Partial Phase II / III & Phase III, Bond Release Request (SL-7)

Yoast Mine

Seneca Property, LLC

Permit No. C-1994-082

August 2019
Revised March 2020

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INTRODUCTION

The Yoast Mine is located approximately nine miles southeast of the town of Hayden, Colorado. Yoast is a reclaimed surface coal mine. Coal extraction began at Yoast in 1995 and ceased in 2006. During the life of the mine over 12 million tons of coal were produced. Reclamation grading, topsoil replacement and seeding of the mine disturbance areas have been mostly completed. A copy of the complete approved Yoast Mine permit is located at the Twentymile Coal Company office, 29515 RCR 27, Oak Creek, Colorado.

This application is submitted in accordance with the *Colorado Division of Minerals and Geology Guideline Regarding Selected Coal Mine Bond Release Issues* (April 18, 1995), *Rule 3.03 Release of Performance Bonds,* the approved permit and consultations with CDRMS on vegetation sampling, analysis and success evaluations.

BOND RELEASE BACKGROUND INFORMATION

This submittal represents a formal partial Phase II and partial Phase III along with a combined partial phase II and III bond release request by Seneca Property, LLC (SPL) for the Seneca Yoast Mine (Yoast). The previous owner, Seneca Coal Company, submitted an initial Phase I Bond release request (SL-1) on June 26, 2007. SL-1 resulted in 173.02 acres released and the bond was reduced by $11,862. SL-2 (partial Phase I) bond release became final on July 22, 2010 and resulted in release of 456.7 acres and bond reduction of $790,205. SL-3 (Partial Phase II) bond release became final on March 9, 2012 and resulted in a Phase II release of 592 acres and bond reduction of $1,693,918. SL-4 (Partial Phase I) bond release became final on November 9, 2012 and resulted in a release of 115.5 acres and bond reduction of $452,336. SL-5 (Phase I, II and III bond release) became final in March 2014 and resulted in the release of 6.25 acres and bond reduction of $1,493.63. SL-6 (Partial Phase I& III) became final in March 14th, 2018 and resulted in the release of 372.1 acres and a bond reduction of $522,435.07. Areas included in this application as Phase III have received formal Phase I and Phase II bond release, with exception to the combined Phase II and Phase III areas. All areas included have had topsoil replaced and were revegetated between 1997 and 2013.

GENERAL REQUIREMENTS

Date of Request ---------- August 2019
Permittee ---------- Seneca Property, LLC
Permit Number ---------- C-1994-082
Permit Approval Date ---------- August 5, 1995
Mine Name ---------- Yoast Mine
Phase of Bond Release Requested ---------- Phase II, Phase III, &
Phase II + Phase III (SL-7)
Total Acres within Permit ---------- 2,318.3
Total Acres Disturbed ---------- 848.6
Number of Acres Requested for Release ------ 39.4 (Phase II&III) + 315. (Phase III)
Reclamation Liability (Bond Amount) --------- $ 1,379,988.51
Dollar Amount Requested for Release --------- To Be Determined By CDRMS

LAND CATEGORIES

The affected lands within the Yoast permit area fall within the permanent program (SMCRA and CSCMRA) category and as defined in the regulations of the Colorado Mined Land Reclamation Board for Coal Mining.

IDENTIFICATION OF LANDS

The Yoast Mine is located approximately nine (9) miles southeast of the Town of Hayden, Colorado. The USGS 7.5 Minute Quadrangle Map of Mt. Harris, contains the described permit area. The permitted area is 2,318.3 acres. The permitted disturbed area totals 848.6 acres. Surface ownership is predominately private, with right of entry based on a variety of private leases, subleases and easements. The permit area also includes limited areas of federal and state controlled surface.

The specific areas to which this bond release request applies are included within the Permit Area described as follows:

T6N, R87W

Section 28:	Portions of NW¼, NW¼ SW¼, SW¼NW¼
Section 29:	Portions of SE¼
Section 32:	Portions of NW¼ NE¼, W½E½

T5N, R87W

Section 5:	Portions of W½E½
Section 8:	NW¼, SW¼, W½NE¼ , and W½SE¼
Section 16:	SW¼NW¼, NW¼SW¼, and portions of SW¼SW¼, NW¼NW¼, SE¼NW¼, NE¼SW¼, and NW¼SE¼
Section 17:	All
Section 18:	NE¼SE¼, S½SE¼
Section 19:	E½ and portions of E½W½
Section 20:	SW¼NW¼, N½NW¼, W½SW¼ and portions of N½NE¼
Section 29:	NW¼NW¼
Section 30:	N½NE¼,

All west of the 6th Principal Meridian; totaling 2,318.3 acres. The exact location of the requested 39.4 acres (Phase II&III) + 315 acres (Phase III) bond release areas within the permit area are shown on Map 1B – SL-7 Phase III Bond Release Block Area Delineation Map.

PERMIT RENEWAL HISTORY

Permit #:	C-1994-082
Issued:	August 5, 1995
Renewals:	RN-1 03/06/2000
	RN-2 08/02/2005
	RN-3 8/5/2010
	RN-4 02/08/2018

The Division's current calculated reclamation liability is $1,379,988.51. SPL has posted a Financial Warranty Corporate Surety issued by Lexon Insurance Company in the amount of $1,379,988.51 effective March 14th, 2018.

MAP DESCRIPTION

~~Map 1A – SL-7 Bond Release Block Area Delineation Map. This map shows all requested Phase II areas.~~

Map 1B - Phase III and Phase II + III Bond Release SL-7 Area Delineation Map. This map shows all requested Phase III areas. The Phase III areas meet the minimum 10 year period for revegetation

Map 2 – Phase II and III Bond Release SL-7 Permanent Features Map. This map shows permanent features documented in the mine permit.

Map 3 - Post Mining Topography Map. This map can be compared to the pre-mining topography map for elevation comparisons

Map 4 – SL-7 General Location Map. This map shows the general location of the Yoast Mine property boundaries relative to other land marks.

BOND RELEASE DOCUMENTATION

This application originally represented a formal request for partial Phase II Bond Release on 143.3 acres, partial Phase III Bond Release on 41.4 acres, and partial Phase II & III on 314.1 acres (BRB-2) of reclaimed lands at the Yoast Mine (see Maps 1A & 1B). SL7 was revised to remove the 143.3 acres of Phase II which will be included in SL8. These reclaimed lands comply with applicable success and demonstration criteria set forth in Rule 4 – Performance Standards and the approved Yoast permit.

SUMMARY OF RECLAMATION AND MANAGEMENT HISTORY

PHASE III RELEASE AREAS

Reclamation (i.e., topsoil replacement and revegetation) in the Phase III request areas were initiated in 2001 and continued through 2007 with approximately 10 acres of interseeding conducted in 2009. This activity is documented in the Yoast Annual Reclamation Reports submitted to CDRMS for these periods. Topsoil depth replacement information and revegetation history are included in the Yoast SL-3 Phase II bond release application approved by CDRMS in March 2012. Vegetation establishment was documented in formal vegetation sampling and results reported in the SL-3 Phase II bond release document.

PHASE II + III RELEASE AREAS

Reclamation (i.e., topsoil replacement and revegetation) in the Phase II + III request areas were initiated in 2001 and continued through 2007 with approximately 10 acres of interseeding conducted in 2009. This activity is documented in the Yoast Annual Reclamation Reports submitted to CDRMS for these periods. Topsoil replacement details can be found within the SL-3 bond release document. While the exact dates of topsoil replacement are not known, it can be logical to assume that topsoil replacement occurred within the same year as revegetation. Revegetation dates are shown on *Exhibit B, Chronological Revegetation*. Vegetation establishment was documented in formal vegetation sampling and results will be reported in this document.

RECLAMATION MANAGEMENT

Reclamation management has been a continuing effort that includes:

Rill and Gully Maintenance. Spring rill and gully surveys are conducted to identify erosional features resulting from spring snowmelt and runoff. The annual survey results are portrayed on maps and submitted to CDRMS. The survey outcomes have been followed up as necessary by maintenance and repairs to rectify identified areas found in the survey and inspections.

Weed Control. Reclaimed areas and mine related disturbances, such as roadsides and facilities, are monitored for noxious weed infestations. Monitoring is conducted through the formal revegetation monitoring program or as qualitative observations by

Yoast Mine reclamation personnel. If noxious weed infestations occur at levels that may interfere with successful reclamation, or are detrimental to reclaimed land quality and management, weed control is implemented. Application of herbicides has been carried out through two primary agents, outside services or Yoast Reclamation Department personnel and complies with applicable regulations and procedures.

Grazing. Livestock grazing (sheep only) has been conducted on Yoast reclaimed lands since 2009. The grazing season has historically been from August through September. Livestock grazing has been conducted annually and livestock numbers have increased as more reclaimed acres have become available and the vegetation communities have continued to mature. Stocking rates have been developed from ongoing vegetation monitoring data and a goal of proper use at 50% forage utilization has been a basis of management, as has pasture development for management and grazing systems. Annual precipitation and the effects on current year's production are factored into annual management. Results of annual grazing are presented in the Yoast Annual Reclamation Reports submitted yearly to CDRMS to demonstrate utility for the post-mine land use.

REVEGETATION SUCCESS (PHASE II)

REMOVED FROM SL7 SUBMITTAL

REVEGETATION SUCCESS (PHASE III & PHASE II + III)

The SL-7 Phase III bond release includes lands within the BRB-2 block areas to total 354.4 acres. The parcels within the BRB-2 area were revegetated between 2001 and 2007 with a small area of interseeding in 2009. Phase II bond release encompassing the BRB-2 Phase III area has been approved based on the previous SL-3 submittal for 315 acres, while the remainder 39.41 acres is being requested as a combined Phase II and Phase III release. These lands have established vegetation that meets the minimum ten-year liability period and are able to support the approved post-mining land uses. Phase III revegetation success evaluations have been based on the applicable regulatory success standard requirements and procedures spelled out in Tab 22 "Revegetation Plan" of the approved Yoast permit, Rules 3.03.1(2)(c), 3.03.1(4) and 4.15.8 and the Division's Guideline Regarding Selected Coal Mine Bond Release Issues (April 1995).

Revegetation success is demonstrated by meeting the appropriate cover, production, woody density and species diversity success standards based on statistically valid sampling and analysis. Species composition and diversity requirements are assessed through the vegetation cover data and evaluations using a species diversity assessment specifically developed for SPL reclaimed lands as detailed in Tab 22.

Vegetation sampling in the BRB-2 Phase III bond release block and the Yoast reference areas was conducted in 2015 by Cedar Creek Associates and in 2016 by Cedar Creek Associates. The 2015/2016 report of the findings for testing revegetation success for the Yoast BRB-2 Phase III bond release evaluation is included as ***Attachment D – Revegetation Success Supporting Documentation***. The Phase III bond release block, reference areas and random sample point locations are shown on Maps 1 - 4 contained in the 2015/2016 revegetation success evaluation report in Attachment D.

As a result of sampling and analysis, successful revegetation for the parameters of cover, herbaceous production, woody plant density (background and concentration areas) and species diversity was demonstrated in both 2015 and 2016 vegetation sampling years. The results of those demonstrations are summarized in the following sections.

