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

Submitted to:

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and

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INTRODUCTION

Wharf Resources (USA), Inc. (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^2 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^2 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^2. 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 DANR 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
TOTAL	**50**	**100**	**17**

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.

Vegetation Cover Parameter	Mean (%)
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^2 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^2. 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.

Vegetation Cover Parameter	Mean (%)
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.

Life Form	Vegetation Cover (%)	
	Absolute	Relative
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^2 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^2. 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.

Vegetation Cover Parameter	Mean (%)
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^2 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^2. 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.

Vegetation Cover Parameter	Mean (%)
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.

Life Form	Vegetation Cover (%)	
	Absolute	Relative
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^2 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^2. 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 southeast 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^2) and quaking aspen series log (4.5 shrubs/m^2) 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^2 (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.

Vegetation Community Type	Total Vegetation Cover (%)	Total Ground Cover (%)	Shrub Density (#/m^2)	Tree Density (#/m^2)
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*), mullen (*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), mullen (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 Wharf 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 Wharf 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 Wharf 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.

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ADDENDUM A

VEGETATION COMMUNITY TYPES MAP


T4N, R2E
PPSA1
PPSA4
PTSE 1
PPSA2
PTSE 3
PPSA Log 2
PTSE 2
PPSA3
PPSA Log 1
PPSA Log 3
PTSE Log 1
PTSE Log 7
PTSE Log 2
PTSE Log 4
PTSE Log 3
PTSE Log 5
PTSE Log 6
COEUR MINING
WHARF MINE
2021 Boston Expansion Baseline Vegetation Study
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 Transect
PPSA Sample Point
PPSA Log Sample Point
PTSE Sample Point
PTSE Log Sample Point
N
0 0.035 0.07 0.14
Miles
1:4,609
BKS Environmental Associates, Inc.
Map Created By: BKS - Nichole Rubeck
Map Created On: October 26, 2021
Map Updated On: January 30, 2022
Map Projection: NAD 1983 UTM Z 13N
K:\Projects\RESPEC\2108_RESPEC_BostonExpansion_2021\Maps\Wharf_BostonExpan_Vegetation_Final_Report_Map_Update_01262022

ADDENDUM B

SUBMITTED METHODOLOGY

BASELINE VEGETATION SAMPLE PLAN FOR COEUR WHARF 2021 PROPOSED BOSTON EXPANSION

prepared for

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June 2021

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
Total	**50**

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,

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.

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[1]	Shrub Density[1]	Tree Density[1]	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
			Total	**10**	**7**

[1]-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.

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^2 belt transect centered over the cover transect (1-meter on either side of the 50-meter cover transect).

F. Shrub Density

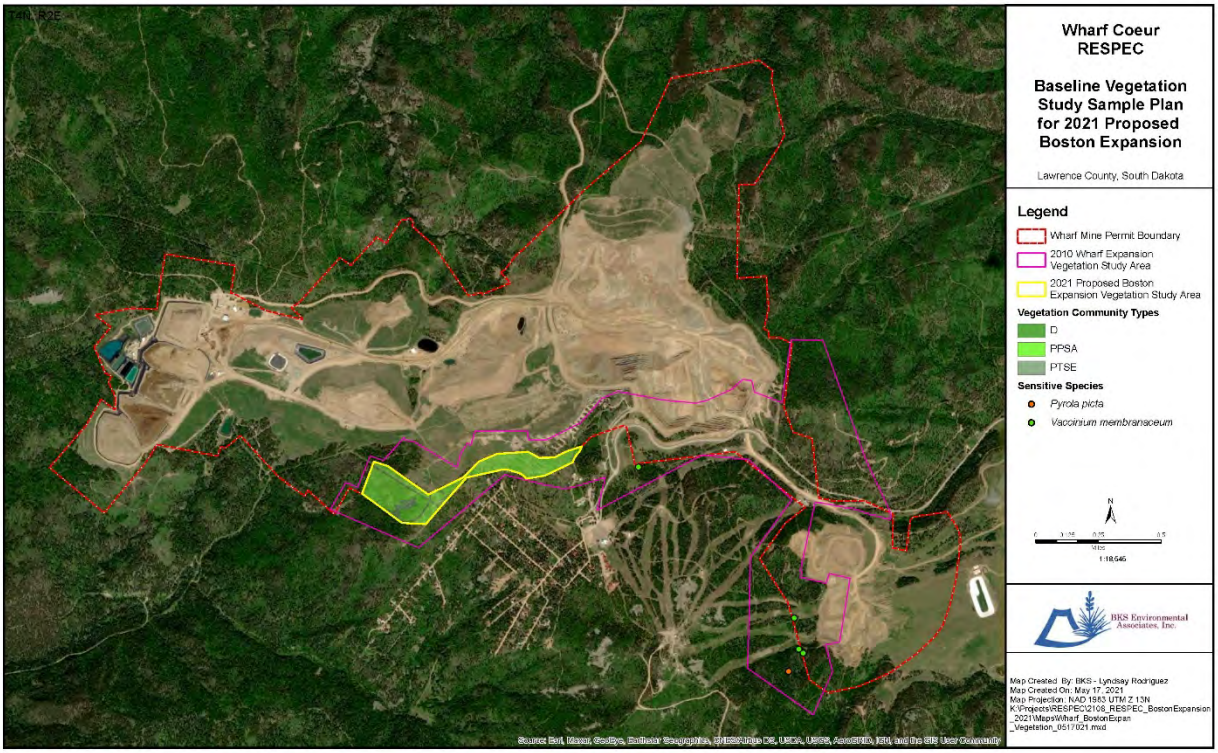
Shrub density will be determined by counting each full shrub and subshrub rooted inside the same 100 m^2 belt transect used for species diversity (1-meter on either side of a 50-meter transect). Mean total shrub density will be derived. Means will be reported in shrubs/m^2.

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.


