrington, 1954, Weber, 1990; Whitson, 1987; Zimdahl, 1990, Stubbendieck, *et al*, 1995). In cases where plant identification was inconclusive in the field, voucher specimens were pressed for lab identification, and identification verified by Mr. Tim Hogan and Ms. Dina Clark of the University of Colorado, Boulder Herbarium.

3.0 RESULTS

3.1 QUANTITATIVE EVALUATION: RECLAIMED AREAS

The 2022 Reclamation Areas sampled contain 9.25 acres with 26 distinct drill hole and road segment features located on the West Bench, within Sylvester Gulch, beside the Shaft Canyon Road, and along the Saddle Road within the West Elk Mine permit area. The reclaimed sites range from 0.1 to 1.6 acres in size and ranged in age from 14 to 18 years. The location, size, and age of the reclaimed sites are presented in the West Elk Mine Phase III (2nd Year) Eligible Areas: 2022 table above. Specific vegetation information for the reclamation area is contained in Tables 1, 2, and 3.

3.1.1 Total Vegetation Cover

Total mean vegetation cover of the reclaimed areas was 67.47 percent. Graminoids provided 50.27 percent mean vegetation cover (74.51% relative cover), forbs accounted for 14.13 percent mean vegetation cover (20.95% relative cover), and four woody species contributed 3.07 percent mean vegetation cover (4.55% relative cover).

The most frequently encountered species was *Agropyron smithii* (western wheatgrass), present in 100 percent of the 15 transects sampled for vegetation cover. *Agropyron trachycaulum* (slender wheatgrass) was encountered in 60 percent of all transects. *Agropyron dasystachyum* (thickspike wheatgrass) and *Festuca arizonica* (Arizona fescue) were each present in 53 percent of transects. All other species were encountered in fewer than fifty percent of the vegetation cover transects.

Within the reclaimed areas, the perennial cool season native grass *Agropyron smithii* was the dominant species, contributing 24.27 percent total mean vegetation cover, and 35.97 percent relative vegetation cover.

Festuca arizonica contributed the second highest vegetation cover, with 6.40 percent total mean vegetation cover and 9.49 percent relative cover. *Bromus marginatus* (mountain brome) accounted for 5.73 percent total vegetation cover and 8.50 percent relative vegetation cover. *Agropyron trachycaulum* provided 5.33 percent total vegetation cover and 7.91 percent relative cover, while *Agropyron dasystachyum* contributed 4.00 percent total cover (5.93% relative cover). *Aster glaucodes* (aster) accounted for 2.53 percent total vegetation cover and 3.75 percent relative vegetation cover. No other species contributed more than three percent relative cover in this year's sampling.

Vegetative litter (prior year's growth, dead wood, and other biologic organic material) comprised 23.47 percent ground cover overall within the reclamation areas. Bare soil comprised 8.40 percent of the ground cover. Rock accounted for 0.67 percent of the ground cover sampled. Cryptogams were not encountered during this year's sampling.

3.1.2 Total Herbaceous Production

Mean total herbaceous production within the 2022 Reclamation areas in 2022 was 227.67 g/m^2 (2029 lb/ac).

3.1.3 Species Composition

Cover sampling identified three lifeforms and forty plant species within the reclamation areas. One forb species was not able to be positively identified. The lifeforms included ten species of perennial grass, no annual grasses, eighteen perennial forbs, two biennial forbs, five annual forbs, and four perennial woody plants. Of the species encountered on the reclaimed areas, twenty-eight were native and eleven were introduced. Perennial species outnumbered annual species by thirty-two to five, with two biennial species. All species were cool season. The woody plants were all perennial and deciduous.

Quantitative vegetation cover sampling this year revealed six species contributing greater than three percent relative cover. Those species included five perennial grasses and one perennial forb. The species and their relative cover included *Agropyron smithii* (35.97%), *Festuca arizonica* (9.49%), *Bromus marginatus* (8.50%), *Agropyron trachycaulum* (7.91%), *Agropyron dasystachyum* (5.93%), and *Aster glaucodes* (3.75%).

