PEABODY WESTERN

Peabody Western Coal Company

January 28, 2025

Ms. Amy Ryser
Western Region Office
Office of Surface Mining
Reclamation and Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065

RE: Phase III Bond Release Application / Peabody Western Coal Company
Kayenta Mine Permit AZ-0001F / J19 and J21 Permanent Program Area

Dear Ms. Ryser:

Peabody Western Coal Company (PWCC) submits the enclosed application materials in accordance with 30 CFR 800.40 for Phase III release of bond on approximately 3,654 acres of mined and reclaimed lands in the permanent program area of J19 and J21 at Kayenta Mine.

Attached, please find one electronic file of the Bond Release Application. PWCC understands that OSMRE will complete a bond release application review and will provide PWCC a response that will include details of information required so that OSMRE can deem the application complete. Once OSMRE has deemed the application complete, PWCC will submit a complete official application with signed documents to OSMRE electronically on the share drive provided by OSMRE and provide one copy of the application on USB drive for Forest Lake Chapter.

The reclaimed lands described within this Bond Release Application are subject to the Permanent Program Performance Standards at 30 CFR 816, because they were disturbed after issuance of Permanent Program Permits AZ-0002A on December 28, 1984 and AZ-0001C on July 6, 1990 pursuant to 30 CFR 750. Permit AZ-0001C was changed to AZ-0001D for the 5-year renewals during 1995, 2000, and 2005. Permit AZ-0001D was later changed to AZ-0001E for the 5-year permit renewal in 2010 and AZ-0001F for the 5-year permit renewal in 2015.

Please direct any questions and correspondence to me at 928-280-7091 or by email at mshepherd2@peabodyenergy.com .

Respectfully,

Marie Shepherd
Senior Manager Environmental
Kayenta Mine

VERIFICATION

I verify under oath that the information contained in this application for a permit, revision, renewal, bond release, or transfer, sales or assignments of permit rights is true and correct to the best of my information and belief.

Signature of Responsible Official _____

Title Director, Operations Support Date 1/28/2025

SUBSCRIBED AND SWORN TO BEFORE ME BY Randy S. Lehn

This 28th Day of January 2025

NOTARY PUBLIC Susie Crank

MY COMMISSION EXPIRES April 5, 2028

SUSIE CRANK
Notary Public - Arizona
Navajo County
Commission # 664886
My Comm. Expires Apr 5, 2028

PEABODY WESTERN COAL COMPANY
KAYENTA MINE
COAL RESOURCE AREA J19 AND J21

PHASE III BOND RELEASE APPLICATION

General Application Information

Date of Request: January 30, 2025

Permittee: Peabody Western Coal Company

Permit Number: AZ-0001F

Date Permit Approved: October 3, 2017

Mine Name: Kayenta Mine

Bond Release Phase Requested: Phase III

Acreage Requested for Release: 3,654 acres

Bonding Company: See Exhibit A

Bond Number: See Exhibit A

Current Bond Amount: $107,171,138 (See Exhibit A)

Bond Amount Requested for Release: $6,696,206 (See Exhibit A)

PEABODY WESTERN COAL COMPANY
KAYENTA MINE
COAL RESOURCE AREA J19 AND J21

PHASE III BOND RELEASE APPLICATION

Supporting Documentation

Permit, Location, and Bond History for Release Area Exhibit A

Maps & GIS Data Exhibit B

1. Bond Release Area
2. Wildlife/Hydrology Features
3. Years of Seeding, Reseeding, & Rill and Gully Repairs
4. Vegetation Communities – Sample Sites by Year
5. Reference Areas – Sample Sites by Year
6. GIS Shapefiles – bond release area, permit area, vegetation sample sites, reference area sample sites, vegetation communities, permanent transects, rock piles & drains, tree transplants, hydrology, grading years, topsoil years seeding years, reseeding and aerial photography.

Reclamation and Management History Exhibit C

1. Reclamation Narrative
2. Period of Responsibility
3. Permanent Facilities

Post- Mining Land Use Exhibit D

1. Rangeland Grazing
2. Wildlife Habitat
3. Cultural Plants

Revegetation Success Demonstration Exhibit E

Protection of the Hydrologic Balance Exhibit F

Certification that Lands are Free from Enforcement Actions Exhibit G

Notification Letters Exhibit H

1. Tribes (Navajo Nation and Hopi Tribe)
2. Government Agencies (BIA, BLM, EPA)
3. Navajo Nation Chapters (Chilchinbeto, Kayenta, Forest Lake, Shonto)
4. Utilities (NTUA)

Newspaper Advertisement Exhibit I

1. Draft Public Notice

PEABODY WESTERN COAL COMPANY
KAYENTA MINE
COAL RESOURCE AREA J19 AND J21

PHASE III BOND RELEASE APPLICATION

2. Final Public Notice
3. Proof of Publication

EXHIBIT A

Permit, Location, and Bond History for Release Area

Introduction

Peabody Western Coal Company (PWCC) is requesting Phase III bond release on portions of lands within the J19 and J21 Coal Resource Areas (CRAs) of Kayenta Mine. The J19 and J21 Phase III bond release application (P3BRA) included in this submittal contains required documentation and information to support Phase III bond release for 1,612 acres in the J19 CRA and 1,934 acres in the J21 CRA for mined and reclaimed lands in the permanent program areas within these CRAs as shown on Map 1, Exhibit B. Phase I bond releases for the 3,546 acres were approved April 5, 2010, July 9, 2012, January 4, 2017, and July 25, 2018. Phase II bond releases for the 3,546 acres were approved January 17, 2012, July 9, 2012, and December 19, 2022. PWCC is also requesting bond release for 108 acres of lands not included in the previous Phase I and II bond releases including two permanent ponds in J21 (4 acres), one permanent pond in J19 (3 acres), 7.0 miles of permanent roads (32 acres), and previously unreleased areas (69 acres) for reclaimed facility areas including roads and ponds. The total combined area for this J19 and J21 P3BRA is 3,654 acres. Information for the technical portions of the J19 and J21 P3BRA are contained in Exhibits B, C, D, E, and F. Certifications, notification letters to the Tribes, government agencies, or utilities, and newspaper advertisement information are included in Exhibits G, H, and I.

Permit and Bond Release Summary Information

The J19 and J21 CRAs are located within the southeastern portion of PWCC's Kayenta Mine. The Kayenta Mine operates under Permit AZ-0001F issued by the Office of Surface Mining Reclamation and Enforcement (OSMRE) to PWCC Kayenta Mine on October 3, 2017. Permanent Program Permit AZ-0001F was renewed five times; on July 6, 1995, on July 6, 2000, on July 6, 2005, on July 6, 2010, and lastly on July 6, 2015. The 5-year renewal application for Permit AZ-0001F was submitted to OSMRE on February 27, 2020. On June 25, 2020, OSMRE administratively delayed their decision to renew Permit AZ-0001F due to COVID-19 pandemic closures and stay-at-home orders. Coal production at the Kayenta Mine ceased on August 26, 2019; reclamation activities continue under Permit AZ-0001F. The J19 and J21 P3BRA shown on Map 1, Exhibit B includes 3,654 acres of land reclaimed following permanent program standards provided in the Permit Application Package of Permit AZ-0001F.

The mine permit area is located approximately 18 miles south southwest of Kayenta, Arizona (USGS 7.5-minute quadrangle maps Longhouse Valley, Marsh Pass S.E., Shonto S.E.,

Yucca Hill, and Cliff Rose Hill). The permit area for the J19 and J21 Phase III bond release is in USGS 7.5-minute quadrangle maps Yucca Hill and Cliff Rose Hill within the following lands of Navajo County, Arizona that are described relative to the Gila and Salt River Base Meridian as:

> A total of 3,654 acres of mined and reclaimed land located within the J19 and J21 CRAs. The computer-generated centroid location of this area is approximately Latitude 36° 26′ 54.0″ N and Longitude 110° 17′ 10.8″ W.

The type of bond and the amount of bond filed for Kayenta Mine Permit AZ-0001F are described in Table A.1. The total bond held for Kayenta Mine is $107,171,138. The portion requested for release in this J19 and J21 P3BRA is $6,696,206. Justification for the release dollars is explained in the following section.

Table A.1. Bond Information for Kayenta Mine.

Bond Surety	Bond Number	Bond Amount
Liberty Mutual	60S003887	$20,871,344.37
SiriusPoint America Insurance	SBP150171_003	$32,649,707.28
Zurich American	8940860	$17,178,247.35
Goldeman Sachs Bank, USA	Letter of Credit	$36,471,839.00
TOTAL		**$107,171,138.00**

Phase III Bond Reduction Cost

PWCC is seeking a reduction in bond for Phase III in the amount of $6,696,206. This amount was determined using direct and indirect unit costs calculated for 3,654 acres in J19 and J21 as documented in Permit AZ-0001F, Chapter 24, and as documented in Table 24-1-4, 24-1-8, and Tables 24-5-21 through 24-5-37. Reclamation cost estimates as of January 2024 ("worst case" or "highest liability") were used and these rates were adjusted for inflation through July 2025. Reduction in bond at the J19 and J21 CRAs was based upon completion of Phase III reclamation activities for 3,654 acres including all permit, reclamation, and management requirements; retention of permanent facilities in the postmining landscape to facilitate and enhance the postmining land use, protection of the hydrologic balance, all revegetation costs per 30 CFR 800.40(c), and a postmine land use evaluation.

The project categories and direct costs applicable to this Phase III bond release are listed in Table A.2 for the J19 and J21 CRAs. The Phase III reclamation activities

include revegetation, vegetation maintenance, permanent facilities retention, and environmental monitoring.

The total direct, indirect, and inflation costs as of July 2025 for the Phase III bond categories in the J19 and J21 CRA are $6,696,206.

Table A.2

Bond Reduction of Direct and Indirect Costs for Revegetation, Permanent Facilities, Vegetation Maintenance, & Environmental Monitoring for 3,654 acres in the J19 & J21 CRAs.

Project Category	**Bond Summary Amount**
Revegetation at J19 (18.00% of Table 24-1-4)[1]	$1,468,171
20% Vegetation Rework at J19 (0.00% of Table 24-1-4)[1]	$0
Revegetation at J21 (25.00% of Table 24-1-4)[2]	$ 814,217
20% Vegetation Rework at J21 (17.04% of Table 24-1-4)[2]	$ 501,721
Permanent Road Culvert Removal[3]	$ 26,182
Permanent Road Surfacing Removal[3]	$ 8,143
Permanent Road Surface Ripping[3]	$ 11,965
Permanent Road Grade Ripped Areas[3]	$ 289,251
Permanent Road Topsoil Replacement[3]	$ 242,161
Permanent Road Revegetation[3]	$ 194,690
Permanent Pond Retention (7 acres)[3]	$ 80,937
Facility Area Reclamation (107.6 acres)[3]	$1,333,272
Inflation (9.97% thru July 2025)	$ 495,580
Phase III Total Direct Cost	$5,466,290
Phase III Total Indirect Cost (22.5%)	$1,229,916
Total Direct and Indirect Cost	**$6,696,206**

[1] 2,333 acres remain for J19 Phase III release.
[2] 852 acres remain for J21 Phase III release.
[3] Per Permit AZ-0001F, Chapter 24, Tables 24-1-4 and 24-1-8.

Permanent Facilities

Exhibits C and D discuss, and Map 1 in Exhibit B shows the facilities that are proposed for retention in the postmining landscape to facilitate and enhance the postmining land uses. The current facilities located in the J19/J21 P3BRA include fences, three permanent impoundments designated J19-RA, J21-A1, and J21-C, permanent ancillary roads for local residents to access grazing areas, and permanent ancillary roads for local residents and

visitors to utilize motor vehicles to access the residences and sites of interest surrounding the J19 and J21 CRAs. Permanent impoundments are discussed in Exhibit F. Existing cross fences, discussed in Exhibits C and D, are used to facilitate managed grazing within the reclaimed pastures. PWCC is requesting approval from OSMRE, Tribal agencies, and the local transportation committee, if applicable, to leave permanent roads for accessing residences, interior grazing areas, permanent ponds, and sites of interest. The postmining access roads, left by PWCC for the purpose of accessing the postmining lands, will be maintained in the manner that other similar residential and range access roads have been traditionally maintained prior to any mining activities. All permanent facilities proposed for retention will enhance and compliment the postmining land uses.

EXHIBIT C

Reclamation & Management History

Contents

Tables

1 Overview

The Office of Surface Mining Reclamation and Enforcement (OSMRE) allows Phase III bond release on areas that have achieved the objectives of their permitted reclamation plan at least 10 years after initial revegetation. The objectives of Peabody Western Coal Company's (PWCC) revegetation program at the Kayenta Mining Complex (KMC) as detailed in Chapter 23 of the AZ-0001F permit application package (PAP) are as follows.

1. To establish diverse, effective, and permanent vegetation communities that are compatible with post-mining land use objectives, satisfy revegetation success criteria, and provide a mosaic of varying vegetal landscapes.
2. To achieve revegetation in a contemporaneous manner.
3. To stabilize and protect soil resources with respect to erosion.
4. To develop highly productive and nutritional grazing sources adaptive to grazing management systems.
5. To enhance wildlife habitat in the post-mining landscape.
6. To provide a source of culturally significant plant materials.

This Exhibit details the reclamation and management history of the 3,654 acres included in the J19/J21 Phase III Bond Release Area (P3BRA) shown on Map 1 of Exhibit B. This P3BRA includes approximately 1,632 acres in the J19 Coal Resource Area (CRA) and 2,022 acres in the J21 CRA (Table 1). A total of 3,614 of the total acres were revegetated, while 33 acres are permanent postmining roads, and almost 7 acres are permanent postmining pond impoundments. The following sections demonstrate that the area was revegetated more than 10 years ago using approved methods and techniques to meet these objectives. Details satisfying objectives 2 and 3 are included here. Information supporting objectives 1, 4, 5, and 6 is included in Exhibits D and E of this application package.

Table 1: Total Acres and Bond Release Status

Permanent Program Lands	**J19 CRA**			**J21 CRA**			**Total in P3BRA**
	Phase II	**Un-released[1]**	**Total**	**Phase II**	**Un-released[1]**	**Total**	
Revegetated Areas	1612.3	17.0	1629.3	1932.9	52.1	1985.0	3614.3
Permanent Post-Mine Facilities							
Roads			0.0	1.3	31.7	33.0	33.0
Pond Footprints		3.0	3.0		3.8	3.8	6.8
Total Acres	**1612.3**	**20.0**	**1632.3**	**1934.2**	**87.6**	**2021.8**	**3654.0**

[1] A discussion of the previously unreleased areas is presented in Section 1.1.

1.1 Areas with No Phase I or II Release

As illustrated in Table 1, there are 107.6 acres of previously unreleased reclaimed areas included in this application. These areas were associated with the removal of ponds and roads and were ready to be included with earlier Phase I and II applications. These areas are shown on Map 1 in Exhibit B. These areas were appropriately seeded and have established vegetation. These revegetated acreages are also included in Table 2.

2 Contemporaneous Reclamation

Mining occurred in the J19/J21 P3BRA from 1985 through 2014 and generally progressed from north northeast to west southwest in a horseshoe pattern in both CRAs. Reclamation activities including backfilling, grading, topsoiling, and seeding occurred concurrent with mining beginning in 1986 and were completed in this P3BRA by the end of 2015. Reclamation maintenance activities including interseeding, noxious weed management, and rill and gully repair have been completed, as needed.

Table 2: Reclamation Acres by Year

Year	J19 CRA			J21 CRA		
	Final Grading	**Topsoiling**	**Seeding**	**Final Grading**	**Topsoiling**	**Seeding**
1986	-	-	-	6.2	7.0	4.0
1987	-	-	-	3.9	3.1	4.9
1988	-	-	-	5.6	4.9	12.5
1989	59.7	1.1	1.0	1.9	1.5	1.0
1990	-	50.6	50.7	4.8	3.2	3.7
1991	-	-	-	0.1	0.4	0.0
1992	-	-	-	3.6	2.8	3.2
1993	-	-	-	0.9	0.0	0.0
1994	-	-	-	13.3	1.7	2.6
1995	70.8	-	-	15.1	5.6	5.9
1996	12.9	47.2	45.9	3.6	2.2	0.9
1997	97.5	2.4	-	80.6	54.1	7.8
1998	62.8	78.8	10.1	57.6	27.5	66.2
1999	287.1	220.4	288.7	111.1	65.7	63.3
2000	212.1	114.6	115.5	123.5	72.4	63.7
2001	102.6	74.9	75.7	151.6	31.4	42.3
2002	47.6	189.3	171.4	231.5	262.2	121.2
2003	77.6	92.8	30.8	248.3	253.0	282.1
2004	34.5	54.9	146.5	92.1	66.8	91.5
2005	8.3	45.2	40.8	129.1	83.2	65.0
2006	26.2	17.8	12.1	215.8	99.9	84.6
2007	63.1	30.4	9.3	270.8	232.3	298.5
2008	-	6.8	26.7	40.6	130.5	89.2
2009	140.0	98.2	9.8	32.0	173.0	191.2
2010	51.9	53.4	119.4	10.9	25.5	39.7
2011	1.9	10.5	29.8	6.8	19.2	31.5
2012	142.7	42.0	12.9	18.1	106.6	144.6
2013	75.7	38.7	61.0	16.5	139.4	22.8
2014	27.0	116.7	98.0	55.7	55.0	137.0
2015	27.5	242.5	272.9	33.3	54.7	104.0
Total	**1629.3**	**1629.3**	**1629.3**	**1984.9**	**1984.9**	**1984.9**

3 Period of Responsibility

The 3,654 reclaimed acres included in the J19/J21 P3BRA were reclaimed more than 10 years prior to this bond release request. Seeding years are shown on Map 3 in Exhibit B. Final grading, topsoiling, and seeding occurred from 1986 to 2015.

4 Reclamation Narrative

Reclamation activities on the J19/J21 P3BRA followed the methods and procedures detailed in Chapters 22 and 23 of the AZ-0001F PAP. Upon completion of topsoil application and final grading, reclamation areas were ripped on the contour using dozers, graders, or farm equipment equipped with multi-shanked deep rippers. After ripping, a modified offset disk was used to create contour furrows. This prepared seed bed was then seeded with either drill or broadcast methods using an approved seed mixture and seeding rate. Native hay mulch was applied and crimped in most areas after seeding with straw mulch used as an alternative on temporary reclamation areas and erosion blankets or geotextile fabrics used for localized slope stabilization. Most reclamation activities were conducted between April and September except cultural planting and tree/shrub transplanting areas which are typically planted in September through March. However, reclamation activities have been conducted throughout the year as ground conditions allowed.

4.1 Species Selection

PWCC uses the rangeland reclamation seed mixture presented in Chapter 23 Table 1 of the AZ-0001F PAP for most reclamation. However, species used, their relative percentages, and overall seeding rates may vary based on commercial availability of seed in any given year as well as site-specific reclamation goals such as increased shrub density in some areas. The PAP includes a list of approved alternative species (Chapter 23 Appendix A Table A-1) that can be substituted for unavailable species of the same life form and seasonality. Additionally, other seed mixtures are approved for use in specific reclamation situations including drainage channels and small depressions, around ponds, temporary stabilization, rill and gully repairs, and cultural planting areas. Some of the areas in the J19/J21 P3BRA seeded prior to 1993 were seeded with a previously approved rangeland reclamation seed mixture which included some other species. There are 30 species that were most commonly used in reclamation seed mixtures within the J19/J21 P3BRA (Table 3).

4.2 Reclamation Communities

The J19/J21 P3BRA includes three reclamation communities: grassland, shrubland, and woodland. Grassland areas encompass 1,377 acres of the J19/J21 P3BRA. These areas primarily support livestock and wildlife grazing. Shrubland areas encompass 2,068 acres and are intended to aid community diversity and increase wildlife habitat potential with an average of twice as many shrubs than the grassland areas. Grassland and shrubland areas were delineated using aerial photography and field reconnaissance in 2022 in the J19/J21 P3BRA. Both community types are established using the same seed mixture, but over the liability period, the microhabitats most suited to shrubs such as north-facing slopes and coarser surface soils tend to develop a greater density of shrubs.

Table 3: J19/J21 P3BRA Reclamation Species

Scientific Name	Synonym	Common Name	Approved Seed Mixture				
			Rangeland	Drainage	Temporary	Rill/Gully	Pre-1993
Agropyron cristatum	*Agropyron desertorum*	crested wheatgrass					x
Agropyron dasystachyum	*Elymus lanceolatus*	thickspike wheatgrass	x		x	x	
Agropyron elongatum	*Thinopyrum ponticum*	tall wheatgrass		x			
Agropyron inerme	*Pseudoroegneria spicata*	bluebunch wheatgrass	x				
Agropyron riparium	*Elymus lanceolatus*	streambank wheatgrass		x			
Agropyron smithii	*Pascopyrum smithii*	western wheatgrass	x	x		x	x
Agropyron trichophorum	*Thinopyrum intermedium*	pubescent wheatgrass	x		x	x	x
Astragalus cicer		Cicer milkvetch				x	
Atriplex canescens		fourwing saltbush	x	x		x	
Atriplex confertifolia		shadscale	x	x			
Bouteloua curtipendula		sideoats grama	x				
Bouteloua gracilis		blue grama	x				
Bromus inermis		Lincoln brome					x
Distichlis spicata		inland saltgrass		x			
Elymus cinereus	*Leymus cinereus*	basin wildrye		x			
Elymus junceus	*Psathyrostachys juncea*	Russian wildrye	x		x		x
Eurotia lanata	*Krascheninnikovia lanata*	winterfat	x				
Hilaria jamesii	*Pleuraphis jamesii*	galleta	x				x
Kochia prostrata	*Bassia prostrata*	prostrate kochia	x	x			
Linum lewisii		blue flax	x				
Medicago sativa		alfalfa					x
Melilotus officinalis		yellow sweetclover			x		x
Onobrychis viciaefolia		sainfoin	x				
Oryzopsis hymenoides	*Achnatherum hymenoides*	Indian ricegrass	x				x
Penstemon palmeri		Palmer penstemon	x				
Ratibida columnaris	*Ratibida columnifera*	prairie coneflower	x				
Sanguisorbia minor		small burnet	x	x		x	
Sarcobatus vermiculatus		greasewood		x			
Sporobolus airoides		alkali sacaton	x	x			x
Sporobolus cryptandrus		sand dropseed	x				

The woodland areas encompass 169 acres and were designed to feature plant species that are culturally important to Navajo or Hopi peoples while also enhancing the diversity of available wildlife habitat. Included within each of the reclamation communities in the J19/J21 P3BRA are rock habitat features. Rock features are placed in reclaimed areas to provide wildlife escape and thermal cover, small animal den locations, promote enhanced shrub and tree establishment, and provide raptor perches for hunting and resting. Forty-eight rock features are shown on Map 2 in Exhibit B.

4.3 Tree Transplanting

There are twenty-four tree transplant sites within the J19/J21 P3BRA. These sites have a variety of pinyon and juniper trees that were transplanted using a tree spade from areas of the mine that were scheduled for mining disturbance. Several surveys were conducted and documented in Annual Reports to determine tree survival. Results of the surveys conducted in 2023 and 2024 are included in Exhibit E of this application. Tree transplanting has since been discontinued at KMC due to limited long-term survival and emphasis has been placed on the more successful program of planting tree seedlings in red rock areas.

5 Maintenance

Maintenance activities have been performed in the J19/J21 P3BRA, as needed, per the methods outlined in the AZ-0001F PAP. Maintenance activities have included interseeding, reseeding, weed control, erosion monitoring and repairs, fence installation and maintenance, and grazing.

5.1 Interseeding & Reseeding

Interseeding of reclaimed areas is performed as needed based on the results of annual quantitative vegetation monitoring and qualitative field inspections. Germination is evaluated after the first growing season, but poor establishment is often not apparent until after the third growing season. Interseeding is conducted to improve stand density in areas that are developing but require augmentation.

Reseeding involves re-tilling of the surface soils and reseeding in areas where monitoring data suggests that the stand will not adequately develop. Historical monitoring of reclaimed areas throughout the KMC has shown that very few areas require reseeding, and most stands establish well and develop to meet the success criteria for bond release. Areas within the J19/J21 P3BRA that required reseeding over the past 25 years are listed in Table 4 and are shown on Map 3 in Exhibit B. While a few of these areas were reseeded less than 10 years ago, these areas have generally been very small and have consisted of terraces that were reworked or removed as a part of rill and gully repairs. At the time when these terraces were reworked, OSMRE indicated that they would allow this limited acreage to be included in the J19/J21 P3BRA.

Table 4: Acres Reseeded by Year

Year	J19 CRA	J21 CRA
1991	1.2	
1997		2.5
1998	3.7	
2001	46.8	0.9
2003		4.0
2004		32.4
2005		28.5
2008	4.9	
2009		15.8
2010	2.6	7.2
2011	8.6	3.7
2012	35.8	3.5
2013	4.5	9.7
2014		8.3
2015	5.1	23.9
2016	12.3	1.9
2017	1.7	1.5
2018	13.8	3.9
2019	12.0	
2020	0.3	1.9
2021	4.7	
2023	10.1	
Total	**168.1**	**149.6**

5.2 Noxious Weed Management

Noxious weeds are minimal on the J19/J21 P3BRA. The KMC is monitored annually for noxious weeds on both the Arizona noxious weed list (Plant Services Division 2024) and the Navajo Nation noxious weed list (Bureau of Indian Affairs 2022). Weed control efforts mine-wide place an emphasis on those species on the "A" and "B" lists by either the Navajo Nation or the State of Arizona. The species listed in these categories must be eradicated or controlled to prevent their spread.

Ten noxious weed species were observed during vegetation monitoring in 2023 – 2024 (Table 5) and only three fall into the priority categories on either list. Whitetop pepperweed was observed on one shrubland transect in 2024 and contributed only 0.1% of the average cover in the shrubland areas. Musk thistle was observed on a single grassland transect in both 2023 and 2024 and did not contribute to the vegetation cover data in either year. One Russian olive tree was observed on one woodland transect in 2023 and accounted for 0.5% of the overall tree density. The other seven species found on the noxious weed lists all have the "C" rating which states that "control efforts are not a high priority…Emphasis is placed on management, education, awareness, and identification/monitoring." Overall, the ten noxious species contributed between 0.08% and 0.75% of the overall cover in their respective datasets. Detailed vegetation cover data is presented in Exhibit E.

Table 5: Noxious Weeds Observed 2023 – 2024

Scientific Name	Common name	Arizona Noxious Weed List	Navajo Nation Noxious Weed List	2023	2024
Cardaria draba	whitetop pepperweed	A	A		X
Carduus nutans	musk thistle	B	A	X	X
Elaeagnus angustifolia	Russian olive	B	B	X	
*Bromus inermis**	smooth brome		C	X	
Bromus japonicus	Japanese brome		C	X	
Bromus tectorum	cheatgrass		C	X	X
Convolvulus arvensis	field bindweed	C	C	X	
Kochia scoparia	fireweed summercypress	C	C	X	X
Marrubium vulgare	horehound		C	X	
Salsola iberica	Russian thistle		C	X	X

* Species was included in older PWCC reclamation seed mixtures

Noxious weed management at KMC has focused on herbicide treatment of vegetation around the electrical substations and fuel storage areas as well as noxious species observed along roadways and conveyors. The lack of priority noxious weeds present in the reclamation on the J19/J21 P3BRA suggests that the KMC noxious weed management program has been effective. Details of noxious weed treatments are reported in annual weed management reports.

6 Roads & Permanent Facilities

Exhibit D discusses and Map 1 in Exhibit B shows the facilities that are proposed for retention in the postmining landscape to facilitate and enhance the postmining land uses. The current facilities located in the J19/J21 P3BRA include fences, three permanent impoundments designated J19-RA, J21-A1 and J21-C, permanent ancillary roads for local residents to access grazing areas, and permanent ancillary roads for local residents and visitors to utilize motor vehicles to access the residences and sites of interest surrounding the J19 and J21 CRAs. Permanent impoundments are discussed in Exhibit F. Permanent roads and impoundments account for approximately 40 acres of the total P3BRA (Table 1).

There are 15 pastures in the J19 CRA and 21 pastures in the J21 CRA. All of the J19 pastures and 10 of the J21 pastures are at least partially included in the P3BRA. These fenced pastures are grazed by local resident's cattle, sheep, and/or horses. Details of PWCC's grazing program are included in Exhibit D. These fences will remain in place unless the Navajo Nation requests their removal. Splitting pastures into smaller units and rotating livestock through the pastures improves rangeland and soil health by allowing each pasture time to re-grow without grazing pressure. PWCC is requesting approval from OSMRE, Tribal agencies, and the local transportation committee, if applicable, to leave permanent roads for accessing residences, interior grazing areas, permanent ponds, and sites of interest surrounding the J19/J21 CRAs. The postmining access roads, left by PWCC for the purpose of accessing the postmining lands, will be maintained in the manner that other similar residential and range access roads have been traditionally maintained prior to any mining activities. All permanent facilities proposed for retention will enhance and complement the postmining land use.

7 References

Bureau of Indian Affairs. 2022. Navajo Nation Integrated Weed Management Plan. August 2022. URL: https://www.bia.gov/sites/default/files/dup/inline-files/appendix_a._navajo_nation_integrated_weed_management_plan_no_appendix.pdf [Accessed July 2024].

Plant Services Division. 2024. Regulated and Restricted Noxious Weeds. Arizona Department of Agriculture. URL: https://agriculture.az.gov/pestspest-control/agriculture-pests/noxious-weeds [Accessed July 2024].

EXHIBIT D

Post-Mining Land Use

Contents

Tables

1 Overview

The permitted post-mining land uses for the Kayenta Mining Complex (KMC) are rangeland grazing, wildlife habitat, and cultural plants. To demonstrate that these land uses have been achieved, Peabody Western Coal Company (PWCC) manages a sustainable community-based grazing program, conducts annual monitoring to document wildlife use mine-wide, and conducts annual vegetation monitoring.

The rangeland grazing program was initiated in 1999 and is ongoing. This program uses site-specific annual vegetation production and precipitation information to adjust grazing intensity and duration. The rangeland grazing program actively involves the post-mining land users and serves to educate them regarding sustainable livestock and pasture management. This program was recognized by the Office of Surface Mining Reclamation and Enforcement (OSMRE) in 2005 with the National Excellence in Surface Coal Mining and Reclamation Award.

Wildlife monitoring is conducted year-round at the mine for reclaimed lands and specific species. Formal studies are augmented by opportunistic sightings recorded by mine personnel and contractors engaged in mining and reclamation activities. Reclaimed lands have developed vegetation communities capable of supporting a wide range of wildlife species including birds, mammals, and reptiles. As reclaimed vegetation communities continue to develop it is expected that they will attract additional species and wildlife use will continue to increase. Wildlife monitoring programs conducted since 1981 support increased use over time.

Shrubland, woodland, and cultural plant communities are established as islands interspersed within reclaimed areas on predominantly north-facing hillslopes, below ridgelines, and along drainage bottoms. These areas are selected to improve landscape and community diversity, develop diverse habitat features, establish travel corridors, expand the use of more open rangeland areas, diversify and increase the prey base for predatory mammals and raptors, provide a source of culturally significant plant materials, and introduce sources of native plant propagules for migration into the surrounding rangeland vegetation. The cultural planting program at the KMC was recognized by OSMRE in 1998 with the National Excellence in Surface Coal Mining and Reclamation Award and in 2002 with the Director's Award. Additionally, this program received the 1996 American Society of Surface Mining and Reclamation Award.

2 Rangeland Grazing Program

There are 15 pastures in the J19 Coal Resource Area (CRA) and 21 pastures in the J21 CRA. All of the J19 pastures and 10 of the J21 pastures are at least partially included in the Phase III bond release area (P3BRA). These pastures total 3,359 acres. Details of the grazing program are included in each year's annuals report starting in 2000. A summary of the annual grazing program's use of the J19/J21 P3BRA pastures is included in Table 1.

Table 1: J19/J21 P3BRA Pastures in the Annual Grazing Program

Year	Pastures Grazed	Acres Grazed	Estimated AUMs	Months Grazed	Species
2007	1	219	77.5	Sep-Nov	Cattle
2008	2	363	114.8	Jan-Apr	Cattle
2012	1	324	*	Jan-Apr; Oct-Dec	Cattle
2013	1	324	*	Jan-Apr; Oct-Dec	Cattle
2014	15	2,260	*	Jan-Apr; Oct-Dec	Cattle
2015	15	2,260	*	Jan-Apr	Cattle
2016	6	1,063	73	Nov-Dec	Cattle
2017	13	1,903	314	Jan-Apr; Nov-Dec	Cattle
2018	12	1,811	209	Jan-Mar	Cattle
2019	8	1,520	157	Nov-Dec	Cattle/Sheep
2020	15	2,379	339	Jan-Mar; Nov-Dec	Cattle/Sheep/Horses
2021	13	2,130	137	Jan-Mar	Cattle/Horses
2022	9	1,952	76	Nov-Dec	Cattle
2023	14	2,470	209	Jan-Mar; Nov-Dec	Cattle
2024	14	2,047	130	Jan-Mar	Cattle/Horses

* Months and AUMs were not tracked by individual pasture in these years.

At least some grazing has occurred in the pastures within the J19/J21 P3BRA every year since 2012 with grazing in a few pastures previously in 2007 and 2008. Starting in 2005, PWCC has predominantly allowed mine-wide dormant season grazing only, which allows vegetation to grow unhindered during the growing season. There are some cases of extended grazing beyond the dormant season, but these are special cases only. From the fall of 2012 through the spring of 2015, PWCC tried an honor system grazing program in an effort to teach local residents about rotational grazing practices. PWCC staff provided oversight and suggested when animals should be moved, but did not track dates and animal units by pasture. Formal tracking by pasture resumed in the fall of 2016 and has continued through the present.

2.1 Stocking Rates

Annual livestock stocking rates and pasture rotations are determined based on estimated available forage. Reclaimed vegetation productivity samples adjusted for annual and seasonal variations in precipitation are used to calculate available forage. Stocking rates are based on animal units (AU); one AU is the equivalent of a 1000-pound dry cow. An animal unit month (AUM) is the amount of forage required to support one animal unit for one month and is equal to 900 pounds of dry forage. AU equivalents as described in Valentine (1990) were used to determine mixed age class or mixed species herd stocking rates. A 50% utilization rate is applied along with a 20% reduction to account for wildlife use and trampling loss.

Families participating in PWCC's grazing program are asked to submit a list of their animals and preferred pastures. Total AUs are calculated for each family's herd and grazing durations in each pasture are based on the estimated available AUMs of forage. An effort is made to accommodate each family's preferences when assigning pastures, but available forage, rangeland health, and herd composition are the primary considerations. PWCC staff and contractors visually monitor

pastures at least once a month during the winter grazing season to verify the grazing plans are being followed and evaluate forage health.

3 Wildlife Habitat Establishment

Wildlife habitats and ranges are not limited by anthropogenic boundaries. Evaluation of wildlife use on reclaimed habitats requires a holistic approach that considers reclaimed lands, adjacent undisturbed lands, and the interaction of wildlife species between and within these habitat types. Wildlife monitoring is conducted mine-wide every year to document species presence and habitat use.

PWCC has committed to returning more than 5% of the permanent program reclaimed lands to wildlife habitat. This is achieved through a combination of reclamation components, non-vegetal enhancements, and the development of water sources in the post-mining landscape.

3.1 Reclamation for Wildlife

Post-mining topography, variations in growth media, multiple seed mixtures, shrub and tree establishment, and developed water sources are all components of PWCC's reclamation plan designed to provide a diversity of wildlife habitats. Successful achievement of vegetation cover, diversity, shrub density, and tree transplant survival standards (Exhibit E) demonstrate that reclaimed vegetation communities have been established and are developing to provide suitable habitats for a variety of wildlife species.

3.2 Non-Vegetal Habitat Enhancements

Rock features are placed in reclaimed areas to provide escape and thermal cover, small animal den locations, promote shrub and tree establishment, and provide raptor perches for hunting and resting. At least one rock feature is to be constructed for every 100 acres of reclamation except where local residents have objected to their creation. Per Chapter 23 of Permit AZ-0001F, rock downdrains, spillways, and drainages are often included as rock features since they typically provide area-wide habitat, structural diversity, and landscape stability. The J19/J21 P3BRA includes 48 such features and meets this minimum density requirement. The locations of these features are shown on Map 2 in Exhibit B.

Additionally, installation of raptor hunting and resting perches is required at a density of one perch per 400 acres of reclamation. There are four constructed perches that falls within the P3BRA shown on Map 2 in Exhibit B. There are also two powerline corridors that transect the P3BRA. The poles within this corridor are currently functioning as raptor perches and several of the poles will be retained for this purpose if the powerline is decommissioned in the future.

3.3 Water for Wildlife

There are several proposed and/or constructed permanent sediment control structures in the J19 and J21 CRAs that impound and provide suitable water for wildlife and livestock. Three of these water features (Ponds J21-A1, J21-C, and J19-RA) are located within the J19/J21 P3BRA, they are located in close proximity and support wildlife use of this area (Map 2 Exhibit B).

3.4 Annual Wildlife Monitoring

Mine-wide wildlife monitoring has been formally conducted at KMC every year since 1981 in compliance with the current Permit Application Package (PAP). Six separate monitoring tasks

were completed annually during active mining until 2018 when mining ceased. Starting in 2019, four of these wildlife monitoring tasks continued to be conducted each year:

1. Red-tailed hawk (*Buteo jamaicensis*) nest monitoring
2. Gunnison's prairie dog (*Cynomys gunnisoni*) colony assessment
3. Navajo special-status species reconnaissance surveys
4. Reclaimed land species reconnaissance

Results from these four monitoring tasks are provided in the following sections. In addition to these specific monitoring tasks, opportunistic wildlife observations are recorded during the year. Complete details of the past wildlife monitoring can be found in each individual year's annual report.

3.4.1 Red-Tailed Hawk Nest Monitoring

The year-round population of red-tailed hawks at KMC has been estimated at 12 to 18 pairs within the lease. However, the habitat at KMC is thought to be capable of supporting up to 75 pairs in peak years when adequate vegetation can support increased prey (LaRue 1994). Each year known nesting locations are monitored and opportunistic sightings are recorded during other wildlife, meteorological, and vegetation surveys. Nests are often located adjacent to reclaimed areas which provide excellent hunting for small mammals.

Currently, there are two active red-tailed hawk nests though none fall within the J19/J21 P3BRA. However, red-tailed hawks have been observed flying, hunting, and perching within the area.

3.4.2 Gunnison's Prairie Dog Colony Assessment

Gunnison's prairie dog colonies are annually monitored within the KMC permit boundary to determine if suitable habitat exists for the federally threatened black-footed ferret (*Mustela nigripes*) which is considered a prairie dog obligate species. Since survey efforts began, 22 active prairie dog colonies have been documented, though none have fit the Navajo Nation Department of Fish and Wildlife (NNDFW) criteria for formal black-footed ferret surveys.

There are five currently active Gunnison's prairie dog colonies on the KMC: near the Black Mesa facility, J3, J16, and N6 mining areas. None of them are in the J19/J21 P3BRA.

3.4.3 Navajo Special-Status Species Reconnaissance Surveys

Special-status species reconnaissance surveys have been performed on the KMC since the mid-1980s to identify suitable habitat and topographical features for species of interest. Threatened, endangered, or candidate species including migratory bird species, non-endangered raptors, or animals of interest (reptiles, mammals) observed were recorded. The most current NNDFW sensitive species list, Navajo Endangered Species List (NESL), Arizona state list, Federal Endangered Species list, and Migratory Bird Treaty Act (MBTA) list were used for observations. Species observed that have unknown population distribution, unique habitat requirements, and/or at-risk population viability are also noted. Both official and opportunistic surveys are conducted throughout the year.

Twenty-four special-status species have been observed within the J19/J21 area during the last seven survey years including thirteen sensitive or endangered species for NNDFW and five bird of prey species (Table 2).

3.4.4 Reclaimed Land Species Reconnaissance

Wildlife observations on reclaimed areas have been reported annually since the mid-1980s and have included bats, birds, herps, lagomorphs, ungulates, and other mammals. Formal monitoring efforts specific to bond release began in 2002. Recorded data come from both formal wildlife surveys on reclaimed areas and opportunistic observations made during other field activities performed throughout the year, such as vegetation and meteorological monitoring.

The reclaimed areas throughout the KMC include grasslands, sagebrush, woodlands, cultural planting areas, drainages, and ponds that attract an array of bird, mammal, and herp species. Wildlife species observed in the J19/J21 area total 97 species during recent years (Table 2).

4 Cultural Planting Program

The Navajo Nation and Hopi Tribe requested that plants of cultural significance be reestablished as a part of reclamation activities at the KMC. Cultural planting areas have been included as a component of the reclamation program since 1991. Culturally important plants that have religious, medicinal, functional, or economic importance were included on the list of potential species listed in the AZ-0001F Permit (Table B-1, Chapter 23). This list was compiled from multiple written references and consultations with the Navajo and Hopi Tribes with input from medicine men, herbalists, and residents of the area. Over 120 species have been identified and over 50 of these species have been used for seeding and planting projects.

The KMC began using red rock (scoria) for cultural planting sites in 1998 using both seeding and/or transplanting of culturally important species. Most of these areas are on north facing slopes and currently comprise 5 to 10% of the annual reclamation. These areas comprise about 5% of the reclamation in the J19/J21 P3BRA. Planted seedlings are grown in a nursery from locally or regionally collected seed sources. Nursery cultural protocols have been developed over time to maximize success including inoculation with mycorrhizal fungi and all seedlings are hand-planted. The KMC has established over 600 acres of red rock cultural areas mine-wide and transplanted over 500,000 seedlings.

There are 45 cultural planting areas included in the J19/J21 P3BRA identified as Woodland areas on the map in Exhibit B Map 4. In these areas as well as elsewhere throughout the P3BRA, 49 species identified through this program as having cultural significance were found during vegetation monitoring in 2023 – 2024 (Table 3). Twelve of these species are included in approved seed mixtures that may have been used in this reclamation, but the other 37 species have volunteered in the reclamation area. Many of these volunteers likely established due to seed sources from cultural planting areas adjacent to this reclamation. Not only have the cultural planting areas been successfully established themselves, but they are promoting the development of vegetation communities with culturally important plants beyond their planting boundaries.

5 References

LaRue, C. 1994. Birds of Northern Black Mesa, Navajo County, Arizona. Great Basin Naturalist 54(1).

Valentine, J. F. 1990. Grazing Management. Academic Press, San Diego, CA.