T4N, R2E
Wharf Coeur
RESPEC
Baseline Vegetation Study Sample Plan for 2021 Proposed Boston Expansion
Lawrence County, South Dakota
Legend
Wharf Mine Permit Boundary
2010 Wharf Expansion Vegetation Study Area
2021 Proposed Boston Expansion Vegetation Study Area
Vegetation Community Types
D
PPSA
PTSE
Sensitive Species
Pyrola picta
Vaccinium membranaceum
N
1:18,645
BKS Environmental Associates, Inc.
Map Created By: BKS - Lyndsay Rodriguez
Map Created On: May 17, 2021
Map Projection: NAD 1983 UTM Z 13N
K:\Projects\RESPEC\2108_RESPEC_BostonExpansion_2021\Maps\Wharf_BostonExpan_Vegetation_0517021.mxd

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

prepared for

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prepared by

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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

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
Total	**50**

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[1]	Shrub Density[1]	Tree Density[1]	
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
			Total	**17**

[1]-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.

Ponderosa Pine – Common Snowberry (PPSA) June 2021

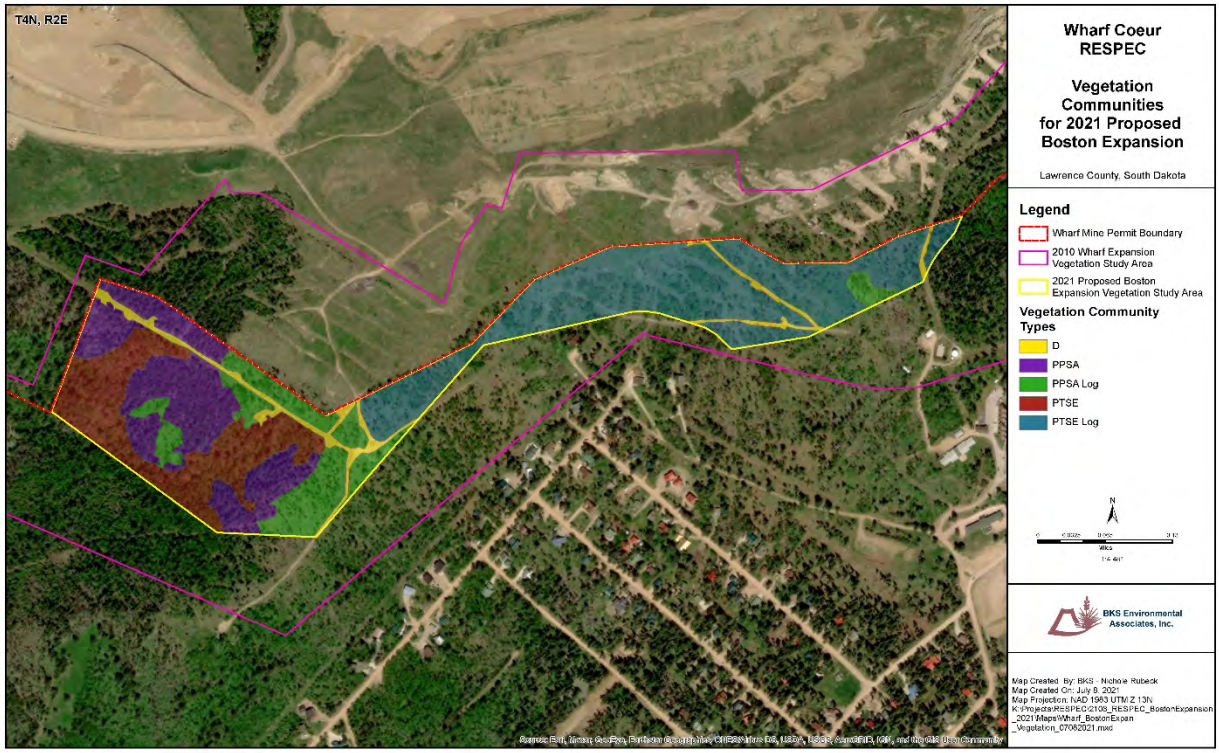
Ponderosa Pine – Common Snowberry Logged (PPSA Log) June 2021

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

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

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

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

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.
	Mean Absolute	Relative	(n-1)
Native Cool Season Perennial Grasses			
Oryzopsis asperifolia	0.5	0.6	1.0
Sub-Total	0.5	0.6	1.0
Introduced Perennial Grasses			
Phleum pratense	0.5	0.6	1.0
Poa pratensis	0.5	0.6	1.0
Sub-Total	1.0	1.2	1.2
Native Perennial Forbs			
Monarda fistulosa	0.5	0.6	1.0
Sub-Total	0.5	0.6	1.0
Native Subshrubs			
Arctostaphylos uva-ursi	2.5	3.0	5.0
Cornus canadensis	0.5	0.6	1.0
Juniperus horizontalis	1.5	1.8	1.9
Mahonia repens	1.0	1.2	2.0
Sub-Total	5.5	6.7	5.7
Native Shrubs			
Spiraea lucida	1.0	1.2	1.2
Vaccinium scoparium	2.5	3.0	1.0
Sub-Total	3.5	4.2	1.9
Native Trees			
Picea glauca	10.0	12.1	17.4
Pinus ponderosa	56.0	67.9	14.1
Populus tremuloides	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