COVER

The Yoast cover standard and success evaluation procedures are as follows. The cover success standard is based on a weighted average value (based on the relative extent of primary pre-mine vegetation type contributions to total acreage) for allowable all-hit herbaceous cover derived from sampling in the approved extended reference area. The weighting contribution by type is aspen 24.4%, mountain brush 48.9%, sagebrush 24.0% and steep mountain brush 2.7%. Allowable all-hit herbaceous cover is determined from cover sampling in the Phase III reclaimed lands and the native reference area with subtractions made for woody plants, noxious weeds and cover of annual/biennial weeds in excess of 10% relative cover. *The Phase III bond release area sample value will be no less than 90% of the cover success standard at 90% statistical confidence.* In the following discussion and the bond release vegetation report attached, cover for the reference area derived standard and the Phase III reclaimed area may be variously referred to as allowable all-hit

herbaceous cover or as allowable herbaceous cover. The derivation of the allowable all-hit herbaceous cover for the Phase III bond release block and the reference area types is included in the discussion and data tables in the 2015 and 2016 revegetation success evaluation report included in ***Attachment D – Revegetation Success Supporting Documentation***.

Table 6 provides a summary of the sample cover attributes for the Phase III bond release block and the four native types in the extended reference areas for years 2015 and 2016. Table 6 also includes the calculated allowable first hit herbaceous cover values for these communities.

Table 1. 2015 and 2016 Vegetation Cover Sampling Data Summary for the Yoast BRB-2 Phase III & Phase II + III Bond Release and Reference Areas (RA).

Area	Total First Hit Cover (%)	Allowable All-hit Herbaceous Cover (%)	Standing Dead (%)	Litter (%)	Bare Soil (%)	Rock (%)
BRB-2 Phase III & Phase II + III Bond Release Area **2015**	74.7	69.8	0.9	25.3	8.9	0.7
A[1] RA **2015**	143.3	84.8	1.0	9.6	2.2	---
MB[1] RA **2015**	129.3	47.1	1.5	10.2	2.4	---
SB[1] RA **2015**	78.1	40.7	2.3	19.4	12.1	0.2
SMB[1] RA **2015**	51.9	22.7(25.63)[2]	1.3	23.4	20.3	10.5
BRB-2 Phase III & Phase II + III Bond Release Area **2016**	79.3	71.3	1.7	24.5	7.3	1.1
A[1] RA **2016**	163.6	74.6	0.4	8.7	1.2	---
MB[1] RA **2016**	128.1	44.9	1.1	11.2	3.0	0.1

SB[1] RA **2016**	78.0	36.4	3.5	21.4	7.1	0.1
SMB[1] RA **2016**	62.3	28.2	2.8	18.1	19.8	5.1

[1] Reference Area Types (RA): A = aspen, MB = mountain brush, SB = sagebrush, SMB = steep mountain brush, WW/AS = western wheatgrass/alkali sagebrush
[2] Upward adjusted Steep Mountain Brush value for 2015 success evaluations only. See text following Table 2.

Sample adequacy was calculated during 2015 and 2016 data collection based on allowable all-hit herbaceous cover which is relevant to the cover success criteria. The sampling results and statistics for allowable all-hit herbaceous cover are presented in Table 6 below. In 2015 and 2016, sample adequacy based on allowable all-hit herbaceous cover was achieved in BRB-2 and each of the reference area types except for 2015 Steep Mountain Brush (note that sample adequacy was met when 2015 Steep Mountain Brush all-hit total vegetation cover was assessed). The 2015 Steep Mountain Brush sample adequacy approach and basis for application to success criteria evaluations is addressed below following Table 6. Please refer to report text and Tables C4, G3 and G8 in the vegetation bond release study report contained in Attachment D for more detail.

Table 2. 2015 and 2016 Data and Sample Adequacy Summary for Allowable All-Hit Herbaceous Cover for the Yoast BRB-2 Phase III & Phase II + III Bond Release and Reference Areas (RA).

Area	Allowable All-Hit Herbaceous Cover (x)	s	N	N_{min}	t
BRB-2 Phase III & Phase II + III Bond Release Area **2015**	69.8	18.6	32	13	1.309
A[1] RA **2015**	84.8	13.3	21	5	1.325
MB[1] RA **2015**	47.1	13.2	20	14	1.328
SB[1] RA **2015**	40.7	11.0	16	14	1.341
SMB[1] RA **2015**	22.7	9.0	17	29[2]	1.337
BRB-2 Phase III & Phase II + III Bond Release Area **2016**	71.3	17.9	35	11	1.307

A[1] RA **2016**	74.6	20.1	20	13	1.328
MB[1] RA **2016**	44.9	11.5	16	12	1.341
SB[1] RA **2016**	36.4	9.6	17	13	1.337
SMB[1] RA **2016**	28.2	5.6	17	7	1.337

[1] Reference Area Types (RA): A = aspen, MB = mountain brush, SB = sagebrush, SMB = steep mountain brush, WW/AS = western wheatgrass/alkali sagebrush
[2] See text below for statistical measure to address sample adequacy and use of adjusted Steep Mountain Brush data for 2015success evaluations. Value in parenthesis represents the upper 90% probability value of the mean used in success evaluations.

In 2015, sample adequacy based on all-hit allowable herbaceous cover was not achieved for the Steep Mountain Brush type in the Extended Reference Area. Note however that sample adequacy based on all hit total foliar cover was met in 2015 (Table C-4 in Attachment D). An alternative that used the upper 90% probability value of the mean was exercised. In other words, after having established a reliable estimate of population variance having taken 17 samples in 2015, the maximum possible values of the mean (with 90% confidence) was taken to represent the allowable herbaceous cover of the Steep Mountain Brush type within the reference area. This was calculated in either of two ways below.

2015 data

1) Confidence Intervals

C.I. = $(s/\sqrt{n})*t = (9.04/\sqrt{17})*1.337 = 2.93$

22.7+2.93 = 25.63

2) Sample Adequacy Expression

$$N = \frac{s^2 t^2}{d^2 \bar{x}^2}$$

$d = \sqrt{((s^2t^2)/(x^2N))} = \sqrt{((9.04^2*1.337^2)/(22.7^2*17))} = 0.129$

X + d = 22.7 + (22.7 *0.129) = 25.63

25.63% allowable herbaceous cover represents with 90% confidence the highest possible value of the true mean for the Mountain Brush Reference Area in 2015.

Cover Success Evaluations

Calculation of 90 percent of the cover performance standard determined from 2015 and 2016 sampling is demonstrated below based on the reference area data that is weight averaged by type. The approximate weighting contribution is aspen 24.4%, mountain brush 48.9%, sagebrush 24.0%, and steep mountain brush 2.7%.

2015

Calculation of the cover performance standard for 2015 sampling data and using the highest possible value for the Mountain Brush Reference Area component as described above, is demonstrated below.

Aspen Reference Area Allowable All-Hit Herbaceous Cover[1] = 84.8%

Mountain Brush Reference Area Allowable All-Hit Herbaceous Cover[1] = 47.1%

Sagebrush Reference Area Allowable All-Hit Herbaceous Cover[1] = 40.7%

Steep Mountain Brush Reference Area Allowable All-Hit Herbaceous Cover[1] = 25.6%[2]

[1] *Herbaceous cover adjusted to allowable by subtracting noxious weeds and annual/biennial plant cover in excess of 10% of the remainder.*

[2] *Highest possible value of the true mean calculation*

The calculation of 90 percent of the 2015 Cover Standard =

0.90* [0.244(84.8%) +0.489(47.1%) +0.24(40.7%) +0.027(25.6%)] = 48.7%

The 2015 mean allowable all-hit herbaceous vegetation cover sampled in the BRB-2 area was 69.8 percent, exceeding the cover standard of 48.7 percent (90 percent of the upwardly adjusted cover performance standard) and success is demonstrated. This direct comparison of reclaimed area mean to standard is allowed under DRMS rules (CDMG 2005 revised rule, 4.15.11 (2)(a)). [Note that were the Steep Mountain Brush Reference Area mean (22.7%) not upwardly adjusted to the maximum value (25.63%) for the calculation of the performance standard, 90% of the cover standard would have been remained at 48.7%].

2016

Calculation of the cover performance standard for 2016 sampling data is demonstrated below.

Aspen Reference Area Allowable All-Hit Herbaceous Cover[1] = 74.6%

Mountain Brush Reference Area Allowable All-Hit Herbaceous Cover[1] = 44.9%

Sagebrush Reference Area Allowable All-Hit Herbaceous Cover[1] = 36.4%

Steep Mountain Brush Reference Area Allowable All-Hit Herbaceous Cover[1] = 28.2%

[1] *Herbaceous cover adjusted to allowable by subtracting noxious weeds and annual/biennial plant cover in excess of 10% of the remainder.*

The calculation of 90 percent of the 2018 Cover Standard =

0.90* [0.244(74.6%) +0.489(44.9%) +0.24(36.4%) +0.027(28.2%)] = 44.7

The mean allowable all-hit herbaceous vegetation cover sampled in 2016 BRB-2 was 71.3%, exceeding 44.7%, which is 90% of the upwardly adjusted cover performance standard. (see Table C-1 in Attachment D). This direct comparison of reclaimed area mean to standard is allowed under DRMS rules (CDMG 2005 revised rule, 4.15.11 (2)(a)) when sample adequacy has been demonstrated for the reclaimed area. Thus for 2016, successful revegetation for allowable all-hit herbaceous cover is indicated.

Successful revegetation for the parameter of cover was demonstrated in both 2015 and 2016.

PRODUCTION

The Yoast herbaceous production standard and success evaluation is based on reference area sampling to derive a weight averaged value (based on the four primary pre-mine vegetation type contributions to total acreage). The current 2015 and 2016 annual herbaceous production was determined from sampling in the approved four vegetation types in the extended reference area. The weighting contribution for each type is as described above under the Cover discussion. Based on the production sampling an allowable herbaceous production value is determined by excluding noxious weeds and allowing no more than 10% relative production of annual/biennial weeds. The allowable herbaceous production values for the four vegetation types in the reference area are used in the weight averaged calculations to determine the production standard.

Table 3. 2015 and 2016 Data and Sample Adequacy Summary for Total and Allowable Herbaceous Production (pounds/acre) for the Yoast BRB-2 Phase III & Phase II + III Bond Release Area.

Vegetation Type	Total Herbaceous Production	Allowable Herbaceous Production	s	N	N_{min}	t
BRB-2 Phase III & Phase II + III Bond Release Area **2015**	1709.2	1709.2	48.0	30	44	1.311
BRB-2 Phase III & Phase II + III Bond Release Area **2016**	1873.8	1873.8	58.8	35	54	1.307

Table 4. 2015 and 2016 Data and Sample Adequacy Summary for Total and Allowable Herbaceous Production (pounds/acre) in the Reference Area Vegetation Types for the Yoast BRB-2 Phase III & Phase II + III Bond Release Herbaceous Production Performance Standard.

Vegetation Type	Total Herbaceous Production	Allowable Herbaceous Production	s	N	N_{min}	t
A[1] RA **2015**	828.1	828.1	43.6	32	152	1.309
MB[1] RA **2015**	648.0	648.0	21.7	32	62	1.309
SB[1] RA **2015**	1188.5	1188.5	39.4	32	61	1.309
SMB[1] RA **2015**	518.0	518.0	14.8	32	45	1.309
A[1] RA **2016**	985.1	985.1	28.1	32	45	1.309
MB[1] RA **2016**	494.2	494.2	10.8	32	27	1.309
SB[1] RA **2016**	1046.1	1046.1	36.1	32	66	1.309
SMB[1] RA **2016**	532.4	532.4	11.4	32	25	1.309

[1] Reference Area Types (RA): A = aspen, MB = mountain brush, SB = sagebrush, SMB = steep mountain brush, WW/AS = western wheatgrass/alkali sagebrush

2015 Production Success Evaluation

Calculation of 90 percent of the production performance standard relative to 2015 sample data is demonstrated below.