Table 2: Wildlife Species Observed in J19/J21 2018 – 2024

Family	Common Name	Scientific Name
Birds		
Accipitriformes	Golden Eagle[2,3]	Aquila chrysaetos
	Red-tailed Hawk[5]	Buteo jamaicensis
	Ferruginous Hawk[2,3]	Buteo regalis
	Northern Harrier[1]	Circus hudsonius
	Bald Eagle[2,3]	Haliaeetus leucocephalus
Anseriformes	American Wigeon	Anus americana
	Northern Shoveler	Anas clypeata
	Green-winged Teal[1]	Anas crecca
	Cinnamon Teal[1]	Anas cyanoptera
	Mallard	Anas platyrhynchos
	Gadwall	Anus strepera
	Lesser Scaup	Aythya affinis
	Redhead	Aythya americana
	Ring-necked Duck	Aythya collaris
	Canvasback	Aythya valisineria
	Canada Goose	Branta canadensis
	Common Merganser[1]	Mergus merganser
	Ruddy Duck	Oxyura jamaicensis
	Blue-winged Teal	Spatula discors
Caprimulgiformes	White-throated Swift	Aeronautes saxatalis
	Black-chinned Hummingbird	Archilochus alexandri
Cathartiformes	Turkey Vulture[5]	Cathartes aura
Charadriiformes	Killdeer	Charadrius vociferous
	California Gull	Larus californicus
	Franklin's Gull	Leucophaeus pipixcan
	American Avocet[1]	Recurvirostra americana
	Greater Yellowlegs	Tringa melanoleuca
Columbiformes	White-winged Dove	Zenaida asiatica
	Mourning Dove	Zenaida macroura
Cuculiformes	Greater Roadrunner[1]	Geococcyx californianus
Falconiformes	Merlin[5]	Falco columbarius
	Prairie Falcon[5]	Falco mexicanus
	Peregrine Falcon[1,3]	Falco peregrinus
	American Kestrel[5]	Falco sparverius
Gruiformes	Sora[2]	Porzana carolina
	American Coot	Fulica americana
Passeriformes	Red-winged Blackbird	Agelaius phoeniceu
	Black-throated Sparrow	Amphispiza bilineata
	Western Scrub-jay	Aphelocoma californica

Table 2 (continued): Wildlife Species Observed in J19/J21 2018 – 2024

Family	Common Name	Scientific Name
Birds		
Passeriformes	Sagebrush Sparrow	Artemisiospiza nevadensis
	Juniper Titmouse	Baeolophus ridgwayi
	Lark Sparrow	Chondestes grammacus
	American Crow	Corvus brachyrhynchos
	Common Raven	Corvus corax
	Gray Flycatcher	Empidonax wrightii
	Horned Lark	Eremophila alpestris
	Pinyon Jay3	Gymnorhinus cyanocephalus
	House Finch	Haemorhous mexicanus
	Dark-eyed Junco	Junco hyemalis
	Loggerhead Shrike[3]	Lanius ludovicianus
	Song Sparrow	Melospiza melodia
	Northern Mockingbird	Mimus polyglottos
	Brown-headed Cowbird	Molothrus ater
	Ash-Throated Flycatcher	Myiarchus cinerascens
	Sage Thrasher	Oreoscoptes montanus
	Blue Grosbeak	Passerina caerulea
	Western Tanager	Piranga ludoviciana
	Spotted Towhee	Pipilo maculatus
	Blue-gray Gnatcatcher	Polioptila caerulea
	Mountain Chickadee	Poecile gambeli
	Vesper Sparrow[3]	Pooecetes gramineus
	Bushtit	Psaltriparus minimus
	Ruby-crowned Kinglet	Regulus calendula
	Rock Wren	Salpinctes obsoletus
	Say's Phoebe	Sayornis saya
	Yellow-rumped Warbler	Setophaga coronata
	Black-throated Gray Warbler	Setophaga nigrescens
	White-breasted Nuthatch	Sitta carolinensis
	Western Bluebird	Sialia mexicana
	Brewer’s Sparrow	Spizella breweri
	Pine Siskin	Spinus pinus
	Lesser Goldfinch	Spinus psaltria
	Western Meadowlark	Sturnella neglecta
	Mountain Bluebird	Sialia currucoides
	Northern Rough-winged Swallow	Stelgidopteryx serripennis
	Violet-green Swallow	Tachycineta thalassina
	Bewick's Wren	Thryomanes bewickii
	Western Kingbird	Tyrannus verticalis

Table 2 (continued): Wildlife Species Observed in J19/J21 2018 – 2024

Family	Common Name	Scientific Name
Birds		
Pelecaniformes	White-faced Ibis[3]	Plegadis chihi
Piciformes	Northern Flicker	Colaptes auratus
	Red-naped Sapsucker	Sphyrapicus nuchalis
Strigiformes	Northern Saw-whet Owl[2]	Aegolius acadicus
Mammals		
Artiodactyla	Elk	Cervus elaphus
	Mule Deer	Odocoileus hemionus
Carnivora	Coyote	Canis latrans
	Bobcat	Lynx rufus
Lagomorpha	Black-tailed Jackrabbit	Lepus californicus
	Desert Cottontail	Sylvilargus audubonii
Rodentia	White-tailed Antelope Squirrel	Ammospermophilus leucurus
	Gray-collared Chipmunk[3]	Neotamias cinereicollis
	Desert Woodrat1	Neotoma lepida
	Hopi Chipmunk	Neotamias rufus
Herps		
Squamata	Arizona Striped Whiptail Lizard[3]	Aspidoscelis arizonae
	Greater Short-horned Lizard	Phrynosoma hernandesi
	Desert Spiny Lizard	Sceloporus magister
	Fence Lizard	Scelophorus undulates
	Side-blotched Lizard	Uta stansburiana

[1]NNDFW Sensitive Species, [2]NNDFW Endangered Species, [3]AZGFD Special-status Species, [4]MBTA, [5]Non-endangered Raptors

Table 3: Culturally Important Plant Species Observed in J19/J21 P3BRA

Scientific Name	Common Name
Grasses	
Agropyron smithii	western wheatgrass
Bouteloua gracilis	blue grama
Hilaria jamesii	James' galleta
Monroa squarrosa	false buffalograss
Oryzopsis hymenoides	Indian ricegrass
Sporobolus airoides	alkali sacaton
Sporobolus cryptandrus	sand dropseed
Forbs	
Achillea lanulosa	common yarrow
Castilleja linariaefolia	Indian paintbrush
Chenopodium graveolens	fetid goosefoot
Convolvulus arvensis	field bindweed
Cymopterus purpurascens	widewing springparsley
Eriogonum alatum	winged wildbuckwheat
Helianthus annuus	common sunflower
Leucelene ericoides	rose heath
Marrubium vulgare	horehound
Medicago sativa	alfalfa
Mirabilis multiflora	Colorado four o'clock
Penstemon barbatus	scarlet bugler
Petradoria pumila	rock goldenrod
Portulaca oleracea	common purslane
Rumex crispus	curly dock
Sphaeralcea ambigua	desert globemallow
Sphaeralcea coccinea	scarlet globemallow
Sphaeralcea parvifolia	littleleaf globemallow
Townsendia exscapa	ground daisy
Subshrubs	
Artemisia frigida	prairie sagewort
Ceratoides lanata	winterfat
Chrysothamnus greenei	Greene's rabbitbrush
Shrubs	
Chrysothamnus viscidiflorus	yellow rabbitbrush
Ephedra viridis	mormon tea
Senecio douglasii var. longilobus	threadleaf ragwort
Artemisia tridentata	big sagebrush
Atriplex canescens	fourwing saltbush
Atriplex confertifolia	shadscale saltbush
Chrysothamnus nauseosus	rubber rabbitbrush
Cowania mexicana	Stansbury cliffrose

Table 3 (continued): Culturally Important Plant Species Observed in J19/J21 P3BRA

Scientific Name	**Common Name**
Shrubs	
Fallugia paradoxa	apacheplume
Lycium pallidum	rabbitthorn
Purshia tridentata	antelope bitterbrush
Gutierrezia sarothrae	broom snakeweed
Quercus gambelii	Gambel oak
Sarcobatus vermiculatus	black greasewood
Shepherdia rotundifolia	roundleaf buffaloberry
Yucca angustissima	narrowleaf yucca
Yucca baccata	banana yucca
Trees	
Juniperus osteosperma	Utah juniper
Pinus edulis	Colorado pinyon
Succulents	
Opuntia phaeacantha	tulip pricklypear

EXHIBIT E

J19/J21 Phase III Bond Release Revegetation Success Demonstration

Contents

Tables

Figures

Attachments

1 Introduction

The Phase III bond release information contained in this application includes results and analysis of 2023 – 2024 vegetation sampling. This information supports Phase III bond release for a 3,654-acre area within Coal Resource Areas (CRA) J19 and J21. The combination of these two areas into a larger Phase III bond release area (P3BRA) was approved in 2023 by the Office of Surface Mining Reclamation and Enforcement (OSMRE).

The lands included in the P3BRA were approved for Phase I bond release in April 2010, July 2012, January 2017, and July 2018 and for Phase II bond release in January 2012, July 2012, and December 2022. Map 1 in Exhibit B of this bond release application shows the location and extent of the P3BRA within the Kayenta Mining Complex (KMC) and Map 5 in Exhibit B shows the locations of the three reference areas.

The J19 CRA and J21 CRA Phase III bond release areas are immediately adjacent to each other on the landscape. The J19 CRA area is approximately 1,632 acres and was seeded over the period from 1989 to 2018. The J21 CRA area is approximately 2,022 acres and was seeded between 1986 and 2015. These two areas were reclaimed using the same methods and seed mixtures which were consistent with the approved AZ-0001C, AZ-0001D, AZ-0001E, and AZ-0001F Permit Application Packages (PAP) that were in effect at that time. See Exhibit C of this bond release application for details of reclamation dates and methods.

2 Vegetation Sampling

Vegetation sampling was conducted in the J19 P3BRA in the combined J19/J21 P3BRA in September 2023 and May 2024. The complete data sets from each sampling event are included as Attachments 1 and 2 and will also be submitted in Microsoft Excel format.

In each year, sampling was conducted within the three approved sagebrush reference areas (SBRA) and the appropriate community types within the J19/J21 Phase III bond release area (J19/J21 P3BRA). The sagebrush reference areas include the J7 SBRA, N7/8 SBRA, and J19 SBRA. The community types sampled in the J19/J21 P3BRA include grassland, shrubland, and woodland.

2.1 Sampling Design

The required number of vegetation sample points within the J19/J21 P3BRA vegetation communities and each of the three sagebrush reference areas were randomly located and sample numbers were randomly generated for each point. The sample points were located within the various community type polygons interspersed within the J19/J21 P3BRA using an area stratified random approach in which fewer samples were allocated to the smallest units, while larger units included more samples. This process was repeated each year, so the sample locations differ each year. GPS equipment was used during field work to locate vegetation sample points.

Table 1 provides a summary of the sampling intensity for the sagebrush reference areas and the three community types within the J19/J21 P3BRA. Sample locations for J19/J21 P3BRA communities are shown on Map 4 of Exhibit B and sample locations for reference areas are shown on Map 5 of Exhibit B.

Table 1: Sampling Intensity for J19/J21 Phase III P3BRA and Reference Areas

Community	Area	Year	Parameter				
			Allowable Ground Cover	Allowable Production	Shrub Density	Tree Density	Species Diversity
J19/J21 P3BRA							
Grassland	J19/J21	2023	40	40	40	-	40
		2024	40	40	40	-	40
Shrubland	J19/J21	2023	40	40	40	-	40
		2024	40	40	40	-	40
Woodland[1]	J19/J21	2023	-	-	40	40	-
		2024	-	-	40	40	-
Tree Transplants[1]	J19/J21	2023	-	-	-	Census	-
		2024	-	-	-	Census	-
Sagebrush Reference Areas							
Sagebrush Reference Areas	J7 SBRA	2023	15	-	-	-	15
		2024	15	-	-	-	15
	N7/8 SBRA	2023	15	-	-	-	15
		2024	15	-	-	-	15
	N14 SBRA	2023	15	-	-	-	15
		2024	15	-	-	-	15

[1] These areas were included in the shrubland sample universe for cover sampling.

2.2 Sample Adequacy

An adequate sample size was based on:

1. A specified minimum (with sample adequacy being met),
2. Sampling to a statistically adequate sample size, or
3. Sampling to a maximum number.

Adequate sample sizes varied depending on the area sampled. These methods were consistent with the methods and procedures detailed in the AZ-0001F PAP. The minimum of 15 samples were collected in each SBRA. The maximum of 40 samples were collected in the P3BRA communities. The sample size of 40 allowed for the use of "reverse null" hypothesis testing with highly variable data (e.g., production and shrub density) that would otherwise require very high sample sizes as determined using the sample adequacy calculation below. \

Table 2 provides sampling information for statistical sample adequacy calculations for the J19/J21 P3BRA grassland, shrubland, and woodland communities as well as the three SBRA communities. Sample adequacy was calculated using the following formula:

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

where:

n_{min} = Minimum sample size
s^2 = Sample variance (n-1 degrees of freedom)
d = Precision (0.10)
$\bar{x}$ = Sample arithmetic mean
t = The (α=0.10) t-table value for a 1 tail t-test, n-1 degrees of freedom (infinite degrees of freedom may be used if n>30)
n = Sample size

2.3 Data Collection

The revegetation success parameters sampled and evaluated as a part of the 2023 and 2024 Phase III bond release studies included allowable ground cover, allowable production, shrub density, tree density, and species diversity. A direct count of all surviving trees in the pinyon/juniper tree transplant areas was also conducted in 2023 and 2024.

2.3.1 Allowable Ground Cover

Cover sampling included first hit cover for vegetation by species, surface plant litter, standing dead litter, rock, and bare ground. Second hit cover was taken only for vegetation to provide more comprehensive composition and species diversity information. Cover data was collected using a point-intercept method carried out with a laser light bar which allows for the vertical projection of two intercepts each perpendicular to and 0.5-meters from either side of a 50-meter transect line for a total of 100 first point intercepts per transect.

Allowable ground cover was calculated for each J19/J21 P3BRA community and each SBRA transect used in sample adequacy and hypothesis testing calculations. Per permit specification, allowable ground cover was calculated for each J19/J21 P3BRA and SBRA transect used in sample adequacy and hypothesis testing calculations. Allowable ground cover was calculated as total ground cover minus:

- Rock cover
- Noxious weeds (Arizona or Navajo Nation A- or B-listed)
- Annual/biennial cover > 10% of the average total live vegetation cover across all transects; and
- Average litter cover across all transects in excess of the total of live vegetation and standing dead cover (litter - vegetation - standing dead)

Table 2: J19/J21 P3BRA Sample Adequacy

Community	Area	Year	Parameter	N[1]	1-tailed t-value	Mean	St. Dev.	Nmin[2]
Grassland	J19/J21	2023	Allowable Ground Cover	40	1.304	52.0	13.0	11
			Production	40	1.304	857.2	437.8	44
			Shrub Density	40	1.304	2,069.0	3,077.9	376
		2024	Allowable Ground Cover	40	1.304	55.1	12.6	9
			Production	40	1.304	570.7	409.1	87
			Shrub Density	40	1.304	1,566.1	1,864.6	241
Shrubland	J19/ J21	2023	Allowable Ground Cover	40	1.304	50.1	11.4	9
			Production	40	1.304	926.4	471.5	44
			Shrub Density	40	1.304	3,167.7	2,857.2	138
		2024	Allowable Ground Cover	40	1.304	55.4	11.2	7
			Production	40	1.304	453.4	224.8	42
			Shrub Density	40	1.304	6,538.7	13,382.3	712
Woodland	J19/ J21	2023	Shrub Density	40	1.304	7,514.0	3,879.8	45
			Tree Density	40	1.304	186.2	159.7	125
		2024	Shrub Density	40	1.304	8,126.1	9,502.5	233
			Tree Density	40	1.304	300.5	757.7	1,081
Sagebrush Reference Areas	J7 SBRA	2023	Allowable Ground Cover	15	1.345	55.3	9.0	5
		2024	Allowable Ground Cover	15	1.345	48.5	7.6	4
	N7/8 SBRA	2023	Allowable Ground Cover	15	1.345	46.7	6.6	4
		2024	Allowable Ground Cover	15	1.345	45.5	8.7	7
	N14 SBRA	2023	Allowable Ground Cover	15	1.345	55.3	5.0	1
		2024	Allowable Ground Cover	15	1.345	58.2	8.7	4

[1] N = Sample Size

[2] N-min = Minimum sample size necessary to detect a 10% reduction in the mean with 90% confidence using n-1 degrees of freedom

2.3.2 Allowable Production

Herbaceous production sampling was conducted using circular plots 0.5 square meters in size. Three plots were each placed 1 meter away from the cover sampling transect at 19.5, 33.5, 47.5 meters along the cover transect. Production plots were placed on the left side of the transect (as viewed from the starting point) during the spring sampling events and on the right side of the transect during the fall sampling events.

Within each plot, all herbaceous growth in a vertical projection (except for tree species) was clipped, separated by species, and placed in labeled paper bags. Labeling included date, sampler, CRA, transect number, and plant species. Current year's herbaceous growth of shrubs was collected in the same manner; however, woody tissue was not harvested. Clipped materials were accumulated for the three 0.5-square meter plots for each vegetation sample point. The total area clipped for each sample point was 1.5 square meters. The bags containing the clipped material were dried at 30 degrees Celsius for 48 hours and then weighed to the nearest 0.1 gram.

No production was collected in reference areas. Per permit specification, allowable production was calculated as the total production minus noxious species and annual/biennial production greater than 10% of the average total production across all transects within each sampling area. Production data are presented as pounds per acre.

2.3.3 Shrub & Tree Density

Shrub and tree density was measured along a 2 m x 50 m belt transect oriented and centered along the cover transect. All shrubs and subshrubs (including seedlings) with root crowns located within the belt transect boundaries were tabulated by species and classified into three height categories: 0 to 20 cm, 21 to 50 cm, and greater than 51 cm. Shrub density was measured along all grassland, shrubland, and woodland transects, while tree density was only measured along woodland transects. No shrub or tree density measurements were made in reference areas. Per permit specification, allowable shrub/tree density was calculated as the total density minus noxious species. Shrub and tree density results are presented as live shrubs per acre.

2.3.4 Species Diversity

Species diversity standards are based on species density data collected during cover sampling. All plant species occurring within one meter on either side of the cover sample transect centerline were observed and recorded in all reclamation and reference areas. The total number of species observed in each sample is the species density and is reported as number of species per 100 square meters. Species density indicates the relative species composition in the reclaimed areas from a different perspective than is available from examination of cover data alone.

2.3.5 Tree Transplant Survival

There are 24 pinyon/juniper tree transplant locations within the J19/J21 P3BRA (Map 4, Exhibit B) which were planted between 2000 and 2015 with a combined total of 781 trees. Each of these areas was visited in both 2023 and 2024 and a complete census was taken to document surviving trees. These areas were included in the greater shrubland sampling universe for all other parameters.

3 Bond Release Standards

Data collection for the J19/J21 P3BRA was completed following the procedures detailed in the Study Plan submitted to OSMRE in 2023. Formal hypothesis testing followed the current procedures detailed in Chapter 23, Appendix F of the AZ-0001F PAP. Revegetation success standards are detailed in Table 3 and follow those outlined in Table 8 of Chapter 23 of the AZ-0001F PAP. The production technical standard is subject to annual adjustment to adjust for variations in precipitation or temperature from long-term average values per Chapter 23 of the AZ-0001F PAP as described in Section 3.1.

Table 3: J19/J21 P3BRA Bond Release Revegetation Standards

Community	Parameter	Standard
Grassland	Allowable Ground Cover[1]	≥ 90% of 3 Sagebrush Reference Areas
	Allowable Production	375 pounds/acre (adjusted for climate[2])
	Allowable Shrub Density	400 stems/acre
	Shrub Diversity	2 shrub or subshrub species present
	Life Form Similarity	Motyka Similarity Index (Test B)
	Overall Species Density	Diversity Supporting Test A (not required)
	Native Species Presence	Diversity Supporting Test C (not required)
Shrubland	Allowable Ground Cover[1]	≥ 90% of 3 Sagebrush Reference Areas
	Allowable Production	375 pounds/acre (adjusted for climate[2])
	Allowable Shrub Density	800 stems/acre
	Shrub Diversity	2 shrub or subshrub species present
	Life Form Similarity	Motyka Similarity Index (Test B)
	Overall Species Density	Supporting Test A (not required)
	Native Species Presence	Supporting Test C (not required)
Woodland	Shrub Density	800 stems/acre
	Shrub Diversity	4 shrub or subshrub species present
	Tree Density	75 stems/acre

[1] Allowable ground cover data is adjusted to exclude noxious weeds, rocks, excess litter, and excess annual cover as described in Section 2.3.1.

[2] The production technical standard is subject to annual adjustment to adjust for variations in precipitation or temperature from long-term average values per Chapter 23 of the AZ-0001F PAP as described in Section 3.1.

3.1 Climate-Adjusted Production Standard

The production technical standard is 375 pounds per acre but is subject to annual adjustment to account for variations in precipitation or temperature from long-term average values per Chapter 23 of the AZ-0001F PAP. The following equation was used to adjust the production standard:

$$y = 42.434(a - b) + 375$$

where:

y = the adjusted production standard for a given year

a = inches of annual rainfall from the previous 12 months (June – May for spring sampling or October – September for fall sampling) minus 8.00 inches

b = percent (%) departure of degree days from the previous 12 months above or below 18363

Based on these calculations, the production standard for 2023 sampling was increased above the 375 pounds per acre while the 2024 standard was decreased below the 375 pounds per acre (Table 4).

Table 4: Climate-Adjusted Production Standard for 2023 and 2024

Climate Station	Fall 2023		Spring 2024	
	Oct-Sept Rainfall (in)	**Oct-Sept Degree Days**	**Jun-May Rainfall (in)**	**Jun-May Degree Days**
1	8.72		7.01	
2R				
3R	15.67		7.97	
6R	7.51		6.18	
7R			11.19	
9	9.64	17935.8		18776.6
12	13.05	18302.1	8.13	19177.7
200	9.43		10	
201	13.78		10.36	
202	14.48		10.72	
Average	**11.54**	**18119.0**	**8.95**	**18977.2**
Difference	**3.53**	**-1.33**	**0.95**	**3.34**
Production Standard (lbs/ac)	**581.40**		**273.17**	

4 Hypothesis Testing

Hypothesis testing was completed using Microsoft Excel in accordance with the procedures outlined in Chapter 23, Appendix F of AZ-0001F PAP. The process for hypothesis testing of allowable ground cover is illustrated in Figure 1 and the process for allowable production and shrub density is illustrated in Figure 2.

All workbooks including data and calculations have been provided in Excel format.

Figure 1: Allowable Ground Cover Hypothesis Testing Flow Chart

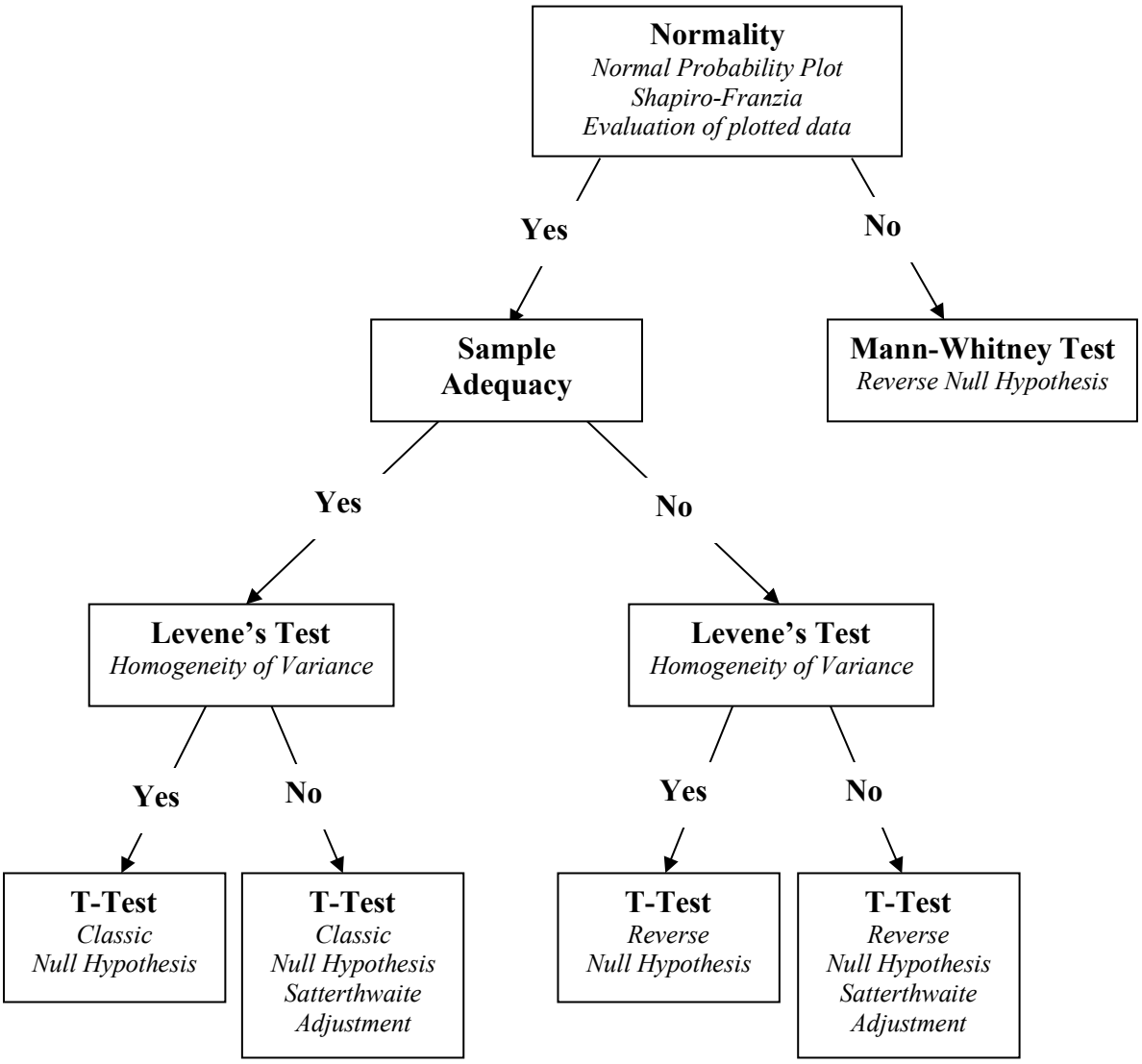
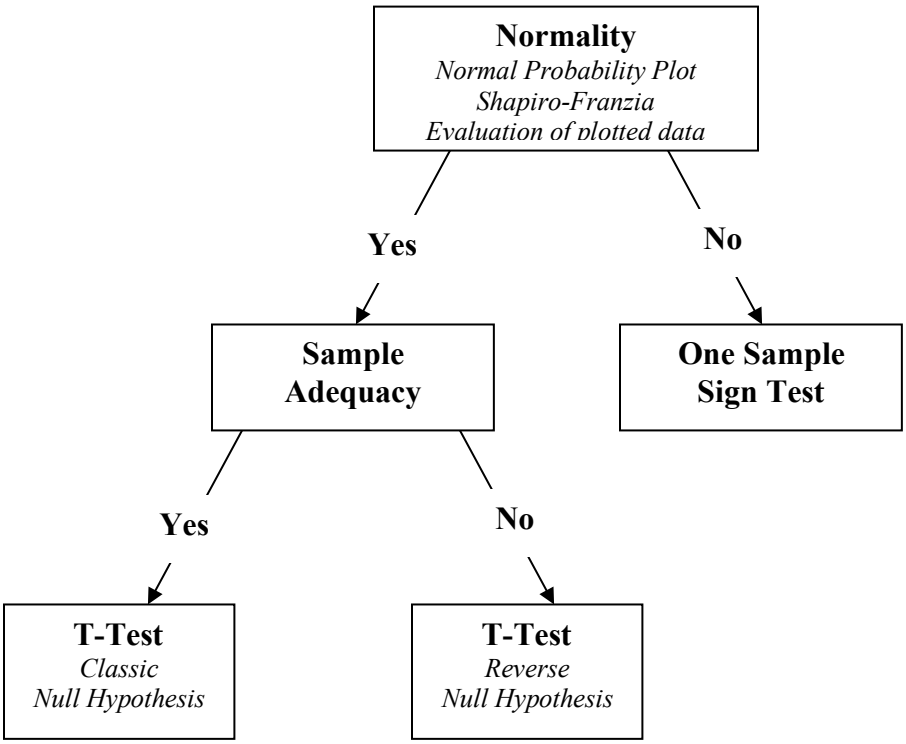


Figure 2: Allowable Production and Shrub Density Hypothesis Testing Flow Chart



4.1 Allowable Ground Cover

Allowable ground cover data from each of the J19/J21 P3BRAs was compared to the average of the three sagebrush reference areas. Both the reclamation data and the reference area pooled data were first evaluated for distribution normality. If the datasets were normally distributed, then they were evaluated for sample adequacy. If sample adequacy was indicated, then they were evaluated for homogeneity of variance.

If homogeneity of variance was indicated, then testing proceeded using a two-sample t-test with a classical null hypothesis. The null hypothesis is that the reclamation mean is equal to or greater than 90% of the reference area mean. The standard is passed when the null hypothesis is accepted.

Because the standard for success is based on the average of the three reference areas, it is necessary to generate a pooled variance value for use in the t-test. The pooled variance was derived using the following equation:

$$S_p^2 = \frac{(n_{J7} - 1)S_{J7}^2 + (n_{N7/8} - 1)S_{N7/8}^2 + (n_{N14} - 1)S_{N14}^2}{n_{J7} + n_{N7/8} + n_{N14} - 3}$$

where:

S_p^2 = Pooled variance
s^2 = Sample variance of each reference areas (n-1 degrees of freedom)
n = Sample size of each reference area

The two-sample t-test assumes approximate normality of both data sets, independence of observations, and approximate equality of variances between the two groups. If homogeneity of variance is not shown, but the data were normally distributed and there was sample adequacy, then the degrees of freedom for the critical t value were adjusted using Satterthwaite's correction (Bilbrough and Howlin 2012).

The test statistic is:

$$t = \frac{\bar{x}_{br} - 0.9\bar{x}_{ref}}{\sqrt{\frac{(n_{br} - 1)S_{br}^2 + (n_{ref} - 1)S_p^2}{(n_{br} + n_{ref} - 2)}(\frac{1}{n_{br}} + \frac{1}{n_{ref}})}}$$

where:

$\bar{x}_{br}$ = Mean of the bond release area
$\bar{x}_{ref}$ = Mean of the three reference areas
S_{br}^2 = Sample variance of the bond release area
S_p^2 = Pooled variance of the reference areas
n_{br} = Sample size of the bond release area
n_{ref} = Sample size of the reference area data

The t-test statistic is compared to a critical t-value (one-tailed, left tail, $\alpha = 0.10$, $n_{br}+n_{ref}$ -2 degrees of freedom). If the test t-value exceeds the critical t-value, the null hypothesis is accepted and revegetation success for cover is supported.

If sample adequacy was not demonstrated, then testing proceeded using a two-sample t-test with a reverse null hypothesis. The reverse null hypothesis is that the reclamation mean is equal to or less

than 90% of the reference area mean and the standard is passed when the null hypothesis is rejected. The assumptions for a two-sample t-test as described above still apply and the test statistic is the same. Data transformations and/or Satterthwaite's correction may be applied, as necessary.

If at the beginning of the process, the reclamation data and/or the reference area were not normally distributed, then they were evaluated using a non-parametric Mann-Whitney test with a reverse null hypothesis. This null hypothesis states that the reclamation values tend to be less than 90% of the reference area values. The standard is passed when the one-sided null hypothesis is rejected: the test statistic is greater than $Z_{1-\alpha}$, (in the right tail). The test z-value is calculated as follows:

$$Z = \frac{\sum_{i=1}^{n} R\,(br_i) + \frac{1}{2} - n_{br}\frac{n_{br} + n_{ref} + 1}{2}}{\sqrt{\frac{n_{br} n_{ref}(n_{br} + n_{ref} + 1)}{12}}}$$

where:

$R(br_i)$ = Ranks of the observations in the revegetation sample
n_{br} = Sample size of the bond release area
n_{ref} = Sample size of the reference area data

4.2 Allowable Production

Production data from each of the J19/J21 P3BRA communities will be compared to the climate-adjusted technical standard (Table 4). The technical standard is 375 pounds per acre adjusted for variations in precipitation or temperature during the previous 12 months from the long-term average values per Chapter 23 of the AZ-0001F PAP.

Once the maximum of 40 samples has been collected and dried, the dataset was evaluated for distribution normality. If the datasets were normally distributed, then they were evaluated for sample adequacy. If sample adequacy was indicated, then testing proceeded using a one-sample t-test with a classical null hypothesis. The null hypothesis is that the reclamation mean is equal to or greater than 90% of the technical standard. The standard is passed when the null hypothesis is accepted.

The one-sample t-test assumes approximate normality of the data set and independence of observations. The test statistic is:

$$t = \frac{\bar{x}_{br} - (0.9 * technical\ standard)}{\frac{s}{\sqrt{n_{br}}}}$$

where:

$\bar{x}_{br}$ = Mean of the bond release area
s = sample standard deviation (n-1)
n_{br} = Sample size of the bond release area

The t-test statistic is compared to a critical t-value (one-tailed, left tail, $\alpha = 0.10$, n_{br}-1 degrees of freedom). If the test t-value exceeds the critical t-value, the null hypothesis is accepted and revegetation success for cover is supported.

If sample adequacy was not demonstrated, then testing proceeded using a one-sample t-test with a reverse null hypothesis. The reverse null hypothesis is that the reclamation mean is equal to or less

than 90% of the technical standard and the standard is passed when the null hypothesis is rejected. The assumptions for a two-sample t-test as described above still apply and the test statistic is the same.

If at the beginning of the process, the reclamation data were not normally distributed, then they were evaluated using a non-parametric one-sample sign test with a reverse null hypothesis. The null hypothesis is that the reclamation values are indistinguishable from 90% of the technical standard. The standard is passed when the null hypothesis is rejected.

The one-sample sign test does not require sample adequacy. Given that the prescribed minimum sample size of 40 exceeds the capacity of typically available tables of Lower Critical Value of Exact Binomial probabilities, the test statistic is approximated as follows:

$$Z = \frac{M + 0.5 - 0.5n}{0.5\sqrt{n}}$$

where:

M = The number of minuses when 90% of the technical standard is subtracted from every observation
n = Sample size

This calculated z-value will be compared to a critical t-value from the left tail with $\alpha = 0.10$, and n-1 degrees of freedom. If the calculated z-value is less than (i.e., more negative than) the critical t-value, the null hypothesis is rejected and revegetation success for production is supported.

4.3 Shrub Density

Shrub density data collected in the appropriate J19/J21 P3BRAs was compared to the technical standard shown in Table 3. Hypothesis testing for shrub density data followed the process outlined for allowable production data in Section 4.2.

5 Direct Standard Comparisons

5.1 Tree Density

Tree density data collected in the woodland areas of the J19/J21 P3BRA was compared to the technical standard shown in Table 3. If the reclamation mean exceeded 90% of the technical standard, then the P3BRA passed this measure of success.

5.2 Shrub Diversity

Shrub diversity data collected in the appropriate J19/J21 P3BRAs was compared to the technical standards shown in Table 3. If the number of species observed in the J19/J21 P3BRAs was equal to or greater than the standard, then the P3BRA passed this measure of success.

5.3 Species Diversity

Species diversity suitable to support the approved post-mining land uses of rangeland, wildlife habitat, and cultural plants was judged using the following three tests. Success was demonstrated using Test B, with Tests A and C providing supporting information.

5.3.1 Test B: Lifeform Similarity Test (Mandatory)

This test uses the Motyka similarity index to assess the resemblance of the distribution of species density by lifeform of the P3BRA vegetation to that of the reference areas. The Motyka similarity index uses the following equation:

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

where:

c = the sum of the smaller of the species density values of the two datasets being compared for each lifeform.
a = the sum of the average species density values of the first dataset for each lifeform.
b = the sum of the average species density values of the second dataset for each lifeform.

Only cover by non-noxious vascular plants will be included. Lifeforms to be used will include:

- Annual/biennial forbs
- Annual grasses
- Perennial forbs
- Perennial warm season grasses
- Perennial cool season grasses
- Subshrubs
- Shrubs

There are two parts to this test. First, it is necessary to determine the average internal resemblance (i.e., calculate between-sample similarity) of each reference area transect.

Each unique pair of transects within the reference areas (990 pairs if 45 samples, 15 in each area, are used) will be compared using the equation above. These 990 IS_{mo} values are then averaged to find the internal similarity of reference areas. Ninety percent (90%) of this value is the standard that will be used for bond release assessment.

Once the standard has been established, the reclaimed area data can be compared to the reference area data. The average species density by lifeform of the reclaimed area data (across all 40 samples) is compared to the average species density by lifeform of the reference area data (across all samples, 45 if there are 15 in each reference area) again using the Motyka equation above. If the resulting IS_{mo} value is greater than the standard calculated above, then the reclamation passes this test.

5.3.2 Test A: Overall Species Density Test (Supporting only)

This test compares the overall richness of the vascular plant species per unit area in the P3BRAs to that observed in the reference areas. If the average vascular, non-noxious plant species density per 100 square meters of the reclaimed area falls within the 90% confidence interval of the three sagebrush reference areas, then this test is passed. The 90% confidence interval includes the values occurring within 1.282 standard deviations about the mean. The 90% confidence interval is calculated for each reference area and the lower limits of each reference area are averaged to establish an average lower limit. The same procedure is performed for the upper limits.

5.3.3 Test C: Native Species Presence Test (Supporting only)

This test evaluates the degree to which the area-based scale of occurrences of native vascular plant species in the reclaimed area matches the reference area. If the cumulative number of native

vascular plant species observed during species density sampling of the reclaimed areas exceeds 90% of the average cumulative presence within the three sagebrush reference areas, then the test is passed.

6 Revegetation Success Evaluation Results

All required bond release standards outlined in the AZ-0001F PAP and summarized in Table 3 were passed in the two years sampled (Table 5). Thus, these areas do not require additional sampling for bond release. Summary statistics for each sampling year are provided in Table 6.

Results of hypothesis testing are summarized in the following tables for allowable ground cover (Table 7), production (Table 8), and shrub density (Table 9). Direct comparison results are presented in subsequent tables for tree density (Table 10), shrub diversity (Table 11), lifeform similarity (Table 12), and supporting diversity tests (Table 13).

6.1 Tree Transplant Survival

Each of the 24 tree transplant areas were mapped with a single GPS point at the time of their installation. While an attempt was made to re-locate all trees associated with each transplanting area in both 2023 and 2024, there were some discrepancies between the two years. In six cases, the total count of live trees in 2024 was greater than the count of live trees in 2023 (Table 14). However, the total survival rate across all areas was consistent with 188 trees living or 26% of those planted in both 2023 and 2024. The survival rate from the previous monitoring in 2018 was 53%. There was no apparent correlation between years since planting and survival rate and the survival rate for those trees planted in the J19 CRA was not different from the survival rate of those planted in the J21 CRA.

Table 5: J19/J21 P3BRA Bond Release Success Summary

Community	Parameter	2023	2024	Passed at least 2 Years
Bond Release Standards				
Grassland	Allowable Ground Cover	Pass	Pass	Yes
	Production	Pass	Pass	Yes
	Shrub Density	Pass	Pass	Yes
	Shrub Diversity	Pass	Pass	Yes
	Life Form Similarity	Pass	Pass	Yes
Shrubland	Allowable Ground Cover	Pass	Pass	Yes
	Production	Pass	Pass	Yes
	Shrub Density	Pass	Pass	Yes
	Shrub Diversity	Pass	Pass	Yes
	Life Form Similarity	Pass	Pass	Yes
Woodland	Shrub Density	Pass	Pass	Yes
	Shrub Diversity	Pass	Pass	Yes
	Tree Density	Pass	Pass	Yes
Supporting Tests (not required)				
Grassland	Overall Species Density	Fail	Fail	No
	Native Species Presence	Pass	Pass	Yes
Shrubland	Overall Species Density	Fail	Fail	No
	Native Species Presence	Pass	Pass	Yes

Table 6: Summary Statistics for J19/J21 P3BRA and Reference Areas

Sampling Area		Allowable Ground Cover (%)		Allowable Production (Lbs/Acre)		Allowable Shrub Density (Stems/Acre)		Tree Density (Stems/Acre)		Species Density (Spp/100 sq.m.)	
		Mean	**St. Dev**	**Mean**	**St. Dev**	**Mean**	**St. Dev**	**Mean**	**St. Dev**	**Mean**	**St. Dev**
Fall 2023											
J19/J21 P3BRA	Grassland	52.0	13.0	857.2	437.8	2069.0	3077.9	-	-	10.2	4.9
	Shrubland	50.1	11.4	926.4	471.5	3167.7	2857.2	-	-	10.8	5.4
	Woodland	-	-	-	-	7514.0	3879.8	186.2	159.7	-	-
SBRA	J7	55.3	9.0	-	-	-	-	-	-	15.1	1.9
	N7/8	46.7	6.6	-	-	-	-	-	-	18.5	3.7
	N14	55.3	5.0	-	-	-	-	-	-	11.1	1.5
Spring 2024											
J19/J21 P3BRA	Grassland	55.1	12.6	570.7	409.1	1566.1	1864.6	-	-	10.6	4.2
	Shrubland	55.4	11.2	453.4	224.8	6538.7	13382.3	-	-	11.6	4.6
	Woodland	-	-	-	-	8126.1	9502.5	300.5	757.7	-	-
SBRA	J7	48.5	7.6	-	-	-	-	-	-	14.0	1.3
	N7/8	45.5	8.7	-	-	-	-	-	-	18.5	3.0
	N14	58.2	8.7	-	-	-	-	-	-	12.1	1.4

Table 7: Results of Hypothesis Testing for J19/J21 P3BRA Allowable Ground Cover Data

Year	Allowable Ground Cover (%)		Hypothesis Testing				
	Reclamation Mean	Reference Mean	Statistical Test	DF	Test Statistic	Critical Value	Pass?
Grassland							
2023	52.0	58.3	T-Test (Classic Null + Satterthwaite Adj)	59	-0.220	-1.296	Yes
2024	55.1	56.4	T-Test (Classic Null)	83	1.900	-1.292	Yes
Shrubland							
2023	50.1	58.3	T-Test (Classic Null)	83	-1.150	-1.292	Yes
2024	55.4	56.4	T-Test (Classic Null)	83	2.200	-1.292	Yes

Table 8: Results of Hypothesis Testing for J19/J21 P3BRA Production Data

Year	Production (Lb/Acre)		Hypothesis Testing				
	Reclamation Mean	Technical Standard	Statistical Test	DF	Test Statistic	Critical Value	Pass?
Grassland							
2023	857.2	581.4	T-Test (Reverse Null)	39	4.820	1.304	Yes
2024	570.7	273.2	T-Test (Reverse Null)	39	5.020	1.304	Yes
Shrubland							
2023	926.4	581.4	Sign Test	n/a	-3.000	-1.280	Yes
2024	453.4	273.2	T-Test (Reverse Null)	39	5.840	1.304	Yes

Table 9: Results of Hypothesis Testing for J19/J21 P3BRA Shrub Density Data

Year	Shrub Density (Stems/Acre)		Hypothesis Testing				
	Reclamation Mean	Technical Standard	Statistical Test	DF	Test Statistic	Critical Value	Pass?
Grassland							
2023	2069.0	400	Sign Test	n/a	-4.590	-1.280	Yes
2024	1566.1	400	Sign Test	n/a	-2.060	-1.280	Yes
Shrubland							
2023	3167.7	800	Sign Test	n/a	-6.170	-1.280	Yes
2024	6538.7	800	Sign Test	n/a	-6.170	-1.280	Yes
Woodland							
2023	7514.0	800	Sign Test	n/a	-6.170	-1.280	Yes
2024	8126.1	800	Sign Test	n/a	-6.170	-1.280	Yes

Table 10: Results of J19/J21 P3BRA Tree Density Testing

Year	Tree Density (Stems/Acre)		
	Reclamation Mean	Technical Standard	Pass?
Woodland			
2023	186.2	75	Yes
2024	300.5	75	Yes

Table 11: Results of J19/J21 P3BRA Shrub Diversity Testing

Area	Shrub Diversity		
	Reclamation Mean	Technical Standard	Pass?
Grassland			
2023	9	2	Yes
2024	13	2	Yes
Shrubland			
2023	13	2	Yes
2024	15	2	Yes
Woodland			
2023	23	4	Yes
2024	18	4	Yes

Table 12: Results of J19/J21 P3BRA Motyka Similarity Index Testing

Year	Motyka Similarity Index		
	Reclamation Ismo	Reference Standard Ismo	Pass?
Grassland			
2023	71.6	64.1	Yes
2024	68.8	66.8	Yes
Shrubland			
2023	72.0	64.1	Yes
2024	73.0	66.8	Yes

Table 13: Results of J19/J21 P3BRA Supporting Diversity Testing

Area	Year	Test A - Species Density					Test C - Native Presence		
		Species Density		90% Confidence Interval		Pass?	Native Species Present	90% of Reference	Pass?
		Mean	St.Dev.	Lower	Upper				
Grassland									
J19/J21	2023	10.2	4.9	11.9	30.2	No	35	28.8	Yes
	2024	10.6	4.2	12.4	30.8	No	39	30.6	Yes
Shrubland									
J19/J21	2023	10.8	5.4	11.9	30.2	No	46	28.8	Yes
	2024	11.6	4.6	12.4	30.8	No	48	30.6	Yes
Reference Areas									
J7 SBRA	2023	15.1	1.9	12.8	31.5	-	29	-	-
	2024	14.0	1.3	12.4	29.9	-	30	-	-
N7/8 SBRA	2023	18.5	3.7	13.7	36.1	-	48	-	-
	2024	18.5	3.0	14.6	37.2	-	49	-	-
N14 SBRA	2023	11.1	1.5	9.3	23.0	-	19	-	-
	2024	12.1	1.4	10.2	25.2	-	23	-	-

Table 14: Tree Transplant Survival 2023 and 2024

Transplant Location	2023			2024		
	Pinyon	Juniper	% Survival	Pinyon	Juniper	% Survival
2000-1	3		15%	3		15%
2000-2	3		16%	4		21%
2000-3	1		6%	1		6%
2001-1	13		29%	12		27%
2001-3	12		36%	12		36%
2004-1			0%			0%
2004-2			0%			0%
2004-3			0%			0%
2005-2			0%	5		7%
2006-1	2		3%	1		2%
2007-1	21		40%	20		38%
2007-2	1	1	13%	1		7%
2008-1	8		30%	7		26%
2008-2	27	1	85%	24	1	76%
2008-3			0%			0%
2009-1	10		28%	11		31%
2009-2	4		10%	3		8%
2009-3	19	1	29%	25	1	38%
2011-1			0%			0%
2011-2	17	3	51%	12	2	36%
2012-1	7		23%	5		16%
2013-1	16	4	57%	17	4	60%
2014-1	13		29%	13	2	33%
2015-1	11	6	68%	12	6	72%
Total	**188**	**16**	***26%***	**188**	**16**	***26%***

7 References

Bilbrough, C., and S. Howlin. 2012. Handbook of Approved Sampling and Statistical Methods for evaluation of Revegetation Success on Wyoming Coal Mines. Wyoming Department of Environmental Quality Land Quality Division.