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.
	Mean Absolute	Relative	(n-1)
Native Cool Season Perennial Grasses			
Oryzopsis asperifolia	2.7	6.1	4.6
Puccinellia distans	4.7	10.8	6.4
Sub-Total	7.4	17.0	11.0
Native Warm Season Perennial Grasses			
Leersia virginica	1.3	3.1	1.2
Sub-Total	1.3	3.1	1.2
Introduced Perennial Grasses			
Phleum pratense	2.7	6.1	1.2
Poa pratensis	0.7	1.5	1.2
Sub-Total	3.4	7.8	1.2
Introduced Annual/Biennial Forbs			
Cirsium vulgare	0.7	1.5	1.2
Sub-Total	0.7	1.5	1.2
Native Perennial Forbs			
Achillea millefolium	0.7	1.5	1.2
Anaphalis margaritacea	2.0	4.6	3.5
Apocynum androsaemifolium	0.7	1.5	1.2
Solidago speciosa	0.7	1.5	1.2
Pteridium aquilinum	1.3	3.1	2.3
Sub-Total	5.4	12.4	4.6
Native Subshrubs			
Arctostaphylos uva-ursi	4.0	9.2	5.3
Juniperus horizontalis	1.3	3.1	2.3
Mahonia repens	0.7	1.5	1.2
Rubus parviflorus	3.3	7.7	3.1
Sub-Total	9.3	21.5	4.6
Native Shrubs			
Shepherdia canadensis	1.3	3.1	2.3
Spiraea lucida	1.3	3.1	2.3
Sub-Total	2.6	6.0	2.3
Native Trees			
Picea glauca	3.3	7.7	5.8
Pinus ponderosa	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

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.
	Mean Absolute	Relative	(n-1)
Native Cool Season Perennial Grasses			
Oryzopsis asperifolia	1.3	1.5	2.3
Puccinellia distans	0.7	0.7	1.2
Sub-Total	2.0	2.2	3.5
Introduced Perennial Grasses			
Phleum pratense	0.7	0.7	1.2
Poa pratensis	0.7	0.7	1.2
Sub-Total	1.4	1.5	2.3
Native Perennial Forbs			
Anaphalis margaritacea	1.3	1.5	2.3
Apocynum androsaemifolium	3.3	3.7	5.8
Apocynum cannabinum	1.3	1.5	2.3
Pteridium aquilinum	2.0	2.2	2.0
Sub-Total	7.9	8.7	6.9
Native Subshrubs			
Arctostaphylos uva-ursi	1.3	1.5	2.3
Cornus canadensis	0.7	0.7	1.2
Juniperus horizontalis	0.7	0.7	1.2
Mahonia repens	0.7	0.7	1.2
Sub-Total	3.4	3.7	2.3
Native Shrubs			
Rosa woodsii	0.7	0.7	1.2
Shepherdia canadensis	1.3	1.5	2.3
Spiraea lucida	2.0	2.2	3.5
Vaccinium scoparium	4.0	4.4	0.0
Sub-Total	8.0	8.8	3.5
Native Trees			
Picea glauca	14.7	16.2	17.0
Pinus ponderosa	18.0	19.8	23.1
Populus tremuloides	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

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.
	Mean Absolute	Relative	(n-1)
Native Cool Season Perennial Grasses			
Oryzopsis asperifolia	2.0	2.3	2.3
Puccinellia distans	3.4	4.0	9.1
Sub-Total	5.4	6.4	8.5
Native Warm Season Perennial Grasses			
Leersia virginica	0.3	0.3	0.8
Sub-Total	0.3	0.3	0.8
Introduced Perennial Grasses			
Bromus inermis	4.0	4.7	8.9
Phleum pratense	1.2	1.4	1.6
Poa pratensis	3.7	4.3	5.1
Sub-Total	8.9	10.4	8.9
Native Grass-likes			
Carex rossii	3.7	4.3	7.3
Sub-Total	3.7	4.3	7.3
Native Perennial Forbs			
Anaphalis margaritacea	0.3	0.3	0.8
Pteridium aquilinum	8.3	9.7	8.0
Sub-Total	8.6	10.0	8.1
Native Subshrubs			
Arctostaphylos uva-ursi	3.7	4.3	6.5
Mahonia repens	0.6	0.7	1.0
Rubus parviflorus	3.4	4.0	9.1
Sub-Total	7.7	9.0	16.1
Native Shrubs			
Rosa woodsii	1.4	1.7	1.9
Spiraea lucida	1.7	2.0	2.1
Symphocicarpus albus	3.7	4.3	5.0
Vaccinium scoparium	0.3	0.3	0.8
Sub-Total	7.1	8.4	6.8
Native Trees			
Betula papyrifera	3.2	3.7	8.3
Pinus ponderosa	5.1	6.0	6.1
Populus tremuloides	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	Plot Size:	100 square meters
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 (#/Plot)	Relative (%)	Mean (#/m²)	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
Corylus cornuta	5	1	0.1	202	10
Rosa woodsii	2	1	0.0	81	2
Shepherdia canadensis	6	2	0.1	243	5
Spiraea lucida	89	25	0.9	3,609	46
Symphoricarpos albus	9	3	0.1	354	14
Vaccinium scoparium	98	28	1.0	3,968	84
Total Native Full Shrubs	209	60	2.1	8,457	111
Arctostaphylos uva-ursi	78	22	0.8	3,163	78
Cornus canadensis	22	6	0.2	881	40
Juniperus horizontalis	11	3	0.1	445	8
Mahonia repens	29	8	0.3	1,164	27
Rubus parviflorus	1	0	0.0	51	3
Total Native Subshrubs	141	40	1.4	5,704	82
Total Shrub Density	350	100	3.5	14,161	140

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	Plot Size:	100 square meters
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 (#/Plot)	Relative (%)	Mean (#/m²)	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
Rosa woodsii	0	0	0.0	13	1
Shepherdia canadensis	18	8	0.2	742	17
Spiraea lucida	48	21	0.5	1,937	69
Symphoricarpos albus	4	2	0.0	148	6
Vaccinium scoparium	48	21	0.5	1,954	53
Total Native Full Shrubs	118	51	1.2	4,794	66
Arctostaphylos uva-ursi	69	30	0.7	2,784	83
Juniperus horizontalis	8	3	0.1	324	8
Mahonia repens	1	1	0.0	54	2
Rubus parviflorus	34	15	0.3	1,367	29
Total Native Subshrubs	112	49	1.1	4,529	91
Total Shrub Density	230	100	2.3	9,323	128

