



RECEIVED  
JUN 13 2022  
MINERALS & MINING PROGRAM



# APPENDIX I

## VEGETATION



2021 BASELINE VEGETATION ASSESSMENT  
WHARF MINE - BOSTON EXPANSION  
LARGE-SCALE MINE PERMIT APPLICATION

Submitted to:

RESPEC Company LLC  
3824 Jet Drive  
Rapid City, South Dakota 57703

and

Coeur Mining – Wharf Mine  
10928 Wharf Road  
Lead, South Dakota 57754

Submitted by:

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, Wyoming 82717

November 2021

---

**TABLE OF CONTENTS**

<b>Description</b>	<b>Page No.</b>
INTRODUCTION .....	1
METHODOLOGY .....	1
General .....	1
Vegetation Community Type Classification and Mapping .....	1
Quantitative Vegetation Sampling .....	2
Sample Parameters and Numbers .....	2
Selection of Sample Location Origins .....	2
Cover .....	2
Species Diversity and Composition .....	3
Shrub Density .....	3
Tree Density .....	3
Plant Species List .....	3
Critical Habitat and Special Status Plant Species .....	4
RESULTS .....	4
Vegetation Community Type Classification and Mapping .....	4
Quantitative Vegetation Sampling .....	5
Ponderosa Pine - Common Snowberry (PPSA) .....	5
Cover .....	5
Species Diversity and Composition .....	5
Shrub Density .....	6
Tree Density .....	6
Ponderosa Pine - Common Snowberry Log (PPSA Log) .....	6
Cover .....	7
Species Diversity and Composition .....	7
Shrub Density .....	8
Tree Density .....	8
Quaking Aspen Series (PTSE) .....	8
Cover .....	8
Species Diversity and Composition .....	8
Shrub Density .....	9
Tree Density .....	9
Quaking Aspen Series Log (PTSE Log) .....	9
Cover .....	10
Species Diversity and Composition .....	10
Shrub Density .....	11

---

<b>Description</b>	<b>Page No.</b>
Tree Density .....	11
Disturbance.....	11
Critical Habitat and Special Status Plant Species .....	11
DISCUSSION .....	12
REFERENCES .....	15



---

**LIST OF TABLES**

<b>Table</b>	<b>Page No.</b>
Table 1: Acreage, Percent of Total Area, and Sample Numbers for Each Vegetation Community Type within the Boston Expansion .....	4
Table 2: 2021 Absolute Cover Values for the Ponderosa Pine – Common Snowberry (PPSA) Vegetation Community Type within the Boston Expansion .....	5
Table 3: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Ponderosa Pine – Common Snowberry (PPSA) Vegetation Community Type within the Boston Expansion .....	6
Table 4: 2021 Absolute Cover Values for the Ponderosa Pine – Common Snowberry Log (PPSA Log) Vegetation Community Type within the Boston Expansion.....	7
Table 5: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Ponderosa Pine – Common Snowberry Log (PPSA Log) Vegetation Community Type within the Boston Expansion .....	7
Table 6: 2021 Absolute Cover Values for the Quaking Aspen Series (PTSE) Vegetation Community Type within the Boston Expansion.....	8
Table 7: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Quaking Aspen Series (PTSE) Vegetation Community Type within the Boston Expansion .....	9
Table 8: 2021 Absolute Cover Values for the Quaking Aspen Series Log (PTSE Log) Vegetation Community Type within the Boston Expansion.....	10
Table 9: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Quaking Aspen Series Log (PTSE Log) Vegetation Community Type within the Boston Expansion.....	10
Table 10: 2021 Summary of Absolute Vegetation Cover, Shrub Density, and Tree Density Data by Vegetation Community Type for the Boston Expansion.....	13

---

**LIST OF ADDENDA**

<b>Addenda</b>	<b>Page No.</b>
Addendum A: Vegetation Community Types Map .....	18
Addendum B: Submitted Methodology .....	20
Addendum C: Vegetation Species List .....	34
Addendum D: Vegetation Cover Summaries .....	39
Addendum E: Vegetation Density Summaries .....	44
Addendum F: Vegetation Tree Density Summaries .....	47
Addendum G: Photographs.....	50
Addendum H: Critical Habitat and Special Status Plant Species Report .....	60

## **INTRODUCTION**

Coeur Mining – Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the 2021 proposed permit area known as the Boston Expansion. The 2021 proposed Boston Expansion (Boston Expansion) is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline. The Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, Township 4 North, Range 2 East in Lawrence County approximately three miles west of Lead, South Dakota.

The Boston Expansion was investigated for baseline vegetation information in June and August 2021 in support of a South Dakota Department of Agriculture and Natural Resources (SD DANR) Large-Scale Mine Permit Application. This report presents baseline information on the vegetation occurring within the approximately 50-acre Boston Expansion and meets South Dakota Codified Law (SDCL) 45-6B-92 by addressing critical resources potentially affected by the proposed mine expansion.

## **METHODOLOGY**

### **General**

The Boston Expansion is located entirely within the Green Mountain Expansion project area that was investigated for baseline vegetation information by BKS Environmental Associates, Inc. (BKS), of Gillette, Wyoming, in 2010 (Addendum A). Sampling methods were derived by BKS in June 2021 and submitted to SD DANR and SD Game, Fish & Parks (GF&P). Per the June 2021 sampling methods, supplemental information to the sampling methods was provided in July 2021, again to SD DANR and GF&P, to outline the vegetation community types, acreages, and sample numbers following the baseline vegetation mapping. All sampling procedures were designed according to previous 2010 Green Mountain Expansion project baseline vegetation assessment. Refer to Addendum B for the approved Baseline Vegetation Sample Plan for the 2021 Proposed Boston Expansion (June 2021) and Supplemental Information (July 2021).

BKS completed the baseline vegetation assessment fieldwork on June 8, August 21, and August 25, 2021. The baseline vegetation assessment was conducted as described in the June 2021 Baseline Vegetation Sample Plan and the July 2021 Supplemental Information.

### **Vegetation Community Type Classification and Mapping**

The 2021 vegetation classification was based on Hoffman and Alexander (1987), as was the original 2010 study. Vegetation mapping and classification was revised from the 2010 baseline vegetation assessment where logging or other disturbance had impacted the previously mapped vegetation community types. The baseline vegetation community type mapping conducted by BKS was based on review of the most current, available aerial photography and verified through field surveys in June 2021. Minor revisions were made to the June 2021 mapping based on the August 2021 field surveys. Disturbed land, which included roads, drill trails, and drill pads within

the Boston Expansion were identified and mapped, based on the scale of the available aerial imagery.

## **Quantitative Vegetation Sampling**

### Sample Parameters and Numbers

Vegetation parameter sampling was conducted as specified in Table 1. A total of 17 samples were collected within the Boston Expansion. Seven samples were collected within the unlogged Ponderosa Pine-Common Snowberry (PPSA) and Quaking Aspen Series (PTSE) vegetation community types. A total of 10 samples were collected within the logged PPSA Log and PTSE Log vegetation community types, due to the difference in understory vegetation between the logged and unlogged vegetation community types. As indicated described in the June 2021 Baseline Vegetation Sample Plan and the July 2021 Supplemental Information, sample adequacy was not necessary for the 2021 Boston Expansion due to the specified number of samples within each mapped vegetation community.

### Selection of Sample Location Origins

Geographic Information System (GIS) software (ArcGIS) was utilized to generate a set of stratified random sample points with various optional constraint parameters. Sample points were randomly located within the four mapped vegetation community types: PPSA, PTSE, PPSA Log, and PTSE Log. The random sample point locations were uploaded to a hand-held GPS device for actual location in the field.

### Cover

A 50-meter line transect was used at each sample point within the Boston Expansion. Each 50-meter line transect represented a single sample point. Each 50-meter line transect began at its specified random origin point and extended in a randomly generated compass direction. Transects that extended beyond the boundary of vegetation community type were redirected back into the interior of the respective vegetation community type. In instances where a 90-degree angle of reflection did not place the transect within the sampled area, a 45-degree angle of reflection was used.

Line transect point-intercept methods were used to collect percent absolute vegetative cover data. Percent cover measurements were taken from point-intercepts at 1-meter intervals along the 50-meter transect using a laser pointer. Each point-intercept represented 2% of the cover measurements for that sample location.

Percent cover measurements were record by first-hit point-intercepts by live foliar vegetation species, litter, rock, cryptogams, or bare ground. Tree canopy cover and herbaceous understory cover were evaluated in the same manner. Where tree canopy cover was present, it was recorded as the first-hit. Litter included all non-living organic material that was recognizable. Rock fragments were recorded when they were equal to or greater than one centimeter in size (i.e., sheet flow, minimum non-erodible particle size). Cryptogams included lichen, moss, algae, and fungi.



First-hit data was recorded and tabulated to determine total ground cover and total vegetative cover. Multiple hits on vegetation were recorded but used only for the purpose of constructing a plant species list.

*Total Vegetation Cover:* Vegetative cover is the vertical projection of the general outline of plants to the ground surface. Vegetative cover data was recorded by species using first-hit point-intercept data. All point-intercepts of living vegetation and growth produced during the current growing season were counted toward total vegetative cover. Total vegetative cover did not include cryptogams. Total vegetative cover measurements were expressed in absolute percentages and relative cover values for individual species and life forms. Except for native grasses, species were divided into life forms based on their origin and longevity. Native grasses were divided into life forms based on seasonality, origin, and longevity.

*Total Ground Cover:* Total ground cover is the sum of percent cover values for vegetation, cryptogams, litter, and rock. Total ground cover included cryptogams. Total ground cover measurements were expressed in absolute percentages.

### Species Diversity and Composition

Species diversity and composition will be determined by noting all plant species observed or sampled within a 100 m<sup>2</sup> belt transect centered over the cover transect (1-meter on either side of the 50-meter cover transect).

### Shrub Density

Shrub density data was collected in conjunction with randomly selected cover transects. Shrub density was determined by counting each full shrub and subshrub rooted inside the same 100 m<sup>2</sup> belt transect used for species diversity (1-meter on either side of the 50-meter cover transect). Mean total shrub density was derived and reported in shrubs/m<sup>2</sup>. The number of belt transects equaled the number of cover transects for a given vegetation community type.

### Tree Density

Tree density data was collected in conjunction with randomly selected cover transects. Tree density was estimated with the point-center quarter method. The point-center quarter quadrat was located at the origin of the cover transect. Mean tree density was derived. The number of point-center quarter quadrats equaled the number of cover transects for a given vegetation community type.

## **Plant Species List**

A plant species list including scientific binomial, common name, and life form was developed for the vegetation community types. This inventory was compiled from species noted during all vegetation monitoring activities including point-intercept line transect cover measurements, species diversity belt transect measurements, special status plant species surveys, and mapping verification. Plant names in the Vascular Plants of Wyoming (Dorn 2001, 3rd Edition) and Plants

of the Black Hills and Bearlodge Mountains (Larson 1999) were utilized. Plant identification was confirmed, when necessary, by Robert Dorn author of Flora of the Black Hills (Dorn 1977) and Vascular Plants of Wyoming (Dorn 2001).

### Critical Habitat and Special Status Plant Species

Information on critical riparian zones, mountain meadows, wetlands, and U.S. Fish and Wildlife Service Threatened and Endangered (USFWS T&E) species was required as part of the baseline vegetation study by SDCL 45-6B-7(3), SDCL 45-6B-92(3), and the Endangered Species Act. SD DNR and South Dakota Game, Fish, and Parks (SD GF&P) also required information regarding South Dakota Natural Heritage Program Rare Plants of South Dakota as part of this baseline vegetation assessment. The methods and result regarding the 2021 Critical Habitat and Special Status Plant Species evaluation for the 2021 baseline vegetation assessment for the Boston Expansion was included as Addendum H.

## RESULTS

### Vegetation Community Type Classification and Mapping

The Boston Expansion contained two native vegetation community types: Ponderosa Pine-Common Snowberry (PPSA) and Quaking Aspen Series (PTSE). In addition, both vegetation community types had areas that were predominantly undisturbed and areas that were predominantly disturbed by logging or other activities. Due to the differences in the understory and overstory vegetation cover in the predominantly undisturbed areas and predominantly disturbed areas, the vegetation community types were mapped as PPSA, PPSA Log, PTSE, and PTSE Log to account for the variation in the understory cover (Addendum A). Disturbed land consisting of roads, drill trails, sumps, and drill pads associated with recent and ongoing exploration activities was also present during the baseline vegetation sampling.

The Boston Expansion is approximately 50 acres. Of those acres surveyed, the PPSA vegetation community type was 11 acres or 22%, and the PTSE vegetation community type was 8 acres or 16% (Table 1). The PPSA Log vegetation community type was 7 acres or 14%, and the PTSE Log vegetation community type was 14 acres or 28%. Existing disturbance was approximately 10 acres or 20%.

**Table 1: Acreage, Percent of Total Area, and Sample Numbers for Each Vegetation Community Type within the Boston Expansion.**

Map Unit	Acres	% Boston Expansion	# of Cover, Shrub Density, Spp. Diversity, and Tree Density Samples
Ponderosa Pine-Common Snowberry (PPSA)	11	22	4
PPSA Log	7	14	3
Quaking Aspen Series (PTSE)	8	16	3
PTSE Log	14	28	7
Disturbance	10	20	n/a
<b>TOTAL</b>	<b>50</b>	<b>100</b>	<b>17</b>

## Quantitative Vegetation Sampling

A comprehensive plant species list by vegetation community type is presented in Addendum C. Refer to Addendum D for complete cover summary reports for each vegetation community type. Refer to Addendum E for complete shrub density summary reports for each vegetation community type. Refer to Addendum F for a complete tree density summary report for each vegetation community type. Photographs of each sampled vegetation transect within the vegetation community types are presented in Addendum G.

### Ponderosa Pine - Common Snowberry (PPSA)

The PPSA vegetation community type was the second most abundant vegetation community type within the Boston Expansion. This vegetation community type occurred in the western half of the Boston Expansion. The topography ranged from moderately steep to very steep. The overstory was dominated by ponderosa pine (*Pinus ponderosa*). Quaking aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) were present in the overstory but were not dominant. The dominant shrubs in the understory included: shinyleaf spirea (*Spiraea lucida*), grouse whortleberry (*Vaccinium scoparium*), kinnikinnick (*Arctostaphylos uva-ursi*), common snowberry (*Symphoricarpos albus*), Oregon grape (*Mahonia repens*), creeping juniper (*Juniperus horizontalis*), and bunchberry dogwood (*Cornus canadensis*). Common grasses included: rough-leaved ricegrass (*Oryzopsis asperifolia*), whitegrass (*Leersia virginica*), Kentucky bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), creeping bentgrass (*Agrostis stolonifera*), and Canada wildrye (*Elymus canadensis*). Common forbs included: wild bergamot (*Monarda fistulosa*), western yarrow (*Achillea millefolium*), northern bedstraw (*Galium boreale*), and mountain blue violet (*Viola adunca*).

#### Cover

The PPSA vegetation community type comprised 11 of the 50 acres of the Boston Expansion (22%) (Table 1). Four cover transects were sampled for this vegetation community type (Table 1). Absolute total vegetation cover was 82.5% (Table 2). Absolute litter/rock cover was 17.0%. Absolute cryptogam cover was 0.5%. Absolute total ground cover was 100.0%.

**Table 2: 2021 Absolute Cover Values for the Ponderosa Pine – Common Snowberry (PPSA) Vegetation Community Type within the Boston Expansion.**

<b>Vegetation Cover Parameter</b>	<b>Mean (%)</b>
Absolute Total Vegetation Cover	82.5
Absolute Litter/Rock	17.0
Absolute Cryptogam	0.5
Absolute Total Ground Cover	100.0

#### Species Diversity and Composition

A total of 37 plant species from 10 life forms were observed within the PPSA vegetation community type (Addendum C).