Attachment 1: J19/J21 Raw Data – Fall 2023

J19/J21 Phase III Grassland Cover Data – Fall 2023

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover																																	
						G1		G2		G3		G4		G5		G6		G7		G8		G9		G10		G11		G12		G13		G14		G15		G16		G17		G18		G19		G20	
						1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NATIVE ANNUAL & BIENNIAL FORBS																																											
Ambrosia artemisiifolia	0.08	2.50	0.22	0.08	0.20																																						
Chenopodium graveolens	0.00	2.50	0.00	0.00	0.00																			P																		
Conyza canadensis	0.00	5.00	0.00	0.00	0.00																																					
Erigeron divergens	0.00	5.00	0.00	0.00	0.00																																					
Euphorbia glyptosperma	0.00	10.00	0.00	0.00	0.00																			P												P						
Lappula redowskii	0.05	17.50	0.15	0.08	0.20									2								P				P	1										P				
Machaeranthera canescens	0.03	12.50	0.07	0.03	0.07																											P										
Machaeranthera tanacetifolia	0.00	2.50	0.00	0.00	0.00																																						
TOTAL NATIVE ANN. & BIEN. FORBS	0.15	35.00	0.45	0.18	0.47									2								P		P		P	1					P				P		P			
INTRODUCED ANNUAL & BIENNIAL FORBS																																											
Carduus nutans	0.00	2.50	0.00	0.00	0.00																																					
Kochia scoparia	0.58	25.00	1.71	0.58	1.55																			P						P				4							
Lactuca serriola	0.00	2.50	0.00	0.00	0.00																											P										
Melilotus officinalis	0.00	5.00	0.00	0.00	0.00																																					
Portulaca oleracea	0.00	2.50	0.00	0.00	0.00																																					
Salsola iberica	0.03	32.50	0.07	0.03	0.07																									P				P							
Sisymbrium altissimum	0.05	10.00	0.15	0.05	0.14																											1										
Tragopogon dubius	0.00	15.00	0.00	0.00	0.00																	P										P		P		P						
TOTAL INTRO. ANN. & BIEN. FORBS	0.65	55.00	1.93	0.65	1.76																	P				P				P		1		4		P					
NATIVE ANNUAL GRASSES																																										
Monroa squarrosa	0.00	2.50	0.00	0.00	0.00																																					
TOTAL NATIVE ANNUAL GRASSES	0.00	2.50	0.00	0.00	0.00																																					
INTRODUCED ANNUAL GRASSES																																										
Bromus japonicus	0.00	10.00	0.00	0.00	0.00									P																				P							
Bromus tectorum	0.15	35.00	0.45	0.15	0.41	P																		P		P		2		P		1									
Eremopyrum triticeum	0.00	2.50	0.00	0.00	0.00																			P																		
TOTAL INTRODUCED ANNUAL GRASSES	0.15	45.00	0.45	0.15	0.41	P								P										P		P		2		P		1		P							
NATIVE PERENNIAL FORBS																																										
Mirabilis multiflora	0.00	2.50	0.00	0.00	0.00																											P										
Ratibida columnaris	0.00	2.50	0.00	0.00	0.00																																					
Sphaeralcea coccinea	0.03	30.00	0.07	0.03	0.07					P														P										P								P
Townsendia exscapa	0.00	2.50	0.00	0.00	0.00																											P										
Viguiera multiflora	0.00	2.50	0.00	0.00	0.00																																					
TOTAL NATIVE PERENNIAL FORBS	0.03	35.00	0.07	0.03	0.07					P														P								P		P								P
INTRODUCED PERENNIAL FORBS																																										
Convolvulus arvensis	0.00	2.50	0.00	0.00	0.00																																					
Medicago sativa	0.03	2.50	0.07	0.03	0.07																																					
Onobrychis viciifolia	0.05	10.00	0.15	0.05	0.14																											P										
Sanguisorba minor	0.00	2.50	0.00	0.00	0.00																																					
TOTAL INTRO. PERENNIAL FORBS	0.08	10.00	0.22	0.08	0.20																											P										
NATIVE PERENNIAL GRASSES (cool)																																										
Agropyron dasystachyum	0.48	27.50	1.41	0.48	1.28																					P										P						
Agropyron smithii	1.88	60.00	5.57	1.88	5.07					P								P				6				P		1						1		1						
Agropyron spicatum	0.03	10.00	0.07	0.03	0.07																																					
Agropyron trachycaulum	0.03	12.50	0.07	0.03	0.07																					P																
Oryzopsis hymenoides	0.20	20.00	0.59	0.20	0.54																											6										
Sitanion hystrix	0.08	5.00	0.22	0.08	0.20																					1						2										
Stipa comata	0.00	5.00	0.00	0.00	0.00									P																		P										
TOTAL NATIVE PERENNIAL GRASSES (c)	2.68	65.00	7.94	2.68	7.23					P				P				P				6				1		1				8		1		1					

J19/J21 Phase III Grassland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover																					
						G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																											
Ambrosia artemisiifolia	0.08	2.50	0.22	0.08	0.20		3																				
Chenopodium graveolens	0.00	2.50	0.00	0.00	0.00																						
Conyza canadensis	0.00	5.00	0.00	0.00	0.00																	P		P			
Erigeron divergens	0.00	5.00	0.00	0.00	0.00																			P	P		
Euphorbia glyptosperma	0.00	10.00	0.00	0.00	0.00																	P			P		
Lappula redowskii	0.05	17.50	0.15	0.08	0.20							P	P	P													
Machaeranthera canescens	0.03	12.50	0.07	0.03	0.07		P															P		1	P		
Machaeranthera tanacetifolia	0.00	2.50	0.00	0.00	0.00																			P			
TOTAL NATIVE ANN. & BIEN. FORBS	0.15	35.00	0.45	0.18	0.47		3					P	P	P								P		1	P		
INTRODUCED ANNUAL & BIENNIAL FORBS																											
Carduus nutans	0.00	2.50	0.00	0.00	0.00																P						
Kochia scoparia	0.58	25.00	1.71	0.58	1.55				P	P	16	2		1						P				P			
Lactuca serriola	0.00	2.50	0.00	0.00	0.00																						
Melilotus officinalis	0.00	5.00	0.00	0.00	0.00		P															P					
Portulaca oleracea	0.00	2.50	0.00	0.00	0.00			P																			
Salsola iberica	0.03	32.50	0.07	0.03	0.07	P	P	P			1		P				P		P	P	P			P	P		
Sisymbrium altissimum	0.05	10.00	0.15	0.05	0.14						1			P										P			
Tragopogon dubius	0.00	15.00	0.00	0.00	0.00								P												P		
TOTAL INTRO. ANN. & BIEN. FORBS	0.65	55.00	1.93	0.65	1.76	P	P	P	P	P	18	2	P	1			P		P	P	P	P		P	P		
NATIVE ANNUAL GRASSES																											
Monroa squarrosa	0.00	2.50	0.00	0.00	0.00							P															
TOTAL NATIVE ANNUAL GRASSES	0.00	2.50	0.00	0.00	0.00							P															
INTRODUCED ANNUAL GRASSES																											
Bromus japonicus	0.00	10.00	0.00	0.00	0.00		P					P															
Bromus tectorum	0.15	35.00	0.45	0.15	0.41				1		1		P	P					P			1		P	P		
Eremopyrum triticeum	0.00	2.50	0.00	0.00	0.00																						
TOTAL INTRODUCED ANNUAL GRASSES	0.15	45.00	0.45	0.15	0.41		P		1		1	P	P	P					P			1		P	P		
NATIVE PERENNIAL FORBS																											
Mirabilis multiflora	0.00	2.50	0.00	0.00	0.00																						
Ratibida columnaris	0.00	2.50	0.00	0.00	0.00																P						
Sphaeralcea coccinea	0.03	30.00	0.07	0.03	0.07		P					P				P	P		P				P		1		
Townsendia exscapa	0.00	2.50	0.00	0.00	0.00																						
Viguiera multiflora	0.00	2.50	0.00	0.00	0.00																P						
TOTAL NATIVE PERENNIAL FORBS	0.03	35.00	0.07	0.03	0.07		P					P				P	P		P		P		P		1		
INTRODUCED PERENNIAL FORBS																											
Convolvulus arvensis	0.00	2.50	0.00	0.00	0.00																P						
Medicago sativa	0.03	2.50	0.07	0.03	0.07																1						
Onobrychis viciifolia	0.05	10.00	0.15	0.05	0.14														1	P	1						
Sanguisorba minor	0.00	2.50	0.00	0.00	0.00																P						
TOTAL INTRO. PERENNIAL FORBS	0.08	10.00	0.22	0.08	0.20														1	P	2						
NATIVE PERENNIAL GRASSES (cool)																											
Agropyron dasystachyum	0.48	27.50	1.41	0.48	1.28		1		P							1		P	P	7	9	1	P				
Agropyron smithii	1.88	60.00	5.57	1.88	5.07	P	14		1	P	3	1		P		2	P	1	P	9	3	7	2	10	13		
Agropyron spicatum	0.03	10.00	0.07	0.03	0.07		1		P			P									P						
Agropyron trachycaulum	0.03	12.50	0.07	0.03	0.07						P								1		P	P					
Oryzopsis hymenoides	0.20	20.00	0.59	0.20	0.54		1									1			P	P		P		P	P		
Sitanion hystrix	0.08	5.00	0.22	0.08	0.20																						
Stipa comata	0.00	5.00	0.00	0.00	0.00																						
TOTAL NATIVE PERENNIAL GRASSES (c)	2.68	65.00	7.94	2.68	7.23	P	17		1	P	3	1		P		4	P	1	1	16	12	8	2	10	13		

J19/J21 Phase III Grassland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE PERENNIAL GRASSES (warm)																									
Bouteloua curtipendula	0.00	7.50	0.00	0.00	0.00																				
Bouteloua gracilis	2.68	72.50	7.94	2.75	7.43	P		8		1		3		P	P	4	6	9	4		2	P		2	8
Buchloe dactyloides	0.05	27.50	0.15	0.05	0.14			P				P						P							
Hilaria jamesii	5.90	80.00	17.52	6.75	18.24	6 1	P	5		7 2	2	4 1		2	2 2	12	22	10	11		9	9		8 1	8 4
Sporobolus airoides	5.10	60.00	15.14	5.30	14.32	30 2		3		1		1		1	11 1	1	3	26 3	1		25			41 1	3
Sporobolus cryptandrus	0.20	32.50	0.59	0.20	0.54												P	2	P			P			
TOTAL NATIVE PERENNIAL GRASSES (w)	13.93	82.50	41.35	15.05	40.68	36 3	P	16		9 2	2	8 1		3	13 3	17	31	47 3	16		36	9		51 2	19 4
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron desertorum	0.00	2.50	0.00	0.00	0.00																				
Bromus inermis	0.00	2.50	0.00	0.00	0.00																				
Elymus junceus	11.18	97.50	33.18	11.45	30.95	4	14	12 2	42	28	22	14	15	23 2	14 1	26	7	3	11		2	10	16	4	15
TOTAL INTRO. PERENNIAL GRASSES (c)	11.18	97.50	33.18	11.45	30.95	4	14	12 2	42	28	22	14	15	23 2	14 1	26	7	3	11		2	10	16	4	15
NATIVE SUBSHRUBS																									
Ceratoides lanata	0.03	32.50	0.07	0.03	0.07											P	1		P						P
Gutierrezia sarothrae	0.03	30.00	0.07	0.03	0.07							P					P			P		P			
Senecio douglasii var. longilobus	0.00	7.50	0.00	0.00	0.00															P					
TOTAL NATIVE SUBSHRUBS	0.05	52.50	0.15	0.05	0.14							P				P	1		P	P		P			P
INTRODUCED SUBSHRUBS																									
Kochia prostrata	2.65	45.00	7.87	2.73	7.36		21						21	P	P				2	15		1			P
TOTAL INTRO. SUBSHRUBS	2.65	45.00	7.87	2.73	7.36		21						21	P	P				2	15		1			P
NATIVE SHRUBS																									
Atriplex canescens	2.05	95.00	6.09	2.08	5.61	P	P	3	3	2	1	1		2	1	10	1	2	P	6	2	P	8	8	P
Atriplex confertifolia	0.03	15.00	0.07	0.03	0.07	P			P														P		
Chrysothamnus nauseosus	0.03	7.50	0.07	0.03	0.07															P					
Cowania mexicana	0.05	2.50	0.15	0.05	0.14															2					
TOTAL NATIVE SHRUBS	2.15	95.00	6.38	2.18	5.88	P	P	3	3	2	1	1		2	1	10	1	2	P	8	2	P	8	8	P
SUCCULENTS																									
Opuntia phaeacantha	0.00	5.00	0.00	0.00	0.00							P													
TOTAL SUCCULENTS	0.00	5.00	0.00	0.00	0.00							P													
Standing dead	5.98	97.50		5.98		10	2	4	5	6	3	3	1	14	5	4	6	11	8		5	7	8	2	9
Litter	12.30	100.00		12.30		17	12	8	15	18	19	11	15	20	15	8	10	4	11	15	8	7	8	7	11
Bare ground	43.58	97.50		43.58		32	47	56	31	34	52	59	46	29	52	33	36	29	52	11	40	64	55	26	44
Rock	4.48	82.50		4.48		1	4	1	4	1	1	4	2	3		2	7	1		41	2	1	5	2	2
TOTALS	100.00		100.00	101.53	95.14	100 3	100 0	100 2	100 0	100 2	100 0	100 1	100 0	100 2	100 4	100 0	100 1	100 3	100 0	100 0	100 0	100 0	100 0	100 2	100 4
TOTAL VEGETATION COVER	33.68	s=(10.56)		37.00	s=(11.53)	40 3	35 0	31 2	45 0	41 2	25 0	23 1	36 0	34 2	28 4	53 0	41 1	55 3	29 0	33 0	45 0	21 0	24 0	63 2	34 4
GROUND COVER (Veg+Litter+St.Dead+Rock)	56.43	s=(15.34)		60.54	s=(16.18)	68 3	53 0	44 2	69 0	66 2	48 0	41 1	54 0	71 2	48 4	67 0	64 1	71 3	48 0	89 0	60 0	36 0	45 0	74 2	56 4
Allowable Ground Cover (per permit)	**51.95**	**s=(13.01)**				**67.0**	**49.0**	**43.0**	**65.0**	**65.0**	**47.0**	**37.0**	**52.0**	**68.0**	**48.0**	**65.0**	**57.0**	**70.0**	**48.0**	**48.0**	**58.0**	**35.0**	**40.0**	**72.0**	**54.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.23	s=(4.92)				7	4	8	3	8	3	9	2	8	8	11	15	9	11	17	11	11	4	5	8

Noxious Cover	0.00
Annual Cover	0.38
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Grassland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE PERENNIAL GRASSES (warm)																									
Bouteloua curtipendula	0.00	7.50	0.00	0.00	0.00				P									P						P	
Bouteloua gracilis	2.68	72.50	7.94	2.75	7.43		5 1		20 2	3		6	1	1		P	1	4	7	5	3	3		P	1
Buchloe dactyloides	0.05	27.50	0.15	0.05	0.14				P	P								1	P		P	P		1	P
Hilaria jamesii	5.90	80.00	17.52	6.75	18.24	1	4 1		16 5	27 13		9	10	3		2	15 4	12	8	4	3	2		3	P
Sporobolus airoides	5.10	60.00	15.14	5.30	14.32		1		1	14			22	3		P	4	5 1	1	3		3			
Sporobolus cryptandrus	0.20	32.50	0.59	0.20	0.54				P		P	P	P	P			1					P		5	P
TOTAL NATIVE PERENNIAL GRASSES (w)	13.93	82.50	41.35	15.05	40.68	1	10 2		37 7	44 13	P	15	33	7		2	21 4	22 1	16	12	6	8		9	1
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron desertorum	0.00	2.50	0.00	0.00	0.00							P													
Bromus inermis	0.00	2.50	0.00	0.00	0.00																P				
Elymus junceus	11.18	97.50	33.18	11.45	30.95	20 1	2	11 3	3	P	18	16	1	8	25 1	16 1	9	3	P	2	9	3	18	P	1
TOTAL INTRO. PERENNIAL GRASSES (c)	11.18	97.50	33.18	11.45	30.95	20 1	2	11 3	3	P	18	16	1	8	25 1	16 1	9	3	P	2	9	3	18	P	1
NATIVE SUBSHRUBS																									
Ceratoides lanata	0.03	32.50	0.07	0.03	0.07				P			P	P			P		P	P	P	P			P	
Gutierrezia sarothrae	0.03	30.00	0.07	0.03	0.07	P	P			P	P	P				1		P		P					
Senecio douglasii var. longilobus	0.00	7.50	0.00	0.00	0.00																			P	P
TOTAL NATIVE SUBSHRUBS	0.05	52.50	0.15	0.05	0.14	P	P		P	P	P	P	P			1		P	P	P	P			P	P
INTRODUCED SUBSHRUBS																									
Kochia prostrata	2.65	45.00	7.87	2.73	7.36			13 3	P				3	12	14			P		P		1		3	P
TOTAL INTRO. SUBSHRUBS	2.65	45.00	7.87	2.73	7.36			13 3	P				3	12	14			P		P		1		3	P
NATIVE SHRUBS																									
Atriplex canescens	2.05	95.00	6.09	2.08	5.61	1	4	3	4	1		3	3	P	5	2 1	2	1	1	P	P	1	P	1	P
Atriplex confertifolia	0.03	15.00	0.07	0.03	0.07														P			1	P		
Chrysothamnus nauseosus	0.03	7.50	0.07	0.03	0.07											P									1
Cowania mexicana	0.05	2.50	0.15	0.05	0.14																				
TOTAL NATIVE SHRUBS	2.15	95.00	6.38	2.18	5.88	1	4	3	4	1		3	3	P	5	2 1	2	1	1	P	P	2	P	1	1
SUCCULENTS																									
Opuntia phaeacantha	0.00	5.00	0.00	0.00	0.00											P									
TOTAL SUCCULENTS	0.00	5.00	0.00	0.00	0.00											P									
Standing dead	5.98	97.50		5.98		1	2	2	9	15	1	8	26	3	2	7	7	13	4	6	4	4	4	2	6
Litter	12.30	100.00		12.30		9	13	15	16	12	22	8	17	4	10	10	14	16	16	10	13	7	9	8	24
Bare ground	43.58	97.50		43.58		56	45	56	28	27	34	47		62	27	56	27	44	58	47	53	66	65	64	53
Rock	4.48	82.50		4.48		12	4		1	1	3		17	3	17	2	20		3	7	1		2	2	
TOTALS	100.00		100.00	101.53	95.14	100 1	100 2	100 6	100 7	100 13	100 0	100 0	100 0	100 0	100 1	100 2	100 4	100 1	100 0	100 0	100 0	100 0	100 0	100 0	100 0
TOTAL VEGETATION COVER	33.68	s=(10.56)		37.00	s=(11.53)	22 1	36 2	27 6	46 7	45 13	40 0	37 0	40 0	28 0	44 1	25 2	32 4	27 1	19 0	30 0	29 0	23 0	20 0	24 0	17 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	56.43	s=(15.34)		60.54	s=(16.18)	44 1	55 2	44 6	72 7	73 13	66 0	53 0	100 0	38 0	73 1	44 2	73 4	56 1	42 0	53 0	47 0	34 0	35 0	36 0	47 0
Allowable Ground Cover (per permit)	**51.95**	**s=(13.01)**				**32.0**	**51.0**	**44.0**	**71.0**	**72.0**	**63.0**	**53.0**	**83.0**	**35.0**	**56.0**	**42.0**	**53.0**	**56.0**	**39.0**	**46.0**	**46.0**	**34.0**	**33.0**	**34.0**	**47.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.23	s=(4.92)				6	16	5	15	9	9	15	12	12	3	13	9	12	16	14	19	18	6	20	18

Noxious Cover	0.00
Annual Cover	0.38
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Shrubland Cover Data – Fall 2023

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover																																							
						S1		S2		S3		S4		S5		S6		S7		S8		S9		S10		S11		S12		S13		S14		S15		S16		S17		S18		S19		S20	
						1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NATIVE ANNUAL & BIENNIAL FORBS																																													
Conyza canadensis	0.00	12.50	0.00	0.00	0.00									P								P																							
Descurainia pinnata	0.00	2.50	0.00	0.00	0.00																																								
Euphorbia glyptosperma	0.00	7.50	0.00	0.00	0.00																																							P	
Lappula redowskii	0.00	17.50	0.00	0.00	0.00							P																																P	
Machaeranthera canescens	0.03	25.00	0.08	0.03	0.08									P				P				1																							
TOTAL NATIVE ANN. & BIEN. FORBS	0.03	40.00	0.08	0.03	0.08							P		P				P				1																						P	
INTRODUCED ANNUAL & BIENNIAL FORBS																																													
Erodium cicutarium	0.00	2.50	0.00	0.00	0.00																																								
Kochia scoparia	0.05	12.50	0.16	0.05	0.15																	P																P							
Melilotus officinalis	0.00	5.00	0.00	0.00	0.00																																								
Polygonum aviculare	0.00	2.50	0.00	0.00	0.00																	P																							
Portulaca oleracea	0.00	2.50	0.00	0.00	0.00																																								
Salsola iberica	0.00	22.50	0.00	0.00	0.00																	P																						P	
Sisymbrium altissimum	0.00	2.50	0.00	0.00	0.00																																								
Tragopogon dubius	0.03	2.50	0.08	0.03	0.08																																								
TOTAL INTRO. ANN. & BIEN. FORBS	0.08	32.50	0.24	0.08	0.23																	P																P						P	
NATIVE ANNUAL GRASSES																																													
Monroa squarrosa	0.00	7.50	0.00	0.00	0.00																	P																							
TOTAL NATIVE ANNUAL GRASSES	0.00	7.50	0.00	0.00	0.00																	P																							
INTRODUCED ANNUAL GRASSES																																													
Bromus japonicus	0.05	10.00	0.16	0.05	0.15																													P											
Bromus tectorum	0.08	17.50	0.24	0.08	0.23																															P									
TOTAL INTRODUCED ANNUAL GRASSES	0.13	25.00	0.41	0.13	0.38																													P		P									
NATIVE PERENNIAL FORBS																																													
Castilleja linariifolia	0.00	5.00	0.00	0.00	0.00									P																															
Eriogonum alatum	0.00	2.50	0.00	0.00	0.00									P																															
Leucelene ericoides	0.00	5.00	0.00	0.00	0.00																																								
Penstemon barbatus	0.00	2.50	0.00	0.00	0.00									P																															
Penstemon palmeri	0.03	5.00	0.08	0.08	0.23									P	1																											1	1		
Penstemon strictus	0.00	2.50	0.00	0.00	0.00																																	P							
Petradoria pumila	0.00	2.50	0.00	0.00	0.00									P																															
Phlox longifolia	0.00	2.50	0.00	0.00	0.00																																								
Ratibida columnaris	0.00	2.50	0.00	0.00	0.00																																								
Sphaeralcea coccinea	0.13	30.00	0.41	0.13	0.38							P										P				P		P				1		P											
Sphaeralcea parvifolia	0.03	2.50	0.08	0.03	0.08																																					1			
TOTAL NATIVE PERENNIAL FORBS	0.18	42.50	0.57	0.23	0.68							P		P	1							P				P		P				1		P				P				2	1		
INTRODUCED PERENNIAL FORBS																																													
Marrubium vulgare	0.00	2.50	0.00	0.00	0.00																																								
TOTAL INTRO. PERENNIAL FORBS	0.00	2.50	0.00	0.00	0.00																																								
NATIVE PERENNIAL GRASSES (cool)																																													
Agropyron dasystachyum	0.38	40.00	1.22	0.40	1.21							P						1																P				1							
Agropyron smithii	1.18	50.00	3.81	1.23	3.70							P						2				1												1				P							
Agropyron spicatum	0.13	27.50	0.41	0.15	0.45							P						P				1												P				P				P			
Agropyron trachycaulum	0.03	7.50	0.08	0.03	0.08																																								
Elymus canadensis	0.00	2.50	0.00	0.00	0.00																																					P			
Oryzopsis hymenoides	0.33	32.50	1.05	0.35	1.06									6	1			3				P																P				1		P	
Sitanion hystrix	0.05	7.50	0.16	0.08	0.23																																	P							
Stipa comata	0.08	10.00	0.24	0.13	0.38									P																								3	1			P	1		
TOTAL NATIVE PERENNIAL GRASSES (c)	2.15	60.00	6.97	2.35	7.09							P		6	1			6				2												1				4	1			1	1	P	

J19/J21 Phase III Shrubland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S21 1st 2nd	S22 1st 2nd	S23 1st 2nd	S24 1st 2nd	S25 1st 2nd	S26 1st 2nd	S27 1st 2nd	S28 1st 2nd	S29 1st 2nd	S30 1st 2nd	S31 1st 2nd	S32 1st 2nd	S33 1st 2nd	S34 1st 2nd	S35 1st 2nd	S36 1st 2nd	S37 1st 2nd	S38 1st 2nd	S39 1st 2nd	S40 1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																									
Conyza canadensis	0.00	12.50	0.00	0.00	0.00									P	P						P				
Descurainia pinnata	0.00	2.50	0.00	0.00	0.00																			P	
Euphorbia glyptosperma	0.00	7.50	0.00	0.00	0.00							P					P								
Lappula redowskii	0.00	17.50	0.00	0.00	0.00							P		P								P	P	P	
Machaeranthera canescens	0.03	25.00	0.08	0.03	0.08	P	P							P		P					P	P		P	
TOTAL NATIVE ANN. & BIEN. FORBS	0.03	40.00	0.08	0.03	0.08	P	P					P		P	P	P	P				P	P	P	P	
INTRODUCED ANNUAL & BIENNIAL FORBS																									
Erodium cicutarium	0.00	2.50	0.00	0.00	0.00												P								
Kochia scoparia	0.05	12.50	0.16	0.05	0.15					P	P					2									
Melilotus officinalis	0.00	5.00	0.00	0.00	0.00										P									P	
Polygonum aviculare	0.00	2.50	0.00	0.00	0.00																				
Portulaca oleracea	0.00	2.50	0.00	0.00	0.00												P								
Salsola iberica	0.00	22.50	0.00	0.00	0.00					P	P	P	P	P		P					P				
Sisymbrium altissimum	0.00	2.50	0.00	0.00	0.00																			P	
Tragopogon dubius	0.03	2.50	0.08	0.03	0.08								1												
TOTAL INTRO. ANN. & BIEN. FORBS	0.08	32.50	0.24	0.08	0.23					P	P	P	1	P	P	2	P				P			P	
NATIVE ANNUAL GRASSES																									
Monroa squarrosa	0.00	7.50	0.00	0.00	0.00												P	P							
TOTAL NATIVE ANNUAL GRASSES	0.00	7.50	0.00	0.00	0.00												P	P							
INTRODUCED ANNUAL GRASSES																									
Bromus japonicus	0.05	10.00	0.16	0.05	0.15	P														P	2				
Bromus tectorum	0.08	17.50	0.24	0.08	0.23					P	P		P	3						P			P		
TOTAL INTRODUCED ANNUAL GRASSES	0.13	25.00	0.41	0.13	0.38	P				P	P		P	3						P	2		P		
NATIVE PERENNIAL FORBS																									
Castilleja linariifolia	0.00	5.00	0.00	0.00	0.00	P																			
Eriogonum alatum	0.00	2.50	0.00	0.00	0.00																				
Leucelene ericoides	0.00	5.00	0.00	0.00	0.00	P																P			
Penstemon barbatus	0.00	2.50	0.00	0.00	0.00																				
Penstemon palmeri	0.03	5.00	0.08	0.08	0.23																				
Penstemon strictus	0.00	2.50	0.00	0.00	0.00																				
Petradoria pumila	0.00	2.50	0.00	0.00	0.00																				
Phlox longifolia	0.00	2.50	0.00	0.00	0.00	P																			
Ratibida columnaris	0.00	2.50	0.00	0.00	0.00									P											
Sphaeralcea coccinea	0.13	30.00	0.41	0.13	0.38						P			4					P	P			P	P	
Sphaeralcea parvifolia	0.03	2.50	0.08	0.03	0.08																				
TOTAL NATIVE PERENNIAL FORBS	0.18	42.50	0.57	0.23	0.68	P					P			4					P	P		P	P	P	
INTRODUCED PERENNIAL FORBS																									
Marrubium vulgare	0.00	2.50	0.00	0.00	0.00																P				
TOTAL INTRO. PERENNIAL FORBS	0.00	2.50	0.00	0.00	0.00																P				
NATIVE PERENNIAL GRASSES (cool)																									
Agropyron dasystachyum	0.38	40.00	1.22	0.40	1.21	1 1	P			P	P		1		P					P	4	1	1	4	1
Agropyron smithii	1.18	50.00	3.81	1.23	3.70	2 1	2		P	P			P	2	9 1	5			P	P	4	3	6	8	2
Agropyron spicatum	0.13	27.50	0.41	0.15	0.45	2	1 1								P						1			P	
Agropyron trachycaulum	0.03	7.50	0.08	0.03	0.08					P													P		1
Elymus canadensis	0.00	2.50	0.00	0.00	0.00																				
Oryzopsis hymenoides	0.33	32.50	1.05	0.35	1.06	2				P			P							P			P	1	P
Sitanion hystrix	0.05	7.50	0.16	0.08	0.23	1 1								1											
Stipa comata	0.08	10.00	0.24	0.13	0.38	P																			
TOTAL NATIVE PERENNIAL GRASSES (c)	2.15	60.00	6.97	2.35	7.09	8 3	3 1		P	P	P		1	3	9 1	5			P	P	9	4	7	13	4

J19/J21 Phase III Shrubland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S1 1st 2nd	S2 1st 2nd	S3 1st 2nd	S4 1st 2nd	S5 1st 2nd	S6 1st 2nd	S7 1st 2nd	S8 1st 2nd	S9 1st 2nd	S10 1st 2nd	S11 1st 2nd	S12 1st 2nd	S13 1st 2nd	S14 1st 2nd	S15 1st 2nd	S16 1st 2nd	S17 1st 2nd	S18 1st 2nd	S19 1st 2nd	S20 1st 2nd
NATIVE PERENNIAL GRASSES (warm)																									
Aristida purpurea	0.00	2.50	0.00	0.00	0.00							1								P				2	
Bouteloua curtipendula	0.23	10.00	0.73	0.23	0.68	1		2	1			8		5 1		1	2	P	5 3	6	3			P	
Bouteloua gracilis	1.88	67.50	6.08	2.00	6.03															P					
Buchloe dactyloides	0.05	25.00	0.16	0.08	0.23															P	P				
Hilaria jamesii	3.45	80.00	11.18	3.95	11.92	6 1	2	3	P	1			P	2	3	5 1	P	P	10 1	8 4	6	P	P		1
Sporobolus airoides	1.68	60.00	5.43	1.75	5.28	6 1	2	4 1				1		P 1	P	8	P		4	5	2		2		
Sporobolus cryptandrus	0.18	32.50	0.57	0.20	0.60				P					1											
TOTAL NATIVE PERENNIAL GRASSES (w)	7.45	95.00	24.15	8.20	24.74	13 2	4	9 1	1	1		10	P	8 2	3	14 1	2	P	19 4	19 4	11	P	2	2	1
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron desertorum	0.00	7.50	0.00	0.00	0.00															P					
Agropyron intermedium	0.03	2.50	0.08	0.03	0.08																				
Elymus junceus	12.93	95.00	41.90	13.28	40.05	11 2	18 3	17	28 1		34	8	21	1	17	26 2	18	33	10	3	15		25	P	14
TOTAL INTRO. PERENNIAL GRASSES (c)	12.95	95.00	41.98	13.30	40.13	11 2	18 3	17	28 1		34	8	21	1	17	26 2	18	33	10	3	15		25	P	14
NATIVE SUBSHRUBS																									
Artemisia frigida	0.00	7.50	0.00	0.00	0.00					P												P		P	
Ceratoides lanata	0.00	30.00	0.00	0.00	0.00				P								P	P	P		P				P
Chrysothamnus greenei	0.00	5.00	0.00	0.00	0.00					P												P			
Eriogonum jamesii	0.00	2.50	0.00	0.00	0.00					P															
Gutierrezia sarothrae	0.28	35.00	0.89	0.33	0.98					P		4			P	P	P			2	P				
TOTAL NATIVE SUBSHRUBS	0.28	57.50	0.89	0.33	0.98				P	P		4			P	P	P	P	P	2	P	P		P	P
INTRODUCED SUBSHRUBS																									
Kochia prostrata	1.33	35.00	4.29	1.50	4.53	6		12 2			1					2 1	P		3	10 2			P		8 1
TOTAL INTRO. SUBSHRUBS	1.33	35.00	4.29	1.50	4.53	6		12 2			1					2 1	P		3	10 2			P		8 1
NATIVE SHRUBS																									
Artemisia tridentata	0.25	17.50	0.81	0.25	0.75					1						P						3		P	
Atriplex canescens	4.88	100.00	15.80	4.98	15.01	2	14	P	9	3	4	1	6	13 1	10	3 1	3	4	6	P	4	7 1	3 1	P	3
Atriplex confertifolia	0.10	25.00	0.32	0.10	0.30				1											P					
Chrysothamnus nauseosus	0.40	12.50	1.30	0.40	1.21					6												4		P	
Cowania mexicana	0.30	10.00	0.97	0.30	0.91					4												P		8	
Ephedra viridis	0.03	10.00	0.08	0.03	0.08					P												1		P	
Purshia tridentata	0.28	5.00	0.89	0.28	0.83					P														11	
Sarcobatus vermiculatus	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE SHRUBS	6.23	100.00	20.18	6.33	19.08	2	14	P	10	14	4	1	6	13 1	10	3 1	3	4	6	P	4	15 1	3 1	19	3
NATIVE TREES																									
Pinus edulis	0.08	7.50	0.24	0.08	0.23					2												1		P	
TOTAL NATIVE TREES	0.08	7.50	0.24	0.08	0.23					2												1		P	
Standing dead	7.50	100.00		7.50		6	5	4	3	8	3	10	7	7	11	6	1	2	9	11	8	15	9	14	3
Litter	11.78	100.00		11.78		18	8	18	12	6	21	12	11	12	10	13	11	13	16	11	10	8	12	9	14
Bare ground	43.78	100.00		43.78		38	50	40	43	19	23	46	49	53	49	36	58	47	35	41	49	13	48	1	50
Rock	6.10	80.00		6.10		6	1		3	44	14	3	6	3			7	1	1	2	3	44	1	52	7
TOTALS	100.00		100.00	101.68	98.14	100 4	100 3	100 3	100 1	100 2	100 0	100 0	100 0	100 3	100 0	100 5	100 0	100 0	100 4	100 6	100 0	100 2	100 1	100 2	100 1
TOTAL VEGETATION COVER	30.85	s=(7.58)		33.14	s=(8.6)	32 4	36 3	38 3	39 1	23 2	39 0	29 0	27 0	25 3	30 0	45 5	23 0	37 0	39 4	35 6	30 0	20 2	30 1	24 2	26 1
GROUND COVER (Veg+Litter+St.Dead+Rock)	56.23	s=(14.7)		59.89	s=(15.7)	62 4	50 3	60 3	57 1	81 2	77 0	54 0	51 0	47 3	51 0	64 5	42 0	53 0	65 4	59 6	51 0	87 2	52 1	99 2	50 1
Allowable Ground Cover (per permit)	**50.13**	**s=(11.41)**				**56.0**	**49.0**	**60.0**	**54.0**	**37.0**	**63.0**	**51.0**	**45.0**	**44.0**	**51.0**	**64.0**	**35.0**	**52.0**	**64.0**	**57.0**	**48.0**	**43.0**	**51.0**	**47.0**	**43.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.83	s=(5.36)				6	4	6	12	21	3	11	3	16	5	9	9	5	8	16	9	17	5	17	9

Noxious Cover	0.00
Annual Cover	0.23
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Shrubland Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S21 1st 2nd	S22 1st 2nd	S23 1st 2nd	S24 1st 2nd	S25 1st 2nd	S26 1st 2nd	S27 1st 2nd	S28 1st 2nd	S29 1st 2nd	S30 1st 2nd	S31 1st 2nd	S32 1st 2nd	S33 1st 2nd	S34 1st 2nd	S35 1st 2nd	S36 1st 2nd	S37 1st 2nd	S38 1st 2nd	S39 1st 2nd	S40 1st 2nd
NATIVE PERENNIAL GRASSES (warm)																									
Aristida purpurea	0.00	2.50	0.00	0.00	0.00		P																		
Bouteloua curtipendula	0.23	10.00	0.73	0.23	0.68										6										
Bouteloua gracilis	1.88	67.50	6.08	2.00	6.03	P	4	5 1	7	P	1		4	P	9	P		1		4	5	1		P	
Buchloe dactyloides	0.05	25.00	0.16	0.08	0.23	P	P 1						P		P						P		1	P	1
Hilaria jamesii	3.45	80.00	11.18	3.95	11.92	9 4	8 3	14 3	8	8 2	18		8	P	5	P				7	P 1	5	1	P	
Sporobolus airoides	1.68	60.00	5.43	1.75	5.28		1	1	7	P	11			2		1		2		2	1	3	2		
Sporobolus cryptandrus	0.18	32.50	0.57	0.20	0.60	P					P	P	P	4					P		P 1	1	P	P	1
TOTAL NATIVE PERENNIAL GRASSES (w)	7.45	95.00	24.15	8.20	24.74	9 4	13 4	20 4	22	8 2	30	P	12	6	20	1		3	P	13	6 2	10	4	P	2
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron desertorum	0.00	7.50	0.00	0.00	0.00					P											P				
Agropyron intermedium	0.03	2.50	0.08	0.03	0.08																			1	
Elymus junceus	12.93	95.00	41.90	13.28	40.05	5	12 1	P	10	21 1	5	14	10	1	1	10	27 2	28 2	17	3	13	14	8	9	10
TOTAL INTRO. PERENNIAL GRASSES (c)	12.95	95.00	41.98	13.30	40.13	5	12 1	P	10	21 1	5	14	10	1	1	10	27 2	28 2	17	3	13	14	8	10	10
NATIVE SUBSHRUBS																									
Artemisia frigida	0.00	7.50	0.00	0.00	0.00																				
Ceratoides lanata	0.00	30.00	0.00	0.00	0.00	P		P	P			P	P								P				
Chrysothamnus greenei	0.00	5.00	0.00	0.00	0.00																				
Eriogonum jamesii	0.00	2.50	0.00	0.00	0.00																				
Gutierrezia sarothrae	0.28	35.00	0.89	0.33	0.98	2 1	P		P				P	3						P		P 1			
TOTAL NATIVE SUBSHRUBS	0.28	57.50	0.89	0.33	0.98	2 1	P	P	P			P	P	3						P	P	P 1			
INTRODUCED SUBSHRUBS																									
Kochia prostrata	1.33	35.00	4.29	1.50	4.53	5		2					4		P							P 1			
TOTAL INTRO. SUBSHRUBS	1.33	35.00	4.29	1.50	4.53	5		2					4		P							P 1			
NATIVE SHRUBS																									
Artemisia tridentata	0.25	17.50	0.81	0.25	0.75	3	2							1											
Atriplex canescens	4.88	100.00	15.80	4.98	15.01	2	3	8	3	4	7	3	4	8	9	9	6	12	2	1	11	P	5	3	P
Atriplex confertifolia	0.10	25.00	0.32	0.10	0.30	1						P	P			P						P	P	P	2
Chrysothamnus nauseosus	0.40	12.50	1.30	0.40	1.21	P	6																		
Cowania mexicana	0.30	10.00	0.97	0.30	0.91	P																			
Ephedra viridis	0.03	10.00	0.08	0.03	0.08	P																			
Purshia tridentata	0.28	5.00	0.89	0.28	0.83																				
Sarcobatus vermiculatus	0.00	2.50	0.00	0.00	0.00	P																			
TOTAL NATIVE SHRUBS	6.23	100.00	20.18	6.33	19.08	6	11	8	3	4	7	3	4	9	9	9	6	12	2	1	11	P	5	3	2
NATIVE TREES																									
Pinus edulis	0.08	7.50	0.24	0.08	0.23																				
TOTAL NATIVE TREES	0.08	7.50	0.24	0.08	0.23																				
Standing dead	7.50	100.00		7.50		14	18	16	15	9	21	3	6	3	3	6	4	4	1	12	3	5	2	2	11
Litter	11.78	100.00		11.78		10	17	24	13	10	9	8	9	8	17	7	12	12	10	8	13	9	8	14	8
Bare ground	43.78	100.00		43.78		32	25	28	37	46	28	71	52	60	40	52	48	40	60	60	42	56	66	58	62
Rock	6.10	80.00		6.10		9	1	2		2		1	1		1	8	3	1	10	3	1	2			1
TOTALS	100.00		100.00	101.68	98.14	100 8	100 6	100 4	100 0	100 3	100 0	100 0	100 0	100 0	100 1	100 0	100 2	100 2	100 0	100 0	100 2	100 2	100 0	100 0	100 0
TOTAL VEGETATION COVER	30.85	s=(7.58)		33.14	s=(8.6)	35 8	39 6	30 4	35 0	33 3	42 0	17 0	32 0	29 0	39 1	27 0	33 2	43 2	19 0	17 0	41 2	28 2	24 0	26 0	18 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	56.23	s=(14.7)		59.89	s=(15.7)	68 8	75 6	72 4	63 0	54 3	72 0	29 0	48 0	40 0	60 1	48 0	52 2	60 2	40 0	40 0	58 2	44 2	34 0	42 0	38 0
Allowable Ground Cover (per permit)	**50.13**	**s=(11.41)**				**59.0**	**74.0**	**70.0**	**63.0**	**52.0**	**72.0**	**28.0**	**47.0**	**40.0**	**59.0**	**40.0**	**49.0**	**59.0**	**30.0**	**37.0**	**57.0**	**42.0**	**34.0**	**42.0**	**37.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.83	s=(5.36)				26	14	7	8	13	11	8	16	17	12	10	6	5	5	12	17	14	14	18	9