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	Plot Size:	100 square meters
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 (#/Plot)	Relative (%)	Mean (#/m²)	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
Rosa woodsii	10	1	0.1	418	8
Shepherdia canadensis	26	4	0.3	1,036	43
Spiraea lucida	210	30	2.1	8,503	45
Symphoricarpos albus	94	13	0.9	3,796	111
Vaccinium membranaceum	3	0	0.0	135	6
Vaccinium scoparium	175	25	1.8	7,086	90
Total Native Full Shrubs	518	73	5.2	20,974	34
Arctostaphylos uva-ursi	97	14	1.0	3,928	88
Chimaphila umbellata	21	3	0.2	864	37
Cornus canadensis	21	3	0.2	830	36
Juniperus horizontalis	12	2	0.1	472	17
Mahonia repens	33	5	0.3	1,316	28
Rubus parviflorus	5	1	0.1	202	9
Total Native Subshrubs	189	27	1.9	7,612	96
Total Shrub Density	707	100	7.1	28,586	93

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	Plot Size:	100 square meters
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 (#/Plot)	Relative (%)	Mean (#/m²)	Mean (#/acre)	Std. Dev. (n-1) (#/Plot)
Rosa woodsii	23	5	0.2	947	51
Shepherdia canadensis	1	0	0.0	29	2
Spiraea lucida	89	19	0.9	3,586	66
Symphoricarpos albus	112	25	1.1	4,525	82
Vaccinium scoparium	26	6	0.3	1,034	57
Total Native Full Shrubs	250	55	2.5	10,121	147
Arctostaphylos uva-ursi	110	24	1.1	4,454	101
Juniperus horizontalis	2	0	0.0	81	2
Mahonia repens	67	15	0.7	2,693	62
Rubus parviflorus	26	6	0.3	1,060	66
Total Native Subshrubs	205	45	2.0	8,288	140
Total Shrub Density	455	100	4.5	18,409	293

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	Sample Type:	Point Center Quarter
Polygon Name:	PPSA	Sample Size:	1
Community Type:	Native	Number of Samples:	4
Sample Date:	8/21&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)	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	Sample Type:	Point Center Quarter
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

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	Sample Type:	Point Center Quarter
Polygon Name:	PTSE	Sample Size:	1
Community Type:	Native	Number of Samples:	3
Sample Date:	8/21&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)	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

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&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

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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. Point and transect data, the time meander species list, and a species effort cure are attached.

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 southeast 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.

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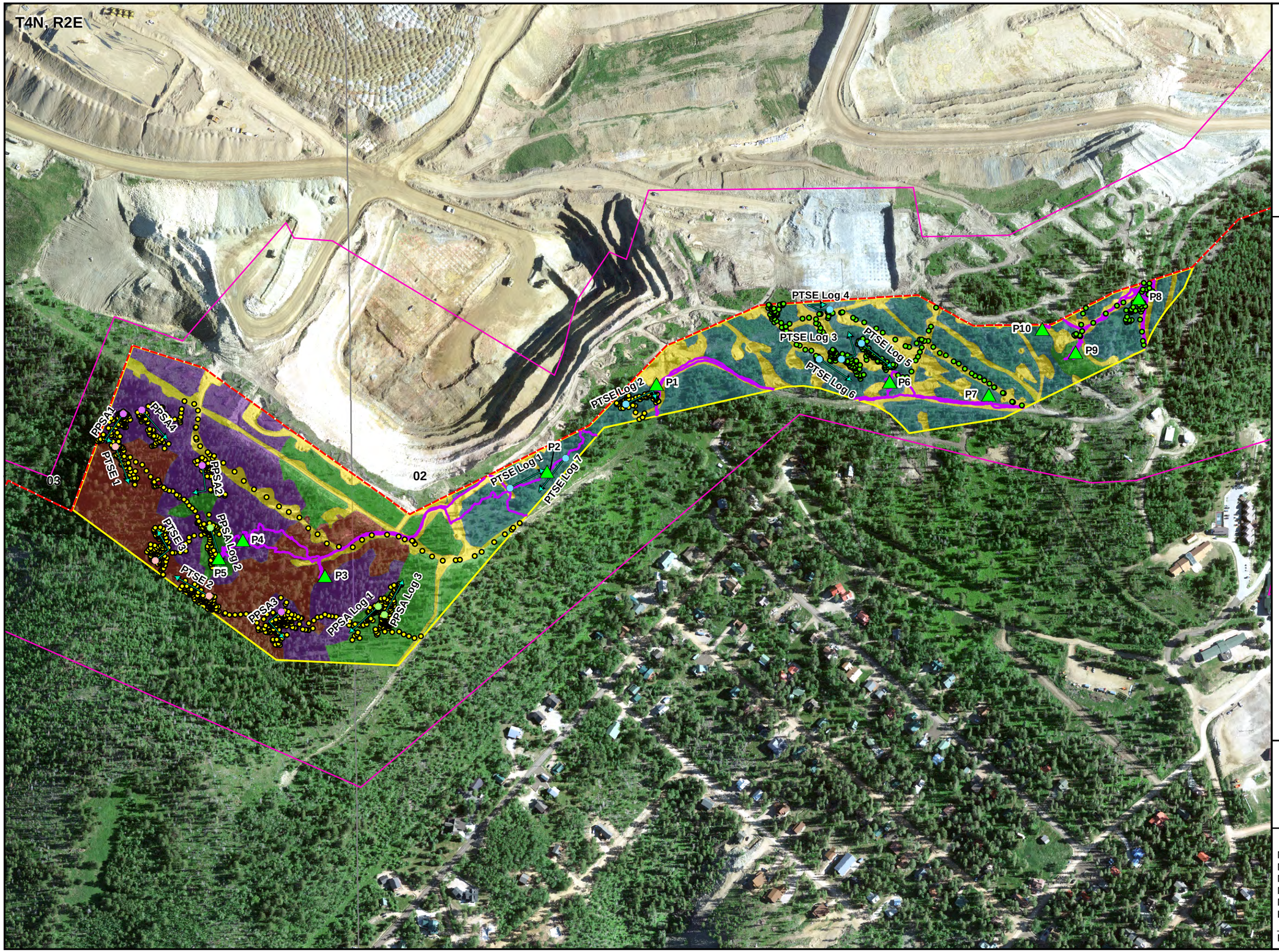
Map 1: Location of mountain huckleberry (*Vaccinium membranaceum*) population within the Quaking Aspen Series of the Boston Expansion.