Aspen Reference Area Allowable Herbaceous Production[1] = 828.1 lbs/acre
Mountain Brush Reference Area Allowable Herbaceous Production[1] = 648.0 lbs/acre
Sagebrush Reference Area Allowable Herbaceous Production[1] = 1188.5 lbs/acre
Steep Mountain Brush Reference Area Allowable Herbaceous Production[1] = 518.0 lbs/acre

[1] *Herbaceous production adjusted by subtracting annual/biennial plant production in excess of 10% of the remainder. Production by noxious weed species is not collected.*

90 percent of the production standard for 2015 =

$$0.90\ [0.244(828.1) + 0.489(648.0) + 0.240(1188.5) + 0.027(518.0) = 736.4 \text{ lbs/acre}$$

The 2015 BRB-2 reclaimed area mean allowable herbaceous production of 1,709.2 pounds per acre (Table 7) far exceeded 90 percent of the production performance standard of 736.4 pounds per acre. The average herbaceous production by annuals and biennials sampled in the BRB-2 was less than 10% of total herbaceous production (149.0 lbs/acre non-noxious annuals and biennials). Therefore an "excess" annual/biennial production deduction was not used in 2015.

The 2015 BRB-2 allowable herbaceous production exceeded 90 percent of the production performance standard, but sample adequacy was not demonstrated in either the reclaimed or the reference areas (minimum of 30 samples – see Table C4 in Attachment D). Therefore reclamation success for Phase III is demonstrated by passing a one sample t-test of the "reverse null" hypothesis (CDMG 2005 revised rule, 4.15.11 (2)(c)). The 2015 BRB-2 production data were first evaluated for normality of distribution using the Shapiro-Francia test (Table 3 and accompanying discussion, Page 26 of the Vegetation Report contained in Attachment D). This test was not passed. Following a square root transformation of the data, the test was passed. Hypothesis testing was conducted using square root transformed data for both the BRB-2 production data and the production technical standard.

A one-sample t-test of the "reverse null" hypothesis asserting that the 2015 BRB-2 total allowable herbaceous production (transformed data) is indistinguishable from the weighted average Reference Area allowable herbaceous production (transformed data) is as follows (transformed data are square roots of oven-dry gm/0.5sq.m. data):

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t\_calc = (40.2 - 24.5)/(9.7/[\![30]\!]\text{^}0.5\ ) = 8.865$

Since critical t_{table} = 0.854 (one-tailed, alpha = 0.2, 30-1 df) is exceeded by t_{calc} (8.865), the hypothesis of no difference is rejected and reclamation success for 2015 BRB-2 Phase III production is demonstrated.

2016 Production Success Evaluation

Calculation of 90 percent of the production performance standard relative to 2016 sample data is demonstrated below.

Aspen Reference Area Allowable Herbaceous Production[1] = 985.1 lbs/acre
Mountain Brush Reference Area Allowable Herbaceous Production[1] = 494.2 lbs/acre
Sagebrush Reference Area Allowable Herbaceous Production[1] = 1046.1 lbs/acre
Steep Mountain Brush Reference Area Allowable Herbaceous Production[1] = 532.4 lbs/acre

[1] *Herbaceous production adjusted by subtracting annual/biennial plant production in excess of 10% of the remainder. Production by noxious weed species is not collected.*

90 percent of the 2016 production standard =

0.90 [0.244(985.1)+0.489(494.2)+0.240(1,046.1)+0.027(532.4) = 672.7 lbs/acre

As can be seen, the 2016 BRB-2 mean allowable herbaceous production of 1,873.8 pounds per acre (Table 7) far exceeded 90 percent of the production performance standard of 672.7 lbs/acre. The average herbaceous production by annuals and biennials sampled in the BRB-2 was less than 10% of total herbaceous production (51.2 lbs/acre non-noxious annuals and biennials). And

therefore an "excess" annual/biennial production deduction was not used during the 2016 evaluation.

The 2016 BRB-2 allowable herbaceous production exceeded 90 percent of the production performance standard, but sample adequacy was not demonstrated in either the reclaimed or the reference areas (minimum of 30 samples - see Tables C1 and C4 in Attachment D). Therefore reclamation success for Phase III is demonstrated by passing a one sample t-test of the "reverse null" hypothesis (CDMG 2005 revised rule, 4.15.11 (2)(c)). The 2016 BRB-2 production data were first evaluated for normality of distribution using the Shapiro-Francia test (see Table 5 and accompanying discussion on page 31 of the Vegetation report in Attachment D). This test was not passed. This is the result of one highly productive plot (Plot #26) which greatly increased the variance of the population. This plot produced more than three times the total average herbaceous production by desirable lifeforms (perennial forbs and perennial grasses). With this plot removed from the data, the average allowable herbaceous production was decreased (1,735.8 lbs/acre) and normality was achieved. To protect the interests of the State, hypothesis testing calculations went forward using the decreased mean herbaceous production.

A one-sample t-test of the "reverse null" hypothesis of the assertion that the 2016 BRB-2 allowable herbaceous production is indistinguishable from the weighted average Reference Area allowable herbaceous production is as follows (transformed data are square roots of oven-dry gm/0.5sq.m. data):

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$$t_{calc} = (1{,}735.8 - 672.7)/(668.1/⟦34⟧\text{^}0.5\ ) = 9.277$$

Since critical t = 0.853 (one-tailed, alpha = 0.2, 34-1 df) is exceeded by t_{calc} (9.277), the hypothesis of no difference is rejected and reclamation success for 2016 BRB-2 Phase III production under is demonstrated.

***Successful revegetation for the parameter of production was demonstrated in both* 2015 and 2016.**

WOODY PLANT DENSITY

The criterion for determining woody plant density success at the Yoast mine site is based on standards categorized as primary and secondary. The primary standards are as follows: (P1) background average woody density will be ≥ 200 stems per acre in upland areas and (P2) at least 10% of the bond release block will be ≥ 1000 stems per acre of concentrated woody density outside of fenced upland sites. Success is evaluated using 90% of the standard or 180 stems per acre (background) and 900 stems per acre (concentrated), respectively. Additionally, there are three secondary standards of which at least two must be satisfied if applicable. Upland fenced shrub areas (S1) must have at least 945 stems per acre, riparian fenced and non-fenced areas (S2) must have 945 stems per acre with 150 of the stems being tall shrub or trees and aspen fenced areas (S3) must have 945 stems per acre with 150 of the stems as aspen. In the case of the Yoast BRB-2 release area, there is both a designated Fenced Aspen Woody "Concentration" area as well as a Fenced Upland Woody "Concentration" area. Thus, both secondary standard S1 and S3 apply to the BRB-2 area. In the evaluation of BRB-2 woody plant Concentration Area density data below, mandatory standards P1 and P2, Upland Fenced Shrub area secondary standard (S1), and Fenced Aspen area secondary standard (S3) mentioned above will be addressed.

Table 5. 2015 and 2016 Data and Sample Adequacy Summary for Background and Concentrated Area Woody Plant Density, Yoast BRB-2 Phase III & Phase II + III Bond Release Area.

Woody Density Area and Sampling Year	Woody Density (stems/acre)	s	N	N_{min}	t
Background Density BRB-2 Phase III & Phase II + III Bond Release Area **2015**	1886.9	59.0	32	117	1.282
Fenced Aspen Woody Plant Density BRB-2	3180.9	57.5	30	40	1.282

Phase III & Phase II + III Bond Release Area **2015**					
Fenced Upland Woody Plant Density BRB-2 Phase III & Phase II + III Bond Release Area **2015**	3137.6	42.0	32	22	1.282
Background Density BRB-2 Phase III & Phase II + III Bond Release Area **2016**	2055.8	63.6	35	115	1.282
Fenced Aspen Woody Plant Density BRB-2 Phase III & Phase II + III Bond Release Area **2016**	4988.1	119.3	35	69	1.282
Fenced Upland Woody Plant Density BRB-2 Phase III & Phase II + III Bond Release Area **2016**	3893.1	56.5	40	26	1.282

2015 Woody Plant Density Success Evaluation

Woody plant density data are presented in the 2015/2016 report of the findings of testing for revegetation success for the Yoast BRB-2 Phase III and Phase II + III bond release area. This is included here as ***Attachment D – Revegetation Success Supporting Documentation***. As can be seen in Table 5, the 1,886.9 stems per acre observed in the background area greatly exceeds the 180 stems per acre (90 percent of the 200 stems per acre background standard) performance standard.

Statistical testing for 2015 background area data is as follows.

Background woody plant density (Standard P1)**.** The 2015 BRB-2 woody plant density were first evaluated for normality using the Shapiro-Francia test. Based on the raw 2015 BRB-2 WPD data the normality test was not passed. Consequently a square root transformation was performed and the normality test was passed. Use of a reverse-null t-test of the assertion that the 2015 BRB-2 background woody plant density exceeds 90% of the standard is shown as follows:

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t_{calc} = (35.9 - 13.4)/(24.8/⟦32⟧\text{^}0.5\ ) = 5.132$

Since critical t_{table} = 0.853 (one-tailed, alpha = 0.2, 32-1 df) and t_{calc} is greater than this critical value, reclamation success for background woody plant density for Phase III in 2015 is demonstrated. It should be noted that the same results would have been achieved using raw values (t_{calc}= 4.046 which exceeds t_t=0.853). Hence the **WPD Mandatory standard 1** that there would be at least 200 woody stems per acre in the background area has been met for 2015.

WPD mandatory standard 2. (Standard P2). Use of a reverse-null t-test of the assertion that the BRB-2 Background woody plant density exceeds 90% of mandatory standard 2 during the 2015 evaluation is shown as follows:

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t_{calc} = (35.9 - 30.0)/24.8/32\text{^}0.5) = 1.346$

Since critical t_{table}= 0.853 (one-tailed, alpha = 0.2, 32-1 df) and t_{calc} is greater than this critical value, reclamation success for background woody plant density for Phase III in 2015 is demonstrated. It should be noted that the same results would have been achieved using raw values (t_{calc}= 2.339 which exceeds t_t=0.853). Hence the **WPD Mandatory standard 2** has been met for 2015.

WPD secondary standard 1 (Standard S1). Sample adequacy based on woody plant density was achieved in the Fenced Upland "Concentration" area of the BRB-2. The mean density (3,137.6 stems per acre) exceeded the performance standard of 851 stems per acre, which is 90% of the secondary performance standard 1 (CDMG 2005 revised rule, 4.15.11 (2)(a)). Thus, revegetation success for **WPD Secondary standard 1** has been met for 2015.

WPD secondary standard 3 (Standard S3). The 2015 Fenced Aspen WPD data were first evaluated for normality using the Shapiro-Francia test. Based on the raw 2015 Fenced Aspen WPD data the normality test was not passed. Consequently a square root transformation was performed and the normality test was passed. Use of a reverse null t-test of the assertion that the BRB-2 Fenced Aspen Concentration Area mean exceeds 90% of the secondary standard 3 shown as follows:

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t_{calc} = (52.6 - 29.2)/(20.7/ \text{〖30〗} \text{^}0.5) = 6.192$

Since critical t_{table}= 0.854 (one-tailed, alpha = 0.2, 30-1 df) and t_{calc} is greater than this critical value, reclamation success for Fenced Aspen "Concentration" area for Phase III in 2015 is demonstrated. It should be noted that the same results would have been achieved using raw values (t_{calc}= 5.483 which exceeds t_t=0.854). Hence the **WPD Secondary standard 3** has been met for 2015.

2016 Woody Plant Density Success Evaluation

Woody plant density data are presented in the 2015/2016 report of the findings of testing for revegetation success for the Yoast BRB-2 Phase III and Phase II + III bond release area. These data tables are included here as ***Attachment D – Revegetation Success Supporting Documentation***. As can be seen in Table 5, the 2,055.8 stems per acre observed in the background area far exceeds the 180 stems per acre (90 percent of the 200 stems per acre background standard) performance standard.

Statistical testing for 2016 background area data is as follows.