Fifteen additional native forb species were encountered in the cover sampling accounting for an additional 11.28 percent relative cover and 37.5 percent of the total number of plant species sampled. Three additional native graminoids provided an additional 3.56 percent relative cover and 7.5 percent of the total number of species encountered. The four additional woody species accounted for 4.55 percent of the relative cover and ten percent of the total number of species.

Two native graminoids, thirteen of the native forb species encountered, and the four woody species encountered were volunteers (not in the seed mix), accounting for 47.5 percent of all species sampled. This indicates that the reclamation practices employed are favorable for re-establishment of volunteer species from adjacent undisturbed areas.

3.2 COMPARISON OF RECLAIMED AREAS WITH FINAL REVEGETATION SUCCESS CRITERIA

Comparison of the reclaimed areas values for total vegetation cover, total herbaceous production, and species composition with the final revegetation success criteria indicates whether revegetation has been successful and compliant with requirements for Phase III bond release.

CDRMS Rule 3.03.1(2) provides for release of bond, “upon the establishment of vegetation which supports the approved post-mining land use and which meets the approved success standard for cover pursuant to 4.15.8…” The tables below allow the comparison of the parameter values from this years sampling at the reclamation areas with the final revegetation criteria to be achieved.

Total Vegetation Cover (2022)

Final Total Vegetation Cover Success Criterion: 53.04 % total vegetation cover

	2022 Reclaimed Areas
X_{bar}	67.47%
S	5.78%
Number of samples	15
Number of samples for sample adequacy	1

Based on the results of the 2022 quantitative sampling, the West Elk Mine reclamation areas sampled exceeded the final total cover revegetation success criterion of 53.04 percent, thereby meeting and exceeding the final revegetation success criterion and supporting the post-mining land use.

Total Herbaceous Production (2022)

Final Total Herbaceous Production Success Criterion: 180.38 g/m^2

	2022 Reclaimed Areas
X_{bar}	227.67 g/m^2
S	60.60 g/m^2
Number of samples	19
Number of samples for sample adequacy	13

Based on the results of the 2022 quantitative vegetation sampling, the West Elk Mine reclaimed areas exceeded the final revegetation total herbaceous production success criterion of 180.38 g/m^2, thereby meeting and exceeding the final revegetation success criterion for total herbaceous production and supporting the post-mining land use.

Species Composition (2022)

The West Elk Mine permit document specifies that to meet the requirements of the final revegetation success criterion for species composition, species composition on any reclaimed area shall be such that there are at least three perennial species of which two are cool season perennial grasses and one is a cool season perennial forb. No one component of the above three species should comprise greater than 40% relative cover nor less than 3% relative cover during a given year's quantitative sampling. The following reflects the number of individual species required by the success standard and the number of individual species encountered in quantitative sampling this year at the West Elk Mine reclamation areas sampled this year.

Species Composition Success Criteria

	Success Standard	2022 Reclaimed Areas
Total Perennial Species* (>3% rel. cover)	3	6
Cool Season Grasses*	2	5
Cool Season Forbs*	1	1
Woody Plants	0	0
Relative Importance (3%<x<40%)	All Species	All Species

*** Numbers reflect only those species meeting the relative importance percentage limitation**

The West Elk Mine reclamation areas sampled in 2022 exceeded the requirements for species composition, thereby meeting the final revegetation success criterion and supporting the post-mining land use.

4.0 DISCUSSION AND CONCLUSIONS

The 2022 Reclamation Areas were quantitatively sampled in 2022 to evaluate whether they would qualify for CDRMS Phase III bond release during the second year of the two year evaluation period.