Native trees were the dominant life form within the overstory of the PPSA vegetation community type with 86.7% relative vegetation cover (Table 3). Ponderosa pine provided the highest relative vegetation cover at 67.9% (Addendum D). White spruce provided the next highest relative vegetation cover at 12.1%. Native subshrubs and native full shrub were the dominant life forms in the understory with 6.7% and 4.2% of the relative vegetation cover, respectively (Table 3). Introduced perennial grasses, native cool season perennial grasses, and native perennial forbs comprised the remaining 2.4% relative vegetation cover in the understory.

**Table 3: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Ponderosa Pine – Common Snowberry (PPSA) Vegetation Community Type within the Boston Expansion.**

Life Form	Vegetation Cover (%)	
	Absolute	Relative
Native Cool Season Perennial Grasses	0.5	0.6
Introduced Perennial Grasses	1.0	1.2
Native Perennial Forbs	0.5	0.6
Native Subshrubs	5.5	6.7
Native Full Shrubs	3.5	4.2
Native Trees	71.5	86.7
Total	82.5	100

#### Shrub Density

The PPSA vegetation community type supported an average of 3.5 shrubs/m<sup>2</sup> or 14,161 shrubs per acre. The dominant full and subshrub species were common grouse whortleberry, shinyleaf spirea, and kinnikinnick.

#### Tree Density

The PPSA vegetation community type supported an average of 75 trees per acre or 0.02 trees/m<sup>2</sup>. The dominant tree was ponderosa pine.

#### **Ponderosa Pine - Common Snowberry Log (PPSA Log)**

The PPSA Log vegetation community type was limited within the Boston Expansion and occurred in the western half of the Boston Expansion. The topography ranged from moderately steep to very steep. The PPSA Log vegetation community type was similar to the PPSA vegetation community type except it was disturbed by logging or other activities. Generally, the understory vegetation in the predominantly disturbed PPSA Log vegetation community type was lower, and the litter cover was higher than in the predominantly undisturbed PPSA vegetation community type. Primarily due to less overstory vegetation cover in the PPSA Log vegetation community type compared to the PPSA vegetation community type and more litter associated with post-harvest conditions. Understory forbs and shrubs were more diverse in the PPSA Log vegetation community type than in the PPSA vegetation community type. Trees within the predominantly disturbed PPSA Log vegetation community type were generally less mature than trees within the PPSA vegetation community type.



### Cover

The PPSA Log vegetation community type comprised 7 of the 50 acres of the Boston Expansion (14%) (Table 1). Three cover transects were sampled for this vegetation community type (Table 1). Absolute total vegetation cover was 43.4% (Table 4). Absolute litter/rock cover was 56.0%. Absolute cryptogam cover was 0.6%. Absolute total ground cover was 100.0%.

**Table 4: 2021 Absolute Cover Values for the Ponderosa Pine – Common Snowberry Log (PPSA Log) Vegetation Community Type within the Boston Expansion.**

<b>Vegetation Cover Parameter</b>	<b>Mean (%)</b>
Absolute Total Vegetation Cover	43.4
Absolute Litter/Rock Cover	56.0
Absolute Cryptogam Cover	0.6
Absolute Total Ground Cover	100.0

### Species Diversity and Composition

A total of 53 plant species from 11 life forms were observed within the PPSA Log vegetation community type (Addendum C).

Native trees were the dominant life form within the overstory of the PPSA Log vegetation community type with 30.7% relative vegetation cover (Table 5). Ponderosa pine provided the highest relative vegetation cover at 23.0% (Addendum D). White spruce provided the next highest relative vegetation cover at 7.7%. Native subshrubs, native cool season perennial grasses, and native perennial forbs were the dominant life forms in the understory with 21.5%, 17.0%, and 12.4% of the relative vegetation cover, respectively (Table 5). Native warm season perennial grasses, introduced grasses, introduced annual/biennial forbs, and native full shrubs comprised the remaining 18.4% relative vegetation cover in the understory.

**Table 5: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Ponderosa Pine – Common Snowberry Log (PPSA Log) Vegetation Community Type within the Boston Expansion.**

<b>Life Form</b>	<b>Vegetation Cover (%)</b>	
	<b>Absolute</b>	<b>Relative</b>
Native Cool Season Perennial Grasses	7.4	17.0
Native Warm Season Perennial Grasses	1.3	3.1
Introduced Perennial Grasses	3.4	7.8
Introduced Annual/Biennial Forbs	0.7	1.5
Native Perennial Forbs	5.4	12.4
Native Subshrubs	9.3	21.5
Native Full Shrubs	2.6	6.0
Native Trees	13.3	30.7
Total	43.4	100

### Shrub Density

The PPSA Log vegetation community type supported an average of 2.3 shrubs/m<sup>2</sup> or 9,322 shrubs per acre. The dominant full and subshrub species were common grouse whortleberry, shinyleaf spirea, and kinnikinnick.

### Tree Density

The PPSA Log vegetation community type supported an average of 98 trees per acre or 0.02 trees/m<sup>2</sup>. The dominant tree was ponderosa pine. The trees within the PPSA Log vegetation community type were generally smaller and less mature in the more open canopy of the PPSA Log vegetation community compared to the established, mature trees of the PPSA vegetation community.

### **Quaking Aspen Series (PTSE)**

The PTSE vegetation community type was limited within the Boston Expansion and occurred along the southwestern border of the Boston Expansion. The topography was generally moderately steep. The overstory was dominated by quaking aspen. White spruce and ponderosa pine were present in the overstory but were not dominant. The dominant shrubs in the understory included: grouse whortleberry, shinyleaf spirea, kinnikinnick, Bunchberry dogwood, and common snowberry. Common grasses included: rough-leaf ricegrass, whitegrass, Kentucky bluegrass, weeping alkaligrass (*Puccinellia distans*), smooth brome (*Bromus inermis*), and timothy. Common forbs present included: spreading dogbane (*Apocynum androsaemifolium*), western bracken fern (*Pteridium aquilinum*), western pearly everlasting (*Anaphalis margaritacea*), and Indianhemp (*Apocynum cannabinum*).

### Cover

The PTSE vegetation community type comprised 8 of the 50 acres of the Boston Expansion (16%) (Table 1). Three cover transects were sampled for this vegetation community type (Table 1). Absolute total vegetation cover was 90.7% (Table 6). Absolute litter/rock cover was 9.3%. Absolute total ground cover was 100.0%.

**Table 6: 2021 Absolute Cover Values for the Quaking Aspen Series (PTSE) Vegetation Community Type within the Boston Expansion.**

<b>Vegetation Cover Parameter</b>	<b>Mean (%)</b>
Absolute Total Vegetation Cover	90.7
Absolute Litter/Rock Cover	9.3
Absolute Total Ground Cover	100.0

### Species Diversity and Composition

A total of 45 plant species from 7 life forms were observed within the PTSE vegetation community type (Addendum C).

Native trees were the dominant life form within the overstory of the PTSE vegetation community type with 75.0% relative vegetation cover (Table 7). Quaking aspen provided the highest relative vegetation cover at 39.0% (Addendum D). Ponderosa pine provided the next highest relative vegetation cover at 19.8%. Native full shrubs and native perennial forbs were the dominant life forms in the understory with 8.8% and 8.7% of the relative vegetation cover, respectively (Table 7). Native cool season perennial grasses, introduced perennial grasses, and native subshrubs comprised the remaining 7.4% relative vegetation cover in the understory.

**Table 7: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Quaking Aspen Series (PTSE) Vegetation Community Type within the Boston Expansion.**

Life Form	Vegetation Cover (%)	
	Absolute	Relative
Native Cool Season Perennial Grasses	2.0	2.2
Introduced Perennial Grasses	1.4	1.5
Native Perennial Forbs	7.9	8.7
Native Subshrubs	3.4	3.7
Native Full Shrubs	8.0	8.8
Native Trees	68.0	75.0
Total	90.7	100

#### Shrub Density

The PTSE vegetation community type supported an average of 7.1 shrubs/m<sup>2</sup> or 28,586 shrubs per acre. The dominant full and subshrub species were grouse whortleberry, shinyleaf spirea, and kinnikinnick.

#### Tree Density

The PTSE vegetation community type supported an average of 31 trees per acre or 0.01 trees/m<sup>2</sup>. The dominant tree was quaking aspen.

#### **Quaking Aspen Series Log (PTSE Log)**

The PTSE Log vegetation community type was the dominant vegetation community type within the Boston Expansion. This vegetation community type occurred in the eastern half and a portion of the western half of the Boston Expansion. The topography ranged from rolling hills to very steep and rocky. The PTSE Log vegetation community type was similar to the PTSE vegetation community type except it was disturbed by logging or other activities. The overstory vegetation cover in the predominantly disturbed PTSE Log vegetation community type was lower than the overstory vegetation cover in the predominantly undisturbed PTSE vegetation community type. The understory was generally less diverse in the PTSE Log vegetation community type than in the PTSE vegetation community type. Trees within the predominantly disturbed PTSE Log vegetation community type were generally less mature than trees within the PTSE vegetation community type.

### Cover

The PTSE Log vegetation community type comprised 14 of the 50 acres of the Boston Expansion (28%) (Table 1). Three cover transects were sampled for this vegetation community type (Table 1). Absolute total vegetation cover was 85.4% (Table 8). Absolute litter/rock cover was 11.7%. Absolute total ground cover was 97.1%. Absolute bare ground cover was 2.9%.

**Table 8: 2021 Absolute Cover Values for the Quaking Aspen Series Log (PTSE Log) Vegetation Community Type within the Boston Expansion.**

<b>Vegetation Cover Parameter</b>	<b>Mean (%)</b>
Absolute Total Vegetation Cover	85.4
Absolute Litter/Rock Cover	11.7
Absolute Total Ground Cover	97.1

### Species Diversity and Composition

A total of 49 plant species from 11 life forms were observed within the PTSE Log vegetation community type (Addendum C).

Native trees were the dominant life form within the overstory of the PTSE Log vegetation community type with 51.2% relative vegetation cover (Table 9). Quaking aspen provided the highest relative vegetation cover at 41.5% (Addendum D). Ponderosa pine provided the next highest relative vegetation cover at 6.0%. Introduced perennial grasses, native perennial forbs, native subshrubs, and native full shrubs were the dominant life forms in the understory with 10.4%, 10.0%, 9.0%, and 8.4% of the relative vegetation cover, respectively (Table 9). Native cool season perennial grasses, native warm season perennial grasses, and native grass-like species comprised the remaining 11.0% relative vegetation cover in the understory.

**Table 9: 2021 Summary of Absolute and Relative Vegetation Cover Data by Life Form for the Quaking Aspen Series Log (PTSE Log) Vegetation Community Type within the Boston Expansion.**

<b>Life Form</b>	<b>Vegetation Cover (%)</b>	
	<b>Absolute</b>	<b>Relative</b>
Native Cool Season Perennial Grasses	5.4	6.4
Native Warm Season Perennial Grasses	0.3	0.3
Introduced Perennial Grasses	8.9	10.4
Native Grass-like Species	3.7	4.3
Native Perennial Forbs	8.6	10.0
Native Subshrubs	7.7	9.0
Native Full Shrubs	7.1	8.4
Native Trees	43.7	51.2
Total	85.4	100



---

### Shrub Density

The PTSE Log vegetation community type supported an average of 4.5 shrubs/m<sup>2</sup> or 18,408 shrubs per acre. The dominant full and subshrub species were kinnikinnick, common snowberry, shinyleaf spirea, and Oregon grape.

### Tree Density

The PTSE Log vegetation community type supported an average of 27 trees per acre or 0.01 trees/m<sup>2</sup>. The dominant tree was quaking aspen.

### **Disturbance**

In addition, to the vegetation communities disturbed by logging activities, disturbance associated with mine exploration activities occurred prior to and during the 2021 baseline vegetation survey. Disturbance comprised approximately of 10 of the 50 acres of the Boston Expansion (20%) (Table 1). Based on memory, Wharf employees recollect that logging in the Boston Expansion occurred in early summer 2015. Aerial photography from 2013 and 2015 confirms logging took place in that time frame. An aerial photo of that area was not acquired in 2014. Logging in the Flossie Pit/Flossie Dump area, northwest of the Boston Expansion, occurred in the fall 2018. Logging just east of the Boston Expansion took place in early 2019 before mining started in the current phase of the Portland Ridgeline Pit. Exploration activities within the Boston Expansion area have occurred from 2010 to present. As of December 31, 2021, approximately 9 acres of the Boston Expansion have been disturbed by exploration activities and included exploration roads, drill trails, sumps, and drill pads. Most of the exploration activities have occurred and were occurring during the August 2021 baseline vegetation survey in the eastern portion of the Boston Expansion.

### **Critical Habitat and Special Status Plant Species**

Based on the 2010 and 2021 baseline vegetation assessments, riparian zones, mountain meadows, and wetlands were not present within the Boston Expansion. Riparian habitats were present west of the Boston Expansion in association with Annie Creek and west of the Boston Expansion in association with Nevada Gulch. There was a very limited extent of areas interspersed throughout the Boston Expansion devoid of tree cover. These areas were not classified as mountain meadows. These areas were primarily found adjacent to disturbance and based on review of available aerial photography previously had tree cover. Additionally, plant species composition in these areas was similar to surrounding vegetation communities. No individuals of USFWS T&E listed for South Dakota, Leedy's Roseroot (*Rhodiola integrifolia* spp. *leddyi*) and Western Prairie Fringed Orchid (*Platanthera praeclara*), were present within the Boston Expansion. Additionally, no potential habitat for these species was present within the proposed Boston Expansion. The USFWS Information, Planning, and Consultation (IPaC) System supports this finding and indicates no USFWS T&E species for Lawrence County, South Dakota.

The South Dakota Natural Heritage Program Rare Plants of South Dakota list was reviewed prior to the 2021 baseline vegetation assessment. The 2021 baseline vegetation assessment found one G5 S2 species: mountain huckleberry (*Vaccinium membranaceum*). The State Rank of S2 indicates

the species is imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range. The Global Rank of G5 indicates demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. BKS received verification of this identification through a collected specimen submitted to Robert Dorn.

One population of mountain huckleberry was found on the western border of the Boston Expansion. This population was located within the quaking aspen series vegetation community type on a relatively steep south-facing slope. Quaking aspen and ponderosa pine were the dominant overstory vegetation. Multiple small shrubs and forbs dominated the understory and included grouse whortleberry, kinnikinnick, and shinyleaf spirea. Approximately 10 individuals were observed within this population.

## DISCUSSION

The 50-acre Boston Expansion contained two native vegetation community types that were predominantly undisturbed: PPSA (11 acres, 22%) and PTSE (8 acres, 16%) (Table 1). In addition, both vegetation community types had areas that were predominantly disturbed by logging or other activities: PPSA Log (7 acres, 14%) and PTSE Log (14 acres, 28%). In June and August 2021, each vegetation community type was investigated for baseline vegetation information in support of a SD DANR Large-Scale Mine Permit Application. An additional, 10 acres (20%) of disturbance from recent and ongoing exploration activities were also present within the Boston Expansion. The disturbance was not investigated for baseline vegetation information.