Noxious Cover	0.00
Annual Cover	0.23
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J7 Sagebrush Reference Area Cover Data – Fall 2023

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																				
Chenopodium fremontii	0.00	6.67	0.00	0.00	0.00				P											
Chenopodium leptophyllum	0.20	80.00	0.79	0.20	0.74	P	P		1	1	P	P	P	P	P		1	P	P	
Cordylanthus wrightii	0.00	33.33	0.00	0.00	0.00			P				P				P	P			P
Cryptantha crassisepala	0.20	46.67	0.79	0.20	0.74				P				P	1		P	1	1	P	
Descurainia pinnata	0.13	20.00	0.52	0.13	0.49	2										P	P			
Machaeranthera canescens	0.00	6.67	0.00	0.00	0.00							P								
Plantago patagonica	0.07	46.67	0.26	0.07	0.25		P	P		P	P		P				1	P		
Townsendia annua	0.53	86.67	2.10	0.53	1.97	P	P	2	2	2	P	P	P	P		P	P	2	P	
TOTAL NATIVE ANN. & BIEN. FORBS	1.13	100.00	4.46	1.13	4.19	2	P	2	3	3	P	P	P	1	P	P	3	3	P	P
INTRODUCED ANNUAL & BIENNIAL FORBS																				
Salsola iberica	0.40	80.00	1.57	0.40	1.48	P	1	P	P	2	P	P	1	2				P	P	P
Portulaca oleracea	0.13	40.00	0.52	0.13	0.49	P	1						1	P			P		P	
TOTAL INTRO. ANN. & BIEN. FORBS	0.53	86.67	2.10	0.53	1.97	P	2	P	P	2	P	P	2	2			P	P	P	P
NATIVE ANNUAL GRASSES																				
Festuca octoflora	0.00	26.67	0.00	0.00	0.00		P		P	P		P								
Monroa squarrosa	0.00	13.33	0.00	0.00	0.00		P												P	
TOTAL NATIVE ANNUAL GRASSES	0.00	33.33	0.00	0.00	0.00		P		P	P		P							P	
NATIVE PERENNIAL FORBS																				
Leucelene ericoides	0.07	53.33	0.26	0.07	0.25			P		P		1	P		P		P	P		P
Mirabilis linearis	0.00	6.67	0.00	0.00	0.00						P									
Sphaeralcea coccinea	0.07	53.33	0.26	0.07	0.25			P		P	1	P		P	P	P			P	
TOTAL NATIVE PERENNIAL FORBS	0.13	80.00	0.52	0.13	0.49			P		P	1	1	P	P	P	P	P	P	P	P
NATIVE PERENNIAL GRASSES (cool)																				
Oryzopsis hymenoides	0.07	26.67	0.26	0.07	0.25						P				1				P	P
Sitanion hystrix	3.93	100.00	15.49	4.40	16.26	2	2	8	2	2	8 3	3 1	4 1	2 1	3 1	5	8	2	5	3
Stipa comata	0.07	6.67	0.26	0.07	0.25										1					
TOTAL NATIVE PERENNIAL GRASSES (c)	4.07	100.00	16.01	4.53	16.75	2	2	8	2	2	8 3	3 1	4 1	2 1	5 1	5	8	2	5	3
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	4.87	100.00	19.16	5.40	19.95	5	8	P 2	5 1	5	7 2	3 1	2	8	P	5	5	11 2	7	2
Hilaria jamesii	3.40	100.00	13.39	3.67	13.55	11	1	P 1	4 1	2	4 1	2	6	1	2	1	8	4 1	4	1
Sporobolus cryptandrus	0.13	33.33	0.52	0.20	0.74	P					P						P	P 1	2	
TOTAL NATIVE PERENNIAL GRASSES (w)	8.40	100.00	33.07	9.27	34.24	16	9	P 3	9 2	7	11 3	5 1	8	9	2	6	13	15 4	13	3
NATIVE SUBSHRUBS																				
Ceratoides lanata	1.00	40.00	3.94	1.00	3.69		2			1	1		3		3					5
Chrysothamnus greenei	3.20	100.00	12.60	3.40	12.56	P	3	3	3 1	4	P	1	3	7	6	1	1	1 1	7	8 1
Eriogonum microthecum	0.00	13.33	0.00	0.00	0.00			P												P
Gutierrezia sarothrae	0.00	46.67	0.00	0.00	0.00		P	P			P	P			P			P	P	
TOTAL NATIVE SUBSHRUBS	4.20	100.00	16.54	4.40	16.26	P	5	3	3 1	5	1	1	6	7	9	1	1	1 1	7	13 1
NATIVE SHRUBS																				
Artemisia tridentata	5.73	100.00	22.57	5.80	21.43	3	4	10	4	9	4	5	4	7	7	9	5	3	2 1	10
Atriplex canescens	1.20	53.33	4.72	1.27	4.68	P	1		6		4 1	2	2						2	1
TOTAL NATIVE SHRUBS	6.93	100.00	27.30	7.07	26.11	3	5	10	10	9	8 1	7	6	7	7	9	5	3	4 1	11

J7 Sagebrush Reference Area Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
SUCCULENTS																				
Coryphantha vivipara	0.00	40.00	0.00	0.00	0.00	P	P			P		P			P					P
Opuntia phaeacantha	0.00	6.67	0.00	0.00	0.00					P										
Opuntia whipplei	0.00	13.33	0.00	0.00	0.00				P									P		
Sclerocactus whipplei	0.00	6.67	0.00	0.00	0.00			P												
TOTAL SUCCULENTS	0.00	60.00	0.00	0.00	0.00	P	P	P	P	P		P			P			P		P
BRYOPHYTES																				
Moss spp.	0.20	26.67	0.79	0.20	0.74	P	1				1					1				
TOTAL BRYOPHYTES	0.20	26.67	0.79	0.20	0.74	P	1				1					1				
LICHEN/FUNGUS																				
Lichen spp.	0.33	100.00	1.31	0.33	1.23	P	1	P	P	2	P	P	P	P	1	P	1	P	P	P
TOTAL LICHEN	0.33	100.00	1.31	0.33	1.23	P	1	P	P	2	P	P	P	P	1	P	1	P	P	P
Standing dead	10.73	100.00		10.73		18	9	11	19	4	10	8	7	12	11	7	10	17	8	10
Litter	24.80	100.00		24.80		14	27	31	27	31	30	39	15	28	17	10	15	36	30	22
Bare ground	37.87	100.00		37.87		45	39	35	27	35	29	36	47	32	45	61	44	23	33	37
Rock	0.67	26.67		0.67							1		5		3					1
TOTALS	100.00		100.00	101.67	100.00	100 0	100 0	100 3	100 3	100 0	100 7	100 2	100 1	100 1	100 1	100 0	100 0	100 5	100 1	100 1
TOTAL VEGETATION COVER	25.40	s=(3.78)		27.07	s=(4.43)	23 0	23 0	23 3	27 3	28 0	29 7	17 2	26 1	28 1	23 1	21 0	30 0	24 5	29 1	30 1
GROUND COVER (Veg+Litter+St.Dead+Rock)	62.13	s=(9.47)		63.80	s=(10.92)	55 0	61 0	65 3	73 3	65 0	71 7	64 2	53 1	68 1	55 1	39 0	56 0	77 5	67 1	63 1
Allowable Ground Cover (per permit)	**61.47**	**s=(10)**				**55.0**	**61.0**	**65.0**	**73.0**	**65.0**	**70.0**	**64.0**	**48.0**	**68.0**	**52.0**	**39.0**	**56.0**	**77.0**	**67.0**	**62.0**
SPECIES DENSITY (# of species/100 sq.m.)	15.13	s=(1.85)				15	18	15	14	16	18	17	15	12	14	12	15	15	17	14

Noxious Cover	0
Annual Cover	1.67
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

N7/8 Sagebrush Reference Area Cover Data – Fall 2023

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																				
Amaranthus retroflexus	0.00	6.67	0.00	0.00	0.00		P													
Chenopodium fremontii	0.00	6.67	0.00	0.00	0.00		P													
Chenopodium graveolens	0.00	40.00	0.00	0.00	0.00	P				P			P			P	P		P	
Chenopodium leptophyllum	0.00	6.67	0.00	0.00	0.00	P														
Descurainia pinnata	0.00	13.33	0.00	0.00	0.00					P						P				
Euphorbia glyptosperma	0.00	26.67	0.00	0.00	0.00		P	P						P		P				
Gilia aggregata	0.00	6.67	0.00	0.00	0.00	P														
Lappula redowskii	0.07	80.00	0.31	0.07	0.31	P	P	P	1	P			P	P	P	P	P	P	P	
Machaeranthera canescens	0.00	6.67	0.00	0.00	0.00				P											
TOTAL NATIVE ANN. & BIEN. FORBS	0.07	80.00	0.31	0.07	0.31	P	P	P	1	P			P	P	P	P	P	P	P	
INTRODUCED ANNUAL & BIENNIAL FORBS																				
Lactuca serriola	0.00	6.67	0.00	0.00	0.00							P								
Portulaca oleracea	0.00	33.33	0.00	0.07	0.31		P		P 1	P			P						P	
TOTAL INTRO. ANN. & BIEN. FORBS	0.00	40.00	0.00	0.07	0.31		P		P 1	P		P	P						P	
INTRODUCED ANNUAL GRASSES																				
Bromus tectorum	0.20	13.33	0.93	0.20	0.92		3												P	
TOTAL INTRODUCED ANNUAL GRASSES	0.20	13.33	0.93	0.20	0.92		3												P	
NATIVE PERENNIAL FORBS																				
Arabis fendleri	0.00	13.33	0.00	0.00	0.00	P				P										
Asclepias spp.	0.00	6.67	0.00	0.00	0.00												P			
Astragalus calycosus var. scaposus	0.00	60.00	0.00	0.00	0.00	P	P			P	P	P	P	P			P			P
Astragalus wingatanus	0.07	46.67	0.31	0.07	0.31	P	P	P			1	P	P			P				
Cryptantha flavoculata	0.00	33.33	0.00	0.00	0.00	P				P	P						P	P		
Euphorbia fendleri	0.00	26.67	0.00	0.00	0.00		P		P			P								P
Lesquerella intermedia	0.00	26.67	0.00	0.00	0.00						P		P	P			P			
Leucelene ericoides	0.47	93.33	2.16	0.47	2.15	P	1	1	P	1	3	P	P	P	1	P		P	P	P
Mirabilis alipes	0.00	33.33	0.00	0.00	0.00		P			P			P	P			P			
Mirabilis linearis	0.00	13.33	0.00	0.00	0.00									P					P	
Phlox longifolia	0.00	20.00	0.00	0.00	0.00									P			P		P	
Psilostrophe sparsiflora	0.07	6.67	0.31	0.07	0.31												1			
Sphaeralcea coccinea	0.20	93.33	0.93	0.20	0.92	1	P	1	P	P	P	P	P	P	P	P	P	1		P
Stanleya pinnata	0.00	26.67	0.00	0.00	0.00					P					P	P		P		
Stenotus armerioides	0.00	6.67	0.00	0.00	0.00									P						
Trifolium gymnocarpon	0.00	6.67	0.00	0.00	0.00											P				
TOTAL NATIVE PERENNIAL FORBS	0.80	100.00	3.70	0.80	3.69	1	1	2	P	1	4	P	P	P	1	P	1	1	P	P
NATIVE PERENNIAL GRASSES (cool)																				
Oryzopsis hymenoides	0.93	100.00	4.32	0.93	4.31	1	P	P	P	P	P	5	P	P	4	P	P	1	1	2
Sitanion hystrix	0.87	100.00	4.01	0.87	4.00	1	P	P	P	3	P	1	P	3	2	P	P	1	2	P
Stipa comata	0.07	33.33	0.31	0.07	0.31	P						1		P	P					P
TOTAL NATIVE PERENNIAL GRASSES (c)	1.87	100.00	8.64	1.87	8.62	2	P	P	P	3	P	7	P	3	6	P	P	2	3	2
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	2.67	93.33	12.35	2.67	12.31	4		P	4	4	2	2	P	9	2	1	3	P	4	5
Hilaria jamesii	1.13	86.67	5.25	1.13	5.23	2	P	1		P	P	4	P		2	3	2	2	P	1
Sporobolus cryptandrus	0.00	33.33	0.00	0.00	0.00	P			P	P				P					P	
TOTAL NATIVE PERENNIAL GRASSES (w)	3.80	100.00	17.59	3.80	17.54	6	P	1	4	4	2	6	P	9	4	4	5	2	4	6

N7/8 Sagebrush Reference Area Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
INTRODUCED PERENNIAL GRASSES (cool)																				
Elymus junceus	0.00	6.67	0.00	0.00	0.00	P														
TOTAL INTRO. PERENNIAL GRASSES (c)	0.00	6.67	0.00	0.00	0.00	P														
NATIVE SUBSHRUBS																				
Ceratoides lanata	0.00	6.67	0.00	0.00	0.00								P							
Chrysothamnus greenei	2.33	100.00	10.80	2.33	10.77	1	1	1	7	1	1	5	3	2	P	2	P	2	3	6
Eriogonum microthecum	0.07	6.67	0.31	0.07	0.31														1	
Gutierrezia sarothrae	4.40	100.00	20.37	4.40	20.31	2	4	6	4	7	3	3	3	4	5	3	7	8	6	1
Senecio douglasii var. longilobus	0.00	6.67	0.00	0.00	0.00										P					
TOTAL NATIVE SUBSHRUBS	6.80	100.00	31.48	6.80	31.38	3	5	7	11	8	4	8	6	6	5	5	7	10	10	7
NATIVE SHRUBS																				
Artemisia tridentata	4.47	100.00	20.68	4.47	20.62	10	6	4	1	6	2	3	9	4	3	4	1	1	7	6
Atriplex canescens	2.13	73.33	9.88	2.13	9.85	4	9	4	4	1	P	5	3	2					P	P
Chrysothamnus nauseosus	0.00	6.67	0.00	0.00	0.00															P
Chrysothamnus viscidiflorus	0.13	40.00	0.62	0.13	0.62	P	1	1					P	P					P	
Ephedra viridis	0.00	6.67	0.00	0.00	0.00										P					
Tetradymia canescens	0.00	26.67	0.00	0.00	0.00	P		P				P		P						
TOTAL NATIVE SHRUBS	6.73	100.00	31.17	6.73	31.08	14	16	9	5	7	2	8	12	6	3	4	1	1	7	6
NATIVE TREES																				
Juniperus osteosperma	0.40	26.67	1.85	0.40	1.85	3		1								1		1		
Pinus edulis	0.93	73.33	4.32	0.93	4.31	1	1	1		1	1	P	3		1	2	2			1
TOTAL NATIVE TREES	1.33	80.00	6.17	1.33	6.15	4	1	2		1	1	P	3		1	3	2	1		1
SUCCULENTS																				
Coryphantha vivipara	0.00	26.67	0.00	0.00	0.00	P						P		P					P	
Opuntia macrorhiza	0.00	13.33	0.00	0.00	0.00	P					P									
Opuntia polyacantha	0.00	20.00	0.00	0.00	0.00	P						P				P				
Opuntia whipplei	0.00	6.67	0.00	0.00	0.00															P
TOTAL SUCCULENTS	0.00	46.67	0.00	0.00	0.00	P					P	P		P		P			P	P
Standing dead	9.60	100.00		9.60		7	7	7	11	7	8	8	9	19	9	8	6	15	10	13
Litter	20.73	100.00		20.73		21	28	22	16	31	16	14	11	12	19	32	39	22	18	10
Bare ground	30.93	100.00		30.93		36	26	37	40	34	34	40	44	19	29	36	15	16	15	43
Rock	17.13	100.00		17.13		6	13	13	12	4	29	9	15	26	23	8	24	30	33	12
TOTALS	100.00		100.00	100.07	100.00	100 0	100 0	100 0	100 1	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0
TOTAL VEGETATION COVER	21.60	s=(4.81)		21.67	s=(4.81)	30 0	26 0	21 0	21 1	24 0	13 0	29 0	21 0	24 0	20 0	16 0	16 0	17 0	24 0	22 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	69.07	s=(10.31)		69.13	s=(10.25)	64 0	74 0	63 0	60 1	66 0	66 0	60 0	56 0	81 0	71 0	64 0	85 0	84 0	85 0	57 0
Allowable Ground Cover (per permit)	**51.93**	**s=(7.36)**				**58.0**	**61.0**	**50.0**	**48.0**	**62.0**	**37.0**	**51.0**	**41.0**	**55.0**	**48.0**	**56.0**	**61.0**	**54.0**	**52.0**	**45.0**
SPECIES DENSITY (# of species/100 sq.m.)	18.53	s=(3.74)				28	21	17	14	21	16	19	20	22	15	19	18	13	19	16

Noxious Cover	0.00
Annual Cover	0.27
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

N14 Sagebrush Reference Area Cover Data – Fall 2023

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover															
						1		2		3		4		5		6		7		8	
						1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NATIVE ANNUAL & BIENNIAL FORBS																					
Descurainia pinnata	0.00	33.33	0.00	0.00	0.00											P				P	
Euphorbia glyptosperma	0.00	6.67	0.00	0.00	0.00																
Lappula redowskii	0.07	80.00	0.18	0.07	0.18			P		P		P		P		P		1		P	
Machaeranthera canescens	0.00	53.33	0.00	0.00	0.00			P		P				P				P		P	
TOTAL NATIVE ANN. & BIEN. FORBS	0.07	93.33	0.18	0.07	0.18			P		P		P		P		P		1		P	
NATIVE PERENNIAL FORBS																					
Arabis fendleri	0.00	13.33	0.00	0.00	0.00			P													
Leucelene ericoides	0.47	86.67	1.26	0.47	1.26	1				1		1		1		P				P	
Sphaeralcea coccinea	0.00	80.00	0.00	0.00	0.00	P						P		P		P		P		P	
TOTAL NATIVE PERENNIAL FORBS	0.47	100.00	1.26	0.47	1.26	1		P		1		1		1		P		P		P	
NATIVE PERENNIAL GRASSES (cool)																					
Oryzopsis hymenoides	0.07	46.67	0.18	0.07	0.18	P						P		P				P			
Sitanion hystrix	1.67	100.00	4.50	1.67	4.50	P		1		4		2		3		2		1		4	
Stipa comata	0.13	40.00	0.36	0.13	0.36					P		1				P					
TOTAL NATIVE PERENNIAL GRASSES (c)	1.87	100.00	5.04	1.87	5.04	P		1		4		3		3		2		1		4	
NATIVE PERENNIAL GRASSES (warm)																					
Bouteloua gracilis	18.80	100.00	50.72	18.80	50.72	17		23		17		24		14		18		15		18	
Hilaria jamesii	0.00	6.67	0.00	0.00	0.00							P									
TOTAL NATIVE PERENNIAL GRASSES (w)	18.80	100.00	50.72	18.80	50.72	17		23		17		24		14		18		15		18	
NATIVE SUBSHRUBS																					
Chrysothamnus greenei	0.60	73.33	1.62	0.60	1.62	P		P		P		2		P		P				1	
Gutierrezia sarothrae	0.93	100.00	2.52	0.93	2.52	P		P		2		1		1		P		4		P	
TOTAL NATIVE SUBSHRUBS	1.53	100.00	4.14	1.53	4.14	P		P		2		3		1		P		4		1	
NATIVE SHRUBS																					
Artemisia tridentata	13.53	100.00	36.51	13.53	36.51	7		13		11		10		15		15		13		13	
Chrysothamnus viscidiflorus	0.00	13.33	0.00	0.00	0.00															P	
TOTAL NATIVE SHRUBS	13.53	100.00	36.51	13.53	36.51	7		13		11		10		15		15		13		13	
NATIVE TREES																					
Pinus edulis	0.80	86.67	2.16	0.80	2.16	3		P		1				P		1		3		P	
TOTAL NATIVE TREES	0.80	86.67	2.16	0.80	2.16	3		P		1				P		1		3		P	
SUCCULENTS																					
Coryphantha vivipara	0.00	13.33	0.00	0.00	0.00					P						P					
Opuntia phaeacantha	0.00	20.00	0.00	0.00	0.00															P	
TOTAL SUCCULENTS	0.00	33.33	0.00	0.00	0.00					P						P				P	
BRYOPHYTES																					
Moss spp.	0.27	20.00	0.72	0.27	0.72					1								2			
TOTAL BRYOPHYTES	0.27	20.00	0.72	0.27	0.72					1								2			

PLANT SPECIES	Percent Foliar Cover																			
	9		10		11		12		13		14		15							
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd						
NATIVE ANNUAL & BIENNIAL FORBS																				
Descurainia pinnata			P		P						P									
Euphorbia glyptosperma							P													
Lappula redowskii	P				P		P				P		P							
Machaeranthera canescens							P		P				P							
TOTAL NATIVE ANN. & BIEN. FORBS	P		P		P		P		P		P		P							
NATIVE PERENNIAL FORBS																				
Arabis fendleri			P																	
Leucelene ericoides	P		P		P		P		1		2		P							
Sphaeralcea coccinea			P		P		P		P		P		P							
TOTAL NATIVE PERENNIAL FORBS	P		P		P		P		1		2		P							
NATIVE PERENNIAL GRASSES (cool)																				
Oryzopsis hymenoides			P										P							
Sitanion hystrix	P		3		2		1		1		1		P							
Stipa comata			1				P		P											
TOTAL NATIVE PERENNIAL GRASSES (c)	P		4		2		1		1		1		P							
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	19		23		21		19		14		20		20							
Hilaria jamesii																				
TOTAL NATIVE PERENNIAL GRASSES (w)	19		23		21		19		14		20		20							
NATIVE SUBSHRUBS																				
Chrysothamnus greenei					1		1		P		4									
Gutierrezia sarothrae	P		1		P		1		2		P		2							
TOTAL NATIVE SUBSHRUBS	P		1		1		2		2		4		2							
NATIVE SHRUBS																				
Artemisia tridentata	11		12		11		20		19		19		14							
Chrysothamnus viscidiflorus													P							
TOTAL NATIVE SHRUBS	11		12		11		20		19		19		14							
NATIVE TREES																				
Pinus edulis	P		1		P		1		2				P							
TOTAL NATIVE TREES	P		1		P		1		2				P							
SUCCULENTS																				
Coryphantha vivipara																				
Opuntia phaeacantha							P				P									
TOTAL SUCCULENTS							P				P									
BRYOPHYTES																				
Moss spp.													1							
TOTAL BRYOPHYTES													1							

N14 Sagebrush Reference Area Cover Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
LICHEN/FUNGUS																				
Lichen spp.	0.73	40.00	1.98	0.73	1.98		1							1		2	5	1		1
TOTAL LICHEN	0.73	40.00	1.98	0.73	1.98		1							1		2	5	1		1
Standing dead	10.53	100.00		10.53		8	10	7	8	20	10	7	16	11	9	11	7	11	11	12
Litter	12.87	100.00		12.87		14	14	18	8	13	10	13	16	13	11	9	10	15	14	15
Bare ground	38.47	100.00		38.47		50	38	38	43	33	44	40	32	43	40	42	36	34	29	35
Rock	0.07	6.67		0.07								1								
TOTALS	100.00		100.00	100.00	100.00	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0	100 0
TOTAL VEGETATION COVER	37.07	s=(4.27)		37.07	s=(4.27)	28 0	37 0	36 0	41 0	34 0	36 0	37 0	36 0	32 0	40 0	36 0	42 0	39 0	46 0	36 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	61.53	s=(5.49)		61.53	s=(5.49)	50 0	62 0	62 0	57 0	67 0	56 0	60 0	68 0	57 0	60 0	58 0	64 0	66 0	71 0	65 0
Allowable Ground Cover (per permit)	**61.47**	**s=(5.51)**				**50.0**	**62.0**	**62.0**	**57.0**	**67.0**	**56.0**	**59.0**	**68.0**	**57.0**	**60.0**	**58.0**	**64.0**	**66.0**	**71.0**	**65.0**
SPECIES DENSITY (# of species/100 sq.m.)	11.13	s=(1.46)				9	10	12	11	11	12	10	13	9	11	11	14	11	10	13

Noxious Cover	0
Annual Cover	0.07
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Grassland Production Data – Fall 2023

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NATIVE ANNUAL & BIENNIAL FORBS																							
Ambrosia artemisiifolia	0.14	2.56	2.50																				
Euphorbia glyptosperma	0.00	0	2.50																	T			
Lappula redowskii	0.23	4.03	12.50					9					2.4						0.5				
Machaeranthera canescens	0.00	0.06	5.00																				
Machaeranthera tanacetifolia	0.03	0.59	2.50																				
TOTAL NATIVE ANN. & BIEN. FORBS	0.41	7.24	17.50	-	-	-	-	9.0	-	-	-	-	2.4	-	-	-	-	-	0.5	-	-	-	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Kochia scoparia	3.21	57.31	15.00											T	1.3			93	23.4				
Lactuca serriola	0.02	0.43	2.50															2.9					
Salsola iberica	0.15	2.66	10.00																17				
TOTAL INTRO. ANN. & BIEN. FORBS	3.39	60.4	17.50	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	95.9	40.4	-	-	-	-
NATIVE ANNUAL GRASSES																							
Monroa squarrosa	0.00	0	2.50																	T			
TOTAL NATIVE ANNUAL GRASSES	0.00	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus japonicus	0.04	0.73	10.00																0.9				
Bromus tectorum	0.16	2.82	12.50	0.3											1.2								
TOTAL INTRODUCED ANNUAL GRASSES	0.20	3.55	22.50	0.3	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	0.9	-	-	-	-
NATIVE PERENNIAL FORBS																							
Erigeron concinnus	0.00	0.03	2.50																				
Sphaeralcea coccinea	0.05	0.85	10.00												4.4								
TOTAL NATIVE PERENNIAL FORBS	0.05	0.88	12.50	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-
INTRODUCED PERENNIAL FORBS																							
Onobrychis viciifolia	0.05	0.8	2.50																				
TOTAL INTRODUCED PERENNIAL FORBS	0.05	0.8	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	1.09	19.52	20.00																	2.7			
Agropyron smithii	3.23	57.62	35.00							3		44.8			41.6				32.3	6.9			
Agropyron spicatum	0.23	4.06	5.00																				
Oryzopsis hymenoides	0.37	6.51	15.00															36.6					
TOTAL NATIVE PERENNIAL GRASSES (c)	4.92	87.71	42.50	-	-	-	-	-	-	3.0	-	44.8	-	-	41.6	-	-	36.6	32.3	9.6	-	-	-
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	3.21	57.21	55.00			15.1		7.3		5.5			12.7	6.1	33	31.7	25		9.6			10.3	8.6
Buchloe dactyloides	0.17	2.96	5.00																				
Hilaria jamesii	5.88	104.88	65.00	14.6		37.8		44.4	1.6	9.5			3.7	9.4	94.5	1.4	46.7		69.2	13.1		40.6	5.4
Sporobolus airoides	4.31	76.89	35.00	63.8				3.2		6.1			37.5			62.7			10.9			106.5	5.8
Sporobolus cryptandrus	0.24	4.31	17.50					0.3											2	0.5			
TOTAL NATIVE PERENNIAL GRASSES (w)	13.80	246.25	72.50	78.4	-	52.9	-	55.2	1.6	21.1	-	-	53.9	15.5	127.5	95.8	71.7	-	91.7	13.6	-	157.4	19.8
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	19.41	346.32	72.50		74.5	21	353.9	95.6	108.8	4.9	41.5	65.2	138.6	85.2	67	47.5	56.5		14.5	45.2	108.5	35.3	51.4
TOTAL INTRO. PERENNIAL GRASSES (c)	19.41	346.32	72.50	-	74.5	21.0	353.9	95.6	108.8	4.9	41.5	65.2	138.6	85.2	67.0	47.5	56.5	-	14.5	45.2	108.5	35.3	51.4
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.06	0.98	5.00												3.9								
Senecio douglasii var. longilobus	0.01	0.18	2.50																				
TOTAL NATIVE SUBSHRUBS	0.07	1.16	7.50	-	-	-	-	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	-	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	3.52	62.74	20.00		16.4						181											13.6	
TOTAL INTRO. SUBSHRUBS	3.52	62.74	17.50	-	16.4	-	-	-	-	-	181.0	-	-	-	-	-	-	-	-	-	-	13.6	-

J19/J21 Phase III Grassland Production Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
NATIVE ANNUAL & BIENNIAL FORBS																							
Ambrosia artemisiifolia	0.14	2.56	2.50		17.2																		
Euphorbia glyptosperma	0.00	0	2.50																				
Lappula redowskii	0.23	4.03	12.50							15.1	0.1												
Machaeranthera canescens	0.00	0.06	5.00		0.2																	0.2	
Machaeranthera tanacetifolia	0.03	0.59	2.50																			4	
TOTAL NATIVE ANN. & BIEN. FORBS	0.41	7.24	17.50	-	17.4	-	-	-	-	15.1	0.1	-	-	-	-	-	-	-	-	-	-	4.2	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Kochia scoparia	3.21	57.31	15.00						230.6	37.2													
Lactuca serriola	0.02	0.43	2.50																				
Salsola iberica	0.15	2.66	10.00							0.1									0.5			0.3	
TOTAL INTRO. ANN. & BIEN. FORBS	3.39	60.4	17.50	-	-	-	-	-	230.6	37.3	-	-	-	-	-	-	-	-	0.5	-	-	0.3	-
NATIVE ANNUAL GRASSES																							
Monroa squarrosa	0.00	0	2.50																				
TOTAL NATIVE ANNUAL GRASSES	0.00	0	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus japonicus	0.04	0.73	10.00		1.8			0.8		1.4													
Bromus tectorum	0.16	2.82	12.50						2.4		14.8											0.3	
TOTAL INTRODUCED ANNUAL GRASSES	0.20	3.55	22.50	-	1.8	-	-	0.8	2.4	1.4	14.8	-	-	-	-	-	-	-	-	-	-	0.3	-
NATIVE PERENNIAL FORBS																							
Erigeron concinnus	0.00	0.03	2.50																				0.2
Sphaeralcea coccinea	0.05	0.85	10.00	0.4	0.7					0.2													
TOTAL NATIVE PERENNIAL FORBS	0.05	0.88	12.50	0.4	0.7	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	0.2
INTRODUCED PERENNIAL FORBS																							
Onobrychis viciifolia	0.05	0.8	2.50																5.4				
TOTAL INTRODUCED PERENNIAL FORBS	0.05	0.8	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	1.09	19.52	20.00				0.7		15.7					2.3			41.6	5.4	36.2				26.7
Agropyron smithii	3.23	57.62	35.00	10.7	34.8		3.9		13.8									11.8	16.6	24		30.2	113.2
Agropyron spicatum	0.23	4.06	5.00		26.6														0.7				
Oryzopsis hymenoides	0.37	6.51	15.00	2.6										0.7				0.9		1.4			1.6
TOTAL NATIVE PERENNIAL GRASSES (c)	4.92	87.71	42.50	13.3	61.4	-	4.6	-	29.5	-	-	-	-	3.0	-	-	41.6	18.1	53.5	25.4	-	30.2	141.5
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	3.21	57.21	55.00		20		83.5	5		47.6	6.3				2		19.6	23.2	1.3	10.7			0.7
Buchloe dactyloides	0.17	2.96	5.00				0.9													19			
Hilaria jamesii	5.88	104.88	65.00	3.8	30.8		3.2	124.8		6.1	32.4				24.6	34	45.8	3.8	0.4	3.9			
Sporobolus airoides	4.31	76.89	35.00					90.9		10.5	88.8	2.9			27			0.6					
Sporobolus cryptandrus	0.24	4.31	17.50							3.8	0.5											19.6	2.3
TOTAL NATIVE PERENNIAL GRASSES (w)	13.80	246.25	72.50	3.8	50.8	-	87.6	220.7	-	68.0	128.0	2.9	-	-	53.6	34.0	65.4	27.6	1.7	33.6	-	19.6	3.0
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	19.41	346.32	72.50	143.3		28.8			120.9	41.4		136.6	93.3	31	30.8	62		137			89.3		
TOTAL INTRO. PERENNIAL GRASSES (c)	19.41	346.32	72.50	143.3	-	28.8	-	-	120.9	41.4	-	136.6	93.3	31.0	30.8	62.0	-	137.0	-	-	89.3	-	-
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.06	0.98	5.00				2.7																
Senecio douglasii var. longilobus	0.01	0.18	2.50																			1.2	
TOTAL NATIVE SUBSHRUBS	0.07	1.16	7.50	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	3.52	62.74	20.00			113.4	22.3					20.1	55.2					T					
TOTAL INTRO. SUBSHRUBS	3.52	62.74	17.50	-	-	113.4	22.3	-	-	-	-	20.1	55.2	-	-	-	-	-	-	-	-	-	-

J19/J21 Phase III Grassland Production Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NATIVE SHRUBS																							
Atriplex canescens	2.61	46.58	37.50	22.3	2.8			13.2						39.2	0.8			1.9	5.7		47.3	4.6	
Atriplex confertifolia	0.03	0.49	2.50																3.3				
TOTAL NATIVE SHRUBS	2.64	47.07	37.50	22.3	2.8	-	-	13.2	-	-	-	-	-	39.2	0.8	-	-	1.9	9.0	-	47.3	4.6	-
TOTAL PRODUCTION	48.44	864.13	100.00	101.0	93.7	73.9	353.9	173.0	110.4	29.0	222.5	110.0	194.9	139.9	247.7	143.3	128.2	134.4	189.3	68.4	155.8	210.9	71.2
Standard Deviation	24.54	437.81																					
ALLOWABLE PRODUCTION (lbs/acre)	864.12	(s=437.81)		600.6	557.2	439.5	2104.5	1028.8	656.5	172.5	1323.1	654.1	1159.0	831.9	1473.0	852.2	762.4	799.2	1125.7	406.8	926.5	1254.2	423.4
SPECIES DENSITY (# of species/1.5 sq.m.)	4.85	(s=2.6)		4.0	3.0	3.0	1.0	7.0	2.0	5.0	2.0	2.0	5.0	5.0	9.0	4.0	3.0	4.0	12.0	7.0	2.0	6.0	4.0

Noxious Production	0.00
Annual Production	3.99
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Grassland Production Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
NATIVE SHRUBS																							
Atriplex canescens	2.61	46.58	37.50				43.5			55			1.6	66.4		4.7			4.3				
Atriplex confertifolia	0.03	0.49	2.50																				
TOTAL NATIVE SHRUBS	2.64	47.07	37.50	-	-	-	43.5	-	-	55.0	-	-	1.6	66.4	-	4.7	-	-	4.3	-	-	-	-
TOTAL PRODUCTION	48.44	864.13	100.00	160.8	132.1	142.2	160.7	221.5	383.4	218.4	142.9	159.6	150.1	100.4	84.4	100.7	107.0	182.7	65.4	59.0	89.3	55.8	144.7
Standard Deviation	24.54	437.81																					
ALLOWABLE PRODUCTION (lbs/acre)	864.12	(s=437.81)		956.2	785.6	845.6	955.6	1317.2	2280.0	1298.8	849.8	949.1	892.6	597.1	501.9	598.8	636.3	1086.5	388.9	350.9	531.0	331.8	860.5
SPECIES DENSITY (# of species/1.5 sq.m.)	4.85	(s=2.6)		5.0	8.0	2.0	8.0	4.0	5.0	11.0	6.0	3.0	3.0	4.0	4.0	3.0	3.0	8.0	8.0	5.0	1.0	7.0	6.0

Noxious Production	0.00
Annual Production	3.99
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Shrubland Production Data – Fall 2023

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NATIVE ANNUAL & BIENNIAL FORBS																							
Lappula redowskii	0.01	0.22	5.00																				1.1
TOTAL NATIVE ANN. & BIEN. FORBS	0.01	0.22	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Kochia scoparia	0.22	3.85	2.50																				
Salsola iberica	0.01	0.16	2.50																				1.1
TOTAL INTRO. ANN. & BIEN. FORBS	0.23	4.01	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.01	0.09	2.50																				
TOTAL INTRODUCED ANNUAL GRASSES	0.01	0.09	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL FORBS																							
Ratibida columnaris	0.36	6.41	2.50																				
Sphaeralcea coccinea	0.25	4.49	7.50									0.4					0.9						
TOTAL NATIVE PERENNIAL FORBS	0.61	10.9	7.50	-	-	-	-	-	-	-	-	0.4	-	-	-	-	0.9	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.36	6.33	15.00							7													
Agropyron smithii	1.40	24.93	32.50									0.9						7		1.8		1.4	
Agropyron spicatum	0.19	3.35	10.00									8.3						11.2				0.9	
Agropyron trachycaulum	0.01	0.19	2.50																				
Oryzopsis hymenoides	0.25	4.52	10.00							6.7												3.6	
Sitanion hystrix	0.02	0.37	2.50																				
Stipa comata	0.02	0.27	2.50																				
TOTAL NATIVE PERENNIAL GRASSES (c)	2.24	39.96	42.50	-	-	-	-	-	-	13.7	-	9.2	-	-	-	-	-	18.2	-	1.8	-	5.9	-
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	1.39	24.72	37.50					25		10.6		2				2.4	4.7	4.9	5.7	11.4			
Buchloe dactyloides	0.03	0.59	5.00																				
Hilaria jamesii	5.82	103.75	55.00	10.7				53				47.5	2.1		4.8	1.6	41.2	87.5	22.9	16.3			0.2
Sporobolus airoides	1.44	25.69	27.50		4.2			1						19.6			6.3	19	22.3				
Sporobolus cryptandrus	0.20	3.6	7.50							17.9		4.5											
TOTAL NATIVE PERENNIAL GRASSES (w)	8.88	158.36	70.00	10.7	4.2	-	-	79.0	-	28.5	-	54.0	2.1	19.6	4.8	4.0	52.2	111.4	50.9	27.7	-	-	0.2
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	28.09	501.2	92.50	31.6	158.9	65.1	182.2		301.8	10.3	94.5		80.8	73.2	82.1	114.3	23.2	30.3	95.7	186.8	145	43.7	85.1
TOTAL INTRO. PERENNIAL GRASSES (c)	28.09	501.2	92.50	31.6	158.9	65.1	182.2	-	301.8	10.3	94.5	-	80.8	73.2	82.1	114.3	23.2	30.3	95.7	186.8	145.0	43.7	85.1
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.03	0.49	2.50														3.3						
Gutierrezia sarothrae	0.10	1.75	10.00							3.5								0.1				0.3	
TOTAL NATIVE SUBSHRUBS	0.13	2.24	12.50	-	-	-	-	-	-	3.5	-	-	-	-	-	-	3.3	0.1	-	-	-	0.3	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	3.25	58.01	22.50	81.4		51.7											18.3	26.9			17.7	3.9	70.9
TOTAL INTRO. SUBSHRUBS	3.25	58.01	22.50	81.4	-	51.7	-	-	-	-	-	-	-	-	-	-	18.3	26.9	-	-	17.7	3.9	70.9
NATIVE SHRUBS																							
Artemisia tridentata	1.02	18.27	2.50																				
Atriplex canescens	7.36	131.35	62.50	3	10.9		73.5			0.3	28		70.6	8.1	10.1	89.9	48.7	9.2		60.1	26.6		
Atriplex confertifolia	0.38	6.84	5.00																				
Chrysothamnus nauseosus	0.11	1.96	2.50																				
TOTAL NATIVE SHRUBS	8.88	158.42	67.50	3.0	10.9	-	73.5	-	-	0.3	28.0	-	70.6	8.1	10.1	89.9	48.7	9.2	-	60.1	26.6	-	-
TOTAL PRODUCTION	52.32	933.42	100.00	126.7	174.0	116.8	255.7	79.0	301.8	56.3	122.5	63.6	153.5	100.9	97.0	208.2	146.6	196.1	146.6	276.4	189.3	53.8	158.4
Standard Deviation	26.43	471.48																					
ALLOWABLE PRODUCTION (lbs/acre)	933.42	(s=471.48)		753.4	1034.7	694.6	1520.6	469.8	1794.7	334.8	728.5	378.2	912.8	600.0	576.8	1238.1	871.8	1166.1	871.8	1643.7	1125.7	319.9	942.0
SPECIES DENSITY (# of species/1.5 sq.m.)	5.33	(s=1.89)		5.0	4.0	3.0	3.0	4.0	2.0	8.0	3.0	7.0	4.0	4.0	4.0	5.0	9.0	10.0	5.0	6.0	4.0	7.0	6.0

Noxious Production	0.00
Annual Production	0.24
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Shrubland Production Data – Fall 2023 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) 21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
NATIVE ANNUAL & BIENNIAL FORBS																							
Lappula redowskii	0.01	0.22	5.00							0.4													
TOTAL NATIVE ANN. & BIEN. FORBS	0.01	0.22	5.00	-	-	-	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Kochia scoparia	0.22	3.85	2.50											25.9									
Salsola iberica	0.01	0.16	2.50																				
TOTAL INTRO. ANN. & BIEN. FORBS	0.23	4.01	5.00	-	-	-	-	-	-	-	-	-	-	25.9	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.01	0.09	2.50																0.6				
TOTAL INTRODUCED ANNUAL GRASSES	0.01	0.09	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-
NATIVE PERENNIAL FORBS																							
Ratibida columnaris	0.36	6.41	2.50									43.1											
Sphaeralcea coccinea	0.25	4.49	7.50									28.9											
TOTAL NATIVE PERENNIAL FORBS	0.61	10.9	7.50	-	-	-	-	-	-	-	-	72.0	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.36	6.33	15.00		1.1						4.9		3.4							8.5		17.7	
Agropyron smithii	1.40	24.93	32.50	0.3									21.5	5.9				0.2	49	4.1	15.4	31.2	29
Agropyron spicatum	0.19	3.35	10.00																2.1				
Agropyron trachycaulum	0.01	0.19	2.50																				1.3
Oryzopsis hymenoides	0.25	4.52	10.00	19.8																			0.3
Sitanion hystrix	0.02	0.37	2.50									2.5											
Stipa comata	0.02	0.27	2.50	1.8																			
TOTAL NATIVE PERENNIAL GRASSES (c)	2.24	39.96	42.50	21.9	1.1	-	-	-	-	-	4.9	2.5	24.9	5.9	-	-	-	0.2	51.1	12.6	15.4	48.9	30.6
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	1.39	24.72	37.50		24.3	1.4	21.3	8.7					32.1			5.2		6.6					
Buchloe dactyloides	0.03	0.59	5.00															2.3					1.7
Hilaria jamesii	5.82	103.75	55.00	11	50.7	34.6	58	8.7	200.6		1.3	0.2	9.4	2.8				32.8					
Sporobolus airoides	1.44	25.69	27.50				16	37.6	28.5									17.4		0.9			
Sporobolus cryptandrus	0.20	3.6	7.50									1.8											
TOTAL NATIVE PERENNIAL GRASSES (w)	8.88	158.36	70.00	11.0	75.0	36.0	95.3	55.0	229.1	-	1.3	2.0	41.5	2.8	-	5.2	-	59.1	-	0.9	-	-	1.7
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	28.09	501.2	92.50	32.8	16.3	6.7	23.3	244.5		173.6	72.2	10.7	25.9	114.9	209.6	158.4	143.4	15.5	88.2	57.7	110.2	39	23.8
TOTAL INTRO. PERENNIAL GRASSES (c)	28.09	501.2	92.50	32.8	16.3	6.7	23.3	244.5	-	173.6	72.2	10.7	25.9	114.9	209.6	158.4	143.4	15.5	88.2	57.7	110.2	39.0	23.8
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.03	0.49	2.50																				
Gutierrezia sarothrae	0.10	1.75	10.00	7.9																			
TOTAL NATIVE SUBSHRUBS	0.13	2.24	12.50	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	3.25	58.01	22.50			118.2														1.2			
TOTAL INTRO. SUBSHRUBS	3.25	58.01	22.50	-	-	118.2	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-
NATIVE SHRUBS																							
Artemisia tridentata	1.02	18.27	2.50	122.9																			
Atriplex canescens	7.36	131.35	62.50	38.3		162.7	8.5	83.1	38.6	15.2	4.5	T			8.8	32.2			36.1		15.4	1.1	
Atriplex confertifolia	0.38	6.84	5.00																		32.5		13.5
Chrysothamnus nauseosus	0.11	1.96	2.50		13.2																		
TOTAL NATIVE SHRUBS	8.88	158.42	67.50	161.2	13.2	162.7	8.5	83.1	38.6	15.2	4.5	-	-	-	8.8	32.2	-	-	36.1	-	47.9	1.1	13.5
TOTAL PRODUCTION	52.32	933.42	100.00	234.8	105.6	323.6	127.1	382.6	267.7	189.2	82.9	87.2	92.3	149.5	218.4	195.8	143.4	74.8	176.0	72.4	173.5	89.0	69.6
Standard Deviation	26.43	471.48																					
ALLOWABLE PRODUCTION (lbs/acre)	933.42	(s=471.48)		1396.3	628.0	1924.3	755.8	2275.2	1591.9	1125.1	493.0	518.6	548.9	889.0	1298.8	1164.4	852.8	444.8	1046.6	430.5	1031.8	529.3	413.9
SPECIES DENSITY (# of species/1.5 sq.m.)	5.33	(s=1.89)		9.0	6.0	6.0	6.0	6.0	4.0	4.0	5.0	8.0	6.0	5.0	3.0	4.0	2.0	7.0	6.0	6.0	5.0	5.0	7.0