Background woody plant density (Standard P1). The 2016 BRB-2 woody plant density were first evaluated for normality using the Shapiro-Francia test. Based on the raw 2015 BRB-2 WPD data the normality test was not passed. Consequently a square root transformation was performed and the normality test was passed. Use of a reverse-null t-test of the assertion that the 2016 BRB-2 background woody plant density exceeds 90% of the standard is shown as follows:

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t_{calc} = (38.3 - 13.4)/(24.6/[\![35]\!]\text{^}0.5\ ) = 5.983$

Since critical t_{table} = 0.852 (one-tailed, alpha = 0.2, 35-1 df) and t_{calc} (5.983) is greater than this critical value, reclamation success for background woody plant density for Phase III in 2016 is demonstrated. It should be noted that the same results would have been achieved using raw values (t_{calc}= 4.315 which exceeds t_t=0.852). Hence the **WPD Mandatory standard 1** that there would be at least 200 woody stems per acre in the background area has been met for 2016.

WPD mandatory standard 2. (Standard P2). Use of a reverse-null t-test of the assertion that the BRB-2 Background woody plant density exceeds 90% of mandatory standard 2 during the 2015 evaluation is shown as follows:

$$t_{calc} = \frac{\bar{x} - (0.9 * technical\ standard)}{\left(\frac{s}{\sqrt{n}}\right)}$$

$t_{calc} = (38.3 - 30.0)/24.6/35\text{^}0.5) = 1.997$

Since critical t_{table}= 0.852 (one-tailed, alpha = 0.2, 35-1 df) and t_{calc} is greater than this critical value, reclamation success for background woody plant density for Phase III in 2015 is demonstrated. It should be noted that the same results would have been achieved using raw values (t_{calc}= 2.659 which exceeds t_t=0.852). Hence the **WPD Mandatory standard 2** has been met for 2016.

WPD secondary standard 1 (Standard S1). Sample adequacy based on woody plant density was achieved in the Fenced Upland "Concentration" area of the BRB-2. The mean density (3,893.1 stems per acre) exceeded the performance standard of 851 stems per acre, which is 90% of the secondary performance standard 1 (CDMG 2005 revised rule, 4.15.11 (2)(a)). Thus, revegetation success for **WPD Secondary standard 1** has been met for 2016.

WPD secondary standard 3 (Standard S3). Sample adequacy based on woody plant density was not achieved in the Fenced Aspen "Concentration" area of the BRB-2 and normality could not be demonstrated in 2016. Reclamation success for WPD secondary standard 3 is demonstrated by passing a non-parametric rank order "L" test (CDMG 2005 revised rule, 4.15.11 (3)(a)).

$$L = p(n+1) - Z[np(1-p)]^{\frac{1}{2}}$$

$$L = 0.5(35+1) - 0.842[35 * 0.5(1-0.5)]^{\frac{1}{2}} = 15.509$$

Lower 80% confidence limit = rank value 15 + 0.509*(rank value 16 – rank value 15)
Lower 80% confidence limit = 2,509.1 + 0.509*(2,509.1-2,509.1) = 2,509.1

The lower 80% confidence limit (2,509.1) is greater than 70% of the secondary standard 3 (662). Hence the **WPD Secondary standard 3** has been met for 2016.

Successful revegetation for the parameter of background woody plant density was demonstrated in both 2015 and 2016. Successful revegetation of fenced woody plant concentration areas (Standard S1) was demonstrated 2015 and 2016 Successful revegetation of unfenced woody plant concentration areas (Standard P2) was demonstrated in planted area sampling in 2015 and 2016 Successful revegetation for the parameter of aspen woody plant establishment was demonstrated in both 2015 and 2016.

SPECIES DIVERSITY

Successful revegetation for species diversity is evaluated through a series of tests, one of which is a mandatory test and three are alternative tests. At least two of the alternative tests must be met.

The mandatory test (Test A) is based on the cover sampling data and requires that no single plant exceeds 60 percent relative cover. Alternative test B (or Alternative Test 1) is a comparison for total species density between the reference and reclaimed areas. Alternative Test C (or Alternative Test 2) is an assessment of the distribution of species abundance among lifeforms in the reclaimed areas compared to the reference. Alternative Test D (or Alternative Test 3) is an assessment of the presence of native species in the reclaimed areas compared to the reference areas. Details of the means for evaluating success with supporting information on calculation methods is detailed in the text and appendix tables of the 2015/2016 vegetation monitoring report contained in ***Attachment D – Revegetation Success Supporting Documentation***.

2015 Species Diversity Success Evaluations

Success for Mandatory Test **A** requires that no single species comprise greater than 60% relative cover in the 2015 reclaimed Phase III bond release area. Table J-1 of the revegetation monitoring report (***Attachment D – Revegetation Success Supporting Documentation***) shows that the most abundant single species alfalfa (*Medicago sativa*) was 26.4% relative first-hit cover, well below the 60% threshold of concern.

Thus, **Mandatory Test A is passed** based on assessment of 2015 cover data.

With regard to Alternative Test **B**, Total Species Density Test, the standard is the point at which the central 75 percent of the distribution of overall species density in the Reference Areas begins. Mathematically this would be the Mean Reference Area species density (# of species per 100 sq. m.) – 1.15s where s is the standard deviation. The following is calculated for the 2015 BRB-1 Phase III release area (see Table J-2 in Attachment D):

> Mean Species density (un-weighted, without noxious species) in the four reference areas = 27.16 species per 100 sq.m.
> *Probability-adjusted density standard:*
> Mean Reference Area Species Density – 1.15s = 27.16 – 1.15 (5.39) = 20.96
> Mean total species density in the 2015 BRB-2 = 27.94

Since the reclaimed area value (27.94) was greater than the standard (20.96), **Alternative Test B is passed** for 2015 data.

Regarding Alternative Test **C**, this test uses the Motyka similarity index to assess the resemblance of the distribution of species density by life form of the reclamation vegetation compared to that of the Reference Areas. The Motyka index formula used is:

$$IS_{mo} = \frac{2c}{(a+b)}$$

As used in Test C, the index assesses similarity between the lifeform species density values for the prescribed lifeforms for the 2015 BRB-2 Phase III and Phase II + III release area and the Mean Species density (area-weighted) in the four reference areas (text and Table J-3 Attachment D). The resulting Motyka similarity index value is 72%, exceeding 90% of the standard (0.9 x 70% = 63%).

Hence **Alternative Test C is passed** for 2015 data.

Alternative Test **D** is conducted as a direct test of the presence of native species in the reclaimed area as reflected in the cumulative presence of reclaimed area native species within the usual first ten to twenty 2m x 50m plots associated with the species density assessment that accompanies cover sampling. In 2015 testing, the total number of native species encountered in the first thirteen 100 sq. m. (2 m x 50 m) samples of the 2015 BRB-2 Phase III and Phase II + III release area that constituted an adequate cover sample equaled 52 native species (Table J-4, Attachment D), substantially greater than the weighted reference area average native species density of 23.9 species per 100 sq.m.

Hence **Alternative Test D is passed** for 2015 data.

In summary for 2015 species diversity evaluations, Mandatory Test **A** was passed as were Alternative Tests **B**, **C** and **D**.

<u>2016 Species Diversity Success Evaluations</u>

Success for Mandatory Test **A** requires that no single species comprise greater than 60% relative cover in the 2016 reclaimed Phase III and Phase II + III bond release area. Table J-5 of the revegetation monitoring report (***Attachment D – Revegetation Success Supporting Documentation***) shows that the most abundant single species alfalfa (*Medicago sativa*) was 28.2% relative first-hit cover, well below the 60% threshold of concern.

Thus, **Mandatory Test A is passed** based on assessment of 2016 cover data.

With regard to Alternative Test **B**, Total Species Density test, the standard is the point at which the central 75 percent of the distribution of overall species density in the Reference Areas begins. Mathematically this would be the Mean Reference Areas species density (# of species per 100 sq. m.) – 1.15s where s is the standard deviation. The following is calculated for the 2018 BRB-2 Phase III and Phase II + III release area (see Table J-6 in Attachment D):

> Mean Species density (un-weighted, without noxious species) in the four reference areas = 26.38 species per 100 sq.m.
> *Probability-adjusted density standard:*
> Mean Reference Area Species Density – 1.15s = 26.38– 1.15 (5.04) = 20.59
> Mean total species density in the 2016 BRB-1 = 25.94

Since the reclaimed area value (25.94) was greater than the standard (20.59), **Alternative Test B is passed** for 2016 data.

Regarding Alternative Test **C**, this test uses the Motyka similarity index to assess the resemblance of the distribution of species density by life form of the reclamation vegetation compared to that of the Reference Areas. The Motyka index formula used is:

$$IS_{mo} = \frac{2c}{(a+b)}$$

As used in Test C, the index assessed similarity between the lifeform species density values for the prescribed lifeforms for the 2016 BRB-2 Phase III and Phase II + III release area and the Mean Species density (area-weighted) in the four reference areas (text and Table J-7 Attachment D). The resulting Motyka similarity index value is 74%, exceeding 90% of the standard (0.9 x 70% = 63%).

Hence **Alternative Test C is passed** for 2016 data.

Alternative Test **D** is conducted as a direct test of the presence of native species in the reclaimed area as reflected in the cumulative presence of reclaimed area native species within the usual first ten to twenty 2m x 50m plots associated with the species density determination that accompanies

cover sampling. In 2016 testing, the total number of native species encountered in the first eleven 100 sq. m. (2 m x 50 m) samples of the 2016 BRB-2 Phase III and Phase II + III release area that constituted an adequate cover sample equaled 46 (Table J-8, Attachment D), substantially greater than the weighted reference area average native species density of 23.3 species per 100 sq.m.

Hence **Alternative Test D is passed** for 2016 data.

In summary for 2016 species diversity evaluations, Mandatory Test **A** was passed as were Alternative Tests **B**, **C** and **D**.

Successful revegetation for the parameter of species diversity was demonstrated in both 2015 and 2016.

POSTMINING LAND USE

The postmine land uses for the Yoast mine are livestock grazing and wildlife habitat. Grazing has been conducted since 2009 on reclaimed lands at the mine to implement and demonstrate the postmine land use. Proper grazing management has been used to encourage re-establishment and enhancement of native plant diversity and woody plant density. Sheep have been the only livestock grazing reclaimed lands at the Yoast mine. The grazing season at Yoast has historically been from August through September. The 2015 estimated stocking rate based on available herbaceous production data, forage palatability and a fifty percent (50%) proper use factor was 1.4 acres per animal unit month (AUM - the forage required for one animal unit for one month). The estimated stocking rate for 2016 based on available herbaceous production, forage palatability and the above proper use factor was 1.28 acres per AUM. These values reflect a range of historic stocking rate levels at the Yoast Mine. The lower stocking rates in 2015 represent below normal winter through early summer precipitation and above normal temperatures while the higher 2016 stocking rates reflect above normal precipitation and near normal temperatures. The ability of the reclaimed lands to provide good stocking rate values for 2015 and 2016 represent the results of implemented best practices for reclamation, management of the reclaimed areas and the restoration of ecosystem function and continuing successional development of the reclaimed lands. With the exception of the aspen community the native lands within the mine area have generally lower stocking potential due to heavy woody composition that reduces herbaceous forage production and access.

Yoast reclaimed area livestock grazing by sheep was initiated in 2009 using the reclaimed pastures located in the general BRB-2 Phase III and Phase II + III release area. A total of 560 sheep were grazed approximately 45 days and forage use averaged 9 percent use of all forage and 19% of the PUF forage (PUF = 50% of available forage as a proper use factor). Since 2009 sheep grazing has continued annually through 2019 on reclaimed areas. The sheep numbers have ranged from 620 (2012) to 850 (2014). Days of grazing have ranged from 20 (2014) days to 49 (2011) days. Utilization has generally been light to with rates from 11% of total forage (23% of PUF forage) in 2018 to 16% of total forage (32% of PUF forage) in 2012. Anecdotal comments by the livestock operators to reclamation management personnel indicate satisfaction with the reclaimed grazing resource and animal performance.