The quaking aspen series (90.7%) and quaking aspen series log (85.4%) vegetation community types had the highest absolute total vegetation cover (Table 10). All vegetation community types except the quaking aspen series log vegetation community type (97.1%) had 100.0% absolute total ground cover. Shrub density was highest in the quaking aspen series (7.1 shrubs/m<sup>2</sup>) and quaking aspen series log (4.5 shrubs/m<sup>2</sup>) vegetation community types (Table 10). Tree density was highest in the ponderosa pine-common snowberry and ponderosa pine-common snowberry log vegetation community types at 0.02 trees/m<sup>2</sup> (Table 10). Across all vegetation community types a total of 76 plant species from 13 life forms were observed within the Boston Expansion (Addendum C).

Native trees were the dominant life form within overstory in all four of the vegetation community types. Native tree cover was less in the predominantly disturbed vegetation community cover types, ponderosa pine-common snowberry log and quaking aspen series log, than in the predominantly undisturbed vegetation cover types, ponderosa pine-common snowberry and quaking aspen series. Ponderosa pine was the dominant species in the ponderosa pine-common snowberry vegetation community types, and quaking aspen was the dominant species in the quaking aspen series vegetation community types. Both species and white spruce were present in the overstory of all four vegetation community types. Trees within the predominantly disturbed quaking aspen series log and ponderosa pine-common snowberry log vegetation community types were generally less mature than trees within the same predominantly undisturbed vegetation community types.

**Table 10: 2021 Summary of Absolute Vegetation Cover, Shrub Density, and Tree Density Data by Vegetation Community Type for the Boston Expansion.**

<b>Vegetation Community Type</b>	<b>Total Vegetation Cover (%)</b>	<b>Total Ground Cover (%)</b>	<b>Shrub Density (#/m<sup>2</sup>)</b>	<b>Tree Density (#/m<sup>2</sup>)</b>
Ponderosa Pine-Common Snowberry (PPSAA)	82.5	100.0	3.5	0.02
PPSA Log	43.4	100.0	2.3	0.02
Quaking Aspen Series (PTSE)	90.7	100.0	7.1	0.01
PTSE Log	85.4	97.1	4.5	0.01

Understory vegetation was primarily composed of native full shrubs, native and introduced subshrubs, native perennial forbs, and perennial grass and grass-like species. The dominance of these life forms varied between the four vegetation community types. Generally, grouse whortleberry, kinnikinnick, shinyleaf spirea, common snowberry, and Oregon grape were the most common native full and subshrubs. Rough-leaf ricegrass, whitegrass, Kentucky bluegrass, weeping alkaligrass, timothy, smooth brome, creeping bentgrass, and Ross sedge (*Carex rossii*) were the most common perennial grasses and grass-like species. Native perennial forbs western yarrow, western pearly everlasting, bluebell bellflower (*Campanula rotundifolia*), spreading dogbane, cream pea (*Lathyrus ochroleucus*), wild bergamot, western bracken fern, veiny meadow-rue (*Thalictrum venulosum*), and mountain blue violet.

Isolated occurrences of six weed species were observed within the Boston Expansion: bull thistle (*Cirsium vulgare*), houndstongue (*Cynoglossum officinale*), mullein (*Verbascum thapsus*), Canada thistle (*Cirsium arvense*), yellow toadflax (*Linaria vulgaris*), and common tansy (*Tanacetum vulgare*). Bull thistle (PPSA-L-1, PTSE-L-3 and -6, and one general observation), mullein (two general observations), and Canada thistle (PPSA-L-2 and -3, PTSE-L-1 and -6, and two general observations) were present within the ponderosa pine-common snowberry log and quaking aspen series log vegetation community types. Houndstongue (PPSA-1 and -2 and two general observations) was present within the ponderosa pine-common snowberry and ponderosa pine-common snowberry log vegetation community types. Yellow toadflax (PTSE-L-2) and common tansy (PTSE-L-4 and -6) were present within the quaking aspen series log vegetation community type.

Based on the 2010 and 2021 baseline vegetation assessments, riparian zones, mountain meadows, and wetlands were not present within the Boston Expansion. No individuals of USFWS T&E listed for South Dakota were present within the Boston Expansion. The 2021 baseline vegetation assessment found one G5 S2 species, mountain huckleberry, within the Boston Expansion (Addendum H).

There has been no change in the global or state rank of mountain huckleberry since 1992 in the state of South Dakota. The Global Rank of G5 indicates demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. South Dakota populations of mountain huckleberry would likely be considered periphery populations (Simonin 2000). The State Rank of S2 indicates the species is imperiled because of rarity (6 to 20 occurrences or few remaining

individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

Review of 2021 SD Natural Heritage Program Database records (SDNHPD 2021) indicated 26 populations have been identified and observed within a 14-mile radius of Lead, South Dakota, between 1929 and 2010. For purposes of this discussion, population equals one record in the SD Natural Heritage Program Database or one location in the historic Coeur data. Approximately half of the populations were identified within a 1-mile radius of the Wharf Mine Permit. The remaining populations were located one to eight miles from the Wharf Mine Permit. Aerial photography indicated that 19 of the 26 populations were in relatively undisturbed locations. The other seven populations were in moderately to heavily disturbed locations and likely were no longer present. Limited records provided counts on the number of plants in each population. In the nine records with counts, most indicated 100s of plants per population, one noted one, and one noted 1000s.

Review of historic Coeur studies conducted between 1990 and 1996 (BKS 1990-1996), indicated 59 mountain huckleberry populations outside of the current Wharf Mine Permit. All identified populations were within an approximate 1.25-mile radius of the Wharf Mine Permit in relatively undisturbed locations. Except for four populations located south of the Wharf Mine Permit near Terry Peak were likely undisturbed and still present. Within the current Wharf Mine Permit area, 65 populations have been identified. These populations have been eliminated or directly or indirectly impacted by mining activities. Eight populations were identified outside of the Wharf Mine Permit but within the Green Mountain Expansion study area and one population was identified within the Boston Expansion (It is likely this population was the same population identified in 2021 due to the general proximity and lack of GPS location from the former studies). All but 13 of these populations appear to be unique compared to the SD Natural Heritage Program Database populations.

Review of the historic records and aerial photography would indicate the possibility of 70 populations within the vicinity of Wharf Mine Permit. The populations were located north and east of the current Wharf Mine Permit within a 1-1.5-mile radius of the Wharf Mine Permit. Within this same radius, limited populations have been identified south of the Wharf Mine Permit, and none have identified west of the Wharf Mine Permit. This could reflect the location of potential expansion areas more than actual presence/absence. Most identified populations in the SD Natural Heritage Program Database and Coeur data appear to be associated with surveys for disturbance and very limited observations from general reconnaissance. Due to the sensitivity of the SD Natural Heritage Program Database data, a map illustrating the mountain huckleberry populations relative to the Wharf Mine Permit cannot be included in public permit documents.

General reconnaissance surveys for mountain huckleberry conducted by Wharf Resources, Inc. in 1992 and 1996 around the Annie Creek Mine and adjacent areas indicated that mountain huckleberry was intolerant of disturbance that opened the canopy (BKS 1996). According to the earlier surveys, isolated individuals of mountain huckleberry were found in previously disturbed habitats with open canopies, but no large patches were observed. Areas devoid of any past mining, logging, recreation, residential, agricultural, or exploration activity were most suitable for mountain huckleberry according to the earlier surveys.



Lands within the Boston Expansion have been significantly impacted by multiple types of historic disturbance and do not represent highly suitable habitat for large populations of mountain huckleberry. The isolated and limited population found within the Boston Expansion during the 2021 survey is reflective of the 1996 survey findings where only isolated individual were found in previously disturbed habitats.

Wharf will continue to provide SD Natural Heritage Program Database with results of all future surveys to enhance the current understanding of mountain huckleberry populations. Since wild mountain huckleberry is rhizomatous, individual plants lack dense, centralized root systems. Therefore, transplanting wild mountain huckleberry bushes is difficult (Barney 1999, Barney 2003). Despite the documented low probability of successful transplants with mountain huckleberry, Wharf will attempt a transplant of these plants to an area recommended by BKS within the Wharf permit boundary. It is also noted that due to the presence of more suitable habitat in the vicinity (BKS 1996), it is unlikely the potential loss of this small group of plants (less than 10 individuals) would change their S2 status in South Dakota.

## REFERENCES

- Barney, Danny L. 1999. Growing Western Huckleberries. University of Idaho Extension. BUL 821.
- Barney, Danny L. 2003. Prospects of Domesticating Western Huckleberries. Small Fruits Review: 2:1: 15-29.
- BKS Environmental Associates, Inc. 1990. Clinton Baseline. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. Drill Trails. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. Saddle Area EXNI #341. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. South Greater Portland. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Clinton Supplement. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Golden Reward Harmony Layback Area. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Squaw Valley. Prepared for Wharf Resources, Inc. Lead, SD.

- 
- BKS Environmental Associates, Inc. 1994. Carcinoma EXNI #364. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Copper Head EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Cornicopia EXNI #348. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Long Valley EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Summit Flats EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Texana EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1995. BLM EXNI #336. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1995. Golden Reward EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1996. General Reconnaissance for Plant Species of Concern Area Survey for *Vaccinium membranaceum*. Prepared for Wharf Resources, Inc. Lead, SD.
- Dorn, R.D. 2001. Vascular Plants of Wyoming, 3<sup>rd</sup> ed. Mountain West Publishing, Cheyenne, Wyoming. 412 pp.
- Dorn, R.D. 1977. Flora of the Black Hills. Mountain West Publishing, Cheyenne, Wyoming. 377 pp.
- Hoffman G. and Alexander R. 1987. Forest Vegetation of the Black Hills of South Dakota and Wyoming: A Habitat Type Classification USDA Forest Service Research Paper RM-276.
- Larson G.E. and Johnson J.R. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University, College of Agriculture and Biological Sciences, South Dakota Agricultural Experiment Station B732. 608p.
- Simonin, Kevin A. 2000. *Vaccinium membranaceum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).  
<[www.fs.fed.us/database/feis/plants/shrub/vacmen/all.html](http://www.fs.fed.us/database/feis/plants/shrub/vacmen/all.html)> Accessed October 2021.

---

South Dakota Natural Heritage Program Database. South Dakota Department of Game, Fish, and Parks. *Vaccinium membranaceum* and *Pyrola picta* occurrences within 14 miles of Lead, South Dakota. December 2021.

South Dakota Natural Heritage Program. 2018. Rare Plants of South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota. <<https://gfp.sd.gov/rare-plants/>>. Accessed June 2021.

U.S. Fish and Wildlife Service. 2021. IPac Information for Planning and Consultation. <[ecos.fws.gov/ipac](https://ecos.fws.gov/ipac)>. Accessed August 2021.

ADDENDUM A  
VEGETATION COMMUNITY TYPES MAP







ADDENDUM B  
SUBMITTED METHODOLOGY

**BASELINE VEGETATION SAMPLE PLAN FOR  
COEUR WHARF  
2021 PROPOSED BOSTON EXPANSION**

*prepared for*

Coeur Mining  
10928 Wharf Road  
Lead, South Dakota 57754

*prepared by*

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, Wyoming 82717

June 2021

## COEUR WHARF

## 2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

## I. INTRODUCTION

Coeur Wharf (Wharf) has proposed to expand existing gold mine operations on the 2021 proposed permit area known as the Boston Expansion. This area is approximately two to three miles west of Lead, South Dakota, in Lawrence County. The 2021 proposed Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, T4N, R2E. The 2021 proposed Boston Expansion is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline. Figure 1 shows the 2021 proposed Boston Expansion baseline vegetation study area.

The purpose of this document is to summarize the baseline sample plan for vegetation. A baseline vegetation study for the 2021 proposed Boston Expansion is being completed as part of the South Dakota Department of Agriculture and Natural Resources (SD DANR) Large-Scale Mine Permit Application process. The baseline data will be important in addressing South Dakota Codified Law (SDCL) 45-6B-92 by addressing critical resources potentially affected by the proposed mine expansion.

## II. BASELINE STUDY AREA

A baseline vegetation study was conducted in 2010 by BKS Environmental Associates, Inc. (BKS) in the Wharf Expansion project area which covered 573 acres (Figure 1). The baseline vegetation study proposed by BKS for 2021 will only cover the proposed Boston Expansion which is located entirely within the larger 2010 Wharf Expansion project area (Figure 1). The vegetation classification will be based on Hoffman and Alexander (1987) and only revised from the 2010 baseline vegetation study where logging or other disturbance has impacted the previously mapped vegetation community types. The 2021 proposed Boston Expansion contains the following native vegetation community types, based on the 2010 Wharf Expansion baseline vegetation study: Ponderosa Pine-Common Snowberry (PPSA) and Quaking Aspen Series (PTSE). In addition, disturbed land is also present. Table II-1 shows the 2010 vegetation community types and mapping acreages based on the 2010 Wharf Expansion baseline vegetation study.

Table II-1. Vegetation Map Units and Associated Acreages

Vegetation Community Type	2021 Proposed Boston Expansion Acres Based on 2010 Wharf Expansion Baseline Vegetation Study
Disturbed	3
Ponderosa Pine-Common Snowberry (PPSA)	44
Quaking Aspen Series (PTSE)	3
<b>Total</b>	<b>50</b>

## III. Critical Habitat and Special Status Plant Species

Information on critical riparian zones, mountain meadows, wetlands, and U.S. Fish and Wildlife Service Threatened and Endangered (USFWS T&E) species is required as part of the baseline vegetation study by SDCL 46-6B-7(3), SDCL 45-6B-92(3), and the Endangered Species Act. Based on the 2010 baseline vegetation study of the Wharf Expansion project area, it is expected riparian zones, mountain meadows,



## COEUR WHARF

## 2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

and wetlands do not exist in the 2021 proposed Boston Expansion.

Special status plant species, including USFWS T&E species and Rare Plants of South Dakota were surveyed for in the 2010 baseline vegetation study. No USFWS T&E species were observed within the 2010 Wharf Expansion project area. Two Rare Plants of South Dakota were observed: *Pyrola picta* and *Vaccinium membranaceum*. These species were observed within the 2010 Wharf Expansion project area, but not in the 2021 proposed Boston Expansion. BKS will conduct a maximum of three rare plant species surveys in 2021 within the proposed Boston Expansion due to the proximity of the 2010 documented occurrences to the 2021 proposed Boston Expansion (Figure 1).

- First survey will be conducted around June 1.
- Second survey will be conducted in late June/early July in conjunction with the quantitative vegetation sampling.
- Third survey will be conducted in August, if habitat for late blooming special status plant species is present within the 2021 proposed Boston Expansion. If habitat is not present, a survey will not be conducted in August.

The special status plant species surveys will generally follow the timed meander methodology recommended by the SD Game, Fish, and Parks (SD GF&P): Goff, Dawson, and Rochow (1982). BKS vegetation ecologists will conduct the timed meander survey by walking through the 2021 proposed Boston Expansion. The survey will start at a point closest to the easiest access to the 2021 proposed Boston Expansion. From the start location a typical meander search path will be utilized to survey the extent of the 2021 proposed Boston Expansion. A recreational grade hand-held Global Positioning System (GPS) device will be used to mark the survey locations within the meander. At each survey location, the vegetation community type and time will be noted. Species composition will be verified. The entire 2021 proposed Boston Expansion will be considered one unit for purposes of the special status plant species survey. The length of the survey will depend on professional judgement of the number of new species observed and the extent of the 2021 proposed Boston Expansion covered.

If a special status plant species is identified within the 2021 proposed Boston Expansion, the location will be marked with a hand-held GPS device and photographs will be taken of the individual or population. The following will be documented: habitat, abundance/estimated number of individuals, phenological stage, health, and land use. Specimens will only be collected, if positive identification cannot be made by BKS vegetation ecologists on site. Any specimens that cannot be identified will be sent to Bob Dorn, author of *Vascular Plants of Wyoming*, for identification. BKS will report rare plant occurrences to the SD GF&P Natural Heritage Program, with written approval from Wharf.