Noxious Production	0.00
Annual Production	0.24
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Grassland Shrub Density Data – Fall 2023

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
NATIVE SUBSHRUBS																								
Ceratoides lanata	(0-20cm)	0.15	6.07	7.50														1						
Ceratoides lanata	(21-50cm)	0.80	32.37	25.00											2	16		2						
Ceratoides lanata	(>50cm)	0.25	10.12	12.50												1								1
Gutierrezia sarothrae	(0-20cm)	1.60	64.75	25.00			1				1								1		2			
Gutierrezia sarothrae	(21-50cm)	0.78	31.36	22.50							1					3					3			
Senecio douglasii var. longilobus	(0-20cm)	0.05	2.02	5.00																				
Senecio douglasii var. longilobus	(21-50cm)	0.03	1.01	2.50																				
Senecio douglasii var. longilobus	(>50cm)	0.03	1.01	2.50															1					
TOTAL NATIVE SUBSHRUBS		3.68	148.72	55.00			1				2				2	20		3	2		5			1
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	8.23	332.85	22.50		26						143	2						41					
Kochia prostrata	(21-50cm)	16.28	658.63	42.50		136						185	2	1				4	81		5			
Kochia prostrata	(>50cm)	5.80	234.72	22.50		51						63	4						28					4
TOTAL INTRO. SUBSHRUBS		30.30	1226.20	45.00		213						391	8	1				4	150		5			4
NATIVE SHRUBS																								
Artemisia tridentata	(>50cm)	0.03	1.01	2.50																				
Atriplex canescens	(0-20cm)	1.08	43.50	50.00	1		1		20				2	1		1		1				1	2	
Atriplex canescens	(21-50cm)	7.00	283.28	87.50	3	2	19		13		7	1	3	8	12	17	12	11	15	7	2	15	8	4
Atriplex canescens	(>50cm)	8.28	334.88	82.50	2	5	13	6	13	9	16		11	2	43	9	8	3	5	16		29	22	2
Atriplex confertifolia	(21-50cm)	0.20	8.09	17.50	1			1							1							2		
Chrysothamnus nauseosus	(21-50cm)	0.35	14.16	5.00															13					
Chrysothamnus nauseosus	(>50cm)	0.18	7.08	5.00															6					
Cowania mexicana	(21-50cm)	0.05	2.02	2.50															2					
TOTAL NATIVE SHRUBS		17.15	694.04	97.50	7	7	33	7	46	9	23	1	16	11	56	27	20	15	41	23	2	47	32	6
TOTAL DENSITY (stems/100 sq. m.)		51.13	(s=76.06)	100.00	7	220	34	7	46	9	25	392	24	12	58	47	20	22	193	23	12	47	32	11
TOTAL DENSITY (stems/acre)		2068.96	(s=3077.95)		283	8903	1376	283	1862	364	1012	15864	971	486	2347	1902	809	890	7810	931	486	1902	1295	445
SPECIES DENSITY (# of species/100 sq.m.)		2.43	(s=1.06)		2	2	2	2	1	1	2	2	2	2	3	3	1	3	5	1	3	2	1	3

J19/J21 Phase III Grassland Shrub Density Data – Fall 2023 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
NATIVE SUBSHRUBS																								
Ceratoides lanata	(0-20cm)	0.15	6.07	7.50				3											2					
Ceratoides lanata	(21-50cm)	0.80	32.37	25.00				1			2	2					1	1	4				1	
Ceratoides lanata	(>50cm)	0.25	10.12	12.50				6							1					1				
Gutierrezia sarothrae	(0-20cm)	1.60	64.75	25.00	1	1			30						16		9		2					
Gutierrezia sarothrae	(21-50cm)	0.78	31.36	22.50					2	1	5				4		11		1					
Senecio douglasii var. longilobus	(0-20cm)	0.05	2.02	5.00																			1	1
Senecio douglasii var. longilobus	(21-50cm)	0.03	1.01	2.50																			1	
Senecio douglasii var. longilobus	(>50cm)	0.03	1.01	2.50																				
TOTAL NATIVE SUBSHRUBS		3.68	148.72	55.00	1	1		10	32	1	7	2			21		21	1	9	1			3	1
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	8.23	332.85	22.50			23						54	38			1							1
Kochia prostrata	(21-50cm)	16.28	658.63	42.50			76	1				7	64	75			1		2		1		7	3
Kochia prostrata	(>50cm)	5.80	234.72	22.50			43	9						27			3							
TOTAL INTRO. SUBSHRUBS		30.30	1226.20	45.00			142	10				7	118	140			5		2		1		7	4
NATIVE SHRUBS																								
Artemisia tridentata	(>50cm)	0.03	1.01	2.50													1							
Atriplex canescens	(0-20cm)	1.08	43.50	50.00				1				1		1		1	1	1	2	1	1		1	2
Atriplex canescens	(21-50cm)	7.00	283.28	87.50		6		5	8		20	17	1	10	3	1	14	3	3	5	6	7	11	1
Atriplex canescens	(>50cm)	8.28	334.88	82.50	1	5	9	11	3		10	13		11	12	14	13	5	2		3	5		
Atriplex confertifolia	(21-50cm)	0.20	8.09	17.50														1			1	1		
Chrysothamnus nauseosus	(21-50cm)	0.35	14.16	5.00											1									
Chrysothamnus nauseosus	(>50cm)	0.18	7.08	5.00																				1
Cowania mexicana	(21-50cm)	0.05	2.02	2.50																				
TOTAL NATIVE SHRUBS		17.15	694.04	97.50	1	11	9	17	11		30	31	1	22	16	16	29	10	7	6	11	13	12	4
TOTAL DENSITY (stems/100 sq. m.)		51.13	(s=76.06)	100.00	2	12	151	37	43	1	37	40	119	162	37	16	55	11	18	7	12	13	22	9
TOTAL DENSITY (stems/acre)		2068.96	(s=3077.95)		81	486	6111	1497	1740	40	1497	1619	4816	6556	1497	647	2226	445	728	283	486	526	890	364
SPECIES DENSITY (# of species/100 sq.m.)		2.43	(s=1.06)		2	2	2	3	2	1	3	3	2	2	4	1	5	3	4	2	3	2	4	4

J19/J21 Phase III Shrubland Shrub Density Data – Fall 2023

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.15	6.07	7.50					2												3		1	
Artemisia frigida	(21-50cm)	0.43	17.20	7.50					6												10		1	
Artemisia frigida	(>50cm)	0.03	1.01	2.50																			1	
Ceratoides lanata	(0-20cm)	0.20	8.09	15.00				1									1							1
Ceratoides lanata	(21-50cm)	0.58	23.27	25.00												1		3		1				1
Ceratoides lanata	(>50cm)	0.13	5.06	7.50														1						
Chrysothamnus greenei	(21-50cm)	0.05	2.02	5.00					1												1			
Gutierrezia sarothrae	(0-20cm)	7.73	312.62	22.50					4		55					3			16					
Gutierrezia sarothrae	(21-50cm)	4.23	170.98	32.50					1		38			1	4	6			29					
TOTAL NATIVE SUBSHRUBS		13.50	546.33	60.00				1	14		93			1	4	10	1	4	45	1	14		3	2
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	3.35	135.57	22.50	16		14											2	20			1		23
Kochia prostrata	(21-50cm)	9.48	383.44	32.50	62		80				1				2			10	38			11		119
Kochia prostrata	(>50cm)	6.78	274.17	25.00	53		28			2					17	1		35	75					
TOTAL INTRO. SUBSHRUBS		19.60	793.18	37.50	131		122			2	1				19	1		47	133			12		142
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	0.10	4.05	7.50					1												1		2	
Artemisia tridentata	(21-50cm)	0.38	15.18	12.50					1						1						8			
Artemisia tridentata	(>50cm)	0.65	26.30	15.00					3						5						5			
Atriplex canescens	(0-20cm)	2.83	114.32	57.50	4	1		3		1	1	5	2			4		1		1				4
Atriplex canescens	(21-50cm)	12.70	513.95	90.00	16	5	8	3		6	5	33	23	11		18	4	41	7	27	8	18		9
Atriplex canescens	(>50cm)	19.28	780.03	100.00	16	36	9	17	6	17	12	21	37	39	21	17	15	35	9	30	20	22	1	5
Atriplex confertifolia	(0-20cm)	0.18	7.08	10.00															1					
Atriplex confertifolia	(21-50cm)	1.18	47.55	27.50		1		2																
Atriplex confertifolia	(>50cm)	0.03	1.01	2.50																				
Chrysothamnus nauseosus	(0-20cm)	0.28	11.13	2.50					11															
Chrysothamnus nauseosus	(21-50cm)	1.65	66.77	7.50					42												22			
Chrysothamnus nauseosus	(>50cm)	2.83	114.32	10.00					49												33			
Cowania mexicana	(0-20cm)	0.13	5.06	2.50					5															
Cowania mexicana	(21-50cm)	0.98	39.46	10.00					22												5		11	
Cowania mexicana	(>50cm)	1.05	42.49	10.00					13												2		26	
Ephedra viridis	(0-20cm)	0.03	1.01	2.50																				
Ephedra viridis	(21-50cm)	0.08	3.04	5.00					1															
Ephedra viridis	(>50cm)	0.08	3.04	7.50																	1		1	
Purshia tridentata	(21-50cm)	0.25	10.12	5.00					1														9	
Purshia tridentata	(>50cm)	0.53	21.25	2.50																			21	
Sarcobatus vermiculatus	(21-50cm)	0.03	1.01	2.50																				
TOTAL NATIVE SHRUBS		45.18	1828.17	100.00	36	43	17	25	155	24	18	59	62	50	27	39	19	77	17	58	105	40	71	18
TOTAL DENSITY (stems/100 sq. m.)		78.28	(s=70.6)	100.00	167	43	139	26	169	26	112	59	62	51	50	50	20	128	195	59	119	52	74	162
TOTAL DENSITY (stems/acre)		3167.68	(s=2857.23)		6758	1740	5625	1052	6839	1052	4532	2388	2509	2064	2023	2023	809	5180	7891	2388	4816	2104	2995	6556
SPECIES DENSITY (# of species/100 sq.m.)		3.00	(s=2.01)		2	2	2	3	9	2	3	1	1	2	4	4	2	3	4	2	7	2	6	3

J19/J21 Phase III Shrubland Shrub Density Data – Fall 2023 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.15	6.07	7.50																				
Artemisia frigida	(21-50cm)	0.43	17.20	7.50																				
Artemisia frigida	(>50cm)	0.03	1.01	2.50																				
Ceratoides lanata	(0-20cm)	0.20	8.09	15.00	3		1	1																
Ceratoides lanata	(21-50cm)	0.58	23.27	25.00			1	9			1	3								2		1		
Ceratoides lanata	(>50cm)	0.13	5.06	7.50			2					2												
Chrysothamnus greenei	(21-50cm)	0.05	2.02	5.00																				
Gutierrezia sarothrae	(0-20cm)	7.73	312.62	22.50	196	5		2					13								15			
Gutierrezia sarothrae	(21-50cm)	4.23	170.98	32.50	46	8		1				1	24						2		8			
TOTAL NATIVE SUBSHRUBS		13.50	546.33	60.00	245	13	4	13			1	6	37						2	2	23	1		
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	3.35	135.57	22.50	15		6														37			
Kochia prostrata	(21-50cm)	9.48	383.44	32.50	11		10					13		2							20			
Kochia prostrata	(>50cm)	6.78	274.17	25.00	16		37							7										
TOTAL INTRO. SUBSHRUBS		19.60	793.18	37.50	42		53					13		9							57			
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	0.10	4.05	7.50																				
Artemisia tridentata	(21-50cm)	0.38	15.18	12.50	4								1											
Artemisia tridentata	(>50cm)	0.65	26.30	15.00	8	3							2											
Atriplex canescens	(0-20cm)	2.83	114.32	57.50	2		1				3	1	4		2	1		4	1	57	9		1	
Atriplex canescens	(21-50cm)	12.70	513.95	90.00	1		10	4	15	15	2	24	1	4	7	7	4	8	11	123	5	8	11	6
Atriplex canescens	(>50cm)	19.28	780.03	100.00	5	4	30	24	22	25	13	24	7	22	21	19	22	8	9	97	4	12	13	5
Atriplex confertifolia	(0-20cm)	0.18	7.08	10.00	2																1			3
Atriplex confertifolia	(21-50cm)	1.18	47.55	27.50	6						1	1			1			2			1	11	3	18
Atriplex confertifolia	(>50cm)	0.03	1.01	2.50	1																			
Chrysothamnus nauseosus	(0-20cm)	0.28	11.13	2.50																				
Chrysothamnus nauseosus	(21-50cm)	1.65	66.77	7.50	2																			
Chrysothamnus nauseosus	(>50cm)	2.83	114.32	10.00	1	30																		
Cowania mexicana	(0-20cm)	0.13	5.06	2.50																				
Cowania mexicana	(21-50cm)	0.98	39.46	10.00	1																			
Cowania mexicana	(>50cm)	1.05	42.49	10.00	1																			
Ephedra viridis	(0-20cm)	0.03	1.01	2.50	1																			
Ephedra viridis	(21-50cm)	0.08	3.04	5.00	2																			
Ephedra viridis	(>50cm)	0.08	3.04	7.50	1																			
Purshia tridentata	(21-50cm)	0.25	10.12	5.00																				
Purshia tridentata	(>50cm)	0.53	21.25	2.50																				
Sarcobatus vermiculatus	(21-50cm)	0.03	1.01	2.50	1																			
TOTAL NATIVE SHRUBS		45.18	1828.17	100.00	39	37	41	28	37	40	19	50	15	26	31	27	26	22	21	277	20	31	28	32
TOTAL DENSITY (stems/100 sq. m.)		78.28	(s=70.6)	100.00	326	50	98	41	37	40	20	69	52	35	31	27	26	22	23	279	100	32	28	32
TOTAL DENSITY (stems/acre)		3167.68	(s=2857.23)		13193	2023	3966	1659	1497	1619	809	2792	2104	1416	1255	1093	1052	890	931	11291	4047	1295	1133	1295
SPECIES DENSITY (# of species/100 sq.m.)		3.00	(s=2.01)		10	4	3	3	1	1	3	5	3	2	2	1	1	2	2	2	4	3	2	2

J19/J21 Phase III Woodland Shrub Density Data – Fall 2023

PLANT SPECIES	SIZE	AVERAGE DENSITY (#/100sq.m.)	AVERAGE DENSITY (#/acre)	FREQUENCY (%)	Shrubs per 100 sq.m. W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	27.73	1121.99	67.50	47	1	204		10							24	6	6	20	43	138	1	120	3
Artemisia frigida	(21-50cm)	10.98	444.14	67.50	3	12	90		6							6	10	12	16	35	7		41	
Artemisia frigida	(>50cm)	2.73	110.28	22.50		1																	6	2
Ceratoides lanata	(21-50cm)	0.08	3.04	2.50						3														
Chrysothamnus greenei	(0-20cm)	0.05	2.02	5.00	1																			
Chrysothamnus greenei	(21-50cm)	0.48	19.22	27.50	2		1									1					6			1
Chrysothamnus greenei	(>50cm)	0.05	2.02	5.00																				
Eriogonum jamesii	(0-20cm)	1.20	48.56	12.50		3																	14	28
Eriogonum jamesii	(21-50cm)	0.53	21.25	10.00		1																	4	15
Gutierrezia sarothrae	(0-20cm)	4.40	178.06	32.50	38		1	1				5	4						8	1			1	
Gutierrezia sarothrae	(21-50cm)	4.03	162.89	37.50	46		2					11	4				3		7	3			3	
Senecio douglasii var. longilobus	(0-20cm)	0.05	2.02	2.50																				2
Senecio douglasii var. longilobus	(21-50cm)	0.03	1.01	2.50																				1
TOTAL NATIVE SUBSHRUBS		52.30	2116.51	87.50	137	18	298	1	16	3		16	8			31	19	18	51	82	151	1	189	52
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	1.85	74.87	15.00			12			22										16		21	1	
Kochia prostrata	(21-50cm)	3.30	133.55	12.50			76			14										3		32		
Kochia prostrata	(>50cm)	0.13	5.06	7.50			3																1	
TOTAL INTRO. SUBSHRUBS		5.28	213.47	15.00			91			36										19		53	2	
NATIVE SHRUBS																								
Artemisia bigelovii	(21-50cm)	0.03	1.01	2.50																				
Artemisia tridentata	(0-20cm)	14.53	587.81	77.50	1	14		15	4	20	10	6	36	19	9	13	4	9	13	98		81	3	
Artemisia tridentata	(21-50cm)	21.48	869.06	95.00	35	36	2	64	17	27	16	17	65	26	33	63	6	15	25	124	21	84	1	1
Artemisia tridentata	(>50cm)	9.35	378.38	95.00	12	35	2	25	4	8	2	14	9	5	8	10		5	13	20	20	15	11	2
Atriplex canescens	(0-20cm)	0.73	29.34	25.00	1							1				1		1			2			
Atriplex canescens	(21-50cm)	3.73	150.75	62.50	4		6		3			20	14		11	4	2			2	9	3	3	
Atriplex canescens	(>50cm)	9.13	369.28	85.00	6	11	22	5	3	3	1	20	39		13	4	5		1	14	6	4	21	1
Atriplex confertifolia	(0-20cm)	0.03	1.01	2.50																				
Atriplex confertifolia	(21-50cm)	0.05	2.02	2.50			2																	
Chrysothamnus nauseosus	(0-20cm)	1.83	73.86	45.00						1	1	1		6				5	1	2		1		15
Chrysothamnus nauseosus	(21-50cm)	13.13	531.15	87.50	13	3		1	2	21	7	7	7	56	2	2	17	47	20	12	4	13	17	29
Chrysothamnus nauseosus	(>50cm)	26.05	1054.21	92.50	28	1	1	9	26	20	28	9	20	68	16	17	49	32	17	9	4	2	74	27
Chrysothamnus viscidiflorus	(0-20cm)	0.10	4.05	2.50																				
Chrysothamnus viscidiflorus	(21-50cm)	0.20	8.09	5.00																				
Chrysothamnus viscidiflorus	(>50cm)	0.03	1.01	2.50																				
Cowania mexicana	(0-20cm)	2.73	110.28	62.50	3			4		15	3	1		4	1		2		1		1	1	1	6
Cowania mexicana	(21-50cm)	12.05	487.65	80.00	3	3	5	13	7	25	11	9		5			6		3	2	11	9	2	8
Cowania mexicana	(>50cm)	7.93	320.71	75.00	1	4	1	6			7	1	2	14		1	4				2	1	6	5
Ephedra viridis	(21-50cm)	0.30	12.14	22.50	1							1	2		1				1		2			1
Ephedra viridis	(>50cm)	0.53	21.25	32.50	1	2		1					1			3					6			1
Fallugia paradoxa	(0-20cm)	0.80	32.37	5.00							30			2										
Fallugia paradoxa	(21-50cm)	0.80	32.37	5.00							31			1										
Fallugia paradoxa	(>50cm)	0.23	9.11	7.50				1			4			4										
Lycium berlandieri	(21-50cm)	0.03	1.01	2.50					1															
Lycium pallidum	(21-50cm)	0.03	1.01	2.50																				
Lycium pallidum	(>50cm)	0.08	3.04	7.50		1																	1	

J19/J21 Phase III Woodland Shrub Density Data – Fall 2023 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	27.73	1121.99	67.50	1	13	3		4				93	102	190	26	4	41		3		3	2	1
Artemisia frigida	(21-50cm)	10.98	444.14	67.50	1	2	1		3			1	35	39	33	28	3	35		2	1	10	6	1
Artemisia frigida	(>50cm)	2.73	110.28	22.50		2								38	55			3			1			1
Ceratoides lanata	(21-50cm)	0.08	3.04	2.50																				
Chrysothamnus greenei	(0-20cm)	0.05	2.02	5.00													1							
Chrysothamnus greenei	(21-50cm)	0.48	19.22	27.50									1	1		2	2					1	1	
Chrysothamnus greenei	(>50cm)	0.05	2.02	5.00								1		1										
Eriogonum jamesii	(0-20cm)	1.20	48.56	12.50								1							2					
Eriogonum jamesii	(21-50cm)	0.53	21.25	10.00																	1			
Gutierrezia sarothrae	(0-20cm)	4.40	178.06	32.50			1	2	109			1											4	
Gutierrezia sarothrae	(21-50cm)	4.03	162.89	37.50			6	2	69			1	2	1									1	
Senecio douglasii var. longilobus	(0-20cm)	0.05	2.02	2.50																				
Senecio douglasii var. longilobus	(21-50cm)	0.03	1.01	2.50																				
TOTAL NATIVE SUBSHRUBS		52.30	2116.51	87.50	2	17	11	4	185			5	131	182	278	56	10	79	2	5	3	14	14	3
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	1.85	74.87	15.00												2								
Kochia prostrata	(21-50cm)	3.30	133.55	12.50												7								
Kochia prostrata	(>50cm)	0.13	5.06	7.50												1								
TOTAL INTRO. SUBSHRUBS		5.28	213.47	15.00												10								
NATIVE SHRUBS																								
Artemisia bigelovii	(21-50cm)	0.03	1.01	2.50		1																		
Artemisia tridentata	(0-20cm)	14.53	587.81	77.50	4	4		6	3			182			4	4	5	5	4		1	1	1	2
Artemisia tridentata	(21-50cm)	21.48	869.06	95.00	6	2	4	13	8	6		72	1	3	10	13	8	6	2	2	16	8	1	
Artemisia tridentata	(>50cm)	9.35	378.38	95.00	3	2	2	15	7	9	1	56	2	6	9	4	2	6	4	7	11	5	3	
Atriplex canescens	(0-20cm)	0.73	29.34	25.00			1					1	1		11		9							
Atriplex canescens	(21-50cm)	3.73	150.75	62.50		1	1	1		2		2	18	3	6	3	17		5	1		8		
Atriplex canescens	(>50cm)	9.13	369.28	85.00		5	8	5		5		6	9	28	35	7	9	10	23	9		20	6	1
Atriplex confertifolia	(0-20cm)	0.03	1.01	2.50													1							
Atriplex confertifolia	(21-50cm)	0.05	2.02	2.50																				
Chrysothamnus nauseosus	(0-20cm)	1.83	73.86	45.00	12		1				2	4			1		6		2		1		11	
Chrysothamnus nauseosus	(21-50cm)	13.13	531.15	87.50	68	4	10	9	19	7	12	10		2	2		17		5	2	14	22	42	
Chrysothamnus nauseosus	(>50cm)	26.05	1054.21	92.50	150	29	27	67	27	60	61	28		7	5		5	1	27	6	3	33	49	
Chrysothamnus viscidiflorus	(0-20cm)	0.10	4.05	2.50		4																		
Chrysothamnus viscidiflorus	(21-50cm)	0.20	8.09	5.00		4											4							
Chrysothamnus viscidiflorus	(>50cm)	0.03	1.01	2.50		1																		
Cowania mexicana	(0-20cm)	2.73	110.28	62.50	1	3	1		1	9			9	11	5	19		1	1				5	
Cowania mexicana	(21-50cm)	12.05	487.65	80.00		10	13		7	40		10	74	44	19	72		8	10	6	9	5	22	11
Cowania mexicana	(>50cm)	7.93	320.71	75.00		21	52	3	8	8			4	3	3	15		26	11	25	42	2	13	26
Ephedra viridis	(21-50cm)	0.30	12.14	22.50									2										1	
Ephedra viridis	(>50cm)	0.53	21.25	32.50				1					1						1	1		1		1
Fallugia paradoxa	(0-20cm)	0.80	32.37	5.00																				
Fallugia paradoxa	(21-50cm)	0.80	32.37	5.00																				
Fallugia paradoxa	(>50cm)	0.23	9.11	7.50																				
Lycium berlandieri	(21-50cm)	0.03	1.01	2.50																				
Lycium pallidum	(21-50cm)	0.03	1.01	2.50				1																
Lycium pallidum	(>50cm)	0.08	3.04	7.50				1																

J19/J21 Phase III Woodland Shrub Density Data – Fall 2023 (continued)

PLANT SPECIES	SIZE	AVERAGE DENSITY (#/100sq.m.)	AVERAGE DENSITY (#/acre)	FREQUENCY (%)	Shrubs per 100 sq.m. W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
NATIVE SHRUBS																								
Purshia tridentata	(0-20cm)	0.28	11.13	15.00	2	1																		1
Purshia tridentata	(21-50cm)	0.83	33.39	22.50		2						1												
Purshia tridentata	(>50cm)	0.70	28.33	10.00										1										
Sarcobatus vermiculatus	(21-50cm)	0.03	1.01	2.50																				
Sarcobatus vermiculatus	(>50cm)	0.03	1.01	2.50																				
Shepherdia rotundifolia	(0-20cm)	0.03	1.01	2.50						1														
Shepherdia rotundifolia	(>50cm)	0.10	4.05	10.00				1				1						1						
Tetradymia canescens	(0-20cm)	0.20	8.09	2.50																				
Tetradymia canescens	(21-50cm)	0.08	3.04	5.00														1						
Yucca glauca	(0-20cm)	0.03	1.01	2.50								1												
TOTAL NATIVE SHRUBS		128.10	5184.02	100.00	111	113	41	145	67	141	151	110	195	211	94	118	95	116	95	283	88	214	140	97
TOTAL DENSITY (stems/100 sq. m.)		185.68	(s=95.87)	100.00	248	131	430	146	83	180	151	126	203	211	94	149	114	134	146	384	239	268	331	149
TOTAL DENSITY (stems/acre)		7514.00	(s=3879.78)		10036	5301	17401	5908	3359	7284	6111	5099	8215	8539	3804	6030	4613	5423	5908	15540	9672	10846	13395	6030
SPECIES DENSITY (# of species/100 sq.m.)		6.78	(s=1.72)		9	9	9	8	6	7	5	9	6	5	5	7	6	6	7	7	7	6	9	10

J19/J21 Phase III Woodland Shrub Density Data – Fall 2023 (continued)

PLANT SPECIES	SIZE	AVERAGE DENSITY (#/100sq.m.)	AVERAGE DENSITY (#/acre)	FREQUENCY (%)	Shrubs per 100 sq.m. W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
NATIVE SHRUBS																								
Purshia tridentata	(0-20cm)	0.28	11.13	15.00		2										4					1			
Purshia tridentata	(21-50cm)	0.83	33.39	22.50		3	3							1		10				3			1	9
Purshia tridentata	(>50cm)	0.70	28.33	10.00												5					1			21
Sarcobatus vermiculatus	(21-50cm)	0.03	1.01	2.50													1							
Sarcobatus vermiculatus	(>50cm)	0.03	1.01	2.50													1							
Shepherdia rotundifolia	(0-20cm)	0.03	1.01	2.50																				
Shepherdia rotundifolia	(>50cm)	0.10	4.05	10.00																1				
Tetradymia canescens	(0-20cm)	0.20	8.09	2.50		8																		
Tetradymia canescens	(21-50cm)	0.08	3.04	5.00		2																		
Yucca glauca	(0-20cm)	0.03	1.01	2.50																				
TOTAL NATIVE SHRUBS		128.10	5184.02	100.00	244	106	123	122	80	146	76	371	121	108	110	156	85	63	95	63	99	105	155	71
TOTAL DENSITY (stems/100 sq. m.)		185.68	(s=95.87)	100.00	246	123	134	126	265	146	76	376	252	290	388	222	95	142	97	68	102	119	169	74
TOTAL DENSITY (stems/acre)		7514.00	(s=3879.78)		9955	4978	5423	5099	10724	5908	3076	15216	10198	11736	15702	8984	3845	5747	3925	2752	4128	4816	6839	2995
SPECIES DENSITY (# of species/100 sq.m.)		6.78	(s=1.72)		4	9	7	7	5	4	2	8	7	8	5	7	8	5	6	8	6	7	9	6

J19/J21 Phase III Woodland Tree Density Data – Fall 2023

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
NATIVE TREES																								
Juniperus osteosperma	(0-20cm)	0.03	1.01	2.50													1							
Juniperus osteosperma	(21-50cm)	0.15	6.07	15.00											1									1
Juniperus osteosperma	(>50cm)	0.28	11.13	22.50	1	1				1				1	3							1		
Pinus edulis	(0-20cm)	0.18	7.08	12.50																1				1
Pinus edulis	(21-50cm)	0.90	36.42	32.50							1	2						3		4	1		1	
Pinus edulis	(>50cm)	2.90	117.36	77.50	1	1		1		9	6	2	1	3		4	3	3	3	1	2		2	8
Quercus gambelii	(0-20cm)	0.10	4.05	10.00													1	1						
Quercus gambelii	(21-50cm)	0.08	3.04	5.00													2	1						
TOTAL NATIVE TREES		4.60	186.16	92.50	2	2		1		10	7	4	1	4	4	4	7	8	3	6	3	1	3	10
INTRODUCED TREES																								
Elaeagnus angustifolia	(>50cm)	0.03	1.01	2.50																				
TOTAL INTRO. TREES		0.03	1.01	2.50																				
TOTAL DENSITY (stems/100 sq. m.)		4.63	(s=3.93)	92.50	2	2	0	1	0	10	7	4	1	4	4	4	7	8	3	6	3	1	3	10
TOTAL DENSITY (stems/acre)		187.17	(s=158.91)		81	81	0	40	0	405	283	162	40	162	162	162	283	324	121	243	121	40	121	405
SPECIES DENSITY (# of species/100 sq.m.)		1.33	(s=0.66)		2	2	0	1	0	2	1	1	1	2	1	1	3	2	1	1	1	1	1	2

J19/J21 Phase III Woodland Tree Density Data – Fall 2023 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
NATIVE TREES																								
Juniperus osteosperma	(0-20cm)	0.03	1.01	2.50																				
Juniperus osteosperma	(21-50cm)	0.15	6.07	15.00		1	1			1					1									
Juniperus osteosperma	(>50cm)	0.28	11.13	22.50	1								1						1					
Pinus edulis	(0-20cm)	0.18	7.08	12.50											2		2			1				
Pinus edulis	(21-50cm)	0.90	36.42	32.50				1						1	1	1	16	3				1		
Pinus edulis	(>50cm)	2.90	117.36	77.50		5	3			1	1	1	7	3	4	4		7	3	11		2	5	9
Quercus gambelii	(0-20cm)	0.10	4.05	10.00					1											1				
Quercus gambelii	(21-50cm)	0.08	3.04	5.00																				
TOTAL NATIVE TREES		4.60	186.16	92.50	1	6	4	1	1	2	1	1	8	4	8	5	18	10	4	13		3	5	9
INTRODUCED TREES																								
Elaeagnus angustifolia	(>50cm)	0.03	1.01	2.50								1												
TOTAL INTRO. TREES		0.03	1.01	2.50								1												
TOTAL DENSITY (stems/100 sq. m.)		4.63	(s=3.93)	92.50	1	6	4	1	1	2	1	2	8	4	8	5	18	10	4	13	0	3	5	9
TOTAL DENSITY (stems/acre)		187.17	(s=158.91)		40	243	162	40	40	81	40	81	324	162	324	202	728	405	162	526	0	121	202	364
SPECIES DENSITY (# of species/100 sq.m.)		1.33	(s=0.66)		1	2	2	1	1	2	1	2	2	1	2	1	1	1	2	2	0	1	1	1

Attachment 2: J19/J21 Raw Data – Spring 2024

J19/J21 Phase III Grassland Cover Data – Spring 2024

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																									
Bahia dissecta	0.03	2.50	0.11	0.03	0.11									1											
Cryptantha minima	0.00	5.00	0.00	0.00	0.00									P	P										
Descurainia pinnata	0.00	10.00	0.00	0.00	0.00		P						P									P			
Helianthus annuus	0.03	2.50	0.11	0.03	0.11									1											
Lappula redowskii	0.05	22.50	0.23	0.05	0.21									2		P								P	P
Machaeranthera canescens	0.03	20.00	0.11	0.05	0.21									P 1		1					P	P			
Microsteris gracilis	0.00	2.50	0.00	0.00	0.00																			P	
TOTAL NATIVE ANN. & BIEN. FORBS	0.13	40.00	0.56	0.15	0.64		P						P	4 1	P	1				P		P		P	P
INTRODUCED ANNUAL & BIENNIAL FORBS																									
Carduus nutans	0.00	2.50	0.00	0.00	0.00											P									
Erodium cicutarium	0.00	2.50	0.00	0.00	0.00											P									
Kochia scoparia	0.03	7.50	0.11	0.03	0.11											1									
Lactuca serriola	0.00	2.50	0.00	0.00	0.00											P									
Ranunculus testiculatus	0.00	2.50	0.00	0.00	0.00						P														
Salsola iberica	0.00	2.50	0.00	0.00	0.00																				
Sisymbrium altissimum	0.00	2.50	0.00	0.00	0.00											P									
Tragopogon dubius	0.00	5.00	0.00	0.00	0.00											P									
Verbascum thapsus	0.00	2.50	0.00	0.00	0.00											P									
TOTAL INTRO. ANN. & BIEN. FORBS	0.03	12.50	0.11	0.03	0.11						P					1									
NATIVE ANNUAL GRASSES																									
Festuca octoflora	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE ANNUAL GRASSES	0.00	2.50	0.00	0.00	0.00																				
INTRODUCED ANNUAL GRASSES																									
Bromus tectorum	0.05	27.50	0.23	0.10	0.42						P			P 1		1		P				P		P	
TOTAL INTRODUCED ANNUAL GRASSES	0.05	27.50	0.23	0.10	0.42						P			P 1		1		P				P		P	
NATIVE PERENNIAL FORBS																									
Achillea lanulosa	0.00	2.50	0.00	0.00	0.00																	P			
Ratibida columnaris	0.05	5.00	0.23	0.05	0.21																	1			
Sphaeralcea ambigua	0.03	2.50	0.11	0.03	0.11									1											
Sphaeralcea coccinea	0.08	50.00	0.34	0.08	0.32			P				P	1	P	P	P		P		P		P			P
Sphaeralcea parvifolia	0.00	2.50	0.00	0.00	0.00									P											
Townsendia exscapa	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE PERENNIAL FORBS	0.15	50.00	0.68	0.15	0.64			P				P	1	1	P	P		P		P		1			P
INTRODUCED PERENNIAL FORBS																									
Astragalus cicer	0.03	2.50	0.11	0.03	0.11																	1			
Medicago sativa	0.00	2.50	0.00	0.00	0.00																				
Onobrychis viciifolia	0.00	2.50	0.00	0.00	0.00																P				
TOTAL INTRO. PERENNIAL FORBS	0.03	7.50	0.11	0.03	0.11																P	1			
NATIVE PERENNIAL GRASSES (cool)																									
Agropyron dasystachyum	0.65	52.50	2.93	0.70	2.97				1							1	P			2	1	5	P		
Agropyron smithii	1.40	77.50	6.31	1.53	6.47	P		2	1	P	P	P 1	P	7 1		4 1	2	1		P	2	6	1		P
Agropyron spicatum	0.38	32.50	1.69	0.43	1.80			2	P			P				1				P	P	2			
Agropyron trachycaulum	0.08	15.00	0.34	0.08	0.32																	1			
Oryzopsis hymenoides	0.10	25.00	0.45	0.10	0.42									P		P			P			4			
TOTAL NATIVE PERENNIAL GRASSES (c)	2.60	80.00	11.71	2.83	11.98	P		4	2	P	P	P 1	P	7 1		6 1	2	1	P	2	3	18	1		P
NATIVE PERENNIAL GRASSES (warm)																									
Aristida purpurea	0.03	2.50	0.11	0.03	0.11									1											
Bouteloua gracilis	1.40	77.50	6.31	1.48	6.26	1			8 1	P	P	1	3	P		P	3	P	P		P	P	P	1	7
Buchloe dactyloides	0.10	47.50	0.45	0.10	0.42	P		P	P	P	P		P				P				P	P	P	P		
Hilaria jamesii	0.83	80.00	3.72	1.25	5.30	P	P	P	2	4	P		3 1				P	1	3 1	P	P	P		P 3	2 3
Sporobolus airoides	1.80	55.00	8.11	2.10	8.91	3 1	1		P		13 1		6 3			P	P	P	1		P			29 3	9
Sporobolus cryptandrus	0.13	27.50	0.56	0.13	0.53							P				2		P				1			
TOTAL NATIVE PERENNIAL GRASSES (w)	4.28	95.00	19.26	5.08	21.53	4 1	1	P	10 1	4	13 1	1	12 4	1		2	3	1	4 1	P	P	1	P	30 6	18 3

J19/J21 Phase III Grassland Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover																																							
						G21		G22		G23		G24		G25		G26		G27		G28		G29		G30		G31		G32		G33		G34		G35		G36		G37		G38		G39		G40	
						1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NATIVE ANNUAL & BIENNIAL FORBS																																													
Bahia dissecta	0.03	2.50	0.11	0.03	0.11																																								
Cryptantha minima	0.00	5.00	0.00	0.00	0.00																																								
Descurainia pinnata	0.00	10.00	0.00	0.00	0.00									P																															
Helianthus annuus	0.03	2.50	0.11	0.03	0.11																																								
Lappula redowskii	0.05	22.50	0.23	0.05	0.21					P				P				P		P																						P			
Machaeranthera canescens	0.03	20.00	0.11	0.05	0.21					P																				P										P		P			
Microsteris gracilis	0.00	2.50	0.00	0.00	0.00																																								
TOTAL NATIVE ANN. & BIEN. FORBS	0.13	40.00	0.56	0.15	0.64					P				P				P		P										P										P		P			
INTRODUCED ANNUAL & BIENNIAL FORBS																																													
Carduus nutans	0.00	2.50	0.00	0.00	0.00																																								
Erodium cicutarium	0.00	2.50	0.00	0.00	0.00																																								
Kochia scoparia	0.03	7.50	0.11	0.03	0.11							P																								P									
Lactuca serriola	0.00	2.50	0.00	0.00	0.00																																								
Ranunculus testiculatus	0.00	2.50	0.00	0.00	0.00																																								
Salsola iberica	0.00	2.50	0.00	0.00	0.00																							P																	
Sisymbrium altissimum	0.00	2.50	0.00	0.00	0.00																																								
Tragopogon dubius	0.00	5.00	0.00	0.00	0.00							P																																	
Verbascum thapsus	0.00	2.50	0.00	0.00	0.00																																								
TOTAL INTRO. ANN. & BIEN. FORBS	0.03	12.50	0.11	0.03	0.11							P																P								P									
NATIVE ANNUAL GRASSES																																													
Festuca octoflora	0.00	2.50	0.00	0.00	0.00															P																									
TOTAL NATIVE ANNUAL GRASSES	0.00	2.50	0.00	0.00	0.00															P																									
INTRODUCED ANNUAL GRASSES																																													
Bromus tectorum	0.05	27.50	0.23	0.10	0.42					1		P						P		P	1																							P	
TOTAL INTRODUCED ANNUAL GRASSES	0.05	27.50	0.23	0.10	0.42					1		P						P		P	1																							P	
NATIVE PERENNIAL FORBS																																													
Achillea lanulosa	0.00	2.50	0.00	0.00	0.00																																								
Ratibida columnaris	0.05	5.00	0.23	0.05	0.21					1																																			
Sphaeralcea ambigua	0.03	2.50	0.11	0.03	0.11																																								
Sphaeralcea coccinea	0.08	50.00	0.34	0.08	0.32					P		P												P								P		P		P		1		P		1		P	
Sphaeralcea parvifolia	0.00	2.50	0.00	0.00	0.00																																								
Townsendia exscapa	0.00	2.50	0.00	0.00	0.00																																					P			
TOTAL NATIVE PERENNIAL FORBS	0.15	50.00	0.68	0.15	0.64					1		P												P								P		P		P		1		P		1		P	
INTRODUCED PERENNIAL FORBS																																													
Astragalus cicer	0.03	2.50	0.11	0.03	0.11																																								
Medicago sativa	0.00	2.50	0.00	0.00	0.00																																	P							
Onobrychis viciifolia	0.00	2.50	0.00	0.00	0.00																																								
TOTAL INTRO. PERENNIAL FORBS	0.03	7.50	0.11	0.03	0.11																																	P							
NATIVE PERENNIAL GRASSES (cool)																																													
Agropyron dasystachyum	0.65	52.50	2.93	0.70	2.97	P		4	1	P		P		P		1		P										1				1		2		4		2	1	1		P			
Agropyron smithii	1.40	77.50	6.31	1.53	6.47	P		3		2		2		P		1		P				1						P				4		6		7	1	P		2		2	1		
Agropyron spicatum	0.38	32.50	1.69	0.43	1.80			P		P																						P		1		1	2					8			
Agropyron trachycaulum	0.08	15.00	0.34	0.08	0.32					P																		P				P		1		1									
Oryzopsis hymenoides	0.10	25.00	0.45	0.10	0.42					P		P				P												P				P		P											
TOTAL NATIVE PERENNIAL GRASSES (c)	2.60	80.00	11.71	2.83	11.98	P		7	1	2		2		P		2		P				1						1				5		10		13	3	2	1	3		10	1		
NATIVE PERENNIAL GRASSES (warm)																																													
Aristida purpurea	0.03	2.50	0.11	0.03	0.11																																								
Bouteloua gracilis	1.40	77.50	6.31	1.48	6.26	P		P		P				1				1		P		P		3	1					P		3	1			P		1		P		2		21	
Buchloe dactyloides	0.10	47.50	0.45	0.10	0.42			P		4						P		P														P						P		P		P			
Hilaria jamesii	0.83	80.00	3.72	1.25	5.30	P	1	P	3	P	1			3	1			1		1		P		P		P		P		1		P				P		P		P		1	2	11	1
Sporobolus airoides	1.80	55.00	8.11	2.10	8.91	P	2	P	1					2				1		P		1		5	1			P				1				P									
Sporobolus cryptandrus	0.13	27.50	0.56	0.13	0.53					1		P						P		P																		P		P		1			
TOTAL NATIVE PERENNIAL GRASSES (w)	4.28	95.00	19.26	5.08	21.53	P	3	P	4	5	1	P		6	1	P		3		1		1		8	2	P		P		1		4	1			P		1		P		4	2	32	1