Wildlife baseline and monitoring was conducted annually at the Yoast Mine from 1994 through 2010. Comprehensive monitoring included big game, upland game birds, raptors and predators and continued through 2007. From 2008 through 2010 monitoring centered on upland game birds, golden eagles and Sandhill cranes. From 2011 the general mine area has been included in annual raptor nest monitoring and Columbian Sharp-tailed grouse counts. The results of monitoring are presented in the annual reports submitted to CDRMS. Additionally, CDRMS inspection personnel note wildlife observations in their ongoing inspection activities at the mine.

Yoast reclaimed lands provide excellent habitat for a number of wildlife species. Elk and mule deer make common use of the reclaimed areas where significant numbers of deer and elk can be observed in the reclaimed areas throughout the year. The reclaimed areas provide beneficial and nutritional forage resources throughout the year but especially in the spring and early summer as the elk and mule deer complete gestation and move to lactation cycles. Elk and mule deer numbers on the mine site during the period of monitoring for these species have shown year to year fluctuations as a result of regional trends, mining activities and climatic conditions. As mining activity moved to new areas and reclamation became established, big game moved back into reclaimed areas and adjacent native habitats. This has been especially true for elk as the herbaceous forage quality is compatible with their foraging preferences. The presence of big game on reclaimed areas is significant and requires 8 foot fencing to protect aspen and tall shrub planting sites.

Review of annual monitoring reports shows that mule deer and elk numbers have had a steady increase over the 1994 through 2007 period. This has been in part due to improved survey methods later in the period. In the latter part of the monitoring years elk and mule deer were found increasingly in the established areas of reclamation. In 2006 elk were averaging 2.6 individuals per square mile while mule deer were averaging 1.92 individuals per square mile. Incidental observations by mine personnel and CDRMS inspectors indicate that elk and mule deer are common on reclamation through much of the year.

Raptors including red-tailed hawks and golden eagles nest and hunt in the area and other raptors such as northern harriers and Swainson's hawks that prefer more grassland or grass shrubland habitat have been observed in reclaimed areas in past studies and monitoring. The reclaimed areas are trending towards a sagebrush grassland/shrubland habitat and species with an affinity to that habit type are present in these reclaimed areas. Golden eagle nests are located to the northwest of Permit area. Golden eagles have often been observed over the reclaimed areas. The continued presence of these birds and successful breeding activity in the immediate area could in part be contributed by the reclaimed areas which offer good foraging opportunities related to the stature and nature of the herbaceous dominated reclaimed areas and related prey base.

Columbian sharp-tailed grouse (CSTG) are of particular interest in Colorado. Monitoring efforts have been attuned to documenting presence and numbers, particularly at lek sites during the breeding season. Monitoring has shown a steady increase in presence of these birds at leks adjacent to the Yoast haul road and north of the main permit area. There are as many as 10 known lek sites in this area. In 2011 or 2012 CSTG activity was noted on the mine site. In 2013 and active lek site was discovered on Yoast reclaimed lands and monitoring was begun at this site. The site is located just north of the most southern block of BRB-1. This lek is referred to as the Yoast tree plot lek. The affinity for reclaimed sites by CSTG is well documented in northwest Colorado and this is consistent with observations at the nearby Seneca II/PSCM mine. CSTG have established up to four active leks on Seneca II/PSCM mine reclaimed lands and these leks are monitored annually. The 2013 counts for these four leks totaled 66 CSTG with the lowest lek count having 14 CSTG and the highest with 23 CSTG. Therefore there is a potential for additional CTSG presence on Yoast reclaimed lands over time due to the large amount of similar and available

reclamation habitat and the proximity of active leks and CSTG activity surrounding the mine. Please note that Colorado Parks and Wildlife monitoring is showing an increased upward trend in CSTG numbers and reclaimed lands play a role in this trend.

Sandhill cranes have been monitored for a number of years through 2010. Birds have been present in areas adjacent to the northeast portions of the mine and have been observed flying over the mine. None have been documented as nesting on the Yoast mine site.

PERMANENT INFRASTRUCTURE

Upon final release of the Seneca Yoast Mine many features will be left as permanent infrastructure. These features include access roads, light-use roads, culverts, a water well, power lines and a substation, fenced shrub plots, sediment ponds, stock ponds, and miscellaneous boundary and grazing fences. All of the features and structures to remain as permanent are documented with rational and justification in Attachment 20-1 of the approved mine PAP, and are summarized below. Map 2, Permanent Features, shows the locations of the approved permanent features and structures to remain post mining.

ACCESS ROADS

Access roads remaining permanent features include Road "A" (part of the north permit boundary, not included on Map 2) and Road "B" (turns into LU-3A). Both of these roads provide landowner access to properties within the Yoast permit boundary that would otherwise be considered landlocked and inaccessible. In addition, SPL uses these access roads to perform maintenance and monitoring throughout the Yoast Mine property. These roads have been modified to the acceptable post-mine land use requisitions. The road profiles and cross-sections can be found in the approved mine PAP in Exhibit 20-3, Post Mine Road Profiles.

LIGHT USE ROADS

For limited access, Light-Use Roads have been retained as permanent features to access reclaimed lands and accommodate future landowner use. Light-Use Roads retained include LU 1, LU 2, LU 3A, LU 3B, LU 4, and LU 5. The Light-Use Roads retained are used property access by landowners, access to monitoring sites for water quality, pond access for inspections, and

maintenance and monitoring of shrub plots and reclaimed parcels. All Light-Use Roads meet the criteria for design, grade, and drainage. Maintenance on the Light-Use Roads will be conducted as necessary prior to final bond release.

CULVERTS

For adequate drainage throughout the mine property, multiple culverts have been approved as permanent features. For Access Road "A" culverts YA-1, YA-2, YA-3, YA-3A, YA-4, YA-4A, YA-5, YA-5A, YA-6, YA-7, YA-UN, and YM-1 remain as permanent. For Access Road "B" culverts YB-1, YB-2, YB-3, and YB-6 remain as permanent. Within all of the Light Use Roads there are 4 culverts that remain as permanent features; these include EX-2, EX-4, EX-5, and LU-1. Design documentation of each culvert is included in the approved mine PAP in Attachments 13-8 and 13-12.

WATER WELL

The water well that feed the Yoast Mine Shop has been retained as a permanent feature. This well is a domestic and industrial water supply that has been retained to supply water, as necessary, for wildlife and livestock consumption, shrub plot irrigation, and other land owner uses as identified in the future. A complete well summary can be found in Appendix 7-1 in the approved mine PAP along with the water right in Attachment 16-4.

POWERLINES AND SUBSTATION

The Yoast Mine permit boundary consists of a single remaining substation and approximately 7,355 feet of powerline with poles throughout the property. The substation was constructed to provide electricity to the mining equipment and facilities during the mining operation. The Substation is privately owned by Yampa Valley Electric Association (YVEA). YVEA has provided a letter requesting the substation remain as a permanent feature.

FENCED SHRUB PLOTS

The Yoast Mine Permit area includes six fenced shrub plots that were part of the reclamation efforts of the Yoast Mine. These plots are remaining as permanent features along with the existing

big-game proof fence enclosures. These enclosures where required by permit conditions during the ten-year liability term. Prior to final bond release the gates to the plots will be opened to demonstrate the shrubs can withstand the existing wildlife and livestock foraging pressure.

SEDIMENT PONDS

Permanent pond demonstrations have been approved for three of the five remaining sediment ponds. The three sediment ponds that have CDRMS and the State Engineers Office (SEO) approval include ponds 10, 13, and 14. SPL plans to get approval on the remaining sediment ponds to leave them as permanent features as well. The three permanent ponds meet the criteria specified under Rule 4.05.9(13) and will be used to support the post mining land use. The permanent pond demonstration can be found in Appendix 20-1.2 of the approved mine PAP.

STOCK PONDS

Within the Yoast permit area there are two ponds that have been specified as "Stock Ponds", ST-1 and 11A. Both of these stock ponds have been approved through the CDRMS and the SEO to remain as permanent features. They each have a storage capacity of less than two-acre feet and an embankment no greater than five feet high measured from the invert of the spillway to the upstream toe of the embankment. The permanent pond demonstrations for these stock ponds can be found in Appendix 20-1.2 in the approved mine PAP.

MISCELLANEOUS BOUNDARY AND GRAZING FENCES

There are a variety of fences throughout the Yoast Mine permit area. All of the current fences will remain as permanent features following final bond release. These fences delineate property boundaries, and grazing areas. The fences support reclamation success along with post mining land use.

HYDROLOGY

*** All Tables, Figures, and Attachments referenced in the below Hydrology discussion are located in *Attachment I: Water Quality data***

Phase II – Suspended Solids Evaluation

The Yoast Mine lies within the headwaters of Grassy Creek and Sage Creek watershed. The southwest portion of the permit drains to the west towards Sage Creek, which ultimately flows to the north-northeast towards the Yampa River. A small area on the southeastern end of the permit drains southeast towards Grassy Creek, which flows to the northeast near the southern end of the permit area before bending to the north towards the Yampa River. The remainder of the permit area drains to the north-northeast towards Annand Draw. Annand Draw reports north to Scotchmans Gulch, which flows to the east-northeast to Grassy Creek. Runoff from the reclaimed mine discharges from five NPDES Outfalls: Outfalls 010 located near the northern end of the mine discharges to Annand Draw, Outfall 011 discharges to the southeast to an unnamed tributary of Grassy Creek, and Outfalls 012, 013, and 014 located along southwest permit boundary all discharge to unnamed tributaries to Sage Creek (Map 1A and 1B).

Ongoing stream monitoring points include YSGF5 and YSG5 within the Grassy Creek watershed and YSSF3 and YSS2 within the Sage Creek watershed. YSGF5 is located downstream of Outfall 011 but upstream of Scotchmans Gulch. Monitoring point YSG5 is located downstream of Scotchmans Gulch and receives drainage from both Outfall 010 and 011. Monitoring at YSG5 did not begin until after mining began in the watershed and therefore no background data is available for this location. This portion of Grassy Creek also receives drainage from the adjacent Sage Creek Mine. Sage Creek monitoring point YSSF3 is located upstream of Outfalls 012, 013, and 014 and YSS2 is located downstream of Outfalls 012, 013, and 014.

Analytical results for the Grassy Creek (YSGF5, YSG5) and Sage Creek (YSSF3, YSS2) stream points between 2014 – 2018 are included in Tables 1 – 4. Table 5 provides a comparison of the pre-mine and post-mine total suspended solids (TSS) for these locations. The range of TSS concentrations observed between 2014 – 2018 are lower than the ranges observed prior to mining at Sage Creek YSSF3 and YSS2. Although Grassy Creek stream point YSG5 does not have location specific baseline data the post mining TSS range does fall within the pre-mine range observed upstream at Grassy Creek YSGF5. The post mining TSS range at YSGF5 exceeds the pre-mine range. The post mine TSS range at YSGF5 is skewed by the sample collected September 11, 2018. The 495 mg/L TSS in this sample was more than four times greater than the TSS in any of other samples collected from 2014 – 2018 (n:18; range: 10 -118 mg/L). The TSS measured at downstream point YSG5 during the same event was 36 mg/L. Minimal flow was

present at YSGF5 during this event (0.7 gpm) and the elevated TSS is likely from the disturbance of sediment at the base of the channel during sample collection. If this sample is excluded all remaining post mining TSS results fall within the pre-mine range.