#### IV. Vegetation Community Classification and Mapping

The 2021 proposed Boston Expansion vegetation community types were classified and mapped during the 2010 baseline vegetation study. BKS will revise the 2010 baseline vegetation community type mapping prior to quantitative vegetation sampling in 2021, in conjunction with the first survey for special status plant species. The 2010 baseline vegetation community type mapping will be revised based on review of the most-current, available aerial photography and verified through field surveys in 2021. Disturbed areas within the 2021 proposed Boston Expansion will be identified and mapped, based on the scale of the available aerial imagery.

## COEUR WHARF

## 2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

The vegetation community types within a ½ mile buffer of the 2010 Wharf Expansion project area were classified and mapped during the 2010 baseline vegetation study. The vegetation community types within the buffer will only be revised during 2021, if the aerial imagery indicates changes from the 2010 classification and mapping. No field verification will be conducted within the ½ mile buffer.

## V. Quantitative Vegetation Sampling

The 2021 quantitative sampling will be conducted using the procedures described in this document.

### A. Sample Timing

The 2021 quantitative sampling will be conducted prior to August 1, 2021. Actual sample dates will be based on prevailing weather conditions and maximum growth periods.

### B. Sample Parameters and Numbers

Vegetation parameter sampling will be conducted as specified in Table II-2. At each sample point, vegetation cover data and tree density data will be collected. A maximum of 17 samples will be collected within the 2021 proposed Boston Expansion. A total of 10 samples will be collected within the unlogged PPSA and PTSE vegetation community types. An additional, seven samples may be collected within the logged PPSA and PTSE vegetation community types, if it appears the understory vegetation is greatly different than the understory of the unlogged vegetation community type. The status of the understory vegetation will be discussed with SD DANR after the field verification of the mapping is completed and prior to the initiation of quantitative sampling. Sample adequacy is not necessary for the 2021 proposed Boston Expansion project.

**Table II-2. Number of Sample Points and Sample Parameters**

Vegetation Community Type	Parameters			Number of Sample Points	
	Vegetation Cover <sup>1</sup>	Shrub Density <sup>1</sup>	Tree Density <sup>1</sup>	Required	Optional
Disturbed	No	No	No	0	0
Ponderosa Pine-Common Snowberry (PPSA)	Yes	Yes	Yes	7	0
PPSA Logged	Optional	Optional	Optional	0	5
Quaking Aspen Series (PTSE)	Yes	Yes	Yes	3	0
PTSE Logged	Optional	Optional	Optional	0	2
Reclaimed Grassland	No	No	No	0	0
<b>Total</b>				<b>10</b>	<b>7</b>

<sup>1</sup>-Logged vegetation communities will only be sampled for vegetation cover, shrub density, and tree density, if it appears the understory vegetation is greatly different than the unlogged vegetation community type. This will be discussed and agreed upon with the SD DANR after field verification of the mapping is completed.

### C. Selection of Sample Location Origins

Geographic Information System (GIS) software (ArcGIS) will be utilized to generate a set of stratified random sample points with various optional constraint parameters. Sample points will be randomly located within the mapped vegetation community types. The random sample point locations will be uploaded to a hand-held GPS device for actual location in the field.

## COEUR WHARF

## 2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

## D. Cover Sampling

## 1. Line Transect Layout

A 50-meter line transect will be used at each sample point within the 2021 proposed Boston Expansion. Each 50-meter line transect will represent a single sample point. Each 50-meter line transect will begin at its specified random origin point and extend in a randomly generated compass direction. Transects that extend beyond the boundary of vegetation community type will be redirected back into the interior of the respective vegetation community type. In instances where a 90-degree angle of reflection does not place the transect within the sampled area, a 45-degree angle of reflection will be used.

## 2. Percent Cover Measurements

Line transect point-intercept methods will be used to collect percent absolute vegetative cover data. Percent cover measurements will be taken from point-intercepts at 1-meter intervals along the 50-meter transect using a laser pointer. Each point-intercept will represent 2% of the cover measurements.

Percent cover measurements will record first-hit point-intercepts by live foliar vegetation species, litter, rock, cryptogams, or bare ground. Tree canopy cover and herbaceous understory cover will be evaluated in the same manner. Where tree canopy cover is present, it will be recorded as the first-hit. Litter will include all non-living organic material that is recognizable. Manure will be included with bare ground. Rock fragments will be recorded when they are equal to or greater than one centimeter in size (i.e., sheet flow, minimum non-erodible particle size). Cryptogams will include lichen, moss, algae, and fungi. First-hit data will be recorded and tabulated to determine total ground cover and total vegetative cover. Multiple hits on vegetation will be recorded but used only for the purpose of constructing a plant species list.

## 3. Total Vegetative Cover

Vegetative cover is the vertical projection of the general outline of plants to the ground surface. Vegetative cover data will be recorded by species using first-hit point-intercept data. All point-intercepts of living vegetation and growth produced during the current growing season will be counted toward total vegetative cover. Total vegetative cover WILL NOT include cryptogams. Total vegetative cover measurements will be expressed in absolute percentages for individual species and life forms. Relative cover values for individual species and life forms will also be provided.

## 4. Total Ground Cover

Total ground cover is the sum of percent cover values for vegetation, cryptogams, litter, and rock. Total ground cover WILL include cryptogams. Total ground cover measurements will be expressed in absolute percentages.

## E. Species Diversity

Species diversity and composition will be determined by noting all plant species observed or sampled within a 100 m<sup>2</sup> belt transect centered over the cover transect (1-meter on either side of the 50-meter cover transect).

## F. Shrub Density

Shrub density will be determined by counting each full shrub and subshrub rooted inside the same 100 m<sup>2</sup> belt transect used for species diversity (1-meter on either side of a 50-meter transect). Mean total shrub density will be derived. Means will be reported in shrubs/m<sup>2</sup>.

## COEUR WHARF

2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

---

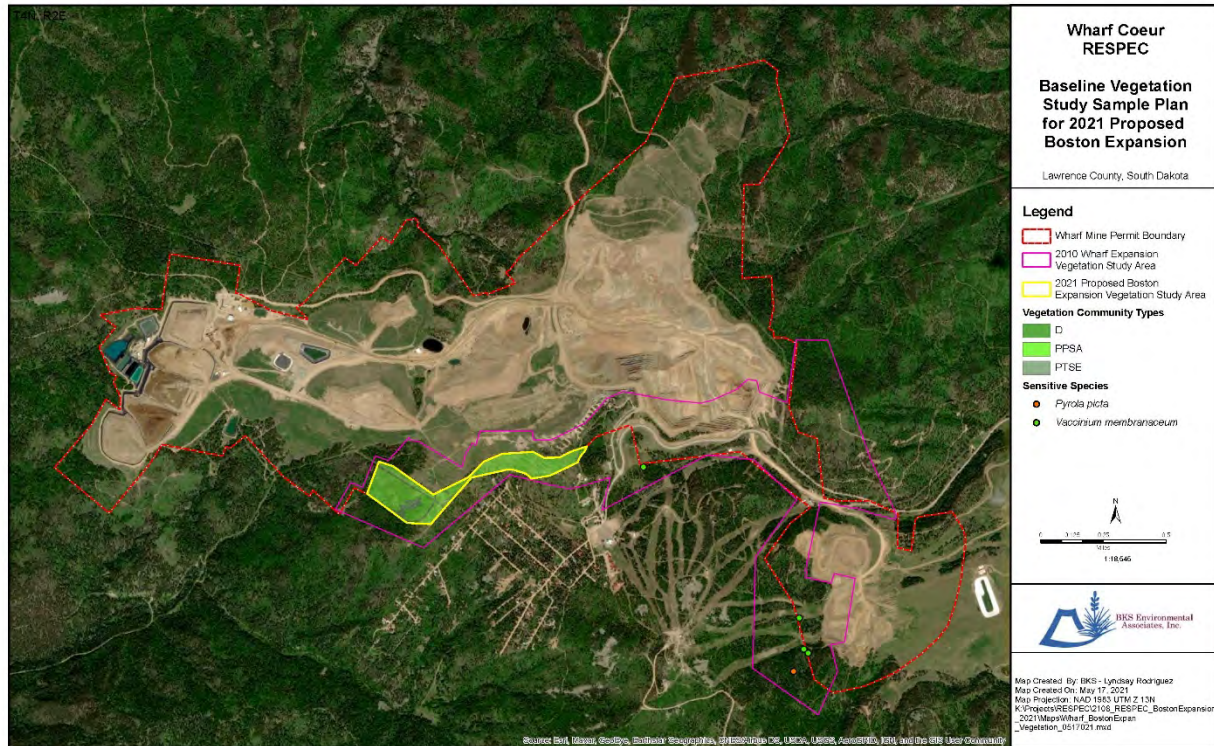
## G. Tree Density

Tree density will be estimated with the point-center quarter method. The point-center quarter quadrat will be located at the origin of the cover transect. Mean tree density will be derived. Estimated counts from aerial photography may be used in conjunction with the point-center quarter method.

## H. Plant Species List

A plant species list including scientific binomial, common name, and life form will be developed for the vegetation community types. This inventory will be compiled from species noted during all vegetation monitoring activities including point-intercept line transect cover measurements, species diversity belt transect measurements, special status plant species surveys, and mapping verification.





**SUPPLEMENTAL INFORMATION  
BASELINE VEGETATION SAMPLE PLAN FOR  
COEUR WHARF  
2021 PROPOSED BOSTON EXPANSION**

*prepared for*

Coeur Mining  
10928 Wharf Road  
Lead, South Dakota 57754

*prepared by*

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, Wyoming 82717

July 2021

COEUR WHARF  
Supplemental Information  
2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

---

## I. INTRODUCTION

The following is provided as supplemental information to the Coeur Wharf (Wharf) 2021 proposed Boston Expansion Baseline Vegetation Study Sample Plan dated June 2021 (June 2021 Sample Plan). This information is provided primarily to fulfill the following requirement of the June 2021 Sample Plan:

*The status of the understory vegetation will be discussed with SD DANR after the field verification of the mapping is completed and prior to the initiation of quantitative sampling.*

Other supplemental information is provided, as needed.

## II. Baseline Study Area

No change from original sample plan.

## III. Critical Habitat and Special Status Plant Species

BKS Environmental Associates, Inc. (BKS) will conduct plant species surveys in 2021 within the proposed Boston Expansion due to the proximity of the 2010 documented occurrences to the 2021 proposed Boston Expansion (Figure 1).

- BKS conducted the first survey June 8, 2021.
- The second survey will be conducted in conjunction with the quantitative vegetation sampling in August.

The special status plant species survey conducted in June 2021 followed the methodology outlined in the June 2021 Sample Plan. No US Fish and Wildlife Service or Rare Plants of South Dakota were observed during the June 2021 survey.

## IV. Vegetation Community Classification and Mapping

BKS conducted 2021 baseline vegetation community type mapping in conjunction with the first survey for special status plant species on June 8, 2021, prior to any quantitative sampling. The 2021 baseline vegetation community type mapping was based on review of the most current, available aerial photography and verified through field surveys. Disturbed areas within the 2021 proposed Boston Expansion were identified and mapped, based on the scale of the available aerial imagery.

Table II-1 shows the 2021 vegetation community types and mapping acreages within the 2021 proposed Boston Expansion based on the field verified mapping. The 2021 proposed Boston Expansion contained the following native vegetation community types: Ponderosa Pine-Common Snowberry (PPSA) and Quaking Aspen Series (PTSE) (see attached photos). In addition, both vegetation community types had areas that are predominantly undisturbed and areas that are predominantly disturbed by logging or other activities (Figures 1-5). The understory vegetation in the predominantly undisturbed areas had higher litter cover

July 2021

2

COEUR WHARF  
Supplemental Information  
2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

and less vegetation cover than the predominantly disturbed areas which had higher vegetation cover and lower litter cover. As a result, the vegetation community types were mapped as PPSA, PPSA Log, PTSE, and PTSE Log to account for the variation in the understory cover. Disturbed land consisting of roads and drill trails was also present.

**Table II-1. Vegetation Map Units and Associated Acreages Based on 2021 Baseline Mapping**

Vegetation Community Type	2021 Proposed Boston Expansion Acres
Disturbed	3
Ponderosa Pine-Common Snowberry (PPSA)	11
PPSA Log	7
Quaking Aspen Series (PTSE)	9
PTSE Log	20
<b>Total</b>	<b>50</b>

## V. Quantitative Vegetation Sampling

The 2021 quantitative sampling will be conducted as described in the Sample Plan. The number of samples and sample parameters for each vegetation community type are provided in Table II-2 and are based on the acreages developed from the June 2021 baseline vegetation mapping.

### A. Sample Parameters and Numbers

Vegetation parameter sampling will be conducted as specified in Table II-2. A maximum of 17 samples will be collected within the 2021 proposed Boston Expansion. A maximum of seven samples will be collected within the unlogged PPSA and PTSE vegetation community types. A maximum of 10 samples will be collected within the logged PPSA and PTSE vegetation community types, due to the difference in understory vegetation between the logged and unlogged vegetation community type.

**Table II-2. Number of Sample Points and Sample Parameters**

Vegetation Community Type	Parameters			Maximum Number of Sample Points
	Vegetation Cover <sup>1</sup>	Shrub Density <sup>1</sup>	Tree Density <sup>1</sup>	
Disturbed	No	No	No	0
Ponderosa Pine-Common Snowberry (PPSA)	Yes	Yes	Yes	4
PPSA Logged	Yes	Yes	Yes	3
Quaking Aspen Series (PTSE)	Yes	Yes	Yes	3
PTSE Logged	Yes	Yes	Yes	7
<b>Total</b>				<b>17</b>

<sup>1</sup>-Logged vegetation communities will be sampled for vegetation cover, shrub density, and tree density, due to the understory vegetation being different than the unlogged vegetation community type understory.