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

0 0.035 0.07 0.14
Miles

1:4,609

N

BKS Environmental Associates, Inc.

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

Acronym	Scientific Binomial	Common Name	VEGETATION COMMUNITY & JUNE 2021 RECORDING LOCATIONS									VEGETATION COMMUNITY & AUGUST 2021 BELT TRANSECT LOCATIONS																
			PTSE-LOG P2	PTSE P3	PPSAP4	PPSA-LOG P5	PTSE-LOG P6	PTSE-LOG P7	PTSE-LOG P8	PPSA-LOG P9	PTSE-LOG P10	PPSA-1	PPSA-2	PPSA-3	PPSA-4	PPSA-LOG-1	PPSA-LOG-2	PPSA-LOG-3	PTSE-1	PTSE-2	PTSE-3	PTSE-LOG-1	PTSE-LOG-2	PTSE-LOG-3	PTSE-LOG-4	PTSE-LOG-5	PTSE-LOG-6	PTSE-LOG-7
Native Cool Season Perennial Grasses																											
ELYCAN	*Elymus canadensis*	Canada wildrye												O		O		O										
ELYSMI	*Elymus smithii*	Western wheatgrass						O																				
NASVIR	*Nassella viridula*	Green needlegrass																			O							
ORYASP	*Oryzopsis asperifolia*	Rough-leaved ricegrass							O			X	O	O		X	O			O	X	O		X	X	X		X
POASEC	*Poa secunda*	Sandberg bluegrass														O		O										
PUCDIS	*Puccinellia distans*	Weeping alkaligrass											O		O	X	X	O	O		X	O	X		O			O
Native Warm Season Perennial Grasses																												
BOUGRA	*Bouteloua gracilis*	Blue grama			O					O																		
LEEVIR	*Leersia virginica*	Whitegrass	O			O	O			O						X	X					X						
Introduced Perennial Grasses																												
AGRSTO	*Agrostis stolonifera*	Creeping bentgrass		O	O											O		O					O					
BROINE	*Bromus inermis*	Smooth brome	O	O		O	O	O	O	O									O				X		X	X		
PHLPRA	*Phleum pratense*	Timothy										O	O		X	X	X	X			X	X	X		O	X	O	
POAPRA	*Poa pratensis*	Kentucky bluegrass						O				X		O		O	O	X	O	O	X	X		O	X		X	X
Unknown Grass Species																												
POASPP	*Poa spp.*	Bluegrass								O																		
Native Grasslike Species																												
CARPRA	*Carex praegracilis*	Clustered field sedge	O				O	O		O															O			
CARROS	*Carex rossii*	Ross sedge				O		O														X			X	O		X
Native Annual/Biennial Forbs																												
ARAGLA	*Arabis glabra*	Tower rockcress						O																				
COLPAR	*Collinsia parviflora*	Maiden blue eyed Mary		O	O																							
Introduced Annual/Biennial Forbs																												
BARVUL	*Barbarea vulgaris*	Garden yellowrocket						O																				
CIRVUL*	*Cirsium vulgare*	Bull thistle						O								X								O			O	
CYNOFF*	*Cynoglossum officinale*	Houndstongue			O	O						O	O															
LACSER	*Lactuca serriola*	Prickly lettuce																					O	O				
TRADUB	*Tragopogon dubius*	Yellow salsify																							O			
VERTHA*	*Verbascum thapsus*	Mullen				O		O																			O	
Native Perennial Forbs																												
ACHMIL	*Achillea millefolium*	Western yarrow		O	O							O	O	O	O	O	X	O	O		O	O						
ANAMAR	*Anaphalis margaritacea*	Western pearly everlasting										O	O	O	O	X	O	O	O		X	X					O	
ANTMIC	*Antennaria microphylla*	Littleleaf pussytoes		O	O	O				O		O	O		O		O	O		O	O							
ANTNEG	*Antennaria neglecta*	Field pussytoes										O		O														
APOAND	*Apocynum androsaemifolium*	Spreading dogbane											O	O		O	X				X							
APOCAN	*Apocynum cannabinum*	Indianhemp															O		O	X	O							
ARNCOR	*Arnica cordifolia*	Heartleaf arnica							O																			
CAMROT	*Campanula rotundifolia*	Bluebell bellflower										O				O	O	O	O			O						
CHAANG	*Chamerion angustifolium*	Fireweed							O																			
COMUMB	*Comandra umbellata*	Bastard toadflax				O																						
CRERUN	*Crepis runcinata*	Fiddleleaf hawksbeard										O		O	O	O	O		O									
DELBIC	*Delphinium bicolor*	Little larkspur																O										
DODPUL	*Dodecatheon pulchellum*	Darkthroat shootingstar																			O							
FRAVIR	*Fragaria virginiana*	Virginia strawberry		O	O				O													O						
GALBOR	*Galium boreale*	Northern bedstraw																		O	O							
HIEALB	*Hieracium albiflorum*	White hawkweed													O	O		O	O									