4.1 TOTAL VEGETATION COVER

Mean total vegetation cover (67.47%) of the reclamation areas exceeded the final revegetation success criterion for vegetation cover (53.04%). Of the forty species encountered in cover sampling, thirty-four were perennial or biennial species, accounting for 85.0 percent of all species encountered. Perennial and biennial species provided 97.24 percent of all total relative cover (74.51% graminoids, 18.18% forbs, and 4.55% shrubs). Of the total vegetation cover, native species contributed 93.47 percent of the relative cover (73.72% graminoids, 15.20% forbs, and 4.55% shrubs). These results indicate the establishment of a predominantly perennial, native vegetation community at the reclamation areas, with total vegetation cover greater than that of the final revegetation success criteria.

4.2 TOTAL HERBACEOUS PRODUCTION

Sampled total herbaceous production on the 2022 Reclamation Areas this year (227.67 g/m^2) exceeded the final revegetation success criterion for total herbaceous production (180.38 g/m^2).

4.3 SPECIES COMPOSITION

The CDRMS considers species composition of the revegetated and reclaimed areas to be an indicator of successful vegetation establishment and a diverse vegetation community. The species composition standard for the West Elk Mine requires that there be at least three perennial species, of which two are cool season perennial grasses and one is a cool season perennial forb. No one component of the above three species should comprise greater than 40% relative importance nor less than 3% relative importance. Relative importance will be measured by calculating relative cover of the revegetation species.

The reclamation areas exceeded the required number of perennial cool season grass species with contributions by *Agropyron smithii*, *Festuca arizonica*, *Bromus marginatus*, *Agropyron trachycaulum*, and *Agropyron dasystachyum* accounting for between three and forty percent relative cover. The reclamation areas met the required number of perennial cool season forb species with representation by *Aster glaucodes*.

No pests or diseases were found within the reclaimed areas, nor were there annual or weedy species that would negatively impact the longevity of the reclaimed vegetation community.

5.0 SUMMARY

Quantitative vegetation sampling of the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Phase III eligible reclamation areas revealed that the revegetated areas exceeded the requirements for final revegetation success for total vegetation cover, total herbaceous production, and species composition. Tables 1 and 2 illustrate that the total number of species encountered during sampling is significant and diverse in numbers of species, lifeforms, and seasonal variety.

Based on the results of the 2022 quantitative vegetation sampling at the West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road reclamation areas, it was concluded that the requirements of CDRMS Rule 3.03.1(2) for Phase III final bond release have been satisfied for the applicable revegetation success criteria of total vegetation cover, total herbaceous production, and species composition; and that overall the sampling results demonstrate the establishment of a diverse, effective and permanent vegetation community of the same seasonal variety native to the land disturbed.

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7.0 TABLES

Table 1. Plant Species List: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2022)

Common Name	Species Name	Lifeform
Graminoids		
Thickspike Wheatgrass	*Agropyron dasystachyum*	P, C, N
Western Wheatgrass	*Agropyron smithii*	P, C, N
Bluebunch Wheatgrass	*Agropyron spicatum*	P, C, N
Slender Wheatgrass	*Agropyron trachycaulum*	P, C, N
Mountain Brome	*Bromus marginatus*	P, C, N
Elk Sedge	*Carex geyerii*	P, C, N
Orchardgrass	*Dactylis glomerata*	P, C, I
Arizona Fescue	*Festuca arizonica*	P, C, N
Kentucky Bluegrass	*Poa pratensis*	P, C, I
Needle and Thread	*Stipa comata*	P, C, N
Forbs		
Yarrow	*Achillea lanulosa*	P, C, N
Wild Onion	*Allium acuminatum*	P, C, N
Aster	*Aster glaucodes*	P, C, N
Cicer Milkvetch	*Astragalus cicer*	P, C, I
Shepherd's Purse	*Capsella bursa-pastoris*	A, C, I
Field Bindweed	*Convolvulus arvensis*	P, C, I
Mustard	*Descurainia pinnata*	A, C, N
Filaree	*Erodium cicutarium*	A, C, I
Sulfur Buckwheat	*Eriogonum umbellatum*	P, C, N
Little Bedstraw	*Galium septentrionale*	A, C, N
Utah Sweetvetch	*Hedysarum boreale*	P, C, N
Goldeneye	*Heliomeris multiflora*	P, C, N
Golden Aster	*Heterotheca villosa*	P, C, N
Lupine	*Lupinus argenteus*	P, C, N
Yellow Sweetclover	*Melilotus officinalis*	B, C, I
Field Mint	*Mentha arvensis*	P, C, N
Beardtongue	*Penstemon virens*	P, C, N
Prostrate Penstemon	*Penstemon linarioides*	P, C, N
Two Lobe Speedwell	*Pocilla biloba*	A, C, I
Cinquefoil	*Potentilla norvegica*	P, C, I
Dandelion	*Taraxacum officinale*	P, C, I
Golden Banner	*Thermopsis montanus*	P, C, N
Salsify	*Tragopogon dubius*	B, C, I
Stinging Nettle	*Urtica gracilis*	P, C, N
Mule's Ears	*Wyethia amplexicaulis*	P, C, N
Unknown forb		