---

COEUR WHARF  
Supplemental Information  
2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

---



Ponderosa Pine – Common Snowberry (PPSA) June 2021



Ponderosa Pine – Common Snowberry Logged (PPSA Log) June 2021

---

July 2021

4

---

COEUR WHARF  
Supplemental Information  
2021 Proposed Boston Expansion Baseline Vegetation Study Sample Plan

---



Quaking Aspen Series (PTSE) June 2021



Quaking Aspen Series Logged (PTSE Log) June 2021

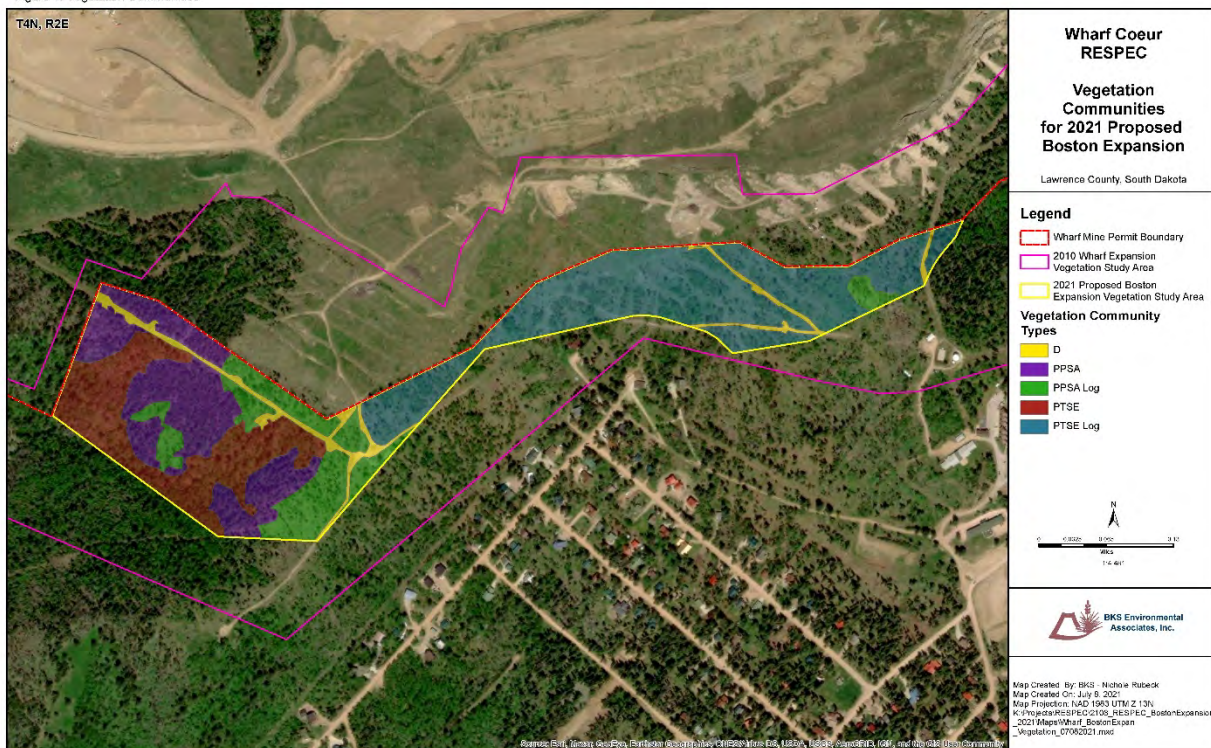
---

July 2021

5



Figure 1. Vegetation Communities



ADDENDUM C  
VEGETATION SPECIES LIST

Acronym	Scientific Binomial	Common Name	Vegetation Community Type			
			PPSA	PPSA Log	PTSE	PTSE Log
Native Cool Season Perennial Grasses						
ELYCAN	<i>Elymus canadensis</i>	Canada wildrye	O	O		
ELYSMI	<i>Elymus smithii</i>	Western wheatgrass				O
NASVIR	<i>Nassella viridula</i>	Green needlegrass				O
ORYASP	<i>Oryzopsis asperifolia</i>	Rough-leaved ricegrass	X	X	X	X
POASEC	<i>Poa secunda</i>	Sandberg bluegrass		O		
PUCDIS	<i>Puccinellia distans</i>	Weeping alkaligrass	O	X	X	X
Native Warm Season Perennial Grasses						
BOUGRA	<i>Bouteloua gracilis</i>	Blue grama	O	O		
LEEVIR	<i>Leersia virginica</i>	Whitegrass		X		X
Introduced Perennial Grasses						
AGRSTO	<i>Agrostis stolonifera</i>	Creeping bentgrass	O	O	O	O
BROINE	<i>Bromus inermis</i>	Smooth brome		O	O	X
PHLPRA	<i>Phleum pratense</i>	Timothy	X	X	X	X
POAPRA	<i>Poa pratensis</i>	Kentucky bluegrass	X	X	X	X
Unknown Grass Species						
POASPP	<i>Poa spp.</i>	Bluegrass		O		
Native Grass-like Species						
CARPRA	<i>Carex praegracilis</i>	Clustered field sedge		O		O
CARROS	<i>Carex rossii</i>	Ross sedge		O		X
Native Annual/Biennial Forbs						
ARAGLA	<i>Arabis glabra</i>	Tower rockcress				O
COLPAR	<i>Collinsia parviflora</i>	Maiden blue eyed Mary	O		O	
Introduced Annual/Biennial Forbs						
BARVUL	<i>Barbarea vulgaris</i>	Garden yellowrocket				O
CIRVUL*	<i>Cirsium vulgare</i>	Bull thistle		X		O
CYNOFF*	<i>Cynoglossum officinale</i>	Houndstongue	O	O		
LACSER	<i>Lactuca serriola</i>	Prickly lettuce				O
TRADUB	<i>Tragopogon dubius</i>	Yellow salsify				O
VERTHA*	<i>Verbascum thapsus</i>	Mullen		O		O

Acronym	Scientific Binomial	Common Name	Vegetation Community Type			
			PPSA	PPSA Log	PTSE	PTSE Log
Native Perennial Forbs						
ACHMIL	<i>Achillea millefolium</i>	Western yarrow	O	X	O	O
ANAMAR	<i>Anaphalis margaritacea</i>	Western pearly everlasting	O	X	X	X
ANTMIC	<i>Antennaria microphylla</i>	Littleleaf pussytoes	O	O	O	
ANTNEG	<i>Antennaria neglecta</i>	Field pussytoes	O		O	
APOAND	<i>Apocynum androsaemifolium</i>	Spreading dogbane	O	X	X	
APOCAN	<i>Apocynum cannabinum</i>	Indianhemp		O	X	
ARNCOR	<i>Arnica cordifolia</i>	Heartleaf arnica				O
CAMROT	<i>Campanula rotundifolia</i>	Bluebell bellflower	O	O	O	O
CHAANG	<i>Chamerion angustifolium</i>	Fireweed				O
COMUMB	<i>Comandra umbellata</i>	Bastard toadflax		O		
CRERUN	<i>Crepis runcinata</i>	Fiddleleaf hawksbeard	O	O	O	
DELBIC	<i>Delphinium bicolor</i>	Little larkspur		O		
DODPUL	<i>Dodecatheon pulchellum</i>	Darkthroat shootingstar		O		
FRAVIR	<i>Fragaria virginiana</i>	Virginia strawberry		O	O	O
GALBOR	<i>Galium boreale</i>	Northern bedstraw			O	
HIEALB	<i>Hieracium albiflorum</i>	White hawkweed	O	O	O	
LATOC	<i>Lathyrus ochroleucus</i>	Cream pea		O	O	O
MAICAN	<i>Maianthemum canadense</i>	Wild lily-of-the-valley	O	O	O	
MONFIS	<i>Monarda fistulosa</i>	Wild bergamot	X	O	O	
OSMBER	<i>Osmorhiza berteroi</i>	Sweetcicely		O		
PTEAQU	<i>Pteridium aquilinum</i>	Western brackenfern		X	X	X
SMISTE	<i>Smilacina stellata</i>	False solomon's seal			O	O
SOLSPE	<i>Solidago speciosa</i>	Showy goldenrod	O	X		
SYMLAE	<i>Symphyotrichum laeve</i>	Smooth blue aster	O		O	O
THAVEN	<i>Thalictrum venulosum</i>	Veiny meadow-rue		O	O	O
TOXRYD	<i>Toxicodendron rydbergii</i>	Poison ivy		O	O	O
VIOADU	<i>Viola adunca</i>	Mountain blue violet	O	O	O	
ZIZAPT	<i>Zizia aptera</i>	Meadow zizia		O		

Acronym	Scientific Binomial	Common Name	Vegetation Community Type			
			PPSA	PPSA Log	PTSE	PTSE Log
Introduced Perennial Forbs						
CIRARV*	<i>Cirsium arvense</i>	Canada thistle		O		O
LINVUL*	<i>Linaria vulgaris</i>	Yellow toadflax				O
TANVUL*	<i>Tanacetum vulgare</i>	Common tansy				O
TAROFF	<i>Taraxacum officinale</i>	Common dandelion		O		O
TRIREF	<i>Trifolium repens</i>	White clover				O
Native Full Shrubs						
AMEALN	<i>Amelanchier alnifolia</i>	Saskatoon serviceberry				O
PRUVIR	<i>Prunus virginiana</i>	Chokecherry			O	O
ROSWOO	<i>Rosa woodsii</i>	Woods rose	O	O	X	X
SHECAN	<i>Shepherdia canadensis</i>	Russet buffaloberry	O	X	X	O
SPILUC	<i>Spiraea lucida</i>	Shinyleaf spirea	X	X	X	X
SYMALB	<i>Symphoricarpos albus</i>	Common snowberry	O	O	O	X
VACMEM	<i>Vaccinium membranaceum</i>	Mountain huckleberry			O	
VACSCO	<i>Vaccinium scoparium</i>	Grouse whortleberry	X	O	X	X
Native Subshrubs						
ARCUVA	<i>Arctostaphylos uva-ursi</i>	Kinnikinnik	X	X	X	X
CHIUMB	<i>Chimaphila umbellata</i>	Pipsissewa			O	
CORCAN	<i>Cornus canadensis</i>	Bunchberry dogwood	X		X	
JUNHOR	<i>Juniperus horizontalis</i>	Creeping juniper	X	X	X	O
MAHREP	<i>Mahonia repens</i>	Oregon grape	X	X	X	X
RUBPAR	<i>Rubus parviflorus</i>	Thimbleberry	O	X	O	X
Native Trees						
BETPAP	<i>Betula papyrifera</i>	Paper birch			O	X
CORCOR	<i>Corylus cornuta</i>	Beaked hazelnut	O	O	O	
PICGLA	<i>Picea glauca</i>	White spruce	X	X	X	O
PINPON	<i>Pinus ponderosa</i>	Ponderosa pine	X	X	X	X
POPTRE	<i>Populus tremuloides</i>	Quacking aspen	X	O	X	X

Acronym	Scientific Binomial	Common Name	Vegetation Community Type			
			PPSA	PPSA Log	PTSE	PTSE Log
Introduced Trees						
ULMPUM	Ulmus pumila	Siberian elm	O			
X	Species sampled on the cover transect.					
O	Species observed within the vegetation community type on the belt transect or general observation.					
*	Denotes a weed species.					



ADDENDUM D  
VEGETATION COVER SUMMARIES

## COEUR MINING - WHARF MINE

## BOSTON EXPANSION

Report: Cover Summary

Page 1 of 1

Project Name:	2021 Boston Expansion	Sampling Method:	Point Line Intercept
Polygon Name:	PPSA	Sample Size:	1
Community Type:	Native	Number of Samples:	4
Sample Date:	8/21&25/2021	Report Date:	9/13/2021

Species	Mean Cover (%)		Std. Dev. (n-1)
	Mean Absolute	Relative	
Native Cool Season Perennial Grasses			
<i>Oryzopsis asperifolia</i>	0.5	0.6	1.0
Sub-Total	0.5	0.6	1.0
Introduced Perennial Grasses			
<i>Phleum pratense</i>	0.5	0.6	1.0
<i>Poa pratensis</i>	0.5	0.6	1.0
Sub-Total	1.0	1.2	1.2
Native Perennial Forbs			
<i>Monarda fistulosa</i>	0.5	0.6	1.0
Sub-Total	0.5	0.6	1.0
Native Subshrubs			
<i>Arctostaphylos uva-ursi</i>	2.5	3.0	5.0
<i>Cornus canadensis</i>	0.5	0.6	1.0
<i>Juniperus horizontalis</i>	1.5	1.8	1.9
<i>Mahonia repens</i>	1.0	1.2	2.0
Sub-Total	5.5	6.7	5.7
Native Shrubs			
<i>Spiraea lucida</i>	1.0	1.2	1.2
<i>Vaccinium scoparium</i>	2.5	3.0	1.0
Sub-Total	3.5	4.2	1.9
Native Trees			
<i>Picea glauca</i>	10.0	12.1	17.4
<i>Pinus ponderosa</i>	56.0	67.9	14.1
<i>Populus tremuloides</i>	5.5	6.7	6.4
Sub-Total	71.5	86.7	12.7
Total		Std. Dev.	
Bare	0.0	--	
Litter	14.5	5.7	
Rock	2.5	3.0	
Cryptogams	0.5	1.0	
Total Vegetation	82.5	7.0	
Total Ground Cover	100.0	0.0	
Total Cover	100	--	

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF MINE

## BOSTON EXPANSION

## Report: Cover Summary

Page 1 of 1

Project Name:	2021 Boston Expansion	Sampling Method:	Point Line Intercept
Polygon Name:	PPSA-Log	Sample Size:	1
Community Type:	Native	Number of Samples:	3
Sample Date:	8/21&25/2021	Report Date:	9/13/2021

Species	Mean Cover (%)		Std. Dev. (n-1)
	Mean Absolute	Relative	
Native Cool Season Perennial Grasses			
<i>Oryzopsis asperifolia</i>	2.7	6.1	4.6
<i>Puccinellia distans</i>	4.7	10.8	6.4
Sub-Total	7.4	17.0	11.0
Native Warm Season Perennial Grasses			
<i>Leersia virginica</i>	1.3	3.1	1.2
Sub-Total	1.3	3.1	1.2
Introduced Perennial Grasses			
<i>Phleum pratense</i>	2.7	6.1	1.2
<i>Poa pratensis</i>	0.7	1.5	1.2
Sub-Total	3.4	7.8	1.2
Introduced Annual/Biennial Forbs			
<i>Cirsium vulgare</i>	0.7	1.5	1.2
Sub-Total	0.7	1.5	1.2
Native Perennial Forbs			
<i>Achillea millefolium</i>	0.7	1.5	1.2
<i>Anaphalis margaritacea</i>	2.0	4.6	3.5
<i>Apocynum androsaemifolium</i>	0.7	1.5	1.2
<i>Solidago speciosa</i>	0.7	1.5	1.2
<i>Pteridium aquilinum</i>	1.3	3.1	2.3
Sub-Total	5.4	12.4	4.6
Native Subshrubs			
<i>Arctostaphylos uva-ursi</i>	4.0	9.2	5.3
<i>Juniperus horizontalis</i>	1.3	3.1	2.3
<i>Mahonia repens</i>	0.7	1.5	1.2
<i>Rubus parviflorus</i>	3.3	7.7	3.1
Sub-Total	9.3	21.5	4.6
Native Shrubs			
<i>Shepherdia canadensis</i>	1.3	3.1	2.3
<i>Spiraea lucida</i>	1.3	3.1	2.3
Sub-Total	2.6	6.0	2.3
Native Trees			
<i>Picea glauca</i>	3.3	7.7	5.8
<i>Pinus ponderosa</i>	10.0	23.0	9.2
Sub-Total	13.3	30.7	11.7
Total		Std. Dev.	
Bare	0.0	--	
Litter	50.7	1.2	
Rock	5.3	3.1	
Cryptogams	0.6	1.2	
Total Vegetation	43.4	4.2	
Total Ground Cover	100.0	0.0	
Total Cover	100	--	

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF MINE

**BOSTON EXPANSION**

## Report: Cover Summary

Page 1 of 1

Project Name:	2021 Boston Expansion	Sampling Method:	Point Line Intercept
Polygon Name:	PTSE	Sample Size:	1
Community Type:	Native	Number of Samples:	3
Sample Date:	8/21&25/2021	Report Date:	9/13/2021