LATOCH	*Lathyrus ochroleucus*	Cream pea		O		O		O	O												O						
MAICAN	*Maianthemum canadense*	Wild lily-of-the-valley		O						O			O	O						O	O							
MONFIS	*Monarda fistulosa*	Wild bergamot										O	O		X		O		O		O						
OSMBER	*Osmorhiza berteroi*	Sweetcicely															O											
PTEAQU	*Pteridium aquilinum*	Western brackenfern	O	O			O	O									X		X		X	X		X	X	X	X	X
SMISTE	*Smilacina stellata*	False solomon's seal																	O	O	O	O				O		
SOLSPE	*Solidago speciosa*	Showy goldenrod											O	O	O	X	O	O										
SYMLAE	*Symphyotrichum laeve*	Smooth blue aster													O					O	O	O			O	O		
THAVEN	*Thalictrum venulosum*	Veiny meadow-rue	O				O		O	O											O			O		O		O
TOXRYD	*Toxicodendron rydbergii*	Poison ivy	O	O		O			O																			O
VIOADU	*Viola adunca*	Mountain blue violet		O		O							O		O		O		O									
ZIZAPT	*Zizia aptera*	Meadow zizia				O																						
Introduced Perennial Forbs																												
CIRARV*	*Cirsium arvense*	Canada thistle					O	O														O	O	O			O	
LINVUL*	*Linaria vulgaris*	Yellow toadflax																				O						
TANVUL*	*Tanacetum vulgare*	Common tansy																							O		O	
TAROFF	*Taraxacum officinale*	Common dandelion					O	O		O								O					O					
TRIREP	*Trifolium repens*	White clover					O	O															O					
Native Full Shrubs																												
AMEALN	*Amelanchier alnifolia*	Saskatoon serviceberry									O																	
PRUVIR	*Prunus virginiana*	Chokecherry		O					O																			
ROSWOO	*Rosa woodsii*	Woods rose	O						O					O	O	O		O	X	O	O	O	O	X	X	X	O	
SHECAN	*Shepherdia canadensis*	Russet buffaloberry										O	O	O	O	O	O	X	X	O					O			
SPILUC	*Spiraea lucida*	Shinyleaf spirea										X	O	X	O	O	X	O	O	O	X	X		O	X	O	X	O
SYMALB	*Symphocicarpus albus*	Common snowberry	O		O	O	O	O	O		O		O		O	O			O	O	O	X		X	X	X	X	O
VACMEM	*Vaccinium membranaceum*	Mountain huckleberry																	O									
VACSCO	*Vaccinium scoparium*	Grouse whortleberry	O						O			X	X	X	X	O	O	O	X	X	X	X				O		O
Native Subshrubs																												
ARCUVA	*Arctostaphylos uva-ursi*	Kinnikinnik		O		O	O					O	O		X		X	X	O		X	X		O	X	X	X	O
CHIUMB	*Chimaphila umbellata*	Pipsissewa																	O									
CORCAN	*Cornus canadensis*	Bunchberry dogwood												X	O					X								
JUNHOR	*Juniperus horizontalis*	Creeping juniper			O	O	O			O		X	X	O	O		O	X	X	O	O	O		O	O	O		
MAHREP	*Mahonia repens*	Oregon grape	O	O	O	O	O		O			O	O	O	X		X	O	O		X	O		X	X	O	O	O
RUBPAR	*Rubus parviflorus*	Thimbleberry		O			O		O	O					O	X		X		O					X	O	O	
Native Trees																												
BETPAP	*Betula papyrifera*	Paper birch																				X						
CORCOR	*Corylus cornuta*	Beaked hazelnut										O		O		O				O								
PICGLA	*Picea glauca*	White spruce	O	O	O	O			O				X	X	O	O		X	X	X	X							
PINPON	*Pinus ponderosa*	Ponderosa pine		O	O	O			O	O		X	X	X	X	O	X	X	X		X	O	X	O		X	X	X
POPTRE	*Populus tremuloides*	Quacking aspen	O	O	O	O	O	O	O		O	X		X	O		O	O	X	X	X	X	X	X	X	X	X	X
Introduced Trees																												
ULMPUM	Ulmus pumila	Siberian elm			O																							
O	Species observed within the vegetation community type on the belt transect or general observation.																											
X	Species sampled on the cover transect.																											
*	Denotes a weed species.																											