J19/J21 Phase III Grassland Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron intermedium	0.00	5.00	0.00	0.00	0.00				P												P				
Elymus junceus	12.35	97.50	55.63	13.00	55.15	26	28 1	30 1	9	25	9 1	20	16 2	5 1	32	7		9 2	5 1	13	11	1	18 1	7	5
TOTAL INTRO. PERENNIAL GRASSES (c)	12.35	97.50	55.63	13.00	55.15	26	28 1	30 1	9	25	9 1	20	16 2	5 1	32	7		9 2	5 1	13	11	1	18 1	7	5
NATIVE SUBSHRUBS																									
Artemisia frigida	0.00	2.50	0.00	0.00	0.00	P																			
Ceratoides lanata	0.00	30.00	0.00	0.00	0.00								P				P	P	P	P	P				
Gutierrezia sarothrae	0.08	37.50	0.34	0.08	0.32	P				P				2				P	P	P	P		P		
TOTAL NATIVE SUBSHRUBS	0.08	50.00	0.34	0.08	0.32	P				P			P	2			P	P	P	P	P		P		
INTRODUCED SUBSHRUBS																									
Kochia prostrata	0.50	30.00	2.25	0.50	2.12	P					P		1												
TOTAL INTRO. SUBSHRUBS	0.50	30.00	2.25	0.50	2.12	P					P		1												
NATIVE SHRUBS																									
Artemisia tridentata	0.00	2.50	0.00	0.00	0.00																				
Atriplex canescens	1.80	90.00	8.11	1.80	7.64		2	2	1	1	2	1	1	9	P		P	9	P	1	3	5	4	P	P
Atriplex confertifolia	0.13	37.50	0.56	0.13	0.53			1	1			P		P					P	P		P	P		
Chrysothamnus nauseosus	0.00	15.00	0.00	0.00	0.00					P				P						P		P			
Cowania mexicana	0.00	2.50	0.00	0.00	0.00									P											
Ephedra viridis	0.00	2.50	0.00	0.00	0.00									P											
Fallugia paradoxa	0.00	2.50	0.00	0.00	0.00									P											
Lycium pallidum	0.10	2.50	0.45	0.10	0.42									4											
Purshia tridentata	0.00	2.50	0.00	0.00	0.00									P											
TOTAL NATIVE SHRUBS	2.03	90.00	9.12	2.03	8.59		2	3	2	1	2	1	1	13	P		P	9	P	1	3	5	4	P	P
SUCCULENTS																									
Opuntia macrorhiza	0.00	2.50	0.00	0.00	0.00																		P		
TOTAL SUCCULENTS	0.00	2.50	0.00	0.00	0.00																		P		
BRYOPHYTES																									
Moss spp.	0.00	2.50	0.00	0.00	0.00				P																
TOTAL BRYOPHYTES	0.00	2.50	0.00	0.00	0.00				P																
Standing dead	10.33	100.00		10.33		12	11	5	8	4	11	2	8	11	7	7	19	30	22	8	15	2	3	10	10
Litter	22.58	100.00		22.58		20	34	25	14	29	20	13	25	17	30	40	16	26	26	37	14	25	15	25	24
Bare ground	42.98	100.00		42.98		37	23	30	53	35	41	59	35	37	31	35	60	24	43	39	52	44	56	27	40
Rock	1.93	72.50		1.93		1	1	3	2	2	4	4	1	2							2	2	3	1	3
TOTALS	100.00		100.00	101.75	101.61	100 1	100 1	100 1	100 1	100 0	100 2	100 1	100 6	100 4	100 0	100 1	100 0	100 2	100 2	100 0	100 0	100 0	100 1	100 6	100 3
TOTAL VEGETATION COVER	22.20	s=(9.71)		23.57	s=(10.37)	30 1	31 1	37 1	23 1	30 0	24 2	22 1	31 6	33 4	32 0	18 1	5 0	20 2	9 2	16 0	17 0	27 0	23 1	37 6	23 3
GROUND COVER (Veg+Litter+St.Dead+Rock)	57.03	s=(12.02)		59.51	s=(12.66)	63 1	77 1	70 1	47 1	65 0	59 2	41 1	65 6	63 4	69 0	65 1	40 0	76 2	57 2	61 0	48 0	56 0	44 1	73 6	60 3
Allowable Ground Cover (per permit)	**55.10**	**s=(12.58)**				**62.0**	**76.0**	**67.0**	**45.0**	**63.0**	**55.0**	**37.0**	**64.0**	**61.0**	**69.0**	**65.0**	**40.0**	**76.0**	**57.0**	**61.0**	**46.0**	**54.0**	**41.0**	**72.0**	**57.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.55	s=(4.24)				9	5	8	12	8	10	8	11	23	4	19	8	11	9	13	11	21	9	9	8

Noxious Cover	0.00
Annual Cover	0.20
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Grassland Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron intermedium	0.00	5.00	0.00	0.00	0.00																				
Elymus junceus	12.35	97.50	55.63	13.00	55.15	17 1	14 3	9 1	23	26 2	14	3	1	12 1	4 2	7 1	10 1	15 2	4	12	8 2	11	4	7	17
TOTAL INTRO. PERENNIAL GRASSES (c)	12.35	97.50	55.63	13.00	55.15	17 1	14 3	9 1	23	26 2	14	3	1	12 1	4 2	7 1	10 1	15 2	4	12	8 2	11	4	7	17
NATIVE SUBSHRUBS																									
Artemisia frigida	0.00	2.50	0.00	0.00	0.00																				
Ceratoides lanata	0.00	30.00	0.00	0.00	0.00		P					P	P	P					P						P
Gutierrezia sarothrae	0.08	37.50	0.34	0.08	0.32		P	P						P						P			P	P	1
TOTAL NATIVE SUBSHRUBS	0.08	50.00	0.34	0.08	0.32		P	P				P	P	P					P	P			P	P	1
INTRODUCED SUBSHRUBS																									
Kochia prostrata	0.50	30.00	2.25	0.50	2.12					P			11	P		1	5	2			P		P	P	
TOTAL INTRO. SUBSHRUBS	0.50	30.00	2.25	0.50	2.12					P			11	P		1	5	2			P		P	P	
NATIVE SHRUBS																									
Artemisia tridentata	0.00	2.50	0.00	0.00	0.00												P								
Atriplex canescens	1.80	90.00	8.11	1.80	7.64	2	5	2		3	1	2	1	1	1	5	P	2	P	P		P	P	1	5
Atriplex confertifolia	0.13	37.50	0.56	0.13	0.53							P	1					P	P			P	1	1	
Chrysothamnus nauseosus	0.00	15.00	0.00	0.00	0.00			P															P		
Cowania mexicana	0.00	2.50	0.00	0.00	0.00																				
Ephedra viridis	0.00	2.50	0.00	0.00	0.00																				
Fallugia paradoxa	0.00	2.50	0.00	0.00	0.00																				
Lycium pallidum	0.10	2.50	0.45	0.10	0.42																				
Purshia tridentata	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE SHRUBS	2.03	90.00	9.12	2.03	8.59	2	5	2		3	1	2	2	1	1	5	P	2	P	P		P	1	2	5
SUCCULENTS																									
Opuntia macrorhiza	0.00	2.50	0.00	0.00	0.00																				
TOTAL SUCCULENTS	0.00	2.50	0.00	0.00	0.00																				
BRYOPHYTES																									
Moss spp.	0.00	2.50	0.00	0.00	0.00																				
TOTAL BRYOPHYTES	0.00	2.50	0.00	0.00	0.00																				
Standing dead	10.33	100.00		10.33		6	9	4	1	4	3	27	17	14	23	7	1	9	18	11	18	11	10	10	5
Litter	22.58	100.00		22.58		24	23	33	33	42	34	23	15	17	23	14	18	25	12	14	16	14	10	22	16
Bare ground	42.98	100.00		42.98		49	42	39	37	18	43	37	50	52	41	62	59	44	53	50	45	59	72	42	24
Rock	1.93	72.50		1.93		2		4	4	1	3	5	3	2		4	6	2	4	3		1		2	
TOTALS	100.00		100.00	101.75	101.61	100 4	100 8	100 2	100 0	100 3	100 0	100 0	100 1	100 1	100 4	100 1	100 1	100 2	100 1	100 0	100 5	100 1	100 0	100 3	100 1
TOTAL VEGETATION COVER	22.20	s=(9.71)		23.57	s=(10.37)	19 4	26 8	20 2	25 0	35 3	17 0	8 0	15 1	15 1	13 4	13 1	16 1	20 2	13 1	22 0	21 5	15 1	8 0	24 3	55 1
GROUND COVER (Veg+Litter+St.Dead+Rock)	57.03	s=(12.02)		59.51	s=(12.66)	51 4	58 8	61 2	63 0	82 3	57 0	63 0	50 1	48 1	59 4	38 1	41 1	56 2	47 1	50 0	55 5	41 1	28 0	58 3	76 1
Allowable Ground Cover (per permit)	**55.10**	**s=(12.58)**				**49.0**	**58.0**	**57.0**	**59.0**	**81.0**	**54.0**	**58.0**	**47.0**	**46.0**	**59.0**	**34.0**	**35.0**	**54.0**	**43.0**	**47.0**	**55.0**	**40.0**	**28.0**	**56.0**	**76.0**
SPECIES DENSITY (# of species/100 sq.m.)	10.55	s=(4.24)				7	11	18	9	10	6	13	12	9	6	4	11	7	14	9	11	11	14	16	8

Noxious Cover	0.00	**To calculate Allowable Cover (per permit):**
Annual Cover	0.20	Subtract average absolute cover of noxious species (AZ & NN)
Excess Annual Cover	0.00	If average annual relative cover is greater than 10%, substract the average excess
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00	If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Shrubland Cover Data – Spring 2024

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																									
Cryptantha minima	0.00	7.50	0.00	0.00	0.00									P											P
Descurainia pinnata	0.00	2.50	0.00	0.00	0.00																				
Lappula redowskii	0.08	22.50	0.33	0.08	0.31		3		P													P	P		
Machaeranthera canescens	0.00	30.00	0.00	0.00	0.00											P		P	P		P	P			
Townsendia annua	0.00	2.50	0.00	0.00	0.00																		P		
TOTAL NATIVE ANN. & BIEN. FORBS	0.08	52.50	0.33	0.08	0.31		3		P					P		P		P	P		P	P	P		P
INTRODUCED ANNUAL & BIENNIAL FORBS																									
Kochia scoparia	0.05	15.00	0.22	0.05	0.21				P															P	
Ranunculus testiculatus	0.03	2.50	0.11	0.03	0.10																				
Sisymbrium altissimum	0.00	5.00	0.00	0.00	0.00	P			P																
Tragopogon dubius	0.00	2.50	0.00	0.00	0.00																				
TOTAL INTRO. ANN. & BIEN. FORBS	0.08	22.50	0.33	0.08	0.31	P			P															P	
INTRODUCED ANNUAL GRASSES																									
Bromus tectorum	0.30	30.00	1.32	0.33	1.33				1					3 1			P	P					6		
TOTAL INTRODUCED ANNUAL GRASSES	0.30	30.00	1.32	0.33	1.33				1					3 1			P	P					6		
NATIVE PERENNIAL FORBS																									
Castilleja linariaefolia	0.00	2.50	0.00	0.00	0.00													P							
Cryptantha flava	0.00	2.50	0.00	0.00	0.00																				P
Cymopterus purpurascens	0.00	2.50	0.00	0.00	0.00		P																		
Dalea purpurea	0.00	2.50	0.00	0.00	0.00																				
Haplopappus armerioides	0.00	5.00	0.00	0.00	0.00													P							P
Leucelene ericoides	0.00	7.50	0.00	0.00	0.00				P																
Penstemon barbatus	0.00	2.50	0.00	0.00	0.00													P							
Penstemon palmeri	0.08	7.50	0.33	0.08	0.31													P							P
Ratibida columnaris	0.00	5.00	0.00	0.00	0.00																				
Sphaeralcea coccinea	0.00	40.00	0.00	0.00	0.00	P	P	P	P												P	P			
Sphaeralcea parvifolia	0.00	2.50	0.00	0.00	0.00													P							
TOTAL NATIVE PERENNIAL FORBS	0.08	47.50	0.33	0.08	0.31	P	P	P	P									P			P	P			P
INTRODUCED PERENNIAL FORBS																									
Cardaria draba	0.10	2.50	0.44	0.10	0.41					4															
Medicago sativa	0.00	2.50	0.00	0.00	0.00			P																	
Rumex crispus	0.00	2.50	0.00	0.00	0.00																P				
TOTAL INTRO. PERENNIAL FORBS	0.10	7.50	0.44	0.10	0.41			P		4											P				
NATIVE PERENNIAL GRASSES (cool)																									
Agropyron dasystachyum	0.40	45.00	1.76	0.45	1.85			3	4 1							2 1							P		
Agropyron smithii	1.13	72.50	4.95	1.20	4.92	P	6 1	2	3	P		P	P		P	P			P		1	1	P		
Agropyron spicatum	0.65	35.00	2.86	0.70	2.87		11 1		8							P 1		2	P			1	P		
Agropyron trachycaulum	0.03	7.50	0.11	0.03	0.10																				
Elymus cinereus	0.00	2.50	0.00	0.00	0.00																				
Oryzopsis hymenoides	0.00	27.50	0.00	0.00	0.00		P	P								P		P					P		P
Poa arida	0.00	2.50	0.00	0.00	0.00											P									
Sitanion hystrix	0.03	10.00	0.11	0.03	0.10													P	P						1
TOTAL NATIVE PERENNIAL GRASSES (c)	2.23	82.50	9.78	2.40	9.85	P	17 2	5	15 1	P		P	P		P	2 2		2	P		1	2	P		1
NATIVE PERENNIAL GRASSES (warm)																									
Aristida purpurea	0.00	2.50	0.00	0.00	0.00																				
Bouteloua curtipendula	0.05	10.00	0.22	0.05	0.21													1							P
Bouteloua gracilis	1.15	35.00	5.05	1.33	5.44	10 2		P	P	P	P	P		20	11 3	2			3						
Buchloe dactyloides	0.08	20.00	0.33	0.08	0.31	2	P		P			P		P	P										
Hilaria jamesii	0.23	40.00	0.99	0.40	1.64	2 5	1	P	P	P 1	P	P		1	P 1	P		P	4						
Sporobolus airoides	0.65	62.50	2.86	0.80	3.28	1				1	1 1			1	10 2	4 2							2	1	
Sporobolus cryptandrus	0.03	25.00	0.11	0.03	0.10			P	P							P									P
TOTAL NATIVE PERENNIAL GRASSES (w)	2.18	82.50	9.56	2.68	10.98	15 7	1	P	P	1 1	1 1	P		22	21 6	6 2		1	7				2	1	P

J19/J21 Phase III Shrubland Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																									
Cryptantha minima	0.00	7.50	0.00	0.00	0.00																P				
Descurainia pinnata	0.00	2.50	0.00	0.00	0.00								P												
Lappula redowskii	0.08	22.50	0.33	0.08	0.31	P			P			P	P	P											
Machaeranthera canescens	0.00	30.00	0.00	0.00	0.00	P			P							P		P	P	P		P			
Townsendia annua	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE ANN. & BIEN. FORBS	0.08	52.50	0.33	0.08	0.31	P			P			P	P	P		P		P	P	P	P	P			
INTRODUCED ANNUAL & BIENNIAL FORBS																									
Kochia scoparia	0.05	15.00	0.22	0.05	0.21	P								2		P		P							
Ranunculus testiculatus	0.03	2.50	0.11	0.03	0.10							1													
Sisymbrium altissimum	0.00	5.00	0.00	0.00	0.00																				
Tragopogon dubius	0.00	2.50	0.00	0.00	0.00						P														
TOTAL INTRO. ANN. & BIEN. FORBS	0.08	22.50	0.33	0.08	0.31	P					P	1		2		P		P							
INTRODUCED ANNUAL GRASSES																									
Bromus tectorum	0.30	30.00	1.32	0.33	1.33	P							P	P	2	P		P	P						
TOTAL INTRODUCED ANNUAL GRASSES	0.30	30.00	1.32	0.33	1.33	P							P	P	2	P		P	P						
NATIVE PERENNIAL FORBS																									
Castilleja linariaefolia	0.00	2.50	0.00	0.00	0.00																				
Cryptantha flava	0.00	2.50	0.00	0.00	0.00																				
Cymopterus purpurascens	0.00	2.50	0.00	0.00	0.00																				
Dalea purpurea	0.00	2.50	0.00	0.00	0.00				P																
Haplopappus armerioides	0.00	5.00	0.00	0.00	0.00																				
Leucelene ericoides	0.00	7.50	0.00	0.00	0.00				P										P						
Penstemon barbatus	0.00	2.50	0.00	0.00	0.00																				
Penstemon palmeri	0.08	7.50	0.33	0.08	0.31																				3
Ratibida columnaris	0.00	5.00	0.00	0.00	0.00				P													P			
Sphaeralcea coccinea	0.00	40.00	0.00	0.00	0.00	P			P				P	P			P		P	P	P	P	P		
Sphaeralcea parvifolia	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE PERENNIAL FORBS	0.08	47.50	0.33	0.08	0.31	P			P				P	P			P		P	P	P	P	P		3
INTRODUCED PERENNIAL FORBS																									
Cardaria draba	0.10	2.50	0.44	0.10	0.41																				
Medicago sativa	0.00	2.50	0.00	0.00	0.00																				
Rumex crispus	0.00	2.50	0.00	0.00	0.00																				
TOTAL INTRO. PERENNIAL FORBS	0.10	7.50	0.44	0.10	0.41																				
NATIVE PERENNIAL GRASSES (cool)																									
Agropyron dasystachyum	0.40	45.00	1.76	0.45	1.85	P			1	P	P	P	P			2		P	1	1	P		P	1	1	
Agropyron smithii	1.13	72.50	4.95	1.20	4.92	P			P	P		P	P	5	1	7	1	P	1	3	7	P	2	2	4	1
Agropyron spicatum	0.65	35.00	2.86	0.70	2.87					P		1							P	1			1	P	1	
Agropyron trachycaulum	0.03	7.50	0.11	0.03	0.10															P	1					P
Elymus cinereus	0.00	2.50	0.00	0.00	0.00																					P
Oryzopsis hymenoides	0.00	27.50	0.00	0.00	0.00	P					P		P							P						P
Poa arida	0.00	2.50	0.00	0.00	0.00																					
Sitanion hystrix	0.03	10.00	0.11	0.03	0.10									P												
TOTAL NATIVE PERENNIAL GRASSES (c)	2.23	82.50	9.78	2.40	9.85	P			1	P	P	1	P	5	1	9	1	P	2	5	8	P	3		3	6	1	P	
NATIVE PERENNIAL GRASSES (warm)																										
Aristida purpurea	0.00	2.50	0.00	0.00	0.00																					P
Bouteloua curtipendula	0.05	10.00	0.22	0.05	0.21																P					1
Bouteloua gracilis	1.15	35.00	5.05	1.33	5.44																		P	1	P	P	P	1
Buchloe dactyloides	0.08	20.00	0.33	0.08	0.31																				1	P		
Hilaria jamesii	0.23	40.00	0.99	0.40	1.64																		P		1	P	P	
Sporobolus airoides	0.65	62.50	2.86	0.80	3.28	P		P	2	1	2	1	P	P	P	P	P		P	P			P		P	P	P	
Sporobolus cryptandrus	0.03	25.00	0.11	0.03	0.10	1							P	P	P					P						P		
TOTAL NATIVE PERENNIAL GRASSES (w)	2.18	82.50	9.56	2.68	10.98	1		P	2	1	2	1	P	P	P	P	P		P	P	P		P	1	2	P	1	1

J19/J21 Phase III Shrubland Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron intermedium	0.00	5.00	0.00	0.00	0.00																				
Bromus inermis	0.00	2.50	0.00	0.00	0.00																				
Elymus junceus	11.05	95.00	48.57	11.90	48.83	8	1 1	8 1	9	12 3	22 2	22 2	39 3	12 2	P	4 1	23 4	P	21 1	27 2	22 3	30 1	4	7	
TOTAL INTRO. PERENNIAL GRASSES (c)	11.05	95.00	48.57	11.90	48.83	8	1 1	8 1	9	12 3	22 2	22 2	39 3	12 2	P	4 1	23 4	P	21 1	27 2	22 3	30 1	4	7	
NATIVE SUBSHRUBS																									
Artemisia frigida	0.08	2.50	0.33	0.08	0.31													3							
Ceratoides lanata	0.05	35.00	0.22	0.05	0.21	P			P					P		P									
Chrysothamnus greenei	0.03	10.00	0.11	0.03	0.10										P				P						
Eriogonum jamesii	0.00	5.00	0.00	0.00	0.00													P							P
Gutierrezia sarothrae	0.08	47.50	0.33	0.08	0.31	P	P		P						P	1		P	P		P		P		
TOTAL NATIVE SUBSHRUBS	0.23	67.50	0.99	0.23	0.92	P	P		P					P	P	1		3	P		P		P		P
INTRODUCED SUBSHRUBS																									
Kochia prostrata	1.78	40.00	7.80	1.93	7.90	P	1	2	P				P			1							7	21 2	
TOTAL INTRO. SUBSHRUBS	1.78	40.00	7.80	1.93	7.90	P	1	2	P				P			1							7	21 2	
NATIVE SHRUBS																									
Artemisia tridentata	0.33	17.50	1.43	0.33	1.33													2	P						10
Atriplex canescens	3.30	100.00	14.51	3.35	13.75	1	2	1	1	3	4	5	10	7	6	4	9 1	1	4	4	3	6 1	2	1	4
Atriplex confertifolia	0.08	25.00	0.33	0.08	0.31		P	P	2			P	P									1	P	P	
Chrysothamnus nauseosus	0.55	20.00	2.42	0.55	2.26													8	5						6
Cowania mexicana	0.15	7.50	0.66	0.15	0.62													P							1
Ephedra viridis	0.03	5.00	0.11	0.03	0.10																				P
Purshia tridentata	0.15	5.00	0.66	0.15	0.62																				P
Unidentified shrub species	0.00	2.50	0.00	0.00	0.00																				
Yucca angustissima	0.00	2.50	0.00	0.00	0.00											P									
TOTAL NATIVE SHRUBS	4.58	100.00	20.11	4.63	18.98	1	2	1	3	3	4	5	10	7	6	4	9 1	11	9	4	3	7 1	2	1	21
NATIVE TREES																									
Juniperus osteosperma	0.00	2.50	0.00	0.00	0.00													P							
Pinus edulis	0.10	2.50	0.44	0.10	0.41													4							
TOTAL NATIVE TREES	0.10	2.50	0.44	0.10	0.41													4							
Standing dead	12.08	100.00		12.08		16	11	5	6	6	3	5	4	17	25	11	4	13	9	10	9	4	8	4	13
Litter	19.93	100.00		19.93		28	17	12	21	27	22	17	22	23	22	25	16	15	10	31	20	16	26	18	30
Bare ground	39.83	100.00		39.83		32	47	66	45	46	47	49	21	16	26	45	47	8	40	22	33	41	44	41	8
Rock	4.65	62.50		4.65				1		1	1	2	4			1	1	43	4	6				7	27
TOTALS	99.23		100.00	100.98	100.53	100 7	100 3	100 1	100 1	100 4	100 3	100 2	100 3	100 3	100 6	100 5	100 5	100 0	100 1	100 2	88 3	100 2	99 0	100 2	100 0
TOTAL VEGETATION COVER	22.75	s=(9.83)		24.37	s=(10.67)	24 7	25 3	16 1	28 1	20 4	27 3	27 2	49 3	44 3	27 6	18 5	32 5	21 0	37 1	31 2	26 3	39 2	21 0	30 2	22 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	59.40	s=(14.12)		60.11	s=(14.47)	68 7	53 3	34 1	55 1	54 4	53 3	51 2	79 3	84 3	74 6	55 5	53 5	92 0	60 1	78 2	55 3	59 2	55 0	59 2	92 0
Allowable Ground Cover (per permit)	**54.65**	**s=(11.22)**				**67.9**	**52.9**	**32.9**	**54.9**	**52.9**	**51.9**	**48.9**	**74.9**	**83.9**	**73.9**	**53.9**	**51.9**	**48.9**	**55.9**	**71.9**	**54.9**	**58.9**	**54.9**	**51.9**	**64.9**
SPECIES DENSITY (# of species/100 sq.m.)	10.38	s=(4.53)				12	13	12	19	7	5	7	5	9	9	16	3	22	12	2	7	8	13	6	15

Noxious Cover	0.10
Annual Cover	0.45
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

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PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
INTRODUCED PERENNIAL GRASSES (cool)																									
Agropyron intermedium	0.00	5.00	0.00	0.00	0.00														P	P					
Bromus inermis	0.00	2.50	0.00	0.00	0.00														P						
Elymus junceus	11.05	95.00	48.57	11.90	48.83	6	13 1	9	6	4	4 1	5	7 1	9	4	6	15	6 1	4	3	26	13	7 1	24 3	
TOTAL INTRO. PERENNIAL GRASSES (c)	11.05	95.00	48.57	11.90	48.83	6	13 1	9	6	4	4 1	5	7 1	9	4	6	15	6 1	4	3	26	13	7 1	24 3	
NATIVE SUBSHRUBS																									
Artemisia frigida	0.08	2.50	0.33	0.08	0.31																				
Ceratoides lanata	0.05	35.00	0.22	0.05	0.21	P		P				P		2		P		P		P		P	P	P	
Chrysothamnus greenei	0.03	10.00	0.11	0.03	0.10	1										P									
Eriogonum jamesii	0.00	5.00	0.00	0.00	0.00																				
Gutierrezia sarothrae	0.08	47.50	0.33	0.08	0.31				P		2		P	P	P	P	P		P			P	P		
TOTAL NATIVE SUBSHRUBS	0.23	67.50	0.99	0.23	0.92	1		P	P		2	P	P	2	P	P	P	P	P	P		P	P	P	
INTRODUCED SUBSHRUBS																									
Kochia prostrata	1.78	40.00	7.80	1.93	7.90		P	11 2	P			20						7 2			1	P		P	
TOTAL INTRO. SUBSHRUBS	1.78	40.00	7.80	1.93	7.90		P	11 2	P			20						7 2			1	P		P	
NATIVE SHRUBS																									
Artemisia tridentata	0.33	17.50	1.43	0.33	1.33	P							1			P									P
Atriplex canescens	3.30	100.00	14.51	3.35	13.75	4	4	1	5	3	P	3	3	4	2	2	P	3	P	2	6	4	3	5	P
Atriplex confertifolia	0.08	25.00	0.33	0.08	0.31												P	P							
Chrysothamnus nauseosus	0.55	20.00	2.42	0.55	2.26				1	P								1				P			1
Cowania mexicana	0.15	7.50	0.66	0.15	0.62																				5
Ephedra viridis	0.03	5.00	0.11	0.03	0.10																				1
Purshia tridentata	0.15	5.00	0.66	0.15	0.62																				6
Unidentified shrub species	0.00	2.50	0.00	0.00	0.00					P															
Yucca angustissima	0.00	2.50	0.00	0.00	0.00																				
TOTAL NATIVE SHRUBS	4.58	100.00	20.11	4.63	18.98	4	4	1	6	3	P	3	4	4	2	2	P	4	P	2	6	4	3	5	13
NATIVE TREES																									
Juniperus osteosperma	0.00	2.50	0.00	0.00	0.00																				
Pinus edulis	0.10	2.50	0.44	0.10	0.41																				
TOTAL NATIVE TREES	0.10	2.50	0.44	0.10	0.41																				
Standing dead	12.08	100.00		12.08		15	10	13	11	19	25	1	17	26	31	5	19	13	8	23	10	12	26	3	13
Litter	19.93	100.00		19.93		24	21	10	16	8	21	24	19	30	13	29	17	15	24	18	14	23	10	33	10
Bare ground	39.83	100.00		39.83		47	50	46	52	62	41	43	49	21	42	48	49	53	57	44	40	39	46	29	11
Rock	4.65	62.50		4.65			2	10	4	2	2	2		1					2	2	3	6	3		49
TOTALS	99.23		100.00	100.98	100.53	98 0	100 1	100 2	98 0	99 0	97 2	100 0	96 1	100 0	95 0	99 1	100 0	100 3	100 0	100 0	100 0	100 1	100 1	100 4	100 1
TOTAL VEGETATION COVER	22.75	s=(9.83)		24.37	s=(10.67)	12 0	17 1	21 2	15 0	8 0	8 2	30 0	11 1	22 0	9 0	17 1	15 0	19 3	9 0	13 0	33 0	20 1	15 1	35 4	17 1
GROUND COVER (Veg+Litter+St.Dead+Rock)	59.40	s=(14.12)		60.11	s=(14.47)	51 0	50 1	54 2	46 0	37 0	56 2	57 0	47 1	79 0	53 0	51 1	51 0	47 3	43 0	56 0	60 0	61 1	54 1	71 4	89 1
Allowable Ground Cover (per permit)	**54.65**	**s=(11.22)**				**50.9**	**47.9**	**43.9**	**41.9**	**34.9**	**53.9**	**54.9**	**46.9**	**77.9**	**52.9**	**50.9**	**50.9**	**46.9**	**40.9**	**53.9**	**56.9**	**54.9**	**50.9**	**70.9**	**39.9**
SPECIES DENSITY (# of species/100 sq.m.)	10.38	s=(4.53)				15	3	5	14	8	7	10	13	12	7	12	8	13	16	10	6	15	12	12	15

Noxious Cover	0.10
Annual Cover	0.45
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J7 Sagebrush Reference Area Cover Data – Spring 2024

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																				
Chenopodium leptophyllum	0.00	46.67	0.00	0.00	0.00			P		P	P			P	P			P		P
Cryptantha minima	0.00	26.67	0.00	0.00	0.00	P		P	P				P							
Descurainia richardsonii	0.00	6.67	0.00	0.00	0.00									P						
Eriogonum cernuum	0.00	6.67	0.00	0.00	0.00							P								
Lappula redowskii	0.00	20.00	0.00	0.00	0.00				P					P						P
Lupinus brevicaulis	0.00	26.67	0.00	0.00	0.00			P	P				P		P					
Plantago patagonica	0.00	13.33	0.00	0.07	0.26				P			1								P
Townsendia annua	0.00	66.67	0.00	0.00	0.00		P	P	P		P	P	P	P		P			P	P
TOTAL NATIVE ANN. & BIEN. FORBS	0.00	93.33	0.00	0.07	0.26	P	P	P	P	P	P	P 1	P	P	P	P		P	P	P
INTRODUCED ANNUAL & BIENNIAL FORBS																				
Salsola iberica	0.00	13.33	0.00	0.00	0.00						P				P					
TOTAL INTRO. ANN. & BIEN. FORBS	0.00	13.33	0.00	0.00	0.00						P				P					
NATIVE ANNUAL GRASSES																				
Festuca octoflora	0.00	6.67	0.00	0.00	0.00				P											
TOTAL NATIVE ANNUAL GRASSES	0.00	6.67	0.00	0.00	0.00				P											
NATIVE PERENNIAL FORBS																				
Allium macropetalum	0.00	6.67	0.00	0.00	0.00						P									
Calochortus nuttallii	0.00	6.67	0.00	0.00	0.00							P								
Cymopterus purpurascens	0.00	26.67	0.00	0.00	0.00		P		P					P			P			
Delphinium scaposum	0.00	33.33	0.00	0.00	0.00	P						P	P				P	P		
Leucelene ericoides	0.00	80.00	0.00	0.00	0.00	P	P			P	P	P	P		P	P	P	P	P	P
Sphaeralcea coccinea	0.27	80.00	1.16	0.27	1.03		P		P	1	P	1	P	P	1		P	P	1	P
TOTAL NATIVE PERENNIAL FORBS	0.27	93.33	1.16	0.27	1.03	P	P		P	1	P	1	P	P	1	P	P	P	1	P
NATIVE PERENNIAL GRASSES (cool)																				
Oryzopsis hymenoides	0.00	53.33	0.00	0.00	0.00	P	P			P			P			P	P	P	P	
Sitanion hystrix	5.93	100.00	25.87	7.33	28.35	9 2	2 1	8 1	3	7 1	9 2	10 4	9	6 4	4 1	3	4 2	2 2	5	8 1
TOTAL NATIVE PERENNIAL GRASSES (c)	5.93	100.00	25.87	7.33	28.35	9 2	2 1	8 1	3	7 1	9 2	10 4	9	6 4	4 1	3	4 2	2 2	5	8 1
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	5.07	100.00	22.09	5.67	21.91	4	3	14 1	5	3	6 2	5	3	9 1	3 1	7 1	3 1	4	1 1	6 1
Hilaria jamesii	1.33	100.00	5.81	2.07	7.99	P	P 2	1	1	2 1	3	1	P	3 4	3 2	1	4 1	P	1 1	P
Muhlenbergia torreyi	0.00	13.33	0.00	0.00	0.00			P							P					
Sporobolus cryptandrus	0.20	53.33	0.87	0.20	0.77	P		P	1			P	1	P	P					1
TOTAL NATIVE PERENNIAL GRASSES (w)	6.60	100.00	28.78	7.93	30.67	4	3 2	15 1	7	5 1	9 2	6	4	12 5	6 3	8 1	7 2	4	2 2	7 1
NATIVE SUBSHRUBS																				
Ceratoides lanata	0.60	46.67	2.62	0.60	2.32	1	5			1						P	2	P	P	
Chrysothamnus greenei	3.40	100.00	14.83	3.47	13.40	3	7 1	P	2	1	5	6	3	1	4	4	5	5	4	1
Gutierrezia sarothrae	0.00	80.00	0.00	0.00	0.00	P		P	P	P	P	P		P	P	P	P	P		P
TOTAL NATIVE SUBSHRUBS	4.00	100.00	17.44	4.07	15.72	4	12 1	P	2	2	5	6	3	1	4	4	7	5	4	1
NATIVE SHRUBS																				
Artemisia tridentata	5.27	100.00	22.97	5.33	20.62	5	2	6	11	5	7 1	6	5	3	5	7	5	1	6	5
Atriplex canescens	0.87	46.67	3.78	0.87	3.35		2					2	1	4				2	P	2
TOTAL NATIVE SHRUBS	6.13	100.00	26.74	6.20	23.97	5	4	6	11	5	7 1	8	6	7	5	7	5	3	6	7

J7 Sagebrush Reference Area Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
SUCCULENTS																				
Coryphantha vivipara	0.00	13.33	0.00	0.00	0.00				P							P				
Opuntia phaeacantha	0.00	20.00	0.00	0.00	0.00	P				P									P	
Sclerocactus parviflorus	0.00	6.67	0.00	0.00	0.00					P										
TOTAL SUCCULENTS	0.00	33.33	0.00	0.00	0.00	P			P	P						P			P	
LICHEN/FUNGUS																				
Lichen spp.	0.27	100.00	1.16	0.27	1.03	2	1	P	P	P	P	P	P	P	P	P	P	1	P	P
TOTAL LICHEN	0.27	100.00	1.16	0.27	1.03	2	1	P	P	P	P	P	P	P	P	P	P	1	P	P
Standing dead	8.33	100.00		8.33		3	7	7	5	4	14	4	6	18	12	4	11	8	10	12
Litter	22.33	100.00		22.33		16	18	29	25	29	19	20	24	21	20	18	20	15	33	28
Bare ground	45.53	100.00		45.53		56	48	35	46	47	37	45	48	35	48	56	44	62	39	37
Rock	0.60	26.67		0.60		1	5		1								2			
TOTALS	100.00		100.00	102.93	100.00	100 2	100 4	100 2	100 0	100 2	100 5	100 5	100 0	100 9	100 4	100 1	100 4	100 2	100 2	100 2
TOTAL VEGETATION COVER	22.93	s=(4.54)		25.87	s=(5.88)	22 2	21 4	29 2	23 0	20 2	30 5	31 5	22 0	26 9	20 4	22 1	23 4	14 2	18 2	23 2
GROUND COVER (Veg+Litter+St.Dead+Rock)	54.47	s=(8.12)		57.40	s=(9.33)	44 2	52 4	65 2	54 0	53 2	63 5	55 5	52 0	65 9	52 4	44 1	56 4	38 2	61 2	63 2
Allowable Ground Cover (per permit)	**53.87**	**s=(8.41)**				**43.0**	**47.0**	**65.0**	**53.0**	**53.0**	**63.0**	**55.0**	**52.0**	**65.0**	**52.0**	**44.0**	**54.0**	**38.0**	**61.0**	**63.0**
SPECIES DENSITY (# of species/100 sq.m.)	14.00	s=(1.25)				14	13	13	17	14	13	15	15	15	14	12	13	14	13	15

Noxious Cover	0
Annual Cover	0.00
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

N7/8 Sagebrush Reference Area Cover Data – Spring 2024

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																				
Euphorbia glyptosperma	0.00	20.00	0.00	0.00	0.00						P	P								P
Gilia aggregata	0.00	6.67	0.00	0.00	0.00		P													
Gilia leptomeria	0.00	6.67	0.00	0.00	0.00		P													
Lappula redowskii	0.00	13.33	0.00	0.00	0.00			P								P				
Lupinus brevicaulis	0.00	20.00	0.00	0.00	0.00	P						P							P	
Machaeranthera canescens	0.00	13.33	0.00	0.00	0.00				P											P
TOTAL NATIVE ANN. & BIEN. FORBS	0.00	60.00	0.00	0.00	0.00	P	P	P	P		P	P				P			P	P
INTRODUCED ANNUAL GRASSES																				
Bromus tectorum	0.00	20.00	0.00	0.00	0.00										P		P			P
TOTAL INTRODUCED ANNUAL GRASSES	0.00	20.00	0.00	0.00	0.00										P		P			P
NATIVE PERENNIAL FORBS																				
Allium macropetalum	0.00	6.67	0.00	0.00	0.00					P										
Arabis fendleri	0.00	6.67	0.00	0.00	0.00		P													
Astragalus calycosus var. scaposus	0.00	73.33	0.00	0.00	0.00	P	P	P					P	P	P	P	P	P	P	P
Astragalus preussii	0.00	13.33	0.00	0.00	0.00	P							P							
Astragalus wingatanus	0.00	73.33	0.00	0.00	0.00	P	P				P	P	P	P	P	P	P		P	P
Calochortus nuttallii	0.00	13.33	0.00	0.00	0.00										P	P				
Castilleja chromosa	0.00	6.67	0.00	0.00	0.00													P		
Cryptantha flava	0.00	6.67	0.00	0.00	0.00								P							
Cymopterus purpurascens	0.07	93.33	0.36	0.07	0.36	P	P		P	P	P	P	1	P	P	P	P	P	P	P
Cymopterus purpureus	0.00	66.67	0.00	0.00	0.00	P	P					P	P	P	P	P	P	P		P
Lesquerella intermedia	0.00	26.67	0.00	0.00	0.00		P				P		P		P					
Leucelene ericoides	0.20	86.67	1.09	0.20	1.07		P	P	P	P	P	P	P	P		1	P	1	1	P
Pedicularis centranthera	0.07	6.67	0.36	0.07	0.36								1							
Penstemon linarioides	0.00	6.67	0.00	0.00	0.00								P							
Phlox longifolia	0.00	26.67	0.00	0.00	0.00	P	P			P				P						
Psilostrophe sparsiflora	0.00	20.00	0.00	0.00	0.00								P		P		P			
Sphaeralcea coccinea	0.13	93.33	0.73	0.13	0.71	P	P	P	P	P	P	P	P		1	P	P	1	P	P
Stanleya pinnata	0.00	6.67	0.00	0.00	0.00								P							
Townsendia exscapa	0.00	6.67	0.00	0.00	0.00									P						
TOTAL NATIVE PERENNIAL FORBS	0.47	100.00	2.55	0.47	2.50	P	P	P	P	P	P	P	2	P	1	1	P	2	1	P
INTRODUCED PERENNIAL FORBS																				
Onobrychis viciifolia	0.00	13.33	0.00	0.00	0.00													P		P
TOTAL INTRO. PERENNIAL FORBS	0.00	13.33	0.00	0.00	0.00													P		P
NATIVE PERENNIAL GRASSES (cool)																				
Oryzopsis hymenoides	0.47	93.33	2.55	0.53	2.86	2		P	P	P	3 1	P	P	P	1	1	P	P	P	P
Sitanion hystrix	0.47	100.00	2.55	0.53	2.86	P	P	1	P	1	P	P	1	P	P	1	P	2 1	1	P
TOTAL NATIVE PERENNIAL GRASSES (c)	0.93	100.00	5.11	1.07	5.71	2	P	1	P	1	3 1	P	1	P	1	2	P	2 1	1	P
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	2.00	100.00	10.95	2.07	11.07	3	2	2	2	1	1	2	1	1	5	1	2	7 1	P	P
Hilaria jamesii	1.07	86.67	5.84	1.07	5.71	3	P			2	2	P	P	3	P	2	P	1	3	P
Sporobolus cryptandrus	0.00	40.00	0.00	0.00	0.00		P		P	P			P	P	P					
TOTAL NATIVE PERENNIAL GRASSES (w)	3.07	100.00	16.79	3.13	16.79	6	2	2	2	3	3	2	1	4	5	3	2	8 1	3	P
INTRODUCED PERENNIAL GRASSES (cool)																				
Agropyron desertorum	0.00	6.67	0.00	0.00	0.00									P						
TOTAL INTRO. PERENNIAL GRASSES (c)	0.00	6.67	0.00	0.00	0.00									P						

N7/8 Sagebrush Reference Area Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE SUBSHRUBS																				
Ceratoides lanata	0.00	13.33	0.00	0.00	0.00		P				P									
Chrysothamnus greenei	1.87	100.00	10.22	1.93	10.36	P	2	1	3	2	3	3	P	3 1	P	P	3	1	5	2
Eriogonum microthecum	0.00	6.67	0.00	0.00	0.00										P					
Gutierrezia sarothrae	1.67	100.00	9.12	1.73	9.29	2	P	1 1	1	2	1	P	2	P	2	1	3	3	4	3
Senecio douglasii var. longilobus	0.07	6.67	0.36	0.07	0.36														1	
TOTAL NATIVE SUBSHRUBS	3.60	100.00	19.71	3.73	20.00	2	2	2 1	4	4	4	3	2	3 1	2	1	6	4	10	5
NATIVE SHRUBS																				
Artemisia tridentata	6.00	100.00	32.85	6.07	32.50	11	4	7 1	8	6	4	10	5	5	5	7	6	7	4	1
Atriplex canescens	1.33	93.33	7.30	1.33	7.14	P	P	P	5	2	1	2	P		P	2	2	4	1	1
Chrysothamnus viscidiflorus	0.13	6.67	0.73	0.13	0.71												2			
Ephedra viridis	0.00	6.67	0.00	0.00	0.00									P						
Tetradymia canescens	0.07	13.33	0.36	0.07	0.36												1			P
TOTAL NATIVE SHRUBS	7.53	100.00	41.24	7.60	40.71	11	4	7 1	13	8	5	12	5	5	5	9	11	11	5	2
NATIVE TREES																				
Juniperus osteosperma	0.27	33.33	1.46	0.27	1.43	P				2			P			1	1			
Pinus edulis	2.40	93.33	13.14	2.40	12.86	2	5	3	1	1	1	1		1	2	6	P	3	9	1
TOTAL NATIVE TREES	2.67	100.00	14.60	2.67	14.29	2	5	3	1	3	1	1	P	1	2	7	1	3	9	1
SUCCULENTS																				
Coryphantha vivipara	0.00	13.33	0.00	0.00	0.00													P	P	
Echinocereus triglochidiatus var. melanacanthus	0.00	6.67	0.00	0.00	0.00									P						
Opuntia phaeacantha	0.00	20.00	0.00	0.00	0.00		P			P								P		
Sclerocactus whipplei	0.00	13.33	0.00	0.00	0.00		P							P						
TOTAL SUCCULENTS	0.00	33.33	0.00	0.00	0.00		P			P				P				P	P	
BRYOPHYTES																				
Moss spp.	0.20	33.33	1.09	0.20	1.07	1				P	P			1				1		
TOTAL BRYOPHYTES	0.20	33.33	1.09	0.20	1.07	1				P	P			1				1		
LICHEN/FUNGUS																				
Lichen spp.	0.00	6.67	0.00	0.00	0.00				P											
TOTAL LICHEN	0.00	6.67	0.00	0.00	0.00				P											
Standing dead	12.20	100.00		12.20		15	17	12	23	17	14	17	5	15	15	7	9	5	4	8
Litter	19.93	100.00		19.93		16	14	12	14	25	17	10	33	21	34	22	24	17	29	11
Bare ground	33.33	100.00		33.33		37	51	29	32	29	36	42	31	40	15	36	42	15	12	53
Rock	16.27	100.00		16.27		9	5	32	11	10	17	13	20	11	20	12	5	33	26	20
TOTALS	100.20		100.00	100.60	100.00	101 0	100 0	100 2	100 0	100 0	100 1	100 0	100 0	101 1	100 0	100 0	100 0	101 2	100 0	100 0
TOTAL VEGETATION COVER	18.27	s=(6.2)		18.67	s=(6.35)	23 0	13 0	15 2	20 0	19 0	16 1	18 0	11 0	13 1	16 0	23 0	20 0	30 2	29 0	8 0
GROUND COVER (Veg+Litter+St.Dead+Rock)	66.87	s=(12.28)		67.27	s=(12.52)	64 0	49 0	71 2	68 0	71 0	64 1	58 0	69 0	61 1	85 0	64 0	58 0	86 2	88 0	47 0
Allowable Ground Cover (per permit)	**50.60**	**s=(9.64)**				**55.0**	**44.0**	**39.0**	**57.0**	**61.0**	**47.0**	**45.0**	**49.0**	**50.0**	**65.0**	**52.0**	**53.0**	**53.0**	**62.0**	**27.0**
SPECIES DENSITY (# of species/100 sq.m.)	18.47	s=(3.02)				19	23	12	14	18	17	16	23	21	20	18	20	19	17	20