Table 1. Plant Species List: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2022) continued

Common Name	Species Name	Lifeform
Woody Plants		
Artemisia tridentata	Big Sagebrush	P, D, N
Chrysothamnus nauseousus	Chamisa	P, D, N
Rosa woodsii	Wood's Rose	P, D, N
Symphoricarpos rotundifolius	Snowberry	P, D, N

Total Graminoids	10
Total Perennial Graminoids	10
Total Annual Graminoids	0
Total Native Graminoids	8
Total Introduced Graminoids	2
Total Cool Season Graminoids	10
Total Warm Season Graminoids	0
Total Forbs	26
Total Perennial Forbs	18
Total Biennial Forbs	2
Total Annual Forbs	5
Total Native Forbs	16
Total Introduced Forbs	9
Total Cool Season Forbs	25
Total Warm Season Forbs	0
Total Unknown Forbs	1
Total Woody Plants	4
TOTAL NUMBER OF SPECIES	40

Lifeform abbreviations:

A: annual
B: biennial
P: perennial
C: cool season
W: warm season
N: native
I: introduced
D:deciduous

Note: Only plant species encountered during cover

Table 2. Vegetation Cover: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2022)

Species Name	Common Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	overall mean	overall relative cover	overall rank
Graminoids																			
Agropyron dasystachyum	**Thickspike Wheatgrass**		**8**	**10**		**10**	**8**	**2**	**4**	**2**		**16**					**4.00**	**5.93**	**5**
Agropyron smithii	**Western Wheatgrass**	**12**	**46**	**30**	**12**	**36**	**16**	**18**	**6**	**28**	**34**	**24**	**44**	**20**	**16**	**22**	**24.27**	**35.97**	**1**
Agropyron spicatum	Bluebunch Wheatgrass									8	12			2		4	1.73	2.57	7
Agropyron trachycaulum	**Slender Wheatgrass**				**4**	**8**	**10**	**8**				**10**	**12**	**14**	**2**	**12**	**5.33**	**7.91**	**4**
Bromus marginatus	**Mountain Brome**	**54**							**28**	**2**					**2**		**5.73**	**8.50**	**3**
Carex geyerii	Elk Sedge	2															0.13	0.20	31
Dactylis glomerata	Orchardgrass								6		2						0.53	0.79	17
Festuca arizonica	**Arizona Fescue**			**6**	**32**	**16**				**14**	**10**			**6**	**2**	**10**	**6.40**	**9.49**	**2**
Poa pratensis	Kentucky Bluegrass				2		2	10	8					2			1.60	2.37	8
Stipa comata	Needle and Thread			2						4					2		0.53	0.79	17
Graminoid Cover																	50.27	74.51	
Forbs																			
Achillea lanulosa	Yarrow								6	6						4	1.07	1.58	10
Allium acuminatum	Wild Onion													2	2		0.27	0.40	23
Aster glaucodes	**Aster**											**2**		**8**	**20**	**8**	**2.53**	**3.75**	**6**
Astragalus cicer	Cicer Milkvetch		8		2											2	0.80	1.19	15
Capsella bursa-pastoris	Shepherd's Purse						4										0.27	0.40	23
Convolvulus arvensis	Field Bindweed							4									0.27	0.40	23
Descurainia pinnata	Mustard				2												0.13	0.20	31