Analytical results for the mines five NPDES outfalls for 2014 – 2018 are provided in Tables 6 – 10. TSS was removed as a monitoring requirement from the outfalls when their drainage status was changed to reclamation. Outfalls 010 and 011 were reclassified as reclamation in November 2006 and Outfalls 012, 013, and 014 were reclassified to reclamation in July 2010. Between 2014 and 2018 only 13 TSS samples were collected from the outfalls (010: 4; 011: 1; 013: 8) and the TSS ranged from <0.5 - 12 mg/L. None of these samples exhibited TSS above the pre-mine maximums measured in Grassy Creek and Sage Creek (Table 5). Table 11 includes a summary of the five outfalls TSS analytical data during the five years prior to the reclamation drainage status change.

The TSS at Outfall 010 during this time period ranged from <5 – 46 mg/L (mean: 8.9 mg/L) and is less than the pre-mine concentrations observed at Grassy Creek point YSGF5 (range: 33.8 – 296 mg/L; mean: 33.8 mg/L). The TSS at Outfall 011 during this time period ranged from <5 – 38 mg/L (mean: 13.8 mg/L) and is less than the pre-mine concentrations observed at Grassy Creek point YSGF5 (range: 33.8 – 296 mg/L; mean: 33.8 mg/L). The TSS measured at the three outfalls that discharge to Sage Creek during the five years prior to being classified as reclamation drainage ranged from <5 – 25 (mean: 8.6) at Outfall 012, <5 – 26 mg/L (mean: 8.5 mg/L) at Outfall 013, and <5 – 170 mg/L (mean: 26.8 mg/L) at Outfall 014. The average TSS concentration at Outfalls 012 and 013 are below the pre-mine average measured at downstream point YSS2 (23.6 mg/L) and the average TSS concentration at Outfall 014 only exceeds the pre-mine average at downstream point YSS2 by a few milligrams per liter. The average at Outfall 014 is strongly influenced by a single sample with elevated TSS (170 mg/L) and its important to note that TSS concentrations in the 13 other samples collected during this time period did not exceeded 42 mg/L. A statistical comparison of pre-mine stream points and post mine NPDES TSS concentrations is provided in Attachment 1. The analysis indicates there is no statistically significant difference (95% Confidence Level) between the TSS concentrations measured at the Yoast NPDES outfalls and the pre-mine stream concentrations. This further indicates that the reclaimed parcels reporting to these ponds are adequately stable.

Phase III - Hydrology Demonstration

A.) Basic Standards Interim Narrative Standard for Ground Water (CWQCC Regulation 41.5(c)(6).

The Yoast Mine Groundwater Points of Compliance (GWPOC) were established in Technical Revision 39 (TR-39) (see Appendix 15-1 of the C-1994-082 permit package). The two GWPOC monitoring wells are YSAL3 which is screened within the Sage Creek Alluvium and GW-S70-A (SGAL70) which is screened within the Grassy Creek Alluvium (see Map 1A and 1B). GW-S70-A (SGAL70) is located downgradient of both the Yoast Mine and adjacent Sage Creek Mine. GWPOC bedrock wells were deemed unnecessary in TR-39 due to the limited potential for the mine to negatively impact the quality of bedrock groundwater. The Wadge and Wolf Creek Coal exhibit low hydraulic conductivity (Wadge Coal: 2.45E-7 to 3.5E-7 cm/sec; Wolf Creek Coal: 4.55E-6 cm/sec) and will limit mine-impacted groundwater from migrating within these units. Attenuation and dilution should further limit water quality impacts. Aquifers of regional significance include the Trout Creek Sandstone and the Twentymile Sandstone. The Twentymile Sandstone is located approximately 500 ft above the Wadge Coal seam and is not found within the Yoast permit boundary. Low permeability confining layers of the Williams Fork Formation isolate the Trout Creek Sandstone from the mine. The Trout Creek Sandstone lies approximately 300 to 400 feet below the Wadge Coal seam and approximately 60 to 100 feet below the Wolf Creek Coal Seam. The groundwater in the Trout Creek Sandstone is under confined conditions and exhibits an upward hydraulic head that further limits the potential for infiltration of mine affected groundwater into the unit. See Technical Revision 39 (TR-39) located in the Appendix 15-1 of the Yoast Mine permit package for additional justification for the Groundwater Points of Compliance.

Tables 12 and 13 include the analytical results for samples collected at wells GW-S70-A (SGAL70) and YSAL3 over the last five years (2014 – 2018) and provide a comparison against the Grassy Creek and Sage Creek Alluvial GWPOC water quality standards established in TR-39. The groundwater quality at GW-S70-A (SGAL70) meets the existing water quality standards for all parameters except for dissolved cadmium and dissolved selenium. The lab detection limit for three of the dissolved cadmium samples exceeds the cadmium water quality standard. None of the exceedances were associated with measurable values of cadmium. Water quality samples at commercial labs are often run in groups that include samples from unrelated locations and the

detection limit for the batch of samples can be increased above the normal detection as a result of elevated concentrations in one or more samples within the batch or from unrelated instrument interference. The fluctuation in the lab's detection limit and the fact that cadmium has not historically been an issue at this well suggest that the increase in the detection limit for these three samples is likely unrelated to the presence of cadmium above the standard. A single dissolved selenium sample (43.7 µg/L) collected in May of 2016 also exceeded the 20 µg/L standard. This appears to be an anomaly as no other sample during the last five years exceeded 11.1 µg/L (Range: <1 – 11.1 µg/L). There were no exceedances of the GWPOC standards at YSAL3.

B.) Instream Numeric Standards (CWQCC Regulation 33)

The Colorado Water Quality Control Commission (CWQCC) has established segment specific aquatic life water quality standards for Grassy Creek (Segment 13i and 13j) and Sage Creek (Segment 13e) of the Yampa River. The water quality standards for these segments are included in CWQCC Regulation 33. Tables 1 and 2 include a summary of the water quality at the two Grassy Creek stream monitoring points over the last five years (2014 – 2018) and a comparison against either the Segment 13i or Segment 13j water quality standards. Tables 3 and 4 include a statistical summary of the water quality at the Sage Creek stream monitoring points over the last five years (2014 – 2018) and a comparison against the Segment 13e water quality standards. The water quality in these streams is also compared to CWQCC Regulation 31 Agricultural Use standards. Additional discussion of the water quality in each stream segment follows.

Grassy Creek – Yampa Segments 13i and 13j

Total Recoverable Iron

As described in CWQCC Regulation 33, a temporary modification of the chronic total recoverable iron standard is in place for Yampa Segment 13i which includes Grassy Creek from its headwaters to immediately above the confluence with Scotchmans Gulch. WQCC intends to continue to extend this modification until Phase II bond release has been obtained for all mines within the watershed and post-mine iron conditions can be adequately characterized. The iron temporary modification is applicable to stream point YSGF5 and Outfall 011. The 1 mg/L total recoverable iron chronic standard for Yampa Segment 13j is applicable to YSG5.

Between 2014 and 2018 total recoverable iron ranged from 0.49 – 9.09 mg/L (mean: 1.96 mg/L) at YSGF5 and 0.29 – 2.53 mg/L (mean: 0.99 mg/L) at YSG5. Total recoverable iron exceeded the Yampa Segment 13j water quality standard six times (n: 15) at YSG5 during this time (Table 2). YSG5 receives drainage from both Outfalls 010 and 011. Total recoverable iron was monitored 60 times at outfall 010 and 12 times at outfall 011 between 2014 and 2018. During this time there was not a single exceedance of the 1 mg/L total recoverable iron water quality standard at either of these outfalls (Table 6 and Table 7). Although the total recoverable iron in the YSGF5 2014 – 2018 samples is more elevated than the iron observed at YSG5, the YSGF5 post mine concentrations fall within the range of total iron observed during the pre-mine monitoring period (range: 0.15 – 9.9 mg/L; mean 1.34 mg/L) (Table 14). Total recoverable iron at these stream points are strongly correlated (r2: 0.65 – 0.91) with suspended solids which become naturally elevated during rain and snow melt runoff events (see Figure 1). Over the last five years there have been eight concurrent monitoring events: six events when samples were collected from Outfall 010, Outfall 011, YSG5 and YSGF5 on the same day and two events when samples were collected from at least three of these locations on the same day (Table 15). In all eight instances the total recoverable iron concentrations in the outfall discharges were lower than the concentrations observed at the stream points. During the five events when there were exceedances of the water quality standard at the stream points the total recoverable iron at the outfalls were at least an order of magnitude lower. This further demonstrates that the elevated iron in Grassy Creek is unrelated to the runoff from the reclaimed mine and is likely the result of natural erosional processes that are occurring within the unmined portions of the watershed.

Ammonia, Nitrogen

The Yampa Segment 13i ammonia, nitrogen water quality standard was exceeded once at YSG5 between 2013 and 2018. The aquatic life ammonia standard, as established by USEPA, is dependent on both the pH and temperature of the surface water body. The ammonia in the sample (0.07 mg/L) was compared to the temperature and pH dependent values of the chronic criterion found in Table 6 of USEPA's 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater (USEPA 2013). The measured value was two orders of magnitude less than the chronic aquatic life criteria value (1.4 mg/L).

Sulfide

The method detection limit for the sulfide analysis (MDL: 0.02 mg/L) conducted by SCC's lab exceeds the Yampa Segment 13i water quality standard for un-ionized sulfide (0.002 mg/L). The analytical method employed detects both dissolved sulfides and acid-soluble metallic sulfides that are present in suspended matter and provides a single cumulative concentration that includes both the ionized (HS-) and un-ionized forms of hydrogen sulfide (H2S). The un-ionized hydrogen sulfide is the potentially toxic form which the standard is based on. The distribution of sulfide between the un-ionized hydrogen sulfide and ionized form is dependent on the temperature and pH. At low pH most of the total dissolved sulfide exists as un-ionized hydrogen sulfide. In alkaline waters, like those present at Yoast Mine, most of the total dissolved sulfide exists as non-toxic ionized sulfide. A procedure for calculating the un-ionized form from the sulfide data can be found in the American Public Health Standard Methods for the Examination of Water and Wastewater. The results of this calculation indicate that un-ionized hydrogen sulfide will not exceed the water quality standard when the non-detect sulfide concentration is equal to 0.02 mg/L. None of the samples collected from YSGF5 and YSG5 during the last five years had detection limits above the non-detect value of 0.02 mg/L (Table 1 and 2).

Manganese

CWQCC Regulation 31 specifies that the manganese agricultural use standard of 0.2 mg/L standard is only applicable when irrigation water is applied to soils with pH lower than 6.0. The soils at Yoast Mine are alkaline and the 0.2 mg/L standard is therefore not applicable. Dissolved manganese at YSGF5 and YSG5 are significantly lower than the CHPHE Yampa Segment 13i acute and chronic manganese standards.

Mercury

The method detection limit for mercury (0.02 ug/L) used by SCC's lab is above the 0.01 ug/L aquatic life standard. None of the samples collected during the last five years exceeded the labs method detection limit. The CDPHE previously performed a reasonable potential analysis for Outfall 010 and determined that there was no reasonable potential for discharges from this outfall to exceed the mercury limit and the monitoring requirement was dropped from the NPDES permit. Total mercury is monitored quarterly at Outfall 011. Between 2014 and 2018, none of the mercury samples collected (range: 0.0004 – 0.002 µg/L; n: 6) exceeded the mercury aquatic life

standard and there is no reason to believe the total mercury within Grassy Creek is above the aquatic life standard (Table 7).