Noxious Cover	0.00
Annual Cover	0.00
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

N14 Sagebrush Reference Area Cover Data – Spring 2024

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
NATIVE ANNUAL & BIENNIAL FORBS																				
Lappula redowskii	0.00	13.33	0.00	0.00	0.00							P								P
Machaeranthera canescens	0.00	73.33	0.00	0.00	0.00	P	P	P	P	P			P	P	P		P		P	P
TOTAL NATIVE ANN. & BIEN. FORBS	0.00	80.00	0.00	0.00	0.00	P	P	P	P	P		P	P	P	P		P		P	P
NATIVE PERENNIAL FORBS																				
Allium macropetalum	0.00	13.33	0.00	0.00	0.00					P			P							
Arabis fendleri	0.00	53.33	0.00	0.00	0.00		P		P	P	P	P		P			P	P		
Calochortus nuttallii	0.00	6.67	0.00	0.00	0.00										P					
Cymopterus purpurascens	0.00	93.33	0.00	0.00	0.00	P	P	P	P	P	P	P	P		P	P	P	P	P	P
Leucelene ericoides	0.20	93.33	0.74	0.20	0.66	1	P	P	P	P	P	P	P	P	P	1	1		P	P
Phlox longifolia	0.00	6.67	0.00	0.00	0.00							P								
Sphaeralcea coccinea	0.00	66.67	0.00	0.00	0.00	P	P	P	P					P	P	P	P		P	P
Townsendia exscapa	0.00	6.67	0.00	0.00	0.00									P						
TOTAL NATIVE PERENNIAL FORBS	0.20	100.00	0.74	0.20	0.66	1	P	P	P	P	P	P	P	P	P	1	1	P	P	P
NATIVE PERENNIAL GRASSES (cool)																				
Agropyron smithii	0.00	6.67	0.00	0.00	0.00								P							
Oryzopsis hymenoides	0.07	26.67	0.25	0.07	0.22			P			P		P						1	
Sitanion hystrix	2.07	100.00	7.69	2.73	9.05	1	2	P	P 1	2	2 1	2	2	3 1	3	4 2	2 2	1 2	3 1	4
Stipa comata	0.00	6.67	0.00	0.00	0.00														P	
TOTAL NATIVE PERENNIAL GRASSES (c)	2.13	100.00	7.94	2.80	9.27	1	2	P	P 1	2	2 1	2	2	3 1	3	4 2	2 2	1 2	4 1	4
NATIVE PERENNIAL GRASSES (warm)																				
Bouteloua gracilis	6.47	100.00	24.07	8.80	29.14	4	4	5 3	4	5	4	7 1	5	5 1	11 5	8 4	8 4	11 7	11 3	5 7
Hilaria jamesii	0.00	13.33	0.00	0.00	0.00				P											P
TOTAL NATIVE PERENNIAL GRASSES (w)	6.47	100.00	24.07	8.80	29.14	4	4	5 3	4	5	4	7 1	5	5 1	11 5	8 4	8 4	11 7	11 3	5 7
NATIVE SUBSHRUBS																				
Chrysothamnus greenei	0.20	66.67	0.74	0.20	0.66		P	P	P		1	P	P		1			P	P	1
Gutierrezia sarothrae	0.53	93.33	1.99	0.60	1.99	P	P	P	P	1	1	P 1	P	2	1	1		1	P	1
TOTAL NATIVE SUBSHRUBS	0.73	93.33	2.73	0.80	2.65	P	P	P	P	1	2	P 1	P	2	2	1		1	P	2
NATIVE SHRUBS																				
Artemisia tridentata	16.27	100.00	60.55	16.53	54.75	11	15	6	14	14	16 1	17	13 1	17 1	20	24	23 1	19	16	19
Atriplex canescens	0.00	6.67	0.00	0.00	0.00	P														
TOTAL NATIVE SHRUBS	16.27	100.00	60.55	16.53	54.75	11	15	6	14	14	16 1	17	13 1	17 1	20	24	23 1	19	16	19
NATIVE TREES																				
Pinus edulis	1.07	93.33	3.97	1.07	3.53		P	P	5	2	1	P	1	1	3	2	P	1	P	P
TOTAL NATIVE TREES	1.07	93.33	3.97	1.07	3.53		P	P	5	2	1	P	1	1	3	2	P	1	P	P
SUCCULENTS																				
Coryphantha vivipara	0.00	13.33	0.00	0.00	0.00								P						P	
Opuntia phaeacantha	0.00	13.33	0.00	0.00	0.00	P									P					
TOTAL SUCCULENTS	0.00	26.67	0.00	0.00	0.00	P							P		P				P	
BRYOPHYTES																				
Moss spp.	0.07	40.00	0.25	0.13	0.44		P				1 1					P	P	P	P	
TOTAL BRYOPHYTES	0.07	40.00	0.25	0.13	0.44		P				1 1					P	P	P	P	

N14 Sagebrush Reference Area Cover Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)	Percent Foliar Cover 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
						1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd	1st 2nd
LICHEN/FUNGUS																				
Lichen spp.	0.33	100.00	1.24	0.33	1.10	P	P	P	P	1	P	1	1	1	P	P	P	1	P	P
TOTAL LICHEN	0.33	100.00	1.24	0.33	1.10	P	P	P	P	1	P	1	1	1	P	P	P	1	P	P
Standing dead	18.00	100.00		18.00		17	18	25	12	20	17	20	36	21	9	11	13	20	13	18
Litter	19.40	100.00		19.40		17	27	16	11	20	12	23	10	11	25	27	22	23	25	22
Bare ground	35.33	100.00		35.33		49	34	48	54	35	45	30	32	39	27	22	31	23	31	30
Rock	0.00	0.00		0.00																
TOTALS	100.00		100.00	103.40	100.00	100 0	100 0	100 3	100 1	100 0	100 3	100 2	100 1	100 3	100 5	100 6	100 7	100 9	100 4	100 7
TOTAL VEGETATION COVER	26.87	s=(7.94)		30.20	s=(10.16)	17 0	21 0	11 3	23 1	24 0	25 2	26 2	21 1	28 3	39 5	40 6	34 7	33 9	31 4	30 7
GROUND COVER (Veg+Litter+St.Dead+Rock)	64.67	s=(9.67)		68.07	s=(11.63)	51 0	66 0	52 3	46 1	65 0	55 3	70 2	68 1	61 3	73 5	78 6	69 7	77 9	69 4	70 7
Allowable Ground Cover (per permit)	**64.67**	**s=(9.67)**				**51.0**	**66.0**	**52.0**	**46.0**	**65.0**	**55.0**	**70.0**	**68.0**	**61.0**	**73.0**	**78.0**	**69.0**	**77.0**	**69.0**	**70.0**
SPECIES DENSITY (# of species/100 sq.m.)	12.07	s=(1.44)				11	13	12	13	11	12	12	14	11	13	10	11	10	15	13

Noxious Cover	0
Annual Cover	0.00
Excess Annual Cover	0.00
Excess Litter (St Dead+Veg-Litter) (minus nc	0.00

To calculate Allowable Cover (per permit):
Subtract average absolute cover of noxious species (AZ & NN)
If average annual relative cover is greater than 10%, substract the average excess
If average litter cover exceeds live vegetation + standing dead, substract average excess litter (veg+stdead-litter)

J19/J21 Phase III Grassland Production Data – Spring 2024

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
NATIVE ANNUAL & BIENNIAL FORBS																							
Bahia dissecta	0.02	0.3	2.50									2											
Descurainia pinnata	0.00	0.04	2.50								0.3												
Helianthus annuus	0.00	0	0.00									T											
Lappula redowskii	0.01	0.15	5.00																				
Machaeranthera canescens	0.01	0.15	5.00									0.5						0.5					
Microsteris gracilis	0.01	0.09	2.50																			0.6	
TOTAL NATIVE ANN. & BIEN. FORBS	0.04	0.73	15.00	-	-	-	-	-	-	-	0.3	2.5	-	-	-	-	-	0.5	-	-	-	0.6	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Cryptantha minima	0.00	0	0.00									T											
Kochia scoparia	0.05	0.88	5.00																				
TOTAL INTRO. ANN. & BIEN. FORBS	0.05	0.88	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.09	1.68	10.00						0.2			1.2				3.3							
TOTAL INTRODUCED ANNUAL GRASSES	0.09	1.68	10.00	-	-	-	-	-	0.2	-	-	1.2	-	-	-	3.3	-	-	-	-	-	-	-
NATIVE PERENNIAL FORBS																							
Sphaeralcea coccinea	0.05	0.92	2.50									6.2					T						
TOTAL NATIVE PERENNIAL FORBS	0.05	0.92	2.50	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED PERENNIAL FORBS																							
Scorzonera laciniata	0.00	0.03	2.50																				
TOTAL INTRODUCED PERENNIAL FORBS	0.00	0.03	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.42	7.46	25.00											19.7				4.2		1.6			
Agropyron smithii	1.55	27.61	42.50	0.9			4.2					7.9		28.6	0.6		7.9		23.5	10.2			
Agropyron spicatum	0.04	0.7	5.00																				
Agropyron trachycaulum	0.01	0.12	2.50																				
Oryzopsis hymenoides	0.03	0.61	7.50									0.6						2.9		0.6			
TOTAL NATIVE PERENNIAL GRASSES (c)	2.05	36.5	50.00	0.9	-	-	4.2	-	-	-	-	8.5	-	48.3	0.6	-	7.9	7.1	23.5	12.4	-	-	-
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	1.02	18.17	37.50	3.8			19.9							2.6	39	5.8			0.6			15.3	3.6
Buchloe dactyloides	0.05	0.86	7.50				2														0.4		
Hilaria jamesii	0.95	16.86	42.50								2.8					29.7	18.3		2.9			6.4	4.4
Sporobolus airoides	2.04	36.3	37.50	9.7					35.1		3.1				19.2		27.1		2.7			28.7	10.4
Sporobolus cryptandrus	0.06	1.12	15.00							2.6				0.8			1.6						
TOTAL NATIVE PERENNIAL GRASSES (w)	4.11	73.31	67.50	13.5	-	-	21.9	-	35.1	2.6	5.9	-	-	3.4	58.2	35.5	47.0	-	6.2	-	0.4	50.4	18.4
INTRODUCED PERENNIAL GRASSES (cool)																							
Agropyron intermedium	0.02	0.43	2.50																	2.9			
Elymus junceus	20.96	373.99	95.00	53.8	279.4	130.9	14.6	143.5	61.7	25.5	50.4		346.1	114.5		15.6	60.4	34.1	0.5	1.9	17.1	17.5	9
TOTAL INTRO. PERENNIAL GRASSES (c)	20.99	374.42	95.00	53.8	279.4	130.9	14.6	143.5	61.7	25.5	50.4	-	346.1	114.5	-	15.6	60.4	34.1	0.5	4.8	17.1	17.5	9.0
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.06	1.04	2.50																				
Gutierrezia sarothrae	0.17	3.11	7.50															16.1	2				
TOTAL NATIVE SUBSHRUBS	0.23	4.15	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.1	2.0	-	-	-	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	0.99	17.65	12.50																				
TOTAL INTRO. SUBSHRUBS	0.99	17.65	12.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

J19/J21 Phase III Grassland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
NATIVE ANNUAL & BIENNIAL FORBS																							
Bahia dissecta	0.02	0.3	2.50																				
Descurainia pinnata	0.00	0.04	2.50																				
Helianthus annuus	0.00	0	0.00																				
Lappula redowskii	0.01	0.15	5.00	T							0.6											0.4	
Machaeranthera canescens	0.01	0.15	5.00																				
Microsteris gracilis	0.01	0.09	2.50																				
TOTAL NATIVE ANN. & BIEN. FORBS	0.04	0.73	15.00	-	-	-	-	-	-	-	0.6	-	-	-	-	-	-	-	-	-	-	0.4	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Cryptantha minima	0.00	0	0.00																				
Kochia scoparia	0.05	0.88	5.00												0.2				5.7				
TOTAL INTRO. ANN. & BIEN. FORBS	0.05	0.88	5.00	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	5.7	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.09	1.68	10.00				6.6																
TOTAL INTRODUCED ANNUAL GRASSES	0.09	1.68	10.00	-	-	-	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL FORBS																							
Sphaeralcea coccinea	0.05	0.92	2.50																			T	
TOTAL NATIVE PERENNIAL FORBS	0.05	0.92	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED PERENNIAL FORBS																							
Scorzonera laciniata	0.00	0.03	2.50																			0.2	
TOTAL INTRODUCED PERENNIAL FORBS	0.00	0.03	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.42	7.46	25.00			2.8											6.8	2.2	0.8	7.1	1.7	3.3	
Agropyron smithii	1.55	27.61	42.50			3.8	2.8		7								11.6	25.4	36.1	5.5		7.7	2
Agropyron spicatum	0.04	0.7	5.00			4.2				0.5													
Agropyron trachycaulum	0.01	0.12	2.50															0.8					
Oryzopsis hymenoides	0.03	0.61	7.50																				
TOTAL NATIVE PERENNIAL GRASSES (c)	2.05	36.5	50.00	-	-	10.8	2.8	-	7.0	0.5	-	-	-	-	-	-	18.4	28.4	36.9	12.6	1.7	11.0	2.0
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	1.02	18.17	37.50			2.1		1.3		12.5			6.9				4.2		2.4		2.2		
Buchloe dactyloides	0.05	0.86	7.50																			3.4	
Hilaria jamesii	0.95	16.86	42.50	8		0.2		3.8		4.3	5.7	6	2.8				4		0.5	1.7			11.9
Sporobolus airoides	2.04	36.3	37.50					16.3		8.7	15.6	12	35.9						6.5		13.2		
Sporobolus cryptandrus	0.06	1.12	15.00				0.5														1.3	0.7	
TOTAL NATIVE PERENNIAL GRASSES (w)	4.11	73.31	67.50	8.0	-	2.3	0.5	21.4	-	25.5	21.3	18.0	45.6	-	-	-	8.2	-	9.4	1.7	16.7	4.1	11.9
INTRODUCED PERENNIAL GRASSES (cool)																							
Agropyron intermedium	0.02	0.43	2.50																				
Elymus junceus	20.96	373.99	95.00	43.4	64.2	43.2	33.2	18.8	19.8	14.6	15.3	45.2	37.5	56.5	185.9	60.6	81.6	68.3	82.7	96.5	39.4	36.7	95.7
TOTAL INTRO. PERENNIAL GRASSES (c)	20.99	374.42	95.00	43.4	64.2	43.2	33.2	18.8	19.8	14.6	15.3	45.2	37.5	56.5	185.9	60.6	81.6	68.3	82.7	96.5	39.4	36.7	95.7
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.06	1.04	2.50									7											
Gutierrezia sarothrae	0.17	3.11	7.50																			2.8	
TOTAL NATIVE SUBSHRUBS	0.23	4.15	10.00	-	-	-	-	-	-	-	-	7.0	-	-	-	-	-	-	-	-	-	2.8	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	0.99	17.65	12.50								63.6	4.1		1.2	12.9								36.9
TOTAL INTRO. SUBSHRUBS	0.99	17.65	12.50	-	-	-	-	-	-	-	63.6	4.1	-	1.2	12.9	-	-	-	-	-	-	-	36.9

J19/J21 Phase III Grassland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
NATIVE SHRUBS																							
Artemisia tridentata	0.00	0.04	2.50																		0.3		
Atriplex canescens	3.28	58.47	35.00		13.5	20.2					3.6	100.1				60.5				2.4	4.1	6.4	
Atriplex confertifolia	0.11	1.95	2.50																				
Lycium pallidum	0.00	0.03	2.50									0.2											
TOTAL NATIVE SHRUBS	3.39	60.49	37.50	-	13.5	20.2	-	-	-	-	3.6	100.3	-	-	-	60.5	-	-	-	2.4	4.4	6.4	-
TOTAL PRODUCTION	31.99	570.75	100.00	68.2	292.9	151.1	40.7	143.5	97.0	28.1	60.2	118.7	346.1	166.2	58.8	114.9	115.3	57.8	32.2	19.6	21.9	74.9	27.4
Standard Deviation	22.93	409.06																					
ALLOWABLE PRODUCTION (lbs/acre)	570.75	(s=409.06)		405.6	1741.8	898.5	242.0	853.4	576.8	167.1	358.0	705.9	2058.1	988.3	349.7	683.3	685.7	343.7	191.5	116.6	130.2	445.4	162.9
SPECIES DENSITY (# of species/1.5 sq.m.)	4.35	(s=1.98)		4.0	2.0	2.0	4.0	1.0	3.0	2.0	5.0	10.0	1.0	5.0	3.0	5.0	6.0	5.0	6.0	6.0	4.0	6.0	4.0

Noxious Production	0.00
Annual Production	0.18
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Grassland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
NATIVE SHRUBS																							
Artemisia tridentata	0.00	0.04	2.50																				
Atriplex canescens	3.28	58.47	35.00		13.1	14.8							51.5	39.2		24.7	39.2						
Atriplex confertifolia	0.11	1.95	2.50																		13.1		
Lycium pallidum	0.00	0.03	2.50																				
TOTAL NATIVE SHRUBS	3.39	60.49	37.50	-	13.1	14.8	-	-	-	-	-	-	51.5	39.2	-	24.7	39.2	-	-	-	13.1	-	-
TOTAL PRODUCTION	31.99	570.75	100.00	51.4	77.3	71.1	43.1	40.2	26.8	40.6	100.8	74.3	134.6	96.9	199.0	85.3	147.4	96.7	134.7	110.8	70.9	55.2	146.5
Standard Deviation	22.93	409.06																					
ALLOWABLE PRODUCTION (lbs/acre)	570.75	(s=409.06)		305.7	459.7	422.8	256.3	239.1	159.4	241.4	599.4	441.8	800.4	576.2	1183.4	507.3	876.5	575.0	801.0	658.9	421.6	328.3	871.2
SPECIES DENSITY (# of species/1.5 sq.m.)	4.35	(s=1.98)		3.0	2.0	7.0	4.0	4.0	2.0	5.0	5.0	5.0	5.0	3.0	3.0	2.0	6.0	4.0	7.0	4.0	6.0	9.0	4.0

Noxious Production	0.00
Annual Production	0.18
Excess Annual Production	0.00

To calculate Allowable Production (per permit):
Subtract average pduction of noxious species (AZ & NN)
If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Shrubland Production Data – Spring 2024

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
NATIVE ANNUAL & BIENNIAL FORBS																							
Lappula redowskii	0.02	0.4	17.50				0.4													0.3	0.4		
Machaeranthera canescens	0.00	0.06	2.50																	T			
TOTAL NATIVE ANN. & BIEN. FORBS	0.03	0.46	20.00	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.4	-	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Cryptantha minima	0.00	0.01	2.50									0.1											
Kochia scoparia	0.01	0.18	2.50																				
Salsola iberica	0.01	0.15	2.50																				
Sisymbrium altissimum	0.01	0.19	2.50																				
TOTAL INTRO. ANN. & BIEN. FORBS	0.03	0.54	5.00	-	-	-	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.25	4.52	12.50	T								1.2			0.2						0.9		
TOTAL INTRODUCED ANNUAL GRASSES	0.25	4.52	12.50	-	-	-	-	-	-	-	-	1.2	-	-	0.2	-	-	-	-	-	0.9	-	-
NATIVE PERENNIAL FORBS																							
Ratibida columnaris	0.00	0.06	2.50																				
Sphaeralcea coccinea	0.01	0.25	7.50																				
TOTAL NATIVE PERENNIAL FORBS	0.02	0.31	10.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
INTRODUCED PERENNIAL FORBS																							
Cardaria draba	0.09	1.55	2.50					10.4															
TOTAL INTRODUCED PERENNIAL FORBS	0.09	1.55	2.50	-	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.45	8	17.50														0.3						
Agropyron smithii	1.54	27.52	47.50	0.7	20.6		32.4						1.1			2	0.3				21.6		13.7
Agropyron spicatum	0.24	4.21	10.00		9.8		9																
Agropyron trachycaulum	0.21	3.76	2.50			25.3																	
Oryzopsis hymenoides	0.05	0.82	2.50																				5.5
Poa juncifolia	0.12	2.08	2.50																				
Sitanion hystrix	0.06	1.03	2.50														6.9						
TOTAL NATIVE PERENNIAL GRASSES (c)	2.66	47.41	60.00	0.7	30.4	25.3	41.4	-	-	-	-	-	1.1	-	-	2.0	7.5	-	-	-	21.6	-	19.2
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	0.74	13.23	45.00	9.1			2.3					16.6	5.7	2.5			0.1		8.2		0.7		3.9
Buchloe dactyloides	0.03	0.52	5.00																				
Hilaria jamesii	1.14	20.37	52.50	15.5		2.1			0.2	1.1		0.6	3.7			1.5	0.4		2.3		17.1		
Sporobolus airoides	0.87	15.6	20.00						1.8				18.6	25.5									
Sporobolus cryptandrus	0.09	1.67	12.50				0.9																
0	0.00	0	0.00																				
TOTAL NATIVE PERENNIAL GRASSES (w)	2.88	51.38	72.50	24.6	-	2.1	3.2	-	2.0	1.1	-	17.2	28.0	28.0	-	1.5	0.5	-	10.5	-	17.8	-	3.9
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	14.52	258.95	95.00	73.8	27	44.3	34.1	67.7	38.8	50.6	61.8	50.6	9	9.1	70.7		22.9	185	79.9	37.2		70.7	22.4
TOTAL INTRO. PERENNIAL GRASSES (c)	14.52	258.95	95.00	73.8	27.0	44.3	34.1	67.7	38.8	50.6	61.8	50.6	9.0	9.1	70.7	-	22.9	185.0	79.9	37.2	-	70.7	22.4
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.01	0.13	2.50																				
Chrysothamnus greenei	0.13	2.23	2.50																				15
Gutierrezia sarothrae	0.14	2.54	10.00														0.7		4		11.9		
TOTAL NATIVE SUBSHRUBS	0.28	4.91	15.00	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	-	4.0	-	11.9	-	15.0
INTRODUCED SUBSHRUBS																							
Kochia prostrata	1.47	26.24	20.00								1.2			4.6								5.8	
TOTAL INTRO. SUBSHRUBS	1.47	26.24	20.00	-	-	-	-	-	-	-	1.2	-	-	4.6	-	-	-	-	-	-	-	5.8	-

J19/J21 Phase III Shrubland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
NATIVE ANNUAL & BIENNIAL FORBS																							
Lappula redowskii	0.02	0.4	17.50	0.7			0.4			0.4											0.1		
Machaeranthera canescens	0.00	0.06	2.50															0.4					
TOTAL NATIVE ANN. & BIEN. FORBS	0.03	0.46	20.00	0.7	-	-	0.4	-	-	0.4	-	-	-	-	-	-	-	0.4	-	-	0.1	-	-
INTRODUCED ANNUAL & BIENNIAL FORBS																							
Cryptantha minima	0.00	0.01	2.50																				
Kochia scoparia	0.01	0.18	2.50																				1.2
Salsola iberica	0.01	0.15	2.50																				1
Sisymbrium altissimum	0.01	0.19	2.50																				1.3
TOTAL INTRO. ANN. & BIEN. FORBS	0.03	0.54	5.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5
INTRODUCED ANNUAL GRASSES																							
Bromus tectorum	0.25	4.52	12.50										12.2										15.9
TOTAL INTRODUCED ANNUAL GRASSES	0.25	4.52	12.50	-	-	-	-	-	-	-	-	-	12.2	-	-	-	-	-	-	-	-	-	15.9
NATIVE PERENNIAL FORBS																							
Ratibida columnaris	0.00	0.06	2.50	0.4																			
Sphaeralcea coccinea	0.01	0.25	7.50									0.5										0.3	0.9
TOTAL NATIVE PERENNIAL FORBS	0.02	0.31	10.00	0.4	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-	-	-	-	0.3	0.9
INTRODUCED PERENNIAL FORBS																							
Cardaria draba	0.09	1.55	2.50																				
TOTAL INTRODUCED PERENNIAL FORBS	0.09	1.55	2.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NATIVE PERENNIAL GRASSES (cool)																							
Agropyron dasystachyum	0.45	8	17.50				1.7			4.3				5.1		7				7.6	27.8		
Agropyron smithii	1.54	27.52	47.50	16.2					1.1	0.8	0.2	19.2					0.4	23.1		2	22.6	5.6	1.5
Agropyron spicatum	0.24	4.21	10.00					0.8												8.7			
Agropyron trachycaulum	0.21	3.76	2.50																				
Oryzopsis hymenoides	0.05	0.82	2.50																				
Poa juncifolia	0.12	2.08	2.50																				14
Sitanion hystrix	0.06	1.03	2.50																				
TOTAL NATIVE PERENNIAL GRASSES (c)	2.66	47.41	60.00	16.2	-	-	1.7	0.8	1.1	5.1	0.2	19.2	-	5.1	-	7.0	0.4	23.1	-	18.3	50.4	5.6	15.5
NATIVE PERENNIAL GRASSES (warm)																							
Bouteloua gracilis	0.74	13.23	45.00	1.1			3.4		13.4	5.3	1.7	7.3						1.4		6.1		0.2	
Buchloe dactyloides	0.03	0.52	5.00					0.3								3.2							
Hilaria jamesii	1.14	20.37	52.50	0.9			3.8	2.2	1.9	6.3	29.5		36		1.3			6.8		1.2	2.6		
Sporobolus airoides	0.87	15.6	20.00				5.6	8.2	28.7		1.3						15.2						
Sporobolus cryptandrus	0.09	1.67	12.50	3									5								0.3		2
0	0.00	0	0.00																				
TOTAL NATIVE PERENNIAL GRASSES (w)	2.88	51.38	72.50	5.0	-	-	12.8	10.7	44.0	11.6	32.5	7.3	41.0	-	1.3	3.2	15.2	8.2	-	7.3	2.9	0.2	2.0
INTRODUCED PERENNIAL GRASSES (cool)																							
Elymus junceus	14.52	258.95	95.00	18.9	44.7	45.4	54.9	30.2	3.8	10.3	5.1	7.7	5.2	31.8	74.9	63	44	62.3	87.1	32.8	18.8	112.1	33.2
TOTAL INTRO. PERENNIAL GRASSES (c)	14.52	258.95	95.00	18.9	44.7	45.4	54.9	30.2	3.8	10.3	5.1	7.7	5.2	31.8	74.9	63.0	44.0	62.3	87.1	32.8	18.8	112.1	33.2
NATIVE SUBSHRUBS																							
Ceratoides lanata	0.01	0.13	2.50													0.9							
Chrysothamnus greenei	0.13	2.23	2.50																				
Gutierrezia sarothrae	0.14	2.54	10.00																		0.5		
TOTAL NATIVE SUBSHRUBS	0.28	4.91	15.00	-	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	0.5	-	-
INTRODUCED SUBSHRUBS																							
Kochia prostrata	1.47	26.24	20.00		9	11.7	1.4			78.3						64.5							
TOTAL INTRO. SUBSHRUBS	1.47	26.24	20.00	-	9.0	11.7	1.4	-	-	78.3	-	-	-	-	-	64.5	-	-	-	-	-	-	-

J19/J21 Phase III Shrubland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
NATIVE SHRUBS																							
Atriplex canescens	3.09	55.17	50.00	10.4		14.3			4.2		10.5	7.3	77.7		59.6			39.6	35.9	9.2	2.8		4.2
Atriplex confertifolia	0.03	0.59	2.50																	4			
Chrysothamnus nauseosus	0.08	1.38	2.50														9.3						
TOTAL NATIVE SHRUBS	3.20	57.15	52.50	10.4	-	14.3	-	-	4.2	-	10.5	7.3	77.7	-	59.6	-	9.3	39.6	35.9	13.2	2.8	-	4.2
TOTAL PRODUCTION	25.42	453.4	100.00	109.5	57.4	86.0	79.1	78.1	45.0	51.7	73.5	76.4	115.8	41.7	130.5	3.5	40.9	224.6	130.3	50.7	55.4	76.5	64.7
Standard Deviation	12.60	224.82																					
ALLOWABLE PRODUCTION (lbs/acre)	453.40	(s=224.82)		651.2	341.3	511.4	470.4	464.4	267.6	307.4	437.1	454.3	688.6	248.0	776.0	20.8	243.2	1335.6	774.9	301.5	329.5	454.9	384.8
SPECIES DENSITY (# of species/1.5 sq.m.)	4.65	(s=2.12)		6.0	3.0	4.0	6.0	2.0	4.0	2.0	3.0	6.0	6.0	4.0	3.0	2.0	8.0	2.0	5.0	5.0	7.0	2.0	6.0

Noxious Production	0.00	**To calculate Allowable Production (per permit):**
Annual Production	0.31	Subtract average pduction of noxious species (AZ & NN)
Excess Annual Production	0.00	If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Shrubland Production Data – Spring 2024 (continued)

PLANT SPECIES	AVERAGE PRODUCTION (g/0.5 sq. m.)	(lbs/acre)	FREQUENCY %	Production (g/1.5 sq m) S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
NATIVE SHRUBS																							
Atriplex canescens	3.09	55.17	50.00	45	8.3		4.6	16.6					6.3	1.8				3.4					9.4
Atriplex confertifolia	0.03	0.59	2.50																				
Chrysothamnus nauseosus	0.08	1.38	2.50																				
TOTAL NATIVE SHRUBS	3.20	57.15	52.50	45.0	8.3	-	4.6	16.6	-	-	-	-	6.3	1.8	-	-	-	3.4	-	-	-	-	9.4
TOTAL PRODUCTION	25.42	453.4	100.00	86.2	62.0	57.1	75.8	58.3	48.9	105.7	37.8	34.7	64.7	38.7	76.2	138.6	59.6	97.4	87.1	58.4	72.7	118.2	80.4
Standard Deviation	12.60	224.82																					
ALLOWABLE PRODUCTION (lbs/acre)	453.40	(s=224.82)		512.6	368.7	339.6	450.8	346.7	290.8	628.6	224.8	206.4	384.8	230.1	453.1	824.2	354.4	579.2	518.0	347.3	432.3	702.9	478.1
SPECIES DENSITY (# of species/1.5 sq.m.)	4.65	(s=2.12)		8.0	3.0	2.0	8.0	6.0	5.0	7.0	5.0	4.0	5.0	3.0	2.0	5.0	3.0	6.0	1.0	6.0	7.0	4.0	10.0

Noxious Production	0.00	**To calculate Allowable Production (per permit):**
Annual Production	0.31	Subtract average pduction of noxious species (AZ & NN)
Excess Annual Production	0.00	If average annual production is greater than 10%, substract the average excess

J19/J21 Phase III Grassland Shrub Density Data – Spring 2024

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14	G15	G16	G17	G18	G19	G20
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.45	18.21	2.50	18																			
Ceratoides lanata	(0-20cm)	0.08	3.04	7.50														1	1					
Ceratoides lanata	(21-50cm)	0.68	27.32	25.00								1				3	1	4	1	3				
Ceratoides lanata	(>50cm)	0.10	4.05	10.00													1							
Gutierrezia sarothrae	(0-20cm)	4.00	161.87	35.00	25				7				7				1	1	26	9		1		
Gutierrezia sarothrae	(21-50cm)	0.58	23.27	22.50					1				6					2	5	3		1		
TOTAL NATIVE SUBSHRUBS		5.88	237.75	50.00	43				8			1	13			3	3	8	33	15		2		
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	7.65	309.58	27.50	1					5		3												
Kochia prostrata	(21-50cm)	3.68	148.72	17.50																				
Kochia prostrata	(>50cm)	0.03	1.01	2.50																				
TOTAL INTRO. SUBSHRUBS		11.35	459.32	30.00	1					5		3												
NATIVE SHRUBS																								
Artemisia tridentata	(21-50cm)	0.03	1.01	2.50																				
Atriplex canescens	(0-20cm)	0.48	19.22	35.00					1	1	4	1	3	1		1				2		1		
Atriplex canescens	(21-50cm)	8.50	343.98	72.50		1	2		4	4	22	5	4	2		2	12	20	4	30		11		4
Atriplex canescens	(>50cm)	9.78	395.58	87.50		6	3	4	3	15	10	4	14	2		1	42	8	11	19	3	35	14	4
Atriplex confertifolia	(0-20cm)	0.38	15.18	12.50							5		5								1			
Atriplex confertifolia	(21-50cm)	0.95	38.45	32.50			2				3		1					1	1		2	1		
Atriplex confertifolia	(>50cm)	0.10	4.05	10.00			1	1													1			
Chrysothamnus nauseosus	(21-50cm)	0.10	4.05	10.00					1										1					
Chrysothamnus nauseosus	(>50cm)	0.08	3.04	7.50					1				1								1			
Cowania mexicana	(21-50cm)	0.03	1.01	2.50									1											
Ephedra viridis	(21-50cm)	0.03	1.01	2.50									1											
Fallugia paradoxa	(0-20cm)	0.03	1.01	2.50									1											
Fallugia paradoxa	(21-50cm)	0.05	2.02	2.50									2											
Fallugia paradoxa	(>50cm)	0.05	2.02	2.50									2											
Lycium pallidum	(0-20cm)	0.18	7.08	2.50									7											
Lycium pallidum	(21-50cm)	0.43	17.20	2.50									17											
Lycium pallidum	(>50cm)	0.25	10.12	2.50									10											
Purshia tridentata	(21-50cm)	0.05	2.02	2.50									2											
Purshia tridentata	(>50cm)	0.03	1.01	2.50									1											
TOTAL NATIVE SHRUBS		21.48	869.06	90.00		7	8	5	10	20	44	10	72	5		4	54	29	17	51	8	48	14	8
TOTAL DENSITY (stems/100 sq. m.)		38.70	(s=46.07)	95.00	44	7	8	5	18	25	44	14	85	5	0	7	57	37	50	66	8	50	14	8
TOTAL DENSITY (stems/acre)		1566.13	(s=1864.58)		1781	283	324	202	728	1012	1781	567	3440	202	0	283	2307	1497	2023	2671	324	2023	567	324
SPECIES DENSITY (# of species/100 sq.m.)		4.15	(s=1.99)		3	2	3	3	7	4	4	5	11	3	1	4	4	7	7	6	4	6	2	2

J19/J21 Phase III Grassland Shrub Density Data – Spring 2024 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	G21	G22	G23	G24	G25	G26	G27	G28	G29	G30	G31	G32	G33	G34	G35	G36	G37	G38	G39	G40
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.45	18.21	2.50																				
Ceratoides lanata	(0-20cm)	0.08	3.04	7.50									1											
Ceratoides lanata	(21-50cm)	0.68	27.32	25.00		4					6	1												3
Ceratoides lanata	(>50cm)	0.10	4.05	10.00							1	1						1						
Gutierrezia sarothrae	(0-20cm)	4.00	161.87	35.00		14	4						8									2	54	1
Gutierrezia sarothrae	(21-50cm)	0.58	23.27	22.50															1				2	2
TOTAL NATIVE SUBSHRUBS		5.88	237.75	50.00		18	4				7	2	9					1	1			2	56	6
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	7.65	309.58	27.50					2			136	34		41	61	20					2	1	
Kochia prostrata	(21-50cm)	3.68	148.72	17.50					8			98	8		5	19	8			1				
Kochia prostrata	(>50cm)	0.03	1.01	2.50					1															
TOTAL INTRO. SUBSHRUBS		11.35	459.32	30.00					11			234	42		46	80	28			1		2	1	
NATIVE SHRUBS																								
Artemisia tridentata	(21-50cm)	0.03	1.01	2.50												1								
Atriplex canescens	(0-20cm)	0.48	19.22	35.00						-1					1		1						2	1
Atriplex canescens	(21-50cm)	8.50	343.98	72.50		7	8					7	15	41	34	2	24	7	1		8	12	3	44
Atriplex canescens	(>50cm)	9.78	395.58	87.50	3	23	4		12	6	5	6	13	30	26	4	16	7			1	4	6	27
Atriplex confertifolia	(0-20cm)	0.38	15.18	12.50							1										3			
Atriplex confertifolia	(21-50cm)	0.95	38.45	32.50							3	6					1				11	5	1	
Atriplex confertifolia	(>50cm)	0.10	4.05	10.00														1						
Chrysothamnus nauseosus	(21-50cm)	0.10	4.05	10.00			1															1		
Chrysothamnus nauseosus	(>50cm)	0.08	3.04	7.50																				
Cowania mexicana	(21-50cm)	0.03	1.01	2.50																				
Ephedra viridis	(21-50cm)	0.03	1.01	2.50																				
Fallugia paradoxa	(0-20cm)	0.03	1.01	2.50																				
Fallugia paradoxa	(21-50cm)	0.05	2.02	2.50																				
Fallugia paradoxa	(>50cm)	0.05	2.02	2.50																				
Lycium pallidum	(0-20cm)	0.18	7.08	2.50																				
Lycium pallidum	(21-50cm)	0.43	17.20	2.50																				
Lycium pallidum	(>50cm)	0.25	10.12	2.50																				
Purshia tridentata	(21-50cm)	0.05	2.02	2.50																				
Purshia tridentata	(>50cm)	0.03	1.01	2.50																				
TOTAL NATIVE SHRUBS		21.48	869.06	90.00	3	30	13		12	5	9	19	28	71	61	7	42	15	1		23	22	12	72
TOTAL DENSITY (stems/100 sq. m.)		38.70	(s=46.07)	95.00	3	48	17	0	23	5	16	255	79	71	107	87	70	16	2	1	23	26	69	78
TOTAL DENSITY (stems/acre)		1566.13	(s=1864.58)		121	1942	688	0	931	202	647	10319	3197	2873	4330	3521	2833	647	81	40	931	1052	2792	3157
SPECIES DENSITY (# of species/100 sq.m.)		4.15	(s=1.99)		2	4	4	1	3	3	5	6	5	2	4	4	5	4	3	2	3	5	7	6

J19/J21 Phase III Shrubland Shrub Density Data – Spring 2024

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.60	24.28	2.50													24							
Artemisia frigida	(21-50cm)	0.15	6.07	2.50													6							
Ceratoides lanata	(0-20cm)	0.10	4.05	7.50	1																			
Ceratoides lanata	(21-50cm)	1.00	40.47	30.00	15								1		1									
Ceratoides lanata	(>50cm)	0.30	12.14	10.00				1																
Chrysothamnus greenei	(0-20cm)	0.18	7.08	7.50										1				2						
Chrysothamnus greenei	(21-50cm)	0.28	11.13	5.00																				
Eriogonum jamesii	(0-20cm)	0.13	5.06	5.00													4							1
Gutierrezia sarothrae	(0-20cm)	10.58	427.96	40.00		1		63						1	63		1	54		154		5		
Gutierrezia sarothrae	(21-50cm)	1.70	68.80	32.50	1	1		2							6			4		1		2		
TOTAL NATIVE SUBSHRUBS		15.00	607.03	67.50	17	2		66					1	2	70		35	60		155		7		1
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	95.55	3866.77	35.00		2	94	1				1			16							290	1117	
Kochia prostrata	(21-50cm)	6.88	278.22	32.50	2	10	20					3			7							35	93	
TOTAL INTRO. SUBSHRUBS		102.43	4144.99	40.00	2	12	114	1				4			23							325	1210	
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	0.93	37.43	7.50													2							29
Artemisia tridentata	(21-50cm)	1.85	74.87	10.00													8							60
Artemisia tridentata	(>50cm)	0.75	30.35	12.50													1	1						25
Atriplex canescens	(0-20cm)	1.75	70.82	60.00		16	1	1				2		1		1		1	2	2	1	1		
Atriplex canescens	(21-50cm)	11.18	452.24	95.00	15	34	11		11	9	9	16	4	22	5	10		1	15	3	15	6	1	3
Atriplex canescens	(>50cm)	17.83	721.35	100.00	26	6	5	12	24	14	27	37	25	20	9	44	4	5	25	15	28	13	3	24
Atriplex confertifolia	(0-20cm)	0.30	12.14	12.50			2	2													3			
Atriplex confertifolia	(21-50cm)	1.40	56.66	25.00		5	2	12			2	7									15	1	1	
Atriplex confertifolia	(>50cm)	0.13	5.06	2.50				5																
Chrysothamnus nauseosus	(0-20cm)	0.18	7.08	10.00													3	2						
Chrysothamnus nauseosus	(21-50cm)	2.23	90.04	20.00													28	24						1
Chrysothamnus nauseosus	(>50cm)	2.88	116.35	15.00													47	19						38
Cowania mexicana	(0-20cm)	0.28	11.13	5.00													5							
Cowania mexicana	(21-50cm)	0.38	15.18	7.50													1							2
Cowania mexicana	(>50cm)	0.70	28.33	7.50													8							4
Ephedra viridis	(>50cm)	0.08	3.04	5.00																				1
Purshia tridentata	(0-20cm)	0.43	17.20	2.50																				
Purshia tridentata	(21-50cm)	0.63	25.29	5.00																				1
Purshia tridentata	(>50cm)	0.23	9.11	2.50																				
Yucca angustissima	(21-50cm)	0.03	1.01	2.50											1									
Unidentified shrub species	(0-20cm)	0.03	1.01	2.50																				
TOTAL NATIVE SHRUBS		44.13	1785.68	100.00	41	61	21	32	35	23	38	62	29	43	15	55	107	53	42	20	62	21	5	188
TOTAL DENSITY (stems/100 sq. m.)		161.55	(s=330.69)	100.00	60	75	135	99	35	23	38	66	30	45	108	55	142	113	42	175	62	353	1215	189
TOTAL DENSITY (stems/acre)		6537.70	(s=13382.72)		2428	3035	5463	4006	1416	931	1538	2671	1214	1821	4371	2226	5747	4573	1700	7082	2509	14285	49169	7649
SPECIES DENSITY (# of species/100 sq.m.)		3.25	(s=1.55)		4	4	3	5	1	1	2	3	2	3	5	1	7	5	1	2	2	4	3	7