Species	Mean Cover (%)		Std. Dev. (n-1)
	Mean Absolute	Relative	
Native Cool Season Perennial Grasses			
<i>Oryzopsis asperifolia</i>	1.3	1.5	2.3
<i>Puccinellia distans</i>	0.7	0.7	1.2
Sub-Total	2.0	2.2	3.5
Introduced Perennial Grasses			
<i>Phleum pratense</i>	0.7	0.7	1.2
<i>Poa pratensis</i>	0.7	0.7	1.2
Sub-Total	1.4	1.5	2.3
Native Perennial Forbs			
<i>Anaphalis margaritacea</i>	1.3	1.5	2.3
<i>Apocynum androsaemifolium</i>	3.3	3.7	5.8
<i>Apocynum cannabinum</i>	1.3	1.5	2.3
<i>Pteridium aquilinum</i>	2.0	2.2	2.0
Sub-Total	7.9	8.7	6.9
Native Subshrubs			
<i>Arctostaphylos uva-ursi</i>	1.3	1.5	2.3
<i>Cornus canadensis</i>	0.7	0.7	1.2
<i>Juniperus horizontalis</i>	0.7	0.7	1.2
<i>Mahonia repens</i>	0.7	0.7	1.2
Sub-Total	3.4	3.7	2.3
Native Shrubs			
<i>Rosa woodsii</i>	0.7	0.7	1.2
<i>Shepherdia canadensis</i>	1.3	1.5	2.3
<i>Spiraea lucida</i>	2.0	2.2	3.5
<i>Vaccinium scoparium</i>	4.0	4.4	0.0
Sub-Total	8.0	8.8	3.5
Native Trees			
<i>Picea glauca</i>	14.7	16.2	17.0
<i>Pinus ponderosa</i>	18.0	19.8	23.1
<i>Populus tremuloides</i>	35.3	39.0	16.0
Sub-Total	68.0	75.0	26.2
Total		Std. Dev.	
Bare	0.0	--	
Litter	8.7	8.1	
Rock	0.6	--	
Cryptogams	0.0	--	
Total Vegetation	90.7	9.2	
Total Ground Cover	100.0	0.0	
Total Cover	100	--	

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF MINE

## BOSTON EXPANSION

## Report: Cover Summary

Page 1 of 1

Project Name:	2021 Boston Expansion	Sampling Method:	Point Line Intercept
Polygon Name:	PTSE-Log	Sample Size:	1
Community Type:	Native	Number of Samples:	7
Sample Date:	8/21&25/2021	Report Date:	9/13/2021

Species	Mean Cover (%)		Std. Dev. (n-1)
	Mean Absolute	Relative	
Native Cool Season Perennial Grasses			
<i>Oryzopsis asperifolia</i>	2.0	2.3	2.3
<i>Puccinellia distans</i>	3.4	4.0	9.1
Sub-Total	5.4	6.4	8.5
Native Warm Season Perennial Grasses			
<i>Leersia virginica</i>	0.3	0.3	0.8
Sub-Total	0.3	0.3	0.8
Introduced Perennial Grasses			
<i>Bromus inermis</i>	4.0	4.7	8.9
<i>Phleum pratense</i>	1.2	1.4	1.6
<i>Poa pratensis</i>	3.7	4.3	5.1
Sub-Total	8.9	10.4	8.9
Native Grass-likes			
<i>Carex rossii</i>	3.7	4.3	7.3
Sub-Total	3.7	4.3	7.3
Native Perennial Forbs			
<i>Anaphalis margaritacea</i>	0.3	0.3	0.8
<i>Pteridium aquilinum</i>	8.3	9.7	8.0
Sub-Total	8.6	10.0	8.1
Native Subshrubs			
<i>Arctostaphylos uva-ursi</i>	3.7	4.3	6.5
<i>Mahonia repens</i>	0.6	0.7	1.0
<i>Rubus parviflorus</i>	3.4	4.0	9.1
Sub-Total	7.7	9.0	16.1
Native Shrubs			
<i>Rosa woodsii</i>	1.4	1.7	1.9
<i>Spiraea lucida</i>	1.7	2.0	2.1
<i>Symphoricarpus albus</i>	3.7	4.3	5.0
<i>Vaccinium scoparium</i>	0.3	0.3	0.8
Sub-Total	7.1	8.4	6.8
Native Trees			
<i>Betula papyrifera</i>	3.2	3.7	8.3
<i>Pinus ponderosa</i>	5.1	6.0	6.1
<i>Populus tremuloides</i>	35.4	41.5	22.5
Sub-Total	43.7	51.2	22.2
Total			Std. Dev.
Bare	2.9	4.5	
Litter	10.3	4.2	
Rock	1.4	2.2	
Cryptogams	0.0	0.0	
Total Vegetation	85.4	7.5	
Total Ground Cover	97.1	4.5	
Total Cover	100	--	

Note: Total values do not always equal the sum of the individual species values due to rounding.

ADDENDUM E  
VEGETATION DENSITY SUMMARIES

## COEUR MINING - WHARF GOLD MINE

**BOSTON EXPANSION**

## Report: Shrub Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PPSA  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Plot Size: 100 square meters  
 Sample Size: 1  
 Number of Samples: 4  
 Report Date: 9/13/2021

Species	Mean (#/Plot)	Relative (%)	Mean (#/m <sup>2</sup> )	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
<i>Corylus cornuta</i>	5	1	0.1	202	10
<i>Rosa woodsii</i>	2	1	0.0	81	2
<i>Shepherdia canadensis</i>	6	2	0.1	243	5
<i>Spiraea lucida</i>	89	25	0.9	3,609	46
<i>Symphoricarpos albus</i>	9	3	0.1	354	14
<i>Vaccinium scoparium</i>	98	28	1.0	3,968	84
<b>Total Native Full Shrubs</b>	<b>209</b>	<b>60</b>	<b>2.1</b>	<b>8,457</b>	<b>111</b>
<i>Arctostaphylos uva-ursi</i>	78	22	0.8	3,163	78
<i>Cornus canadensis</i>	22	6	0.2	881	40
<i>Juniperus horizontalis</i>	11	3	0.1	445	8
<i>Mahonia repens</i>	29	8	0.3	1,164	27
<i>Rubus parviflorus</i>	1	0	0.0	51	3
<b>Total Native Subshrubs</b>	<b>141</b>	<b>40</b>	<b>1.4</b>	<b>5,704</b>	<b>82</b>
<b>Total Shrub Density</b>	<b>350</b>	<b>100</b>	<b>3.5</b>	<b>14,161</b>	<b>140</b>

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF GOLD MINE

**BOSTON EXPANSION**

## Report: Shrub Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PPSA-Log  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Plot Size: 100 square meters  
 Sample Size: 1  
 Number of Samples: 3  
 Report Date: 9/13/2021

Species	Mean (#/Plot)	Relative (%)	Mean (#/m <sup>2</sup> )	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
<i>Rosa woodsii</i>	0	0	0.0	13	1
<i>Shepherdia canadensis</i>	18	8	0.2	742	17
<i>Spiraea lucida</i>	48	21	0.5	1,937	69
<i>Symphoricarpos albus</i>	4	2	0.0	148	6
<i>Vaccinium scoparium</i>	48	21	0.5	1,954	53
<b>Total Native Full Shrubs</b>	<b>118</b>	<b>51</b>	<b>1.2</b>	<b>4,794</b>	<b>66</b>
<i>Arctostaphylos uva-ursi</i>	69	30	0.7	2,784	83
<i>Juniperus horizontalis</i>	8	3	0.1	324	8
<i>Mahonia repens</i>	1	1	0.0	54	2
<i>Rubus parviflorus</i>	34	15	0.3	1,367	29
<b>Total Native Subshrubs</b>	<b>112</b>	<b>49</b>	<b>1.1</b>	<b>4,529</b>	<b>91</b>
<b>Total Shrub Density</b>	<b>230</b>	<b>100</b>	<b>2.3</b>	<b>9,323</b>	<b>128</b>

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF GOLD MINE

**BOSTON EXPANSION**

## Report: Shrub Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PTSE  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Plot Size: 100 square meters  
 Sample Size: 1  
 Number of Samples: 3  
 Report Date: 9/13/2021

Species	Mean (#/Plot)	Relative (%)	Mean (#/m <sup>2</sup> )	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
<i>Rosa woodsii</i>	10	1	0.1	418	8
<i>Shepherdia canadensis</i>	26	4	0.3	1,036	43
<i>Spiraea lucida</i>	210	30	2.1	8,503	45
<i>Symphoricarpos albus</i>	94	13	0.9	3,796	111
<i>Vaccinium membranaceum</i>	3	0	0.0	135	6
<i>Vaccinium scoparium</i>	175	25	1.8	7,086	90
<b>Total Native Full Shrubs</b>	<b>518</b>	<b>73</b>	<b>5.2</b>	<b>20,974</b>	<b>34</b>
<i>Arctostaphylos uva-ursi</i>	97	14	1.0	3,928	88
<i>Chimaphila umbellata</i>	21	3	0.2	864	37
<i>Cornus canadensis</i>	21	3	0.2	830	36
<i>Juniperus horizontalis</i>	12	2	0.1	472	17
<i>Mahonia repens</i>	33	5	0.3	1,316	28
<i>Rubus parviflorus</i>	5	1	0.1	202	9
<b>Total Native Subshrubs</b>	<b>189</b>	<b>27</b>	<b>1.9</b>	<b>7,612</b>	<b>96</b>
<b>Total Shrub Density</b>	<b>707</b>	<b>100</b>	<b>7.1</b>	<b>28,586</b>	<b>93</b>

Note: Total values do not always equal the sum of the individual species values due to rounding.

## COEUR MINING - WHARF GOLD MINE

**BOSTON EXPANSION**

## Report: Shrub Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PTSE-Log  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Plot Size: 100 square meters  
 Sample Size: 1  
 Number of Samples: 7  
 Report Date: 9/13/2021

Species	Mean (#/Plot)	Relative (%)	Mean (#/m <sup>2</sup> )	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
<i>Rosa woodsii</i>	23	5	0.2	947	51
<i>Shepherdia canadensis</i>	1	0	0.0	29	2
<i>Spiraea lucida</i>	89	19	0.9	3,586	66
<i>Symphoricarpos albus</i>	112	25	1.1	4,525	82
<i>Vaccinium scoparium</i>	26	6	0.3	1,034	57
<b>Total Native Full Shrubs</b>	<b>250</b>	<b>55</b>	<b>2.5</b>	<b>10,121</b>	<b>147</b>
<i>Arctostaphylos uva-ursi</i>	110	24	1.1	4,454	101
<i>Juniperus horizontalis</i>	2	0	0.0	81	2
<i>Mahonia repens</i>	67	15	0.7	2,693	62
<i>Rubus parviflorus</i>	26	6	0.3	1,060	66
<b>Total Native Subshrubs</b>	<b>205</b>	<b>45</b>	<b>2.0</b>	<b>8,288</b>	<b>140</b>
<b>Total Shrub Density</b>	<b>455</b>	<b>100</b>	<b>4.5</b>	<b>18,409</b>	<b>293</b>

Note: Total values do not always equal the sum of the individual species values due to rounding.



ADDENDUM F  
VEGETATION TREE DENSITY SUMMARIES

COEUR MINING - WHARF GOLD MINE  
**BOSTON EXPANSION**  
 Report: Tree Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PPSA  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Sample Type: Point Center Quarter  
 Sample Size: 1  
 Number of Samples: 4  
 Report Date: 9/13/2021

Catagory/Species	Total	Mean	Standard Deviation	Total Density (per sq. m)	Total Density (per acre)
Total Distance (m)	58.7	14.7	6.5	0.02	75
Quarter Number					
1	14.3	3.6			
2	15.8	4.0			
3	15.9	4.0			
4	12.7	3.2			
Average	14.7	5.9			

COEUR MINING - WHARF GOLD MINE  
**BOSTON EXPANSION**  
 Report: Tree Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PPSA Log  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Sample Type: Point Center Quarter  
 Sample Size: 1  
 Number of Samples: 3  
 Report Date: 9/13/2021

Catagory/Species	Total	Mean	Standard Deviation	Total Density (per sq. m)	Total Density (per acre)
Total Distance (m)	51.4	17.1	7.0	0.02	98
Quarter Number					
1	16.0	5.3			
2	9.5	3.2			
3	15.9	5.3			
4	10.0	3.3			
Average	12.9	6.4			

COEUR MINING - WHARF GOLD MINE  
**BOSTON EXPANSION**  
 Report: Tree Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion  
 Polygon Name: PTSE  
 Community Type: Native  
 Sample Date: 8/21&25/2021

Sample Type: Point Center Quarter  
 Sample Size: 1  
 Number of Samples: 3  
 Report Date: 9/13/2021

Catagory/Species	Total	Mean	Standard Deviation	Total Density (per sq. m)	Total Density (per acre)
Total Distance (m)	45.5	22.8	6.9	0.01	31
Quarter Number					
1	8.1	2.7			
2	12.9	4.3			
3	13.8	4.6			
4	10.7	3.6			
Average	11.4	5.7			

## COEUR MINING - WHARF GOLD MINE

**BOSTON EXPANSION**

## Report: Tree Density Summary

Page 1 of 1

Project Name: 2021 Boston Expansion

Sample Type: Point Center Quarter

Polygon Name: PTSE Log

Sample Size: 1

Community Type: Native

Number of Samples: 7

Sample Date: 8/21&amp;25/2021

Report Date: 9/13/2021

Catagory/Species	Total	Mean	Standard Deviation	Total Density (per sq. m)	Total Density (per acre)
Total Distance (m)	147.9	21.1	12.4	0.01	27
Quarter Number					
1	31.3	4.5			
2	20.1	2.9			
3	25.7	3.7			
4	70.8	10.1			
Average	37.0	5.3			

ADDENDUM G  
PHOTOGRAPHS



PPSA 1: Looking West-Southwest



PPSA 2: Looking South-Southeast





PPSA 3: Looking Southwest



PPSA 4: Looking Southeast





PPSA-Log 1: Looking Southwest



PPSA-Log 2: Looking South-Southeast





PPSA-Log 3: Looking North-Northeast



PTSE 1: Looking South-Southeast





PTSE 2: Looking West-Northwest



PTSE 3: Looking Northeast





PTSE-Log 1: Looking East-Northeast



PTSE-Log 2: Looking East-Northeast





PTSE-Log 3: Looking East-Southeast



PTSE-Log 4: Looking Northwest





PTSE-Log 5: Looking Southeast



PTSE-Log 6: Looking Southeast





PTSE-Log 7: Looking Southwest

## ADDENDUM H

### CRITICAL HABITAT AND SPECIAL STATUS PLANT SPECIES REPORT



2021 CRITICAL HABITAT AND SPECIAL STATUS PLANT SPECIES REPORT  
WHARF MINE - BOSTON EXPANSION  
LARGE-SCALE MINE PERMIT APPLICATION

Submitted to:

RESPEC Company LLC  
3824 Jet Drive  
Rapid City, South Dakota 57703

and

Coeur Mining – Wharf Mine  
10928 Wharf Road  
Lead, South Dakota 57754

Submitted by:

BKS Environmental Associates, Inc.  
P.O. Box 3467  
Gillette, Wyoming 82717

November 2021

## TABLE OF CONTENTS

<b>Description</b>	<b>Page No.</b>
INTRODUCTION .....	63
BACKGROUND .....	63
METHODOLOGY .....	63
RESULTS .....	64
Critical Habitats .....	64
U.S. Fish and Wildlife Service Threatened and Endangered Species .....	64
South Dakota Natural Heritage Program Rare Plants .....	65
DISCUSSION .....	65
REFERENCES .....	67

## LIST OF MAPS

<b>Map</b>	<b>Page No.</b>
Map 1: Location of mountain huckleberry ( <i>Vaccinium membranaceum</i> ) population within the Quaking Aspen Series of the Boston Expansion. ....	70

## LIST OF FIGURES

<b>Figure</b>	<b>Page No.</b>
Figure 1: Photograph of transect on which mountain huckleberry ( <i>Vaccinium membranaceum</i> ) was observed within the Quaking Aspen Series of the Boston Expansion. ....	71

## INTRODUCTION

Coeur Mining – Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the 2021 proposed permit area known as the Boston Expansion. The 2021 proposed Boston Expansion (Boston Expansion) is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline. The Boston Expansion consists of approximately 50 acres of private land located in Sections 2 and 3, Township 4 North, Range 2 East in Lawrence County approximately three miles west of Lead, South Dakota.