Note = P1 was a photo point only

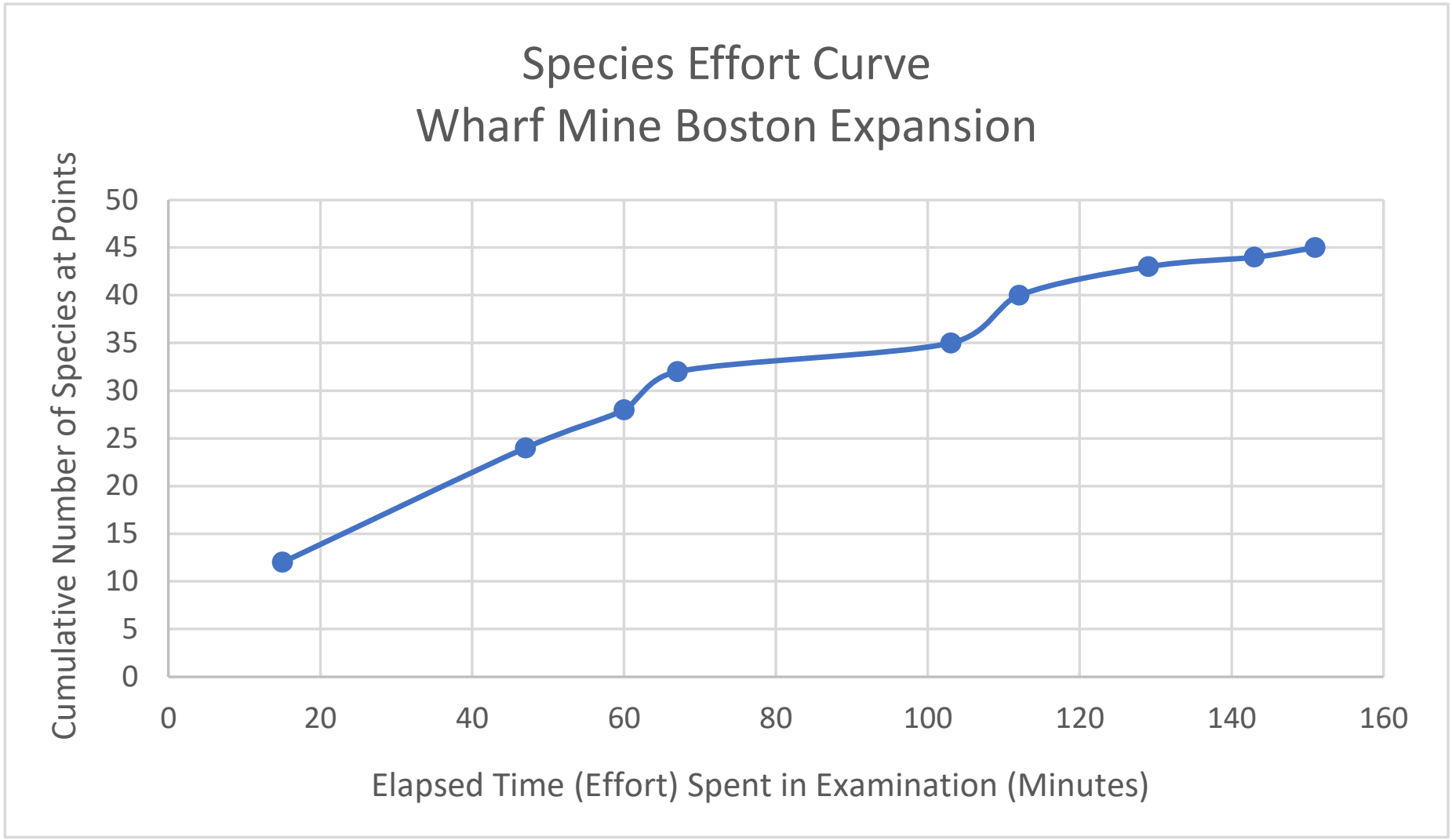
Time Meander Search Record - Wharf Mine Boston Expansion - 06/08/2021

LOCATION/TIME	SPECIES		
	Acronym	**Scientific Binomial**	**Common Name**
PTSE-LOG P2	**Native Warm Season Perennial Grasses**		
10:15	LEEVIR	*Leersia virginica*	Whitegrass
	Introduced Perennial Grasses		
	BROINE	*Bromus inermis*	Smooth brome
	Native Grasslike Species		
	CARPRA	*Carex praegracilis*	Clustered field sedge
	Native Perennial Forbs		
	PTEAQU	*Pteridium aquilinum*	Western brackenfern
	THAVEN	*Thalictrum venulosum*	Veiny meadow-rue
	TOXRYD	*Toxicodendron rydbergii*	Poison ivy
	Native Full Shrubs		
	ROSWOO	*Rosa woodsii*	Woods rose
	SYMALB	*Symphocicarpus albus*	Common snowberry
	VACSCO	*Vaccinium scoparium*	Grouse whortleberry
	Native Subshrubs		
	MAHREP	*Mahonia repens*	Oregon grape
	Native Trees		
	PICGLA	*Picea glauca*	White spruce
	POPTRE	*Populus tremuloides*	Quacking aspen
PTSE P3	**Introduced Perennial Grasses**		
10:47	AGRSTO	*Agrostis stolonifera*	Creeping bentgrass
	Native Annual/Biennial Forbs		
	COLPAR	*Collinsia parviflora*	Maiden blue eyed Mary
	Native Perennial Forbs		
	ACHMIL	*Achillea millefolium*	Western yarrow
	ANTMIC	*Antennaria microphylla*	Littleleaf pussytoes
	FRAVIR	*Fragaria virginiana*	Virginia strawberry
	LATOCH	*Lathyrus ochroleucus*	Cream pea
	MAICAN	*Maianthemum canadense*	Wild lily-of-the-valley
	VIOADU	*Viola adunca*	Mountain blue violet
	Native Full Shrubs		
	PRUVIR	*Prunus virginiana*	Chokecherry
	Native Subshrubs		
	ARCUVA	*Arctostaphylos uva-ursi*	Kinnikinnik
	RUBPAR	*Rubus parviflorus*	Thimbleberry
	Native Trees		
	PINPON	*Pinus ponderosa*	Ponderosa pine

PPSAP4	**Native Warm Season Perennial Grasses**		
11:00	BOUGRA	*Bouteloua gracilis*	Blue grama
	Introduced Annual/Biennial Forbs		
	CYNOFF*	*Cynoglossum officinale*	Houndstongue
	Native Subshrubs		
	JUNHOR	*Juniperus horizontalis*	Creeping juniper
	Introduced Trees		
	ULMPUM	Ulmus pumila	Siberian elm
PPSA-LOG P5	**Native Grasslike Species**		
11:07	CARROS	*Carex rossii*	Ross sedge
	Introduced Annual/Biennial Forbs		
	VERTHA*	*Verbascum thapsus*	Mullen
	Native Perennial Forbs		
	COMUMB	*Comandra umbellata*	Bastard toadflax
	ZIZAPT	*Zizia aptera*	Meadow zizia
PTSE-LOG P6	**Introduced Perennial Forbs**		
11:43	CIRARV*	*Cirsium arvense*	Canada thistle
	TAROFF	*Taraxacum officinale*	Common dandelion
	TRIREP	*Trifolium repens*	White clover
PTSE-LOG P7	**Native Cool Season Perennial Grasses**		
11:52	ELYSMI	*Elymus smithii*	Western wheatgrass
	Introduced Perennial Grasses		
	POAPRA	*Poa pratensis*	Kentucky bluegrass
	Native Annual/Biennial Forbs		
	ARAGLA	*Arabis glabra*	Tower rockcress
	Introduced Annual/Biennial Forbs		
	BARVUL	*Barbarea vulgaris*	Garden yellowrocket
	CIRVUL*	*Cirsium vulgare*	Bull thistle
PTSE-LOG P8	**Native Cool Season Perennial Grasses**		
12:09	ORYASP	*Oryzopsis asperifolia*	Rough-leaved ricegrass
	Native Perennial Forbs		
	ARNCOR	*Arnica cordifolia*	Heartleaf arnica
	CHAANG	*Chamerion angustifolium*	Fireweed
PPSA- LOG P9	**Unknown Grass Species**		
12:23	POASPP	*Poa spp.*	Bluegrass
PTSE-LOG P10	**Native Full Shrubs**		
12:31[(1)]	AMEALN	*Amelanchier alnifolia*	Saskatoon serviceberry

[(1)] Approximate time based on photograph time stamps.