Selenium

As noted in CWQCC Regulation 33, a temporary modification of the dissolved selenium chronic standard is in place for Yampa Segment 13i and 13j while additional information is collected to further evaluate the limited aquatic use of these segments and the extent of ambient sources of selenium within this watershed. Several of the tributaries flow over soils derived from the Lewis Shale, which naturally contains elevated concentrations of selenium. Therefore, only the dissolved selenium acute standard for Segment 13i and 13j and the Regulation 31 agricultural use water quality standards were compared to the selenium data collected from the Grassy Creek surface water points. No exceedances of the Segment 13i acute or CWQCC Regulation 31 agricultural use standards occurred at either YSGF5 or YSG5 between 2014 and 2018 (Tables 1 and 2). Selenium was monitored 59 times at Outfalls 010 and six times at Outfall 011 during this period (Table 10 and Table 11). Potentially dissolved selenium exceeded the Segment 13i acute selenium standard and the agricultural use standard once at Outfall 010. The sample collected on February 3, 2016 had a potentially dissolved selenium of 149 µg/L. However, the total recoverable selenium for this sample was measured as non-detect (<0.5 µg/L). The total recoverable selenium analysis includes a measurement of both the metals that are dissolved in the water and the metals that are present in the particulates in the water after its been treated with acid preservative. The potentially dissolved metals analysis measures the metals present in the filtrate of the water that was first treated with acid preservative and allowed to stand for several hours before being filtered through a membrane filter. The potentially dissolved selenium can not be greater than the total recoverable selenium as the potentially dissolved form is a subset of the selenium that is measured as a part of the total recoverable analysis. This suggests the elevated potentially dissolved selenium results may have been the result of an ICP-MS matrix interference which can result in overestimation of selenium concentrations (Smith and Compton, 2004). There were no exceedances of the Segment 13i acute or agricultural use selenium standard at Outfall 011.

Although the CWQCC Regulation 33 chronic selenium table value standard (4.6 ug/L) is not currently applicable to Yampa Segment 13i and 13j it is worth noting that only two exceedances

of this standard occurred at the Yoast monitoring points between 2013 and 2018. Both exceedances occurred at stream point YSG5. Although two of the discharges from Outfall 010 also had potentially dissolved selenium above the chronic table value standard, both these samples had total recoverable selenium that was less than < 1 ug/L indicating the elevated potentially dissolved selenium was related to lab error. None of the discharges from outfall 011 exceeded the Regulation 33 chronic selenium table value standard. This further suggests that the elevated concentrations observed in the watershed are unrelated to the runoff from the reclaimed mine.

Spoil Springs

Four spoil springs are actively monitored at the Yoast Mine. Spoil Spring 2 (YSSPG2), located above NPDES Outfall 011, is the only spring located within the Grassy Creek Watershed (see Map 1A and 1B). Analytical water quality data for YSSPG2 is provided in Table 16. The post-mining land use of the reclaimed parcels in the SL-7 bond release application are designated as livestock grazing and wildlife habitat. Therefore, the water quality data collected from these springs are compared to the agricultural use surface water standards as established in CWQCC Regulation 31. No exceedances of any of the agricultural use surface water quality standard occurred at YSSPG2 during the five-year monitoring period (2013 – 2018).

Sage Creek - Yampa River Segment 13e
Total Recoverable Iron

Total recoverable iron exceeded the Yampa Segment 13e water quality standard twice (n: 15) at YSS2 between 2014 and 2018 (Table 4). No exceedances of total recoverable iron standard occurred at YSSF3 during this time (Table 3). Both exceedances at YSS2 occurred in 2014. As previously described in the total recoverable iron section for Grassy Creek above, elevated total recoverable iron in the headwaters of these watersheds are often associated with increased concentrations of total suspended solids that occur in response to natural erosion from precipitation and snowmelt. A statistical comparison of the total suspended solids and total recoverable iron concentrations at YSSF3 and YSS2 indicate that they are strongly correlated (r2: 0.76 - 0.81) (see Figure 2). Total recoverable iron was monitored at upstream point YSSF3 and NPDES Outfalls 012, 013, and 014 during both sampling events with iron exceedances at

YSSF2. In both instances the total recoverable iron at the Yoast Mine outfalls met the Segment 13e iron standard and the concentration were an order of magnitude lower than the concentrations observed downstream (Table 17). This indicates that the elevated iron in Sage Creek during these events was unrelated to the runoff from the reclaimed mine and further demonstrates that iron concentrations above the standard in Sage Creek can occur naturally as a result of erosion from the unaffected portion of the watershed.

Ammonia, Nitrogen

The Yampa Segment 13e ammonia nitrogen water quality standard of 0.05 mg/L was exceeded once at YSSF3 and once at YSS2 (Table 7 and Table 8). The aquatic life ammonia standard, as established by USEPA, is dependent on both the pH and temperature of the surface water body. The ammonia in the YSSF3 (0.07 mg/L) and YSS2 (0.11 mg/L) samples were compared to the temperature and pH dependent values of the chronic criterion found in Table 6 of USEPA's 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater (USEPA 2013). The ammonia chronic aquatic life criteria value is 3.3 mg/L for the YSSF3 sample and 0.74 mg/L for the YSS2 samples. Neither of the samples exceed the chronic aquatic life criteria value.

Sulfide

As discussed in greater detail in the Grassy Creek Sulfide section, the sulfide detection limit for the method utilized by SCC's lab exceeds the instream water quality standard. The analytical method detects both dissolved sulfides and acid-soluble metallic sulfides that are present in suspended matter and provides a single cumulative concentration that includes both the ionized (HS-) and un-ionized forms of hydrogen sulfide (H2S). The un-ionized hydrogen sulfide is the potentially toxic form that the instream water quality standard was established for. Calculations of the un-ionized H2S indicate that the alkaline surface water at this location will not result in un-ionized H2S above the water quality standard when the sulfide concentrations are below 0.02 mg/L. None of the samples collected from stream points YSSF3 or YSS2 exceed the 0.02 mg/L concentration.

Mercury

The method detection limit for mercury (0.02 ug/L) used by SCC's lab is above the 0.01 ug/L aquatic life standard for mercury. None of the samples collected from YSSF3 or YSS2 during the last five years exceeded the labs method detection limit (Table 3 and Table 4). The CDPHE previously performed a reasonable potential analysis for Outfall 012 and 014 and determined that there was no reasonable potential for the discharges from these outfalls to exceed the mercury limit and the monitoring requirement was dropped from the permit. Total mercury is monitored quarterly (when discharge occurs) at Outfall 013. Between 2014 and 2018 none of the mercury samples collected from Outfall 013 (Range: 0.0017 – 0.0036 µg/L; n=8) have exceeded the mercury standard (Table 17).

Manganese

The agricultural use dissolved manganese standard of 0.2 mg/L was exceeded twice at YSS2 (Table 8). The CWQCC Regulation 31 Manganese Agricultural Use Standard specifies that this standard is only applicable where irrigation water is applied to soils with pH lower than 6.0. In alkaline soils, as are found at Yoast Mine, a more appropriate standard would be 10 mg/L (EPA, 1976). Dissolved manganese at YSS2 ranged from 0.01 – 0.32 mg/L (mean: 0.09 mg/L) and is significantly lower than 10 mg/L. Neither of the samples exceeded the CHPHE Yampa Segment 13e acute or chronic manganese standards. No exceedances of the agricultural use or Segment 13e standards occurred at YSSF3.

Selenium

As noted in CWQCC Regulation 33, a temporary modification of the dissolved selenium chronic standard is in place for Yampa Segment 13e while additional information is collected to further evaluate the limited aquatic use and the extent of ambient sources of selenium within this segment. None of the samples collected from YSSF3 or YSS2 exceeded the Segment 13e acute selenium standard or the Regulation 31 agricultural use selenium standard. Although only the Segment 13e acute selenium standard and the Regulation 31 agricultural use water quality standards are compared to the water quality in Table 3 and 4, none of the samples collected at YSSF3 or YSS2 exhibited selenium concentrations above the Regulation 33 chronic selenium table value standard of 4.6 µg/L.

Spoil Springs

Four spoil springs are actively monitored at the Yoast Mine. Spoil Spring 1 (YSSPG1), located above the old haul road culvert crossing Annand Draw, and Spoil Springs 3 (YSSPG3) and Spoil Spring 4, located above NPDES Outfall 012, are within the Sage Creek Watershed (see Map 1A and 1B). The post-mine land use of the reclaimed parcels in this Phase III bond release application are designated as livestock grazing and wildlife habitat. Therefore, the water quality data collected from these springs are compared to the Agricultural Use surface water standards as established in CWQCC Regulation 31. A single exceedance of the agricultural use selenium standard occurred at Spoil Spring 3 (YSSPG3) in 2015 (Table 16). This spring has been monitored annually since 2005 (n: 14) and no other sample has exceeded the Agricultural Use Standard. The dissolved selenium in the three samples collected since (2016 – 2018) has not exceed 2 µg/L.

No other agricultural use surface water quality standard was exceeded at Spoil Spring 3 in 2014 – 2018. There were no exceedances of any of the agricultural use standards at Spoil Spring 1 or Spoil Spring 4.

C.) Permit Requirements of the Colorado Department of Public Health & Environment (CDPHE)

The five outfalls at Yoast Mine are permitted under CDPHE Permit No. CO-0000221. Four of the five outfalls receive drainage from the Phase-III request area. Outfalls 010 discharges to Annand Draw which is a tributary to Grassy Creek and Outfalls 012, 013, and 014 discharge to unnamed tributaries to Sage Creek. Outfall 011, located on the southeast end of the permit, discharges to Grassy Creek. Although it does not receive drainage from any of the Phase-III request areas a description of its water quality is included in this submittal. Tables 6 – 10 include analytical results for samples collected from the five outfalls between 2014 – 2018 and a comparison against the NPDES limits and CWQCC surface water quality standards.

Between January 1, 2014 and December 31, 2018 there were no exceedances of the NPDES limits at the five outfalls. Two of the samples from Outfall 012 indicated an exceedance of the daily max dissolved selenium NPDES limit (18.4 µg/L /L), however in both instances the total

recoverable selenium was measured as less than 0.5 µg/L. As previously described, a potentially dissolved metal concentration can not be greater than the total recoverable metal concentration as the potentially dissolved form is a subset of the selenium that is measured as a part of the total recoverable analysis. The potentially dissolved selenium was likely the result of matrix interference during the labs analysis.

The post-mining land use of the reclaimed parcels in this Phase III bond release application are designated as livestock grazing and wildlife habitat. Therefore, the water quality data collected from the NPDES outfalls are compared to the Agricultural Use surface water standards as established in CWQCC Regulation 31. Permit CO-0000221 requires that the metals be collected in the potentially dissolved form whereas the Agricultural Use standards are based on the total form. For comparative purposes, when the total form is not available the potentially dissolved form is compared to the Agricultural Use standards. The selenium agricultural use standard (20 µg/L) was exceeded twice at Outfall 013. The exceedances occurred on April 27, 2015 and April 23, 2018. Outfall 013 only discharges in the spring after snow melt or precipitation events. Downstream monitoring point YSS2 was sampled for dissolved selenium during both discharge events. In both instances the dissolved selenium at YSS2 was < 1 µg/L indicating the streams water quality was not being influenced by the discharge. All remaining selenium samples at 013 were within the Agricultural Use standards.

There were no other exceedances of the NPDES limits or water quality standards at the Yoast Mine Outfalls. See the Yoast Mine Annual Hydrology Reports for 2014 through 2018 for additional discussion about the frequency of discharge at the NPDES outfalls.

D.) Clean Water Act Effluent Limitations (40CFR Part 434)

Monitoring data from the past five years indicate the mine has not caused exceedances of the 40 CFR Part 434 settleable solids and pH limits that are applicable to reclamation areas on coal mines (settleable solids limit: 0.5 ml/l; pH limit: 6.0 - 9.0 S.U.). See the Yoast Mine Annual Hydrology Reports from 2014 through 2018 for additional discussion of the frequency of discharge and analytical data. Note that the results of the monthly settleable solids analysis for these outfalls are documented in the SCC field notebook and only values that are at or above the detection limit (0.4 ml/l) are entered in to the water quality database. The absence of those values

in the Tables within the Annual Hydrology Reports indicates that no samples were measured at or above the detection limit.