The Boston Expansion was investigated for baseline vegetation information in June and August 2021 in support of a South Dakota Department of Agriculture and Natural Resources (SD DANR) Large-Scale Mine Permit Application. Information on critical riparian zones, mountain meadows, wetlands, and U.S. Fish and Wildlife Service Threatened and Endangered (USFWS T&E) species was required as part of the baseline vegetation assessment by SDCL 45-6B-7(3), SDCL 45-6B-92(3), and the Endangered Species Act. This report presents baseline information to meet South Dakota Codified Law (SDCL) 45-6B-92 by addressing critical resources potentially affected by the proposed mine expansion.

## BACKGROUND

The Boston Expansion is located entirely within the Green Mountain Expansion project area. The Green Mountain Expansion project areas was investigated for baseline vegetation information by BKS Environmental Associates, Inc. (BKS), of Gillette, Wyoming, in 2010 (Addendum A). Based on the 2010 baseline vegetation assessment of the Green Mountain Expansion project area, it was expected riparian zones, mountain meadows, and wetlands do not exist in the Boston Expansion. Special status plant species, including USFWS T&E species and Rare Plants of South Dakota were surveyed for in the 2010 baseline vegetation assessment. No USFWS T&E species were observed within the 2010 Wharf Expansion project area. Two South Dakota Natural Heritage Program Rare Plants were observed: mountain huckleberry (*Vaccinium membranaceum*) and white-veined wintergreen (*Pyrola picta*). These species were observed within the 2010 Green Mountain Expansion project area, but not in the Boston Expansion. Additionally, mountain huckleberry and white-veined wintergreen have been discovered in previous surveys within the Wharf Permit boundary.

## METHODOLOGY

BKS conducted two rare plant species surveys in 2021 within the Boston Expansion due to the proximity of the 2010 Green Mountain Expansion documented occurrences to the Boston Expansion.

- The first survey was conducted in conjunction with the baseline vegetation mapping on June 8, 2021.
- The second survey was conducted in conjunction with the quantitative vegetation sampling on August 21 and 25, 2021.

The special status plant species surveys generally followed the timed meander methodology recommended by the South Dakota Game, Fish and Parks (SD GF&P): Goff, Dawson, and Rochow (1982). BKS vegetation ecologists conducted the timed meander survey by walking through the Boston Expansion. The survey started at a point closest to the easiest access to the Boston Expansion (June - the eastern edge, August – center and eastern edge). From the start location a typical meander search path was utilized to survey the extent of the Boston Expansion in June. In August, the quantitative sample points were used to guide the meander search path.

A recreational grade hand-held Global Positioning System (GPS) device was used to mark the survey locations within the meander. At each survey location, the vegetation community type and time was noted. Species composition was verified. The entire Boston Expansion was considered one unit for purposes of the special status plant species survey. The length of the survey was based on professional judgement of the number of new species observed and the extent of the Boston Expansion covered.

If a special status plant species was identified within the Boston Expansion, the location was marked with a hand-held GPS device and photographs were taken of the general area. The following was documented: habitat, abundance/estimated number of individuals, phenological stage, health, and land use. Specimens were only collected, if positive identification could not be made by BKS vegetation ecologists on site. Plant identification was confirmed by Robert Dorn author of *Flora of the Black Hills* (Dorn 1977) and *Vascular Plants of Wyoming* (Dorn 201). BKS reported rare plant occurrences to the SD GF&P Natural Heritage Program, with written approval from Wharf.

## RESULTS

### Critical Habitats

Based on vegetation assessments in 2010 and 2021, riparian zones, mountain meadows, and wetlands do not exist within the Boston Expansion. Riparian habitats were present west of the Boston Expansion in association with Annie Creek and west of the Boston Expansion in association with Nevada Gulch. There was a very limited extent of areas interspersed throughout the Boston Expansion devoid of tree cover. These areas were not classified as mountain meadows. These areas were primarily found adjacent to disturbance and based on review of available aerial photography previously had tree cover. Additionally, plant species composition in these areas was similar to surrounding vegetation communities.

### U.S. Fish and Wildlife Service Threatened and Endangered Species

Baseline vegetation assessments in 2010 and 2021 found no individuals of USFWS T&E species listed for South Dakota, Leedy's roseroot (*Rhodiola integrifolia* spp. *leddyi*) and western prairie fringed orchid (*Platanthera praeclara*), were present within the Boston Expansion. Additionally, no potential habitat for these species was present within the Boston Expansion. The USFWS Information, Planning, and Consultation (IPaC) System supports this finding and indicates no USFWS T&E species for Lawrence County, South Dakota.

---

## South Dakota Natural Heritage Program Rare Plants

The South Dakota Natural Heritage Program Rare Plants list was reviewed prior to the 2021 baseline vegetation assessment. The 2021 baseline vegetation assessment found one G5 S2 species: mountain huckleberry. The State Rank of S2 indicates the species is imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range. The Global Rank of G5 indicates demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. BKS received verification of this identification through a collected specimen submitted to Robert Dorn.

One population of mountain huckleberry was found on the western boundary of the Boston Expansion in the SE ¼ NE ¼, Section 3, Township 4 North, Range 2 East (Map 1). This population was located within the Quaking Aspen Series (PTSE) vegetation community type on a relatively steep south-facing slope. Quaking aspen (*Populus tremuloides*) and ponderosa pine (*Pinus ponderosa*) were the dominant overstory vegetation on the transect on which the population was observed (Figure 1). Absolute tree cover was 80%. Multiple small shrubs (12%) and perennial forbs (4%) dominated the understory. Absolute litter cover was 4%. Absolute total ground cover was 100%. Shinyleaf spirea (*Spiraea lucida*), grouse whortleberry (*V. scoparium*), kinnikinnick (*Arctostaphylos uva-ursi*), russet buffaloberry (*Shepherdia canadensis*), pipsissewa (*Chimaphila umbellata*), and Oregon grape (*Mahonia repens*) were the dominant shrub species present. Western brackenfern (*Pteridium aquilinum*) was the dominant perennial forb. Multiple other forbs and perennial grasses were present.

Approximately 10 individuals were observed within this population. The plants were in the vegetative state when observed. The plants appeared to be in good health.

## DISCUSSION

Based on the 2010 and 2021 baseline vegetation assessments, riparian zones, mountain meadows, and wetlands do not exist within the Boston Expansion. Riparian habitats were present west of the Boston Expansion in association with Annie Creek and west of the Boston Expansion in association with Nevada Gulch. There was a very limited extent of areas interspersed throughout the Boston Expansion devoid of tree cover. These areas were not classified as mountain meadows. These areas were primarily found adjacent to disturbance and based on review of available aerial photography previously had tree cover. Additionally, plant species composition in these areas was similar to surrounding vegetation communities. No individuals of USFWS T&E listed for South Dakota were present within the Boston Expansion. Additionally, no potential habitat for these species was present within the Boston Expansion. The 2021 baseline vegetation assessment found one G5 S2 species, mountain huckleberry, within the Quacking Aspen Series vegetation community type near the western boundary of the Boston Expansion (Addendum H).

There has been no change in the global or state rank of mountain huckleberry since 1992 in the state of South Dakota. The Global Rank of G5 indicates demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. South Dakota populations of mountain huckleberry would likely be considered periphery populations (Simonin 2000). The State Rank of

S2 indicates the species is imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

Review of 2021 SD Natural Heritage Program Database records (SDNHPD 2021) indicated 26 populations have been identified and observed within a 14-mile radius of Lead, South Dakota, between 1929 and 2010. For purposes of this discussion, population equals one record in the SD Natural Heritage Program Database or one location in the historic Coeur data. Approximately half of the populations were identified within a 1-mile radius of the Wharf Mine Permit. The remaining populations were located one to eight miles from the Wharf Mine Permit. Aerial photography indicated that 19 of the 26 populations were in relatively undisturbed locations. The other seven populations were in moderately to heavily disturbed locations and likely were no longer present. Limited records provided counts on the number of plants in each population. In the nine records with counts, most indicated 100s of plants per population, one noted one, and one noted 1000s.

Review of historic Coeur studies conducted between 1990 and 1996 (BKS 1990-1996), indicated 59 mountain huckleberry populations outside of the current Wharf Mine Permit. All identified populations were within an approximate 1.25-mile radius of the Wharf Mine Permit in relatively undisturbed locations. Except for four populations located south of the Wharf Mine Permit near Terry Peak were likely undisturbed and still present. Within the current Wharf Mine Permit area, 65 populations have been identified. These populations have been eliminated or directly or indirectly impacted by mining activities. Eight populations were identified outside of the Wharf Mine Permit but within the Green Mountain Expansion study area and one population was identified within the Boston Expansion (It is likely this population was the same population identified in 2021 due to the general proximity and lack of GPS location from the former studies). All but 13 of these populations appear to be unique compared to the SD Natural Heritage Program Database populations.

Review of the historic records and aerial photography would indicate the possibility of 70 populations within the vicinity of Wharf Mine Permit. The populations were located north and east of the current Wharf Mine Permit within a 1-1.5-mile radius of the Wharf Mine Permit. Within this same radius, limited populations have been identified south of the Wharf Mine Permit, and none have identified west of the Wharf Mine Permit. This could reflect the location of potential expansion areas more than actual presence/absence. Most identified populations in the SD Natural Heritage Program Database and Coeur data appear to be associated with surveys for disturbance and very limited observations from general reconnaissance. Due to the sensitivity of the SD Natural Heritage Program Database data, a map illustrating the mountain huckleberry populations relative to the Wharf Mine Permit cannot be included in public permit documents.

General reconnaissance surveys for mountain huckleberry conducted by Wharf Resources, Inc. in 1992 and 1996 around the Annie Creek Mine and adjacent areas indicated that mountain huckleberry was intolerant of disturbance that opened the canopy (BKS 1996). According to the earlier surveys, isolated individuals of mountain huckleberry were found in previously disturbed habitats with open canopies, but no large patches were observed. Areas devoid of any past mining, logging, recreation, residential, agricultural, or exploration activity were most suitable for mountain huckleberry according to the earlier surveys.



Lands within the Boston Expansion have been significantly impacted by multiple types of historic disturbance and do not represent highly suitable habitat for large populations of mountain huckleberry. The isolated and limited population found within the Boston Expansion during the 2021 survey is reflective of the 1996 survey findings where only isolated individual were found in previously disturbed habitats.

Wharf will continue to provide SD Natural Heritage Program Database with results of all future surveys to enhance the current understanding of mountain huckleberry populations. Since wild mountain huckleberry is rhizomatous, individual plants lack dense, centralized root systems. Therefore, transplanting wild mountain huckleberry bushes is difficult (Barney 1999, Barney 2003). Despite the documented low probability of successful transplants with mountain huckleberry, Wharf will attempt a transplant of these plants to an area recommended by BKS within the Wharf permit boundary. It is also noted that due to the presence of more suitable habitat in the vicinity (BKS 1996), it is unlikely the potential loss of this small group of plants (less than 10 individuals) would change their S2 status in South Dakota.

## REFERENCES

- Barney, Danny L. 1999. Growing Western Huckleberries. University of Idaho Extension. BUL 821.
- Barney, Danny L. 2003. Prospects of Domesticating Western Huckleberries. Small Fruits Review: 2:1: 15-29.
- BKS Environmental Associates, Inc. 1990. Clinton Baseline. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. Drill Trails. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. Saddle Area EXNI #341. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1992. South Greater Portland. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Clinton Supplement. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Golden Reward Harmony Layback Area. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1993. Squaw Valley. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Carcinoma EXNI #364. Prepared for Wharf Resources, Inc. Lead, SD.

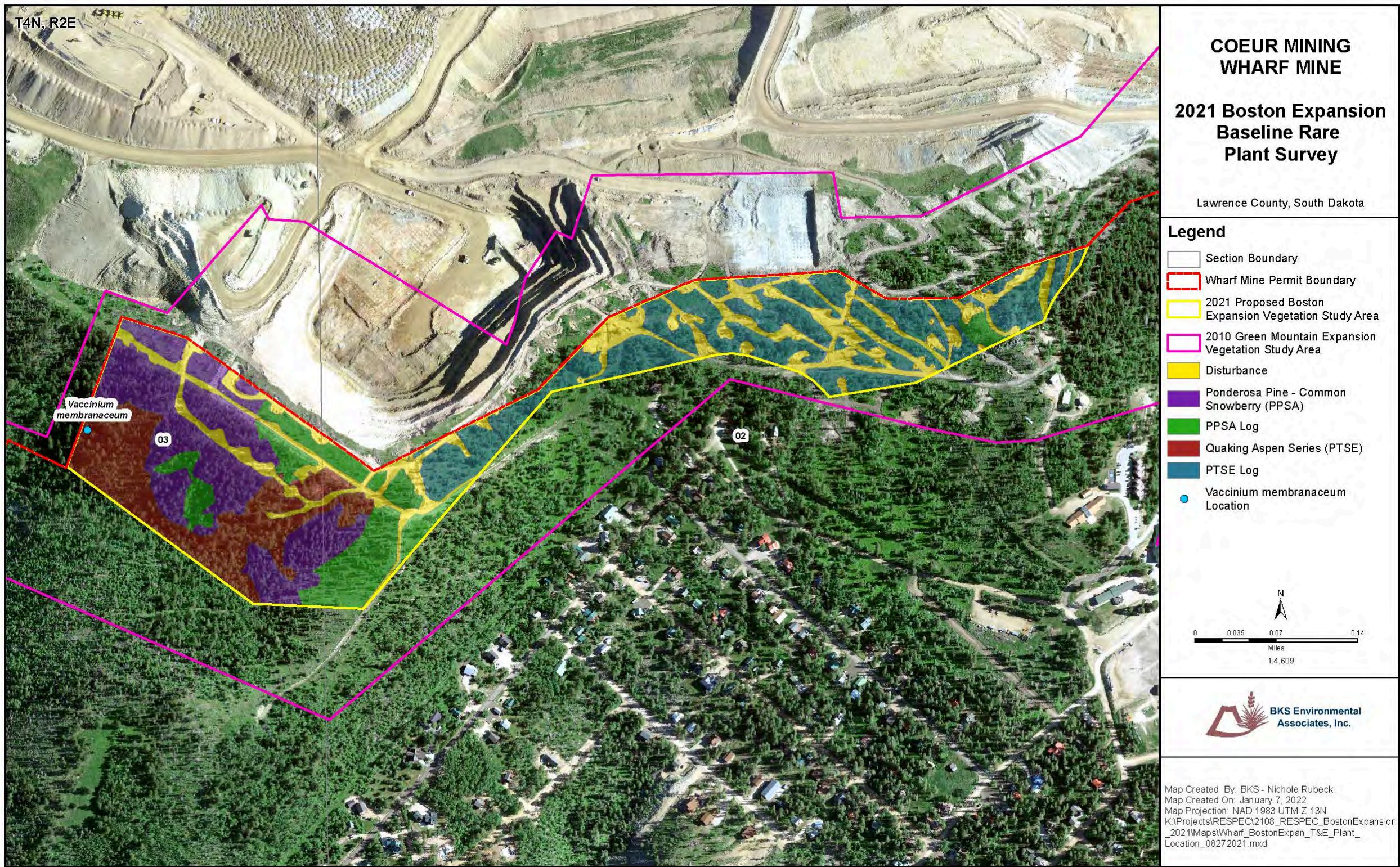
- 
- BKS Environmental Associates, Inc. 1994. Copper Head EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Cornicopia EXNI #348. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Long Valley EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Summit Flats EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1994. Texana EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1995. BLM EXNI #336. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1995. Golden Reward EXNI. Prepared for Wharf Resources, Inc. Lead, SD.
- BKS Environmental Associates, Inc. 1996. General Reconnaissance for Plant Species of Concern Area Survey for *Vaccinium membranaceum*. Prepared for Wharf Resources, Inc. Lead, SD.
- Dorn, R.D. 2001. Vascular Plants of Wyoming, 3rd Edition. Mountain West Publishing. Cheyenne, Wyoming. 340 p.
- Dorn, R.D. 1977. Flora of the Black Hills. Mountain West Publishing, Cheyenne, Wyoming. 377 p.
- Larson G.E. and Johnson J.R. 1999. Plants of the Black Hills and Bear Lodge Mountains. South Dakota State University, College of Agriculture and Biological Sciences, South Dakota Agricultural Experiment Station B732. 608p.
- Simonin, Kevin A. 2000. *Vaccinium membranaceum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).  
<[www.fs.fed.us/database/feis/plants/shrub/vacmen/all.html](http://www.fs.fed.us/database/feis/plants/shrub/vacmen/all.html)> Accessed October 2021.
- South Dakota Natural Heritage Program Database. South Dakota Department of Game, Fish, and Parks. *Vaccinium membranaceum* and *Pyrola picta* occurrences within 14 miles of Lead, South Dakota. December 2021.