* Denotes weeds species.


Species Effort Curve
Wharf Mine Boston Expansion
Cumulative Number of Species at Points
50
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
Elapsed Time (Effort) Spent in Examination (Minutes)

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:

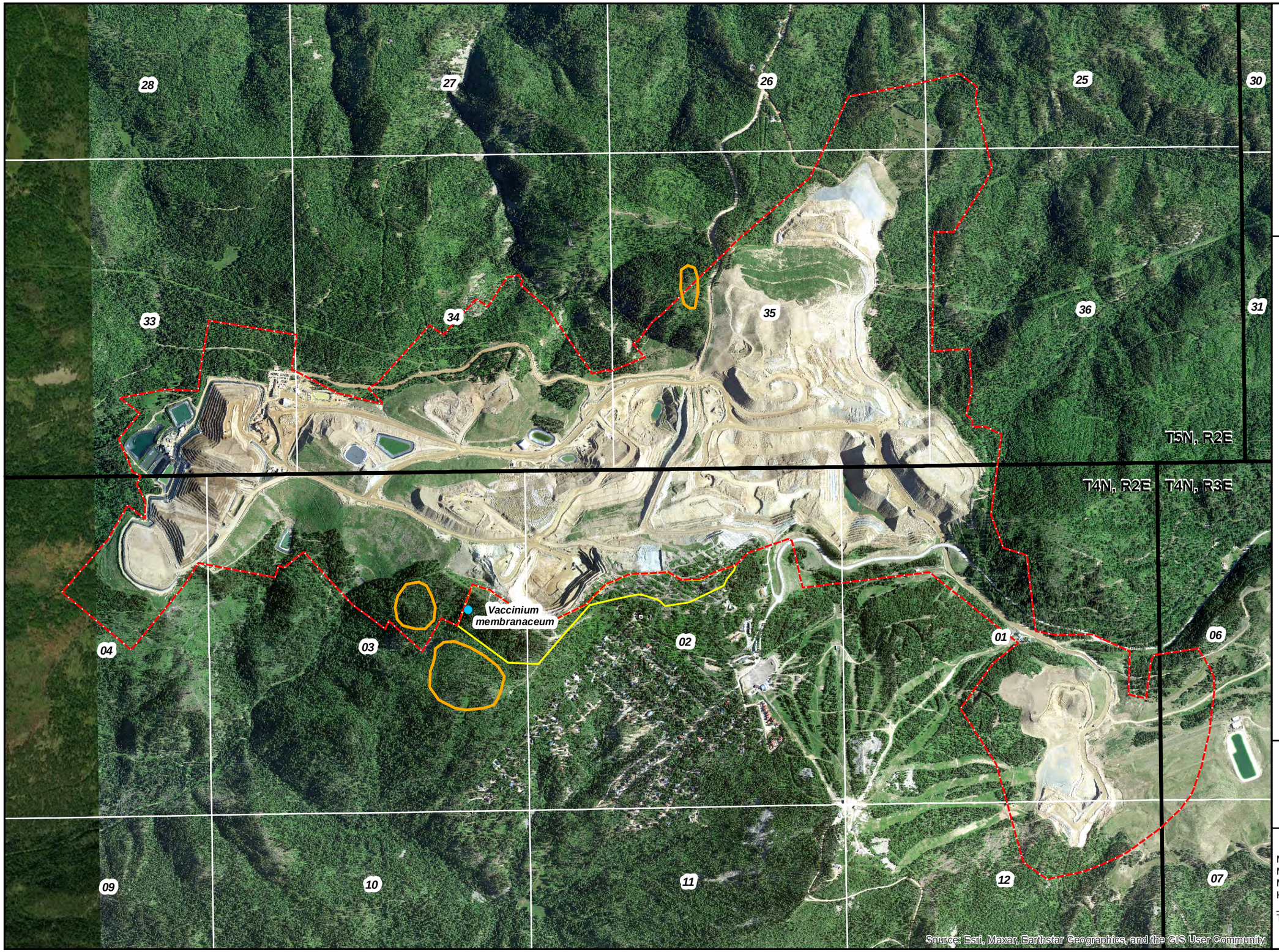
- When possible, the plants should be collected when they are dormant from late fall through late winter for transplanting.
- A root ball large enough to fill a three-to-five-gallon container should be dug for each plant or group of plants, with limited disturbance to the roots.
- The stem and branches 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

N

0 0.125 0.25 0.5
Miles

1:18,545

BKS Environmental Associates, Inc.

Map Created By: BKS - Nichole Rubeck
Map Created On: May 21, 2022
Map Projection: NAD 1983 UTM Z 13N
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COEUR MINING WHARF MINE

2021 Boston Expansion Baseline Vegetation Study

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 Transect
- PPSA Sample Point
- PPSA Log Sample Point
- PTSE Sample Point
- PTSE Log Sample Point

N

0 0.035 0.07 0.14

Miles

1:4,609

BKS Environmental Associates, Inc.

Map Created By: BKS - Nichole Rubeck
Map Created On: October 26, 2021
Map Updated On: January 30, 2022
Map Projection: NAD 1983 UTM Z 13N
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