E.) Impacts to Alluvial Valley Floors (AVFs)

Two alluvial valley floor (AVF) studies were performed on Sage Creek and Grassy Creek along with their associated tributaries. The first study conducted in 1990 focused on Dry Creek, Sage Creek, and the upper portion of Grassy Creek in 1990. The second study conducted in 1992 and 1993 included lower Grassy Creek, Scotchmans Gulch, Annand Draw, and an unnamed drainage lying east of Annand Draw. As described in Tab 16, Protection of the Hydrologic Balance, of permit C-1994-082 both studies found that there is insufficient flow to support flood irrigated crops and neither drainage contains alluvial valley floors. Additional information concerning these determination as well as copies of the two studies are provided in Tab 16 and Attachment 16-3 of the mine permit.

F.) Agreement of Observed Hydrologic Impacts with the "Probable Hydrologic Consequences" (PHC) Projected in the Mining Permit

The Observed Hydrologic Impacts are generally in good agreement with the Probable Hydrologic Consequences projected in the mine permit. The pre-mine groundwater use was marginal for livestock and irrigation and unsuitable for domestic supply. No residential domestic supply wells are present within or downgradient of the mine area. Water quality at downgradient compliance wells SGAL-70 and YSAL3 meet all applicable water quality standards. Due to the limited potential for the mine to negatively impact the quality of bedrock groundwater compliance bedrock wells were deemed unnecessary (see Appendix 15-1 TR 39). Therefore, as predicted in the PHC no groundwater users have been impacted.

Impacts to groundwater and surface water quality were addressed in the Probable Hydrologic Consequences section of the permit (Tab 17, Attachment 17-5). Projected TDS concentrations in the receiving stream alluvium were estimated from geochemical models that evaluated potential salt loads from spoil/groundwater interactions. The impact analysis projected a final TDS value of 798 mg/L at Sage Creek alluvial well YSAL3, a final TDS value of 1296 mg/L at Grassy Creek alluvial well YGAL16, and a final TDS value of 2036 mg/L at Annand Draw alluvial well

YAAL14. A prediction for Lower Grassy Creek alluvial well SGAL-70 was not made as part of the PHC. The average TDS concentrations measured from 2014 – 2018 at alluvial wells are:

Well	TDS (mean) (mg/L)	TDS (range) (mg/L)
Sage Creek Alluvial Well: YSAL3	1077	910 - 1210
Grassy Creek Alluvial Well: YGAL16	1499	1180 - 1670
Annand Draw Alluvial Well: YAAL14	3001	2010 – 3510

Although the post mine TDS concentrations have exceeded the projected concentrations the post mine concentrations do not preclude the potential suitability of this water for livestock or agricultural use. However, well yields may not be sufficient to support this use at YGAL16 and YAAL14. As of 2008, the TDS concentrations at wells YSAL3 and YGAL16 appear to be stabilizing and concentrations at YAAL14 are declining. The TDS concentrations at POC wells SGAL-70 and YSAL3 remain well below the TDS standard established in Appendix 15-1 (TR39) and none of the water quality standards have been exceeded at these locations. Additional information about the TDS trends at Yoast Mine are provided in the 2018 Annual Hydrology Report.

TDS concentrations were projected to increase by 62% in the Upper Grassy Creek to 1337 mg/L, by 230% in Sage Creek to 2118 mg/L, and by 314% in Annand Draw to 3938 mg/L. No change was projected for Lower Grassy Creek with TDS projected to remain 2177 mg/L. The Lower Grassy Creek concentration was based on the TDS measured at former Seneca Mine monitoring location SW-S2-2, located just upstream of Scotchmans Gulch. The TDS concentrations measured in these streams between 2014 – 2018 were:

Stream	TDS (mean) (mg/L)	TDS (range) (mg/L)
Upper Grassy Creek: YSGF5	973	736 - 1170
Lower Grassy Creek: YSG5	2725	1260 - 3860
Sage Creek: YSS2	1617	694 - 3240

The average TDS concentrations in the receiving streams exhibit general agreement with the predicted values. Both the Sage Creek and Upper Grassy Creek monitoring points exhibit average TDS concentrations below the predicted values. Although YSG5 exhibits TDS concentrations that are above the predicted value for lower Grassy Creek its important to remember that YSG5 is located downstream of Scotchmans Gulch and the predicted concentrations did not consider contributions from Scotchmans Gulch.

The PHC predicted that impacts from Yoast Mine spoil discharges to Annand Draw/Scotchmans Gulch/Grassy Creek and Sage Creek would be of moderately long duration, but impacts would not be significant enough to alter their potential use. Streamflow is limited in both reaches and remains insufficient to rely on for flood irrigation practices (see Tab 7, Hydrologic Description). Streamflow in Grassy Creek was determined to be insufficient for drinking water, agricultural water, or livestock water, while stream flow in Annand Draw and Sage Creek were determined to be sufficient for livestock purposes. The TDS concentrations measured at the stream points above indicate that the water quality remains adequate for livestock purposes. As described in Section B, the water quality at both the Grassy Creek and Sage Creek stream points meets the WQCC Regulation 31 Agricultural Use water quality standards.

Impacts from runoff of the reclaimed mine areas and sediment ponds were projected to be of minimal significance. This is in agreement with the water quality observed in the receiving stream and at the NPDES outfalls (see Section B and C above).

G.) Completion of the Hydrologic Reclamation Plan

Yoast Mine has been reclaimed utilizing the approved practices and measures described within the C-1994-082 permit. This application is only for a partial Phase III Bond release. A discussion of the Completion of the Hydrologic Reclamation Plan will be provided with the final Phase III bond release package.

H.) Findings of the Protection of Hydrological Balance

The disturbance of the hydrologic balance within and adjacent to the permit area have been minimized through the use of best management practices. Groundwater levels fall within historic ranges at all bedrock and alluvial wells except for bedrock well YOV30. YOV30 is screened within the Wadge overburden and the water level has generally been declining since it was installed in 1990. YOV30 is part of a well cluster that includes YW30 which monitors the Wadge Coal seam and YWU30 which monitors the Wadge underburden. This well cluster is located immediately adjacent to the mining area and the water level returns are dependent on the time necessary for the spoil to become saturated. Groundwater levels recently returned to pre-mine ranges in the underburden (2008) and Wadge Coal seam (2014). The water level in YOV30 has also exhibited some stabilization during the last three years (2014 – 2018) with the water level fluctuating between 7451 – 7453 ft msl. YOV30 is screened within the shallowest interval of these three units and its not unexpected that the water levels would take longer to stabilize than the lower bedrock units. The radius of influence from the water level drawdown in the adjacent bedrock is expected to be limited in aerial extent based on the low hydraulic conductivity of the bedrock materials. Additional information concerning groundwater levels at Yoast Mine is provided in the 2018 Yoast Mine Annual Hydrology Report.

Groundwater quality meets all applicable standards at compliance wells SGAL-70 and YSAL3. Bedrock groundwater point of compliance wells were deemed unnecessary based on the absence of the potential for the mine to negatively impact the bedrock groundwater quality. Disturbance to adjacent surface water bodies were minimized through the proper utilization of drainage and sediment control structures. As discussed in detail in the sections above the discharges from the mines site meet the NPDES permitted limits and the receiving streams meet all applicable surface water quality standards except for the occasional excursion of total recoverable iron. The

elevated iron is strongly correlated with suspended solids in the streams water column. Multiple concurrent NPDES outfall and receiving stream sampling events indicate that the elevated iron is unrelated to the discharges from the mine site and is the result of natural erosion that is occurring within the unaffected portion of the Grassy Creek and Sage Creek drainage areas. Total dissolved solids within the receiving streams have remained below or near (see Part F above) the concentrations predicted within the Probably Hydrologic Consequences and the streams water uses have not been degraded significantly. Additional hydrology data for Yoast Mine can be found in the Annual Hydrology Reports which have been submitted to CDRMS for several decades.

SUPPORTING INFORMATION

LEGAL SURFACE OWNERS WITHIN THE PERMIT BOUNDARY

Bureau of Land Management
Little Snake Field Office
455 Emerson Street
Craig, Colorado 81625

Colorado State Land Board
Northwest District Office
555 Breeze Street
Craig, Colorado 81625

Red Rock Ranch
2711 South Carter Place
Sioux Falls, South Dakota 57105

20 Mile Sheep, LLC
35513 N. HWY 13
Craig, Colorado 81625

Sage Creek Holdings, LLC
29515 Routt County Road 27
Oak Creek, Colorado 80467

Salt River Project
c/o Mike Diehl Dept. 41495
1800 Larimer Street. Suite 400
Denver, Colorado 80202

Salt River Project
c/o Mark Stewart
13125 US HWY 40
Hayden, Colorado 81639

Camilletti & Sons Inc.
HC 66 Box 69
Steamboat Springs, Colorado 80487

SURFACE OWNERS CONTIGUOUS TO THE PERMIT BOUNDARY

Dennis A. & Laurie L. Hallenbeck
36190 Routt County Road 27
Hayden, Colorado 81639

Carroll Family Land, LLLP
c/o Gordon Grandbouche
786 Industrial Ave.
Craig, Colorado 81625

Stephen & Susan Metcalfe
22415 SE Bohna Ct.
Boring, Oregon 97009-9347

Chris & Kristen Miller
P.O. Box 276
Hayden, Colorado 81639

Chance Revocable Living Trust
Kevin Chance 2012 Trust
P.O. Box 119
Ballico, California 95303-0119

Cross Mountain Ranch LP
P.O. Box 458
Santa Barbra, California 93102

Wilton Earle & Sons
531 4th Ave. W
Craig, Colorado 81625-3303

Jeffery Fry
32250 Routt County Road 37
Hayden, Colorado 81639

Sage Creek Canyon Ranch LLC
c/o Lisa Ricks
2126 L Road
Grand Junction, Colorado 80505

Joseph & Lysa Long
31145 Routt County Road 37
Hayden, Colorado 81639

Gary Valora
32195 Routt County Road 37
Hayden, Colorado 81639

HOLDERS OF EASEMENTS ON THE PROPERTY

Tri-State Generation & Transmission Assoc
P.O. Box 33695
Denver, Colorado 80233

Western Area Power Administration
1800 South Rio Grande
Montrose, Colorado 81401

Yampa Valley Electric Association Inc.
2211 Elk River Road
Steamboat Springs, Colorado 80487

LOCAL GOVERNMENT BODIES

Colorado Parks & Wildlife
P.O Box 775777
925 Weiss Drive
Steamboat Springs, Colorado 80477

Colorado River Water Conservation District
201 Centennial, Suite 200
Glenwood Springs, Colorado 81601

Office of Surface Mining Recl & Enfm
1999 Broadway, Suite 3320
Denver, Colorado 80202

Routt County Board Of Commissioners
522 Lincoln Avenue
P.O. Box 773598
Steamboat Springs, Colorado 80477

Routt County Regional Planning Dept.
Planning Director
P.O. Box 773749
Steamboat Springs, Colorado 80477

Town of Hayden
P.O. Box 190
178 Jefferson Ave.
Hayden, Colorado 81639

Upper Yampa Water Conservancy District
P.O. Box 880339
Steamboat Springs, Colorado 80488

REFERENCES

Matrix effects in the ICP-MS analysis of selenium in saline water samples. Smith, M., Compton, J. S. Proceedings of the 2004 Water Institute of Southern Africa Biennial Conference, Cape Town, South Africa, (2004).