Erodium cicutarium	Filaree							2									0.13	0.20	31
Eriogonum umbellatum	Sulfur Buckwheat			2								2	6	4	6		1.33	1.98	9
Galium septentrionale	Little Bedstraw									6							0.40	0.59	22
Hedysarum boreale	Utah Sweetvetch		2							2							0.27	0.40	23
Heliomeris multiflora	Goldeneye							8									0.53	0.79	17
Heterotheca villosa	Golden Aster							2		2							0.27	0.40	23
Lupinus argenteus	Lupine			2			10	2									0.93	1.38	11
Melilotus officnalis	Yellow Sweetclover												2				0.13	0.20	31
Mentha arvensis	Field Mint									2							0.13	0.20	31
Penstemon virens	Beardtongue						2	6									0.53	0.79	17
Penstemon linarioides	Prostrate Penstemon				14												0.93	1.38	11
Pocilla biloba	Two Lobe Speedwell						8	2			4						0.93	1.38	11
Potentilla norvegica	Cinquefoil														2		0.13	0.20	31
Taraxacum officinale	Dandelion						4	4			4		2				0.93	1.38	11
Thermopsis montanus	Golden Banner											6	2				0.53	0.79	17
Tragopogon dubius	Salsify		2										2				0.27	0.40	23
Urtica gracilis	Stinging Nettle								2								0.13	0.20	31
Wyethia amplexicaulis	Mule's Ears														2		0.13	0.20	31
	Unknown Forb													2			0.13	0.20	31
																	14.13	20.95	
Shrubs																			
Artemisia tridentata	Big Sagebrush													14	12		1.73	2.57	7
Chrysothamnus nauseosus	Chamisa							2			2						0.27	0.40	23
Rosa woodsii	Wood's Rose					2										2	0.27	0.40	23
Symphoricarpos rotundifolius	Snowberry						2		10								0.80	1.19	15
Shrub Cover																	3.07	4.55	
Vegetation Cover		68	66	52	68	72	66	70	70	76	68	60	70	74	68	64	67.47	100.00	
																Std. Dev.	5.78		
																N min	1		
Litter		30	24	28	28	18	28	20	20	14	28	26	24	18	14	32	23.47		
Bare		2	10	16	4	10	6	8	10	10	4	14	6	4	18	4	8.40		
Rock		0	0	4	0	0	0	2	0	0	0	0	0	4	0	0	0.67		

Note: all data presented in percent (%) cover

Table 3. Total Herbaceous Production: West Bench, Sylvester Gulch, Shaft Canyon Road, and Saddle Road Reclamation Areas (2022)

	1	2	3	4	5	6	7	8	9	10	11
Total Herbaceous Production	281.4	279.8	240.6	262.8	313.0	121.0	203.0	282.6	162.4	260.8	101.4

	12	13	14	15	16	17	18	19	mean
Total Herbaceous Production	202.0	182.0	276.4	249.6	220.4	273.4	265.4	147.8	227.67

Std Dev.= 60.6
Nmin.= 13

Note: all data presented in grams per square meter

8.0 APPENDIX


2022 West Elk Mine Phase III Eligible Reclamation Sites
133
19-04, 19-05
& Road
20-31
Exploration Hole AAA
20-01A
1-21-38, 2-21-37
3-21-36, 4-21-32
22-04
23HG1E3XC
23HG3E3XC
24HG2E5XC,
24HG1E4-5XC
24HG1E3XC
24-09
24-06, 24-07
& Road
Road to 24HG sites
15-06
15-05
17-08 A&B
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