South Dakota Natural Heritage Program. 2018. Rare Plants of South Dakota. South Dakota Game, Fish and Parks, Pierre, South Dakota. <<https://gfp.sd.gov/rare-plants/>>. Accessed June 2021.

U.S. Fish and Wildlife Service. 2021. IPac Information for Planning and Consultation. <[ecos.fws.gov/ipac](https://ecos.fws.gov/ipac)>. Accessed August 2021.



**Map 1:** Location of mountain huckleberry (*Vaccinium membranaceum*) population within the Quaking Aspen Series of the Boston Expansion.

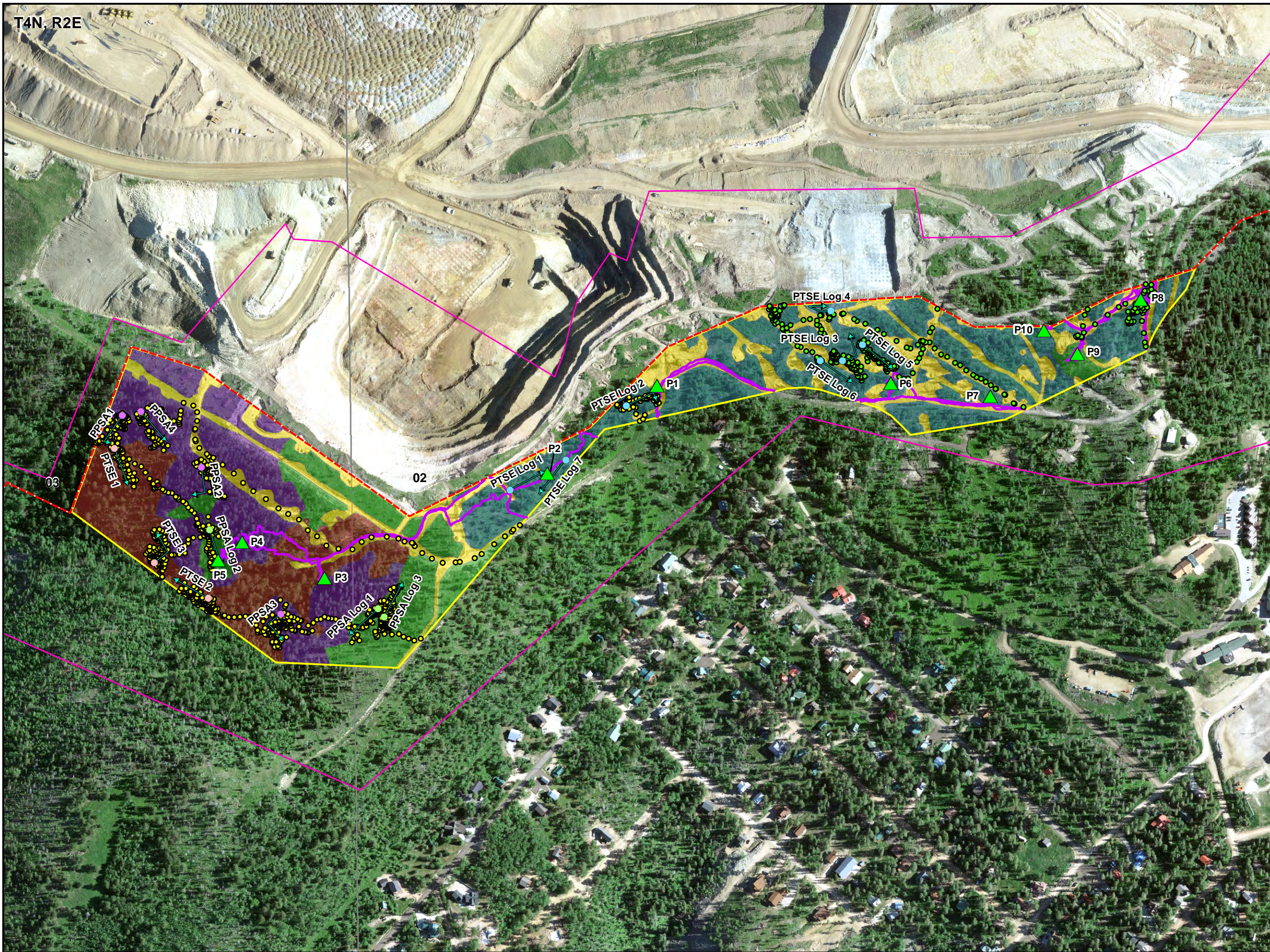






**Figure 1:** Photograph of transect on which mountain huckleberry (*Vaccinium membranaceum*) was observed within the Quaking Aspen Series of the Boston Expansion.





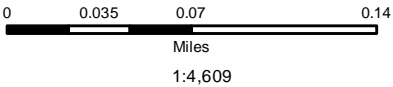
# COEUR MINING WHARF MINE

## 2021 Boston Expansion Special Status Plant Species Survey

Lawrence County, South Dakota

### Legend

- Section Boundary
- Wharf Mine Permit Boundary
- 2021 Proposed Boston Expansion Vegetation Study Area
- 2010 Green Mountain Expansion Vegetation Study Area
- Disturbance
- Ponderosa Pine - Common Snowberry (PPSA)
- PPSA Log
- Quaking Aspen Series (PTSE)
- PTSE Log
- 2021 Belt Transect
- Track 8 June 2021
- PPSA Sample Point
- PPSA Log Sample Point
- PTSE Sample Point
- PTSE Log Sample Point
- 8 Jun 2021 Recording Points
- Track 21 Aug 2021
- Track 25 Aug 2021



Map Created By: BKS - Nichole Rubeck  
Map Created On: October 26, 2021  
Map Updated On: January 30, 2022; April 29, 2022; May 21, 2022  
Map Projection: NAD 1983 UTM Z 13N  
K:\Projects\RESPEC\2108\_RESPEC\_BostonExpansion\_2021\Maps\Wharf\_BostonExpan\_Vegetation\_Final\_Report\_Map\_Update\_05212022.mxd





LATOCH	<i>Lathyrus ochroleucus</i>	Cream pea																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
--------	-----------------------------	-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note = P1 was a photo point only



BKS Environmental Associates, Inc.

DATE: May 23, 2022

TO: Coeur Wharf

FROM: BKS Environmental Associates, Inc.

SUBJECT: Mountain Huckleberry (*Vaccinium membranaceum*) Transplant

CC: RESPEC

Coeur Mining – Wharf Mine (Wharf) has proposed to expand existing gold mine operations in the area known as the Boston Expansion. The proposed Boston Expansion (Boston Expansion) is located along the southern edge of the existing Wharf Mine permit boundary along the Portland Ridgeline. The Boston Expansion was investigated for baseline vegetation information in June and August 2021 in support of a South Dakota Department of Agriculture and Natural Resources (SD DANR) Large-Scale Mine Permit Application.

The 2021 baseline vegetation assessment found one species on the South Dakota Natural Heritage Program Rare plants of South Dakota list: mountain huckleberry (*Vaccinium membranaceum*). The mountain huckleberry population was found on the western border of the Boston Expansion. Approximately 10 individuals were observed within this population.

There has been no change in the global or state rank of mountain huckleberry since 1992 in the state of South Dakota. The Global Rank of G5 indicates demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. South Dakota populations of mountain huckleberry would likely be considered periphery populations. The State Rank of S2 indicates the species is imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range. Due to current Global and State ranks for mountain huckleberry in South Dakota, transplant of the observed population within the Boston Expansion is an option to potentially mitigate loss of the identified population.

A suitable transplant location would have similar aspect, slope, overstory cover, vegetation composition, and soils to where the mountain huckleberry population was found. The Boston Expansion population was located within the quaking aspen series vegetation community type on a relatively steep south-facing slope. Quaking aspen (*Populus tremuloides*) and ponderosa pine (*Pinus ponderosa*) were the dominant overstory vegetation. Multiple small shrubs and forbs dominated the understory and included grouse whortleberry (*Vaccinium scoparium*), kinnikinnick (*Arctostaphylos uva-ursi*), and shinyleaf spirea (*Spiraea lucida*). Soils were classified as Grizzly very gravelly silt loam.

In general, according to Barney (1999), mountain huckleberry:

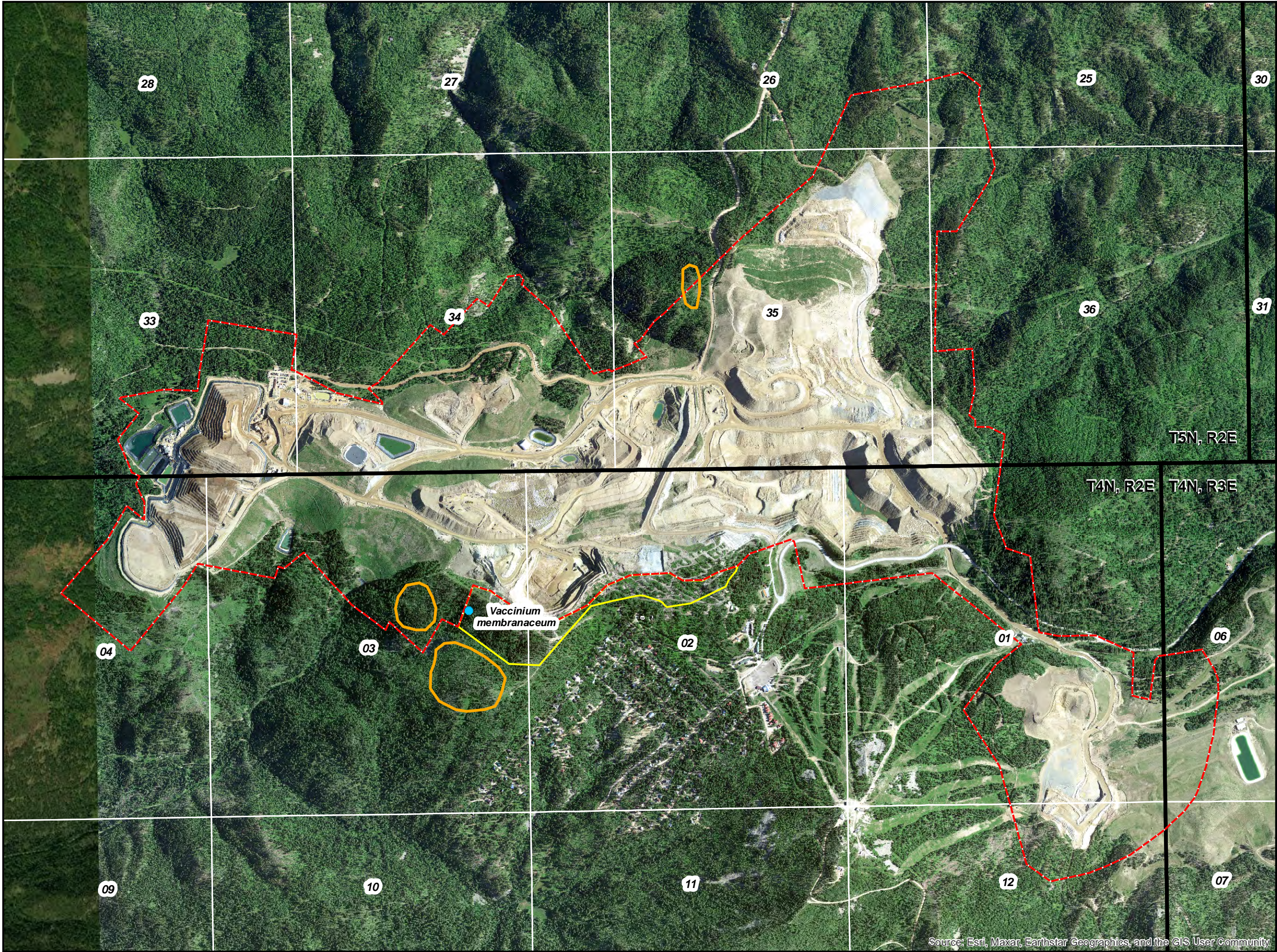
- In forest colonies do better in lightly shaded areas with more available soil moisture than in adjacent drier sites.
- Require a dormant period; as a result, sites where one to two feet of snow persist throughout the winter are preferred.
- Due to the early spring blooms, benches or other raised sites that allow cold air to drain are good locations.
- Well-drained, sandy loam soils that hold moisture well are preferred over poorly drained or droughty soils. Large amounts of soil organic matter including rotted wood and layers of forest duff are favorable.

Since wild mountain huckleberry is rhizomatous, individual plants lack dense, centralized root systems. Therefore, transplanting wild mountain huckleberry bushes is difficult (Barney 1999, Barney 2003). According to Barney (1999) the following provide the most successful transplants:

- When possible, the plants should be collected when they are dormant from late fall through late winter for transplanting.
- A root ball large enough to fill a three-to-five-gallon container should be dug for each plant or group of plants, with limited disturbance to the roots.
- The stem and branches should not be pruned.
- Spring or fall planting is recommended.
- The transplant location should be just deep enough to cover the top of the root ball.
- Mountain huckleberry appears to have a symbiotic relationship with the soil fungi mycorrhizae.
  - These fungi can be transferred by mixing a shovelful of the soil from the collections site with the backfill from each planting hole.
  - Scrape the duff of the soil surface and collect soil from zero to eight inches.
- Fertilization with granular, liquid, and slow-release fertilizers or manure may also be beneficial.
- Select a site with limited aggressive vegetation (e.g., weeds), mountain huckleberry does not compete well with weeds. .

The attached map illustrates three potential transplant locations based on similarities to the habitat of the observed population. In addition, these locations located on Coeur Wharf property in areas where future disturbance from any subsequent expansion of the gold mine operation should not disturb the transplanted population. Final site selection will be done in conjunction with the South Dakota Game, Fish, and Parks.





# COEUR MINING WHARF MINE

## Potential Transplant Locations for *Vaccinium membranaceum*

Lawrence County, South Dakota

### Legend


- Township/Range Boundary
- Section Boundary
- Wharf Mine Permit Boundary
- 2021 Proposed Boston Expansion Vegetation Study Area
- Potential Transplant Locations for Mountain Huckleberry
- Vaccinium membranaceum* Location

T5N, R2E

T4N, R2E T4N, R3E

0 0.125 0.25 0.5  
Miles  
1:18,545

N

 **BKS Environmental  
Associates, Inc.**

Map Created By: BKS - Nichole Rubeck  
Map Created On: May 21, 2022  
Map Projection: NAD 1983 UTM Z 13N  
K:\Projects\RESPEC\2108\_RESPEC\_BostonExpansion\_2021\Maps\Wharf\_BostonExpan\_T&E\_Plant\_Transplant\_Locations\_05192022.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community