J19/J21 Phase III Shrubland Shrub Density Data – Spring 2024 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	0.60	24.28	2.50																				
Artemisia frigida	(21-50cm)	0.15	6.07	2.50																				
Ceratoides lanata	(0-20cm)	0.10	4.05	7.50			1															2		
Ceratoides lanata	(21-50cm)	1.00	40.47	30.00	3						3		2		4		2		1		6	1	1	
Ceratoides lanata	(>50cm)	0.30	12.14	10.00									7								1		3	
Chrysothamnus greenei	(0-20cm)	0.18	7.08	7.50	4																			
Chrysothamnus greenei	(21-50cm)	0.28	11.13	5.00	10										1									
Eriogonum jamesii	(0-20cm)	0.13	5.06	5.00																				
Gutierrezia sarothrae	(0-20cm)	10.58	427.96	40.00				10		15				2	15	3		3			1	32		
Gutierrezia sarothrae	(21-50cm)	1.70	68.80	32.50				18		4		1	4		13							11		
TOTAL NATIVE SUBSHRUBS		15.00	607.03	67.50	17		1	28		19	3	1	13	2	33	3	2	3	1		8	46	4	
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	95.55	3866.77	35.00		45	237	5			1716						293			4	1			
Kochia prostrata	(21-50cm)	6.88	278.22	32.50		1		5			55						42				1		1	
TOTAL INTRO. SUBSHRUBS		102.43	4144.99	40.00		46	237	10			1771						335			4	2		1	
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	0.93	37.43	7.50																				6
Artemisia tridentata	(21-50cm)	1.85	74.87	10.00											1									5
Artemisia tridentata	(>50cm)	0.75	30.35	12.50	1							2												
Atriplex canescens	(0-20cm)	1.75	70.82	60.00	4	1					2	2	6		3	3	3	5	1	9		1	1	
Atriplex canescens	(21-50cm)	11.18	452.24	95.00	12	43	16	8	3	18	18	12	16	13	17	8	5	5	17	16	7	8	14	1
Atriplex canescens	(>50cm)	17.83	721.35	100.00	14	25	7	29	20	23	14	19	8	24	12	3	10	5	26	19	25	7	55	2
Atriplex confertifolia	(0-20cm)	0.30	12.14	12.50												2	3							
Atriplex confertifolia	(21-50cm)	1.40	56.66	25.00												4	7							
Atriplex confertifolia	(>50cm)	0.13	5.06	2.50																				
Chrysothamnus nauseosus	(0-20cm)	0.18	7.08	10.00				1	1															
Chrysothamnus nauseosus	(21-50cm)	2.23	90.04	20.00				12	2								2				2			18
Chrysothamnus nauseosus	(>50cm)	2.88	116.35	15.00				5	2															4
Cowania mexicana	(0-20cm)	0.28	11.13	5.00																				6
Cowania mexicana	(21-50cm)	0.38	15.18	7.50																				12
Cowania mexicana	(>50cm)	0.70	28.33	7.50																				16
Ephedra viridis	(>50cm)	0.08	3.04	5.00																				2
Purshia tridentata	(0-20cm)	0.43	17.20	2.50																				17
Purshia tridentata	(21-50cm)	0.63	25.29	5.00																				24
Purshia tridentata	(>50cm)	0.23	9.11	2.50																				9
Yucca angustissima	(21-50cm)	0.03	1.01	2.50																				
Unidentified shrub species	(0-20cm)	0.03	1.01	2.50					1															
TOTAL NATIVE SHRUBS		44.13	1785.68	100.00	31	69	23	55	29	41	34	35	30	37	33	20	30	15	44	44	34	16	70	122
TOTAL DENSITY (stems/100 sq. m.)		161.55	(s=330.69)	100.00	48	115	261	93	29	60	1808	36	43	39	66	23	367	18	45	48	44	62	75	122
TOTAL DENSITY (stems/acre)		6537.70	(s=13382.72)		1942	4654	10562	3764	1174	2428	73167	1457	1740	1578	2671	931	14852	728	1821	1942	1781	2509	3035	4937
SPECIES DENSITY (# of species/100 sq.m.)		3.25	(s=1.55)		4	2	3	4	3	2	3	3	3	2	5	3	5	2	2	2	5	3	3	6

J19/J21 Phase III Woodland Shrub Density Data – Spring 2024

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	32.65	1321.30	70.00		233	154		41		23	28			5	17	50	28	1	3	6	42	21	
Artemisia frigida	(21-50cm)	3.33	134.56	32.50		3	50					10			1		10							
Chrysothamnus greenei	(0-20cm)	0.10	4.05	7.50	1		2																	
Chrysothamnus greenei	(21-50cm)	0.15	6.07	5.00			4									2								
Chrysothamnus greenei	(>50cm)	0.13	5.06	7.50	1																			
Eriogonum jamesii	(0-20cm)	1.30	52.61	15.00		3								2									35	
Gutierrezia sarothrae	(0-20cm)	12.30	497.76	55.00	37					7	15	4	17	109			1	3	12	21	10	3		
Gutierrezia sarothrae	(21-50cm)	4.45	180.09	30.00						1		1	17	11					7		19		1	
TOTAL NATIVE SUBSHRUBS		54.40	2201.49	92.50	39	239	210		41	8	38	43	34	122	6	19	61	31	20	24	35	45	57	
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	0.13	5.06	10.00		1				1										1				
Kochia prostrata	(21-50cm)	0.20	8.09	12.50		2														2		1		
TOTAL INTRO. SUBSHRUBS		0.33	13.15	15.00		3				1										3		1		
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	44.75	1810.97	82.50	14	17	12	6	7	4	49	2	3	9	7	15	3	6		1330	50	47	11	
Artemisia tridentata	(21-50cm)	24.88	1006.66	92.50	57	47	11	51	12	14	85	6	20	37	27	59	20	6	6	146	89	58	8	
Artemisia tridentata	(>50cm)	12.30	497.76	90.00	36	30	11	16	10	9	14	26	27	21	15	27	9	4	1	26	17	29	7	
Atriplex canescens	(0-20cm)	0.18	7.08	15.00		2	1												1				-1	3
Atriplex canescens	(21-50cm)	1.90	76.89	60.00		3	11	2	5			3	2	4						1	7	1	1	
Atriplex canescens	(>50cm)	9.70	392.55	90.00	3	9	17	10	3	3	3	18	37	36	1	2	4			3	12	10	8	5
Atriplex confertifolia	(0-20cm)	0.10	4.05	2.50																				
Atriplex confertifolia	(21-50cm)	0.05	2.02	5.00																				
Chrysothamnus nauseosus	(0-20cm)	1.68	67.78	45.00						3	3			3		2	5	4	7	3			4	
Chrysothamnus nauseosus	(21-50cm)	12.20	493.72	87.50	4	4		30	7	23	52	5			24	4	17	36	19	10	27	11	16	25
Chrysothamnus nauseosus	(>50cm)	39.08	1581.31	85.00	282	17		60	66	23	19	45	7	1	83	21	24	23	22	16	29		67	94
Chrysothamnus viscidiflorus	(>50cm)	0.03	1.01	2.50																				
Cowania mexicana	(0-20cm)	2.70	109.27	65.00				7	3	28	4				5					2	1	2	2	1
Cowania mexicana	(21-50cm)	7.03	284.29	75.00	1	8	3	10	6	15	22	2		4	15							8	3	2
Cowania mexicana	(>50cm)	7.58	306.55	65.00		12		2	4	6	5	1	1		24								6	6
Ephedra viridis	(0-20cm)	0.08	3.04	2.50																				
Ephedra viridis	(21-50cm)	0.33	13.15	17.50	2		2				1					2		1			3			
Ephedra viridis	(>50cm)	0.23	9.11	15.00												3								
Fallugia paradoxa	(0-20cm)	0.58	23.27	5.00							8				15									
Fallugia paradoxa	(21-50cm)	0.48	19.22	5.00							7				12									
Fallugia paradoxa	(>50cm)	0.25	10.12	2.50											10									
Lycium pallidum	(0-20cm)	0.03	1.01	2.50													1							
Lycium pallidum	(21-50cm)	0.10	4.05	5.00												2		2						
Lycium pallidum	(>50cm)	0.13	5.06	7.50												1		1						
Purshia tridentata	(0-20cm)	3.88	156.82	50.00	5	1	1			3	3			1	9							3		
Purshia tridentata	(21-50cm)	2.73	110.28	35.00	1		1			2				1	3								1	
Purshia tridentata	(>50cm)	1.73	69.81	12.50																				
Shepherdia rotundifolia	(>50cm)	0.10	4.05	10.00				1												1			1	
Yucca angustissima	(0-20cm)	0.03	1.01	2.50						1														
Yucca baccata	(0-20cm)	0.03	1.01	2.50																				
TOTAL NATIVE SHRUBS		174.78	7072.89	100.00	405	150	70	195	123	134	275	108	97	114	253	136	80	84	53	1542	238	169	130	140
TOTAL DENSITY (stems/100 sq. m.)		229.50	(s=236.08)	100.00	444	392	280	195	164	143	313	151	131	236	259	155	141	115	73	1569	273	215	187	140
TOTAL DENSITY (stems/acre)		9287.53	(s=9553.85)		17968	15864	11331	7891	6637	5787	12667	6111	5301	9551	10481	6273	5706	4654	2954	63495	11048	8701	7568	5666
SPECIES DENSITY (# of species/100 sq.m.)		6.75	(s=1.32)		8	8	7	5	5	8	9	6	5	7	7	7	6	6	5	8	7	8	9	3

J19/J21 Phase III Woodland Shrub Density Data – Spring 2024 (continued)

		AVERAGE DENSITY		FREQUENCY	Shrubs per 100 sq.m.																			
PLANT SPECIES	SIZE	(#/100sq.m.)	(#/acre)	(%)	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
NATIVE SUBSHRUBS																								
Artemisia frigida	(0-20cm)	32.65	1321.30	70.00	6		12	29	10			149	11	150	1	148	50	9		51	4	24		
Artemisia frigida	(21-50cm)	3.33	134.56	32.50	1		1			1		41	3			3				3		6		
Chrysothamnus greenei	(0-20cm)	0.10	4.05	7.50														1						
Chrysothamnus greenei	(21-50cm)	0.15	6.07	5.00																				
Chrysothamnus greenei	(>50cm)	0.13	5.06	7.50		2				2														
Eriogonum jamesii	(0-20cm)	1.30	52.61	15.00															7			4	1	
Gutierrezia sarothrae	(0-20cm)	12.30	497.76	55.00		6	1	1	179		4	24		32	2			3				1		
Gutierrezia sarothrae	(21-50cm)	4.45	180.09	30.00		1			100		4	11			5									
TOTAL NATIVE SUBSHRUBS		54.40	2201.49	92.50	7	9	14	30	289	3	8	225	14	182	8	151	50	13	7	54	4	35	1	
INTRODUCED SUBSHRUBS																								
Kochia prostrata	(0-20cm)	0.13	5.06	10.00					2															
Kochia prostrata	(21-50cm)	0.20	8.09	12.50					1								2							
TOTAL INTRO. SUBSHRUBS		0.33	13.15	15.00					3								2							
NATIVE SHRUBS																								
Artemisia tridentata	(0-20cm)	44.75	1810.97	82.50				3	31	1	3	1	57	2	1	9	25	25			3	2	29	6
Artemisia tridentata	(21-50cm)	24.88	1006.66	92.50	4			3	29	8	4	1	40	4	4	32	5	7	2	6	14	8	60	5
Artemisia tridentata	(>50cm)	12.30	497.76	90.00	8		4	9	11	6	9	5	22	1	8	28	12	3	2		3	1	25	
Atriplex canescens	(0-20cm)	0.18	7.08	15.00														1						
Atriplex canescens	(21-50cm)	1.90	76.89	60.00					3	1	3			5	2	1	3	6	2	2	4		3	1
Atriplex canescens	(>50cm)	9.70	392.55	90.00	19	1	6	1		2	11	1	5	2	31	29	18		17	6	25	4	24	2
Atriplex confertifolia	(0-20cm)	0.10	4.05	2.50														4						
Atriplex confertifolia	(21-50cm)	0.05	2.02	5.00			1											1						
Chrysothamnus nauseosus	(0-20cm)	1.68	67.78	45.00		1		4				1	8	1			10	1		4	3			
Chrysothamnus nauseosus	(21-50cm)	12.20	493.72	87.50	1	6	4	13	22	1	3	1	20	15	4	6		27	2		2	28	1	18
Chrysothamnus nauseosus	(>50cm)	39.08	1581.31	85.00	49	53	59	62	20	54	52	86	66	4	1				68		1	47	38	4
Chrysothamnus viscidiflorus	(>50cm)	0.03	1.01	2.50									1											
Cowania mexicana	(0-20cm)	2.70	109.27	65.00	5	5	5	1	2	3	1	1	1	6	1	1	6			4		5		6
Cowania mexicana	(21-50cm)	7.03	284.29	75.00	4	8	8	7	8	1	2		2	52	25		34		2	7	7	1	2	12
Cowania mexicana	(>50cm)	7.58	306.55	65.00	9	18	41	49		1	6		1	7	4		21		6	16	29	8	4	16
Ephedra viridis	(0-20cm)	0.08	3.04	2.50							3													
Ephedra viridis	(21-50cm)	0.33	13.15	17.50							2													
Ephedra viridis	(>50cm)	0.23	9.11	15.00			1						1	1									1	2
Fallugia paradoxa	(0-20cm)	0.58	23.27	5.00																				
Fallugia paradoxa	(21-50cm)	0.48	19.22	5.00																				
Fallugia paradoxa	(>50cm)	0.25	10.12	2.50																				
Lycium pallidum	(0-20cm)	0.03	1.01	2.50																				
Lycium pallidum	(21-50cm)	0.10	4.05	5.00																				
Lycium pallidum	(>50cm)	0.13	5.06	7.50								3												
Purshia tridentata	(0-20cm)	3.88	156.82	50.00		1	2	1	1	7			12		27	40			1	16	4			17
Purshia tridentata	(21-50cm)	2.73	110.28	35.00									2		35	1	18			13	6		1	24
Purshia tridentata	(>50cm)	1.73	69.81	12.50											12		8			20	20			9
Shepherdia rotundifolia	(>50cm)	0.10	4.05	10.00										1										
Yucca angustissima	(0-20cm)	0.03	1.01	2.50																				
Yucca baccata	(0-20cm)	0.03	1.01	2.50							1													
TOTAL NATIVE SHRUBS		174.78	7072.89	100.00	99	93	131	153	127	85	100	99	231	108	156	147	150	84	103	90	122	107	188	122
TOTAL DENSITY (stems/100 sq. m.)		229.50	(s=236.08)	100.00	106	102	145	183	419	88	108	324	245	290	164	298	202	97	110	144	126	142	189	122
TOTAL DENSITY (stems/acre)		9287.53	(s=9553.85)		4290	4128	5868	7406	16956	3561	4371	13112	9915	11736	6637	12060	8175	3925	4452	5827	5099	5747	7649	4937
SPECIES DENSITY (# of species/100 sq.m.)		6.75	(s=1.32)		5	6	9	7	8	7	7	7	8	8	7	6	6	8	6	5	6	7	7	6

J19/J21 Phase III Woodland Tree Density Data – Spring 2024

PLANT SPECIES	SIZE	AVERAGE DENSITY (#/100sq.m.)	AVERAGE DENSITY (#/acre)	FREQUENCY (%)	Shrubs per 100 sq.m. W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20
NATIVE TREES																								
Juniperus osteosperma	(21-50cm)	0.03	1.01	2.50																				
Juniperus osteosperma	(>50cm)	0.53	21.25	32.50		1		1		3						3					1	1	1	
Pinus edulis	(0-20cm)	0.13	5.06	7.50																				
Pinus edulis	(21-50cm)	3.83	154.79	32.50	2								1	1				1		2			2	
Pinus edulis	(>50cm)	2.93	118.37	65.00		5	4			2	3		1	2	8		10	6		1	2		1	
TOTAL NATIVE TREES		7.43	300.48	85.00	2	6	4	1		5	3		2	3	8	3	10	7		3	3	1	4	
TOTAL DENSITY (stems/100 sq. m.)		7.43	(s=18.72)	85.00	2	6	4	1	0	5	3	0	2	3	8	3	10	7	0	3	3	1	4	0
TOTAL DENSITY (stems/acre)		300.48	(s=757.65)		81	243	162	40	0	202	121	0	81	121	324	121	405	283	0	121	121	40	162	0
SPECIES DENSITY (# of species/100 sq.m.)		1.08	(s=0.62)		1	2	1	1	0	2	1	0	1	1	1	1	1	1	0	1	2	1	2	0

J19/J21 Phase III Woodland Tree Density Data – Spring 2024 (continued)

PLANT SPECIES	SIZE	AVERAGE DENSITY (#/100sq.m.)	AVERAGE DENSITY (#/acre)	FREQUENCY (%)	Shrubs per 100 sq.m. W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36	W37	W38	W39	W40
NATIVE TREES																								
Juniperus osteosperma	(21-50cm)	0.03	1.01	2.50						1														
Juniperus osteosperma	(>50cm)	0.53	21.25	32.50		1	1				1	1							4			2		
Pinus edulis	(0-20cm)	0.13	5.06	7.50											1	1		3						
Pinus edulis	(21-50cm)	3.83	154.79	32.50	1									2		5	9	115			10			2
Pinus edulis	(>50cm)	2.93	118.37	65.00	2	5	5	2			8		2		5	1	3		2	5	22	4		6
TOTAL NATIVE TREES		7.43	300.48	85.00	3	6	6	2		1	9	1	2	2	6	7	12	118	6	5	32	6		8
TOTAL DENSITY (stems/100 sq. m.)		7.43	(s=18.72)	85.00	3	6	6	2	0	1	9	1	2	2	6	7	12	118	6	5	32	6	0	8
TOTAL DENSITY (stems/acre)		300.48	(s=757.65)		121	243	243	81	0	40	364	40	81	81	243	283	486	4775	243	202	1295	243	0	324
SPECIES DENSITY (# of species/100 sq.m.)		1.08	(s=0.62)		1	2	2	1	0	1	2	1	1	1	1	1	1	1	2	1	1	2	0	1

Protection of the Hydrologic Balance

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EXHIBIT F

Protection of the Hydrologic Balance

The bond release procedure guidelines for permanent program lands (OSMRE, 2017) describe hydrologic documentation required to be submitted as part of Phase III bond release applications. Specifically, the guidelines require documentation as to whether surface or subsurface water pollution is occurring, the probability of future occurrence, and the estimated cost of abating pollution if it is occurring or predicted to occur. Hydrologic demonstrations (Protection of the Hydrologic Balance - PHB) were developed and submitted in previous Termination of Jurisdiction (TOJ) applications, formally named Reclamation Liability Release Applications (RLRA) for Interim Program Lands located at the Kayenta Mine. A recent Phase III application for permanent program reclaimed parcels within the J21 coal resource area (CRA) comprised of 1,384 acres was submitted to the Office of Surface Mining Reclamation and Enforcement (OSMRE) in August 2018. OSMRE approved that application in August 2019. The PHB demonstrations in that application were organized to address whether Peabody Western Coal Company's (PWCC) mining and reclamation plans resulted in minimizing impacts to the hydrologic balance within and adjacent to the reclaimed parcels and permit boundary and included analyses of both groundwater and surface water quantity and quality. Accordingly, the following sections are organized similarly to PHBs submitted in the August Phase III application and previous TOJ applications. The permanent program reclaimed parcels subject to the following demonstrations include 1,632 acres in the J19 CRA and 2,022 acres in the adjacent J21 CRA. Components of ground and surface water quantity and quality that have been monitored in the vicinity of the J19 and J21 Phase III reclaimed parcels and summaries of findings provided in the previous J21 Phase III PHB including those related to water quality and pollution, are provided in the following sections. No pollution of surface or subsurface sources of water has been found within or adjacent to the J19 and J21 Phase III reclaimed parcels for this bond release application as shown on Maps 1 and 2 in Exhibit B.

Ground Water Quantity

Ground Water Flow, Levels, and Gradients. Ground Water flow directions, flow gradients, and average water levels in Wepo and alluvial monitoring wells from 1980 through 1985 are presented in Chapter 15, Hydrologic Description in Volume 10 of the Permit Application Package (PAP) for Permit AZ-0001F and are further discussed in recent Annual Hydrology Reports (e.g., PWCC, 2024). Water level contours of the Wepo and alluvial aquifers are depicted on Drawings 85610, 85611, and 85620 in Volume 23 of the PAP. In some locations, the Wepo water level contours on the potentiometric surface maps "V" in an upstream direction in the vicinity of the alluvial washes, indicating the Wepo aquifer discharges to the alluvial aquifers. As such, any mining activities that intercept the Wepo aquifer can potentially affect the downgradient alluvial aquifers.

However, mining that occurred within the J19 and J21 CRAs was adequately distant from alluvial washes to have caused negligible impacts to downgradient alluvial aquifers. The following sub-sections summarize findings regarding changes in ground water flow, levels and gradients in the Wepo aquifer below and proximate to the J19 and J21 CRAs discussed in the August 2018 Phase III application. Water level changes in wells associated with both parcels are provided in recent Annual Hydrology Reports (AHR) for the Kayenta Mine.

J19 CRA. The majority of mining within the J19 CRA occurred between 1985 and 2019 when active mining in this CRA ceased due to the closure of the Navajo Generating Station. Backfilling and grading of the final pit in J19 is ongoing as of 2025. Minimal changes to the Wepo aquifer gradients in the vicinity of J19 have occurred over the lengthy period of monitoring in proximate Wepo wells. After more than 2 decades, negligible changes have been observed in the flow direction, gradient and overall quantity of groundwater in the Wepo aquifer downgradient of J19. In addition, minimal impacts have occurred to alluvial groundwater in Reed Valley Wash north of the J19 CRA because of mining and reclamation activities.

J21 CRA. Mining within the J21 CRA commenced in 1985 in the northern portions of the CRA and progressed to the south and east as box cuts were completed and longer pits were developed. The most recent mining within this parcel was completed in the southwestern portion in 2019. Final reclamation activities (backfilling and grading) in J21 were completed as of about 2024. Theoretical projections of potential ground water inflow into the combined J19 and J21 CRAs are provided in Chapter 18, Probable Hydrologic Consequences in the AZ-0001F PAP. No appreciable ground water was intercepted as mining progressed in both the J19 and J21 CRAs. Minimal changes in gradients occurred during mining and reclamation activities in both CRAs. Flow directions have maintained a southwestern direction across both J19 and J21. Combined with minimal changes to the potentiometric surface and flow directions, minimal changes have occurred to the quantity of groundwater in the Wepo aquifer in the vicinity of both CRAs. Impacts from mining in J19 and J21 on groundwater quantity in the alluvium along Reed Valley and Dinnebito Washes were minimal as discussed under the August 2018 Phase III PHB demonstrations for the J21 CRA.

Infiltration and Recharge. Black Mesa is a recharge deficit area (evapotranspiration exceeds precipitation). At the Peabody leasehold, the mean annual evaporation is 45 inches. Between the months of May and October, monthly evaporation ranges from 2.7 to 11.5 inches, while average monthly precipitation only ranges from 0.35 to 1.7 inches. The monthly recharge deficit is quite significant even without considering transpiration losses. Considering the measurable depths to ground water in the Wepo formation, the potential for recharge via infiltration through the undisturbed soil, rock units, and spoil is negligible, except in areas of extensive burn and

fracturing.

Minimal groundwater was encountered during mining of both the J19 and J21 CRAs. Accordingly, no appreciable re-saturation of regraded spoils has been observed in either parcel. Recharge to the alluvial aquifer occurs via horizontal flow from the Wepo aquifer, as well as infiltration through the channel beds and banks (channel transmission losses) during runoff events.

Spring Flow. There is one natural spring within or adjacent to the J19 and J21 CRAs. Spring NSPG191 was discovered in February 2003 on the southern end of the J19 CRA (see Drawing No. 93500-AHR, PWCC, 2024). Flow at this spring ranged from 1.5 gallons per minute (gpm) in early February 2003 to 0.5 gpm in February 2005. Water quality at NSPG191 exhibited CaSO4 and mixed cation SO4 water types with TDS values below 1,400 mg/L. Flow at NSPG191 has not been observed since 2005. It is assumed that the source of the spring was very localized, and subsequent mining activities likely removed the source as mining in the J19 and J21 pits progressed to the south after 2005.

Another spring designated ASPG192 was discovered in the northern portion of the J19 CRA near Reed Valley Wash in May of 2013 (see Drawing No. 93500-AHR, PWCC, 2024). There is no evidence that a spring existed in its location prior to mining, and aerial photographs indicate spring activity commenced sometime between 2009 and 2011 following construction of a long downdrain leading into Reed Valley Wash from the J19 CRA, with a dogleg bend immediately above the spring site. Accordingly, ASPG192 is considered an artificial spring that resulted from final backfilling and grading activities followed by placement of suitable red rock cover and drainage channels. Spring Flow at ASPG192 has ranged from 0.32 gpm (April 2024) up to 15.85 gpm over the period of record. ASPG192 exhibits a consistent water type of $NaSO_4$ with TDS values ranging between 12,700 mg/L in April 2013 and 10,300 mg/L in April 2024 (see Appendix F.1). Sodium levels in ASPG192 have consistently been greater than 2,000 mg/L (see Appendix F.2). Comparisons of water quality data with applicable livestock drinking water Standards (NNEPA, 2008) indicate spring water from ASPG192 meets applicable standards (Table F.1) except for one out of 14 measurements of field pH slightly below the pH standard of 6.5 S.U. The TDS data appears to show a slight decreasing trend since 2013. Due to the high TDS and sodium levels in ASPG192, the area surrounding ASPG192 has been fenced to prevent livestock access. Otherwise, no impacts to naturally occurring springs have occurred because of mining and reclamation activities adjacent to both CRAs.

Ground Water Quality

The 2018 J21 Phase III application presents comprehensive analyses of ground water quality

measured in Wepo monitoring wells located near or adjacent to the J19 and J21 CRAs, and alluvial wells situated along Reed Valley Wash and Dinnebito Wash. Recent water quality data in both Wepo and alluvial monitoring wells is presented in the latest AHR (PWCC, 2024).

The 2023 AHR (PWCC, 2024) provides an assessment of the potential to use Wepo and alluvial aquifer water to provide livestock drinking water based on a comparison of water quality data collected at all currently monitored Wepo and alluvial wells. All Wepo wells used to assess suitability in the vicinity of the J19 and J21 CRAs meet applicable livestock drinking water standards (NNEPA, 2008) except for fluoride at wells 67 and 68 and marginal exceedances of pH. The 2023 AHR also indicates all alluvial wells along Reed Valley and Dinnebito Washes meet applicable livestock drinking water standards except for pH and fluoride (before 2018) at well 199 in Reed Valley Wash. The pH values at this well have been slightly below the standard on occasion over its long history of monitoring. Based on the assessments of Wepo and alluvial ground water quality in the 2018 Phase III application for J21, mining activities associated with the J19 and J21 CRAs has not impacted the use potential of the Wepo or alluvial aquifers adjacent to or downgradient of both CRAs to support the intended postmining land use of livestock grazing.

Surface Water Quantity

J21 CRA. Attachment F.1 in the 2018 Phase III application contains an EASI model report for a majority of the J21 CRA. The model includes all present and future reclaimed parcels located within the boundary of the J21 CRA. The results indicate little difference in average annual runoff between pre-mining and post-mining (reclaimed) conditions. Runoff generated from hill slopes and low-order channels established in the J21 CRA, including the Phase III parcels, will average about 0.42 inches per year. Because reclamation techniques used to reclaim mined lands in J21 were also implemented on reclaimed parcels in the adjacent J19 CRA, runoff generated from hill slopes and low-order channels established in the J19 CRA will also average about 0.42 inches per year. Pond J19-RA is an internally draining permanent impoundment proposed to remain in the post mining landscape in the J19 CRA. Ponds J21-A1 and J21-C are proposed to be left in the post-mining landscape on the southeastern edges of the J21 CRA. All three ponds will serve as viable sources of water for supporting the post-mining land use of livestock grazing as discussed further in this document. No small depressions were created within the reclaimed J19 and J21 parcels of this Phase III application.

Surface Water Quality

Both analytical and graphical techniques were used to evaluate surface water quality impacts to runoff within and downstream of the J21 CRA in the August 2018 Phase III application. PWCC initiated a Small Watershed Study (SWS) monitoring program on Black Mesa in 1985, and details regarding study objectives and monitoring associated with the study are provided in Attachment 4 in Chapter 16, Hydrologic Monitoring Program in the PAP. Several small watersheds located within reclaimed areas were instrumented with supercritical flow flumes, and water quality data collected at these sites are discussed in the August 2018 Phase III application. In addition, water quality data collected at stream monitoring sites established along Dinnebito Wash and Reed Valley Wash (CG34, SW34, CG37 and CG78) were used for impact assessments in the August 2018 J21 Phase III application (see Map 2 in Exhibit B).

Few NPDES discharges from sediment ponds associated with the J19 or J21 CRAs have occurred over the period of record, and those were limited to Pond J21-C. Since 2003 there have been sixteen discharge events totaling 194 days at Pond J21-C. 146 days were due to rainfall less than the 10-year, 24-hour storm event and 48 were due to lagoon dewatering. No applicable Navajo EPA Livestock Drinking Water standards (NNEPA, 2008) were exceeded during any of these events. No NPDES discharges occurred at Pond J21-A1, and Pond J19-RA has never discharged. These NPDES discharges were either completely infiltrated along the main sand bed channel before reaching the lower stream monitoring sites (CG37 and SW37) on Dinnebito Wash or were significantly diluted due the magnitudes of runoff in which they mixed as they flowed downstream.

Water quality data collected at the SWS flumes were compared to livestock watering standards established by the Navajo Nation EPA for surface water (NNEPA, 2008). Table 3.6 in the August 2019 TOJ application for N6/J1/N14/J16 shows the results of these comparisons, and excepting total recoverable copper, lead and vanadium at select sites, all water quality collected in runoff at the SWS met livestock watering standards. Based on the comparisons, runoff from reclaimed areas monitored as part of the SWS program is suitable for livestock drinking water, which is the primary land use proposed for the reclaimed areas at the Kayenta Complex. Runoff from reclaimed areas established on mined lands at the Kayenta Complex will have no significant impact on receiving stream water quality, including runoff from areas associated with the J19 or J21 CRAs in this application.

Baseflow Quantity and Quality

Limited and infrequent persistent baseflow has been observed along Dinnebito Wash and Reed Valley Washes. Consequently, no baseflow monitoring site has been established in either wash. However, water quality samples were collected from baseflow at Upper Dinnebito Wash historical site CG78

in 1990 and between 1997 and 1999 (see Appendix F.3). The location of CG78 is shown on Drawing No. 85600, Historical Monitoring Site Map in the PAP. This data is used for comparison purposes in the following sections.

Sediment Yields

J21 Sediment Yield Model. Attachment F.1 in the 2018 Phase III application contains an EASI model report for the J21 CRA. The model includes all reclaimed parcels located within the boundary of the J21 CRA. EASI model results provided are presented as average annual values, and sediment yield results are expressed as tons per acre. Sediment yield is the amount of eroded sediment that leaves the modeled area on an average annual basis and includes production from both hill slope areas and channel erosion. Erosion results are typically lower than sediment yield results because these numbers only represent sediment yield from hill slopes and sub-watersheds with minimal channel development and do not include erosion in channels. The model predicts average annual sediment yield of 2.99 tons/acre/year and erosion of 0.56 tons/acre/year. These values are lower than pre-mining sediment yields and erosion largely due to more effective hydrologic cover and lower drainage density, channel lengths and slopes in the J-21 CRA. Because reclamation methods used for backfilling and grading and revegetation in the J21 area are the same as used for the adjacent J19 CRA, the lower sediment yields, and erosion rates predicted for the J21 CRA are expected for J19. The results also indicate runoff from reclaimed Phase III parcels in both J19 and J21 will not contribute additional solids to receiving stream flows above established background levels.

Permanent Impoundments

One permanent impoundment designated Pond J19-RA exists within the J19 reclaimed CRA and two permanent impoundments designated Ponds J21-A1 and J21-C exist within the J21 CRA subject to this Phase III application (see Maps 1 and 2 in Exhibit B). Pond J19-RA is an internally draining impoundment, and both Ponds J21-A1 and J21-C feature earthen embankments with emergency spillways.

Water Levels and Water Persistence. Pond J19-RA was constructed in 2005 and has been monitored for water persistence for nineteen years as part of routine quarterly pond inspections through 2023. Maximum water levels observed in Pond J19-RA from 2003 through 2023 ranged from 0.5 feet in 2014 to 15.8 feet in 2008 (see Table F.2). Table F.2 also presents annual maximum water volumes

estimated for Pond J19-RA over the 19-year period and ranged from 0.4 acre-feet in 2014 to 49.8 acre-feet in 2022. The as-built storage capacity for J19-RA was originally 26.1 acre-feet (see Drawing No. 85406, Siltation and Impoundment Structures Data in the PAP). Following further grading in the vicinity and re-evaluation of engineering designs, the July 2023 measurements of storage capacity in this internally draining impoundment is 636.3 acre-feet at the crest of the incised pond. Water in J19-RA has been persistent for almost 20 years following initial construction. Water persistence is largely dependent on precipitation, although a portion may originate from shallow groundwater from upgradient sources.

Pond J21-A1 was constructed in 1990 and has been monitored for water persistence for over two decades as part of quarterly pond inspections through 2023. Maximum water levels observed in Pond J21-A1 from 2003 through 2023 ranged from 0.0 feet (dry) in 2017 to 12.4 feet in 2007 (see Table F.3). Table F.3 also presents annual maximum water volumes estimated for J21-A1 over the same 21-year period and ranged from 0.0 acre-feet (dry) in 2017 to 12.4 acre-feet in 2007. The as-built storage capacity for J21-A1 is 18.4 acre-feet and remains at 9.61 acre-feet as of July 2023.. Water in J21-A1 has been mostly persistent for more than 20 years following construction, although the pond experienced dry conditions during 2017.

Pond J21-C was constructed in 1991 and has been monitored for water persistence for over two decades as part of quarterly pond inspections through 2023. Maximum water levels observed in Pond J21-C from 2003 through 2023 ranged from 0.7 feet in 2023 to 16.6 feet in 2013 (see Table F.4). Table F.4 also presents annual maximum water volumes estimated for J21-C over the same 21-year period and ranged from 0.1 acre-feet in 2009 and 2011 to 21.4 acre-feet in 2017. The original as-built storage capacity for J21-C was 20.0 acre-feet and remains at 17.8 acre-feet as of July 2024. Water in J21-C has been mostly persistent for more than 20 years following construction, although the pond experienced dry conditions during some years due to low precipitation within the J21-C watershed.

Access Safety and Stability. Slopes leading to Ponds J19-RA, J21-A1 and J21-C are moderate (see Map 1) and should provide safe access for the livestock which will be using the area.

J19-RA Water Quality. Monitoring of water quality in Pond J19-RA was conducted from 2022 through 2024 (see Appendix F.4). Table F.5 lists the concentration means and ranges for the chemical constituents measured in samples collected from Pond J19-RA for comparison purposes. Table F.5 shows average values of all parameters listed for J19-RA are lower than rainfall runoff and baseflow average values measured at site CG78. Average values are comparable to (similar order of magnitudes) most average parameters measured in SWS sites (reclaimed area runoff). Maximum

values of SO_4 and TDS are higher than maximum values in reclaimed area runoff. The higher maximum values are indicative of the effects of evaporation and transpiration on pond water quality during periods of low precipitation from time to time.

Appendix F.5 presents trilinear diagrams of percent milliequivalents for major ions and TDS measured in Pond J19-RA over its short monitoring history. Three different water types have been observed at J19-RA and are typified by mixed cations dominated by the Ca cation and both SO_4 and HCO_3. TDS data collected in Pond J19-RA have been less than 350 mg/L over the short period of record.

Water quality data collected at Pond J19-RA were compared to livestock watering standards established by the Navajo Nation EPA for surface water (NNEPA, 2008) for determining the suitability of water in the impoundment to support livestock grazing. Table F.6 shows the results of these comparisons, and indicates water monitored in Pond J19-RA met all livestock watering standards. Based on the comparisons, water monitored in Pond J19-RA is suitable for livestock drinking water and will support the postmining land use of livestock grazing. Also, there is no potential for diminution of the water quality of adjacent landowners as the pond water quality is of better quality compared to baseflow measured at Upper Dinnebito Wash historic stream site CG78. And, due to significantly higher discharge rates during rainfall runoff in the downstream main channels, any discharges from Pond J19-RA will be appreciably diluted within relatively short distances.

J21-A1 Water Quality. Monitoring of water quality in Pond J21-A1 was conducted from 2003 through 2021 (see Appendix F.4). Table F.5 also lists the concentration means and ranges for the chemical constituents measured in samples collected from J21-A1 and shows average values of all parameters are lower than rainfall runoff and the baseflow average values measured at site CG78. Average values of SO_4, HCO_3, and TDS in Pond J21-A1 are comparable to reclaimed area runoff.

Appendix F.5 presents trilinear diagrams of percent milliequivalents for major ions and TDS measured in Pond J21-A1 over its monitoring history. Five different water types have been observed at J21-A1 with $CaHCO_3$ as the most common type. TDS data collected in Pond J21-A1 has been less than 600 mg/L over the period of record.

Water quality data collected at Pond J21-A1 were compared to livestock watering standards established by the Navajo Nation EPA for surface water (NNEPA, 2008) for determining the suitability of water in the impoundment to support livestock grazing. Table F.6 shows the results of these comparisons, and indicates water monitored in Pond J21-A1 met all livestock watering

standards except for four out of thirteen measurements of field pH, and one out of thirteen measurements of pH at 25 Degrees Centigrade (laboratory derived values). High values of pH can be influenced by low water levels coupled with algal growth or prolonged icing over of the pond surface. Based on the comparisons, water monitored in Pond J21-A1 is suitable for livestock drinking water and will support the postmining land use of livestock grazing. Also, there is no potential for diminution of the water quality of adjacent landowners as the pond water quality is of better quality compared to baseflow measured at Upper Dinnebito Wash historic stream site CG78. And, due to significantly higher discharge rates during rainfall runoff in the downstream main channels, occasional discharges from Pond J21-A1 will be appreciably diluted within relatively short distances.

J21-C Water Quality. Monitoring of water quality in Pond J21-C was conducted from 1995 through 2007 for a limited set of parameters, and from 2008 through 2023 for an expanded suite of parameters typically analyzed in surface water samples (see Appendix F.4). Table F.5 also lists the concentration means and ranges for the chemical constituents measured in samples collected from Pond J21-C and shows average values of all parameters are lower than rainfall runoff and the baseflow average values measured at site CG78. Average values of SO_4, HCO_3, and TDS in Pond J21-C are comparable to or slightly greater than reclaimed area runoff.

Appendix F.5 presents trilinear diagrams of percent milliequivalents for major ions and TDS measured in Pond J21-C over its monitoring history. Four different water types have been observed at J21-C. The most common water type at this pond is $CaHCO_3$. TDS data collected in Pond J21-C has been less than 700 mg/L over its period of record.

Water quality data collected at Pond J21-C were compared to livestock watering standards established by the Navajo Nation EPA for surface water (NNEPA, 2008) for determining the suitability of water in the impoundment to support livestock grazing. Table F.6 shows the results of these comparisons, and indicates water monitored in J21-C met all livestock watering standards except for two out of eighteen measurements of field pH and one out of fourteen measurements of fluoride. High values of pH can be influenced by low water levels coupled with algal growth or prolonged icing over of the pond surface. Based on the comparisons, water monitored in Pond J21-C is suitable for livestock drinking water and will support the postmining land use of livestock grazing. Also, there is no potential for diminution of the water quality of adjacent landowners as the pond water quality is of better quality compared to baseflow measured in Upper Dinnebito Wash at historic stream site CG78. And, due to significantly higher discharge rates during rainfall runoff in the downstream main channels, occasional discharges from Pond J21-C will be appreciably diluted within relatively short distances.

Diminution of Adjacent Water Quantity. Peabody believes sufficient information has been submitted and evaluated by OSMRE in Hydrology Reports, Permits, and other documents to demonstrate that Ponds J19-RA, J21-A1 and J21-C will not result in the diminution of the quantity of water utilized by adjacent or surrounding landowners. Chapter 17 (Protection of Hydrologic Balance) of the AZ-0001F Permit PAP presents detailed descriptions of pre-existing water sources within the leasehold, including those proximate to the J19 and J21 Phase III parcels. Drawing No. 85322 in Volume 20 of the PAP shows the locations of all pre-existing livestock and wildlife watering structures. No pre-existing structures were purported to exist within or adjacent to either the J19 or J21 Phase III parcels.

Chapter 18 (Probable Hydrologic Consequences) of the PAP presents analyses of the potential impacts of the mining operation, including a section that discusses the effects of dams, sediment ponds, and permanent impoundments on downstream users. In this section of Chapter 18, an evaluation of drainage area associated with all permanent impoundments proposed to be left within the Moenkopi and Dinnebito basins indicates the impoundments may restrict about 4.7 percent and 1.0 percent, respectively, of the average annual runoff at the lower end of the basins. The permanent impoundments may result in localized decreases in receiving stream runoff, but these will become less pronounced and unmeasurable further downstream, as lateral inflows from undisturbed basins will provide additional contributions to downstream runoff. Channel transmission losses, evapotranspiration, and other losses in the main channels further downstream along Moenkopi Wash would completely mask any runoff reductions from the smaller reclaimed areas on the leasehold. Water levels in alluvial wells adjacent and immediately downgradient in the alluvium from existing temporary sediment ponds show normal fluctuations in response to low and high stream flow years. There is no evidence of persistent diminished recharge to the alluvium from runoff, which would be potentially attributed to the loss of watershed area associated with either existing temporary sediment ponds or permanent impoundments. In addition, PWCC has no evidence that flood irrigation has been practiced along the reaches of Moenkopi and Dinnebito Washes downstream of Ponds J19-RA, J21-A1 and J21-C. Monitoring of stream flows in the main channels within and just downstream of the leasehold for three decades has shown extremely high sediment concentrations, which would preclude flood irrigation practices due to high maintenance costs. Based on the above summaries, PWCC maintains these impoundments will not result in the diminution of the quantity of water utilized by adjacent or surrounding landowners.

Pond Sediment Accumulations. Pond sediment accumulation monitoring has been conducted at Ponds J19-RA, J21-A1 and J21-C periodically from 2004 through 2024. As mentioned previously, the original as-built capacity of J19-RA in 2005 was 26.1 acre-feet (see Drawing No. 85406, Siltation

and Impoundment Structures Data in the PAP). Following further grading in the vicinity and re-evaluation of engineering designs, the July 2023 measurements of storage capacity in this internally draining impoundment is 636.3 acre-feet at the crest of the incised pond. The original as-built capacity of Pond J21-A1 was 18.4 ac-ft., and the most recent capacity determined in July 2023 was 9.61 ac-ft. The original as-built capacity of Pond J21-C was 20.0 ac-ft, and the most recent capacity determined in July 2024 was 17.8 ac-ft. Based on periodic measurements of pond bottom elevations from 2005 through 2023, the average sediment accumulation rate in J19-RA was 0.04 ac-ft/year. Using periodic measurements of pond bottom elevations from 2004 through 2023, the average sediment accumulation rate in Pond J21-A1 was 0.19 ac-ft/year. Based on periodic pond bottom measurements in Pond J21-C from 2004 through 2024, the average sediment accumulation rate at this pond was 0.30 ac-ft/year. The pond bottom measurements discussed above collected over more than 15 years indicate sediment accumulation rates in all three permanent impoundments both ponds are negligible.

References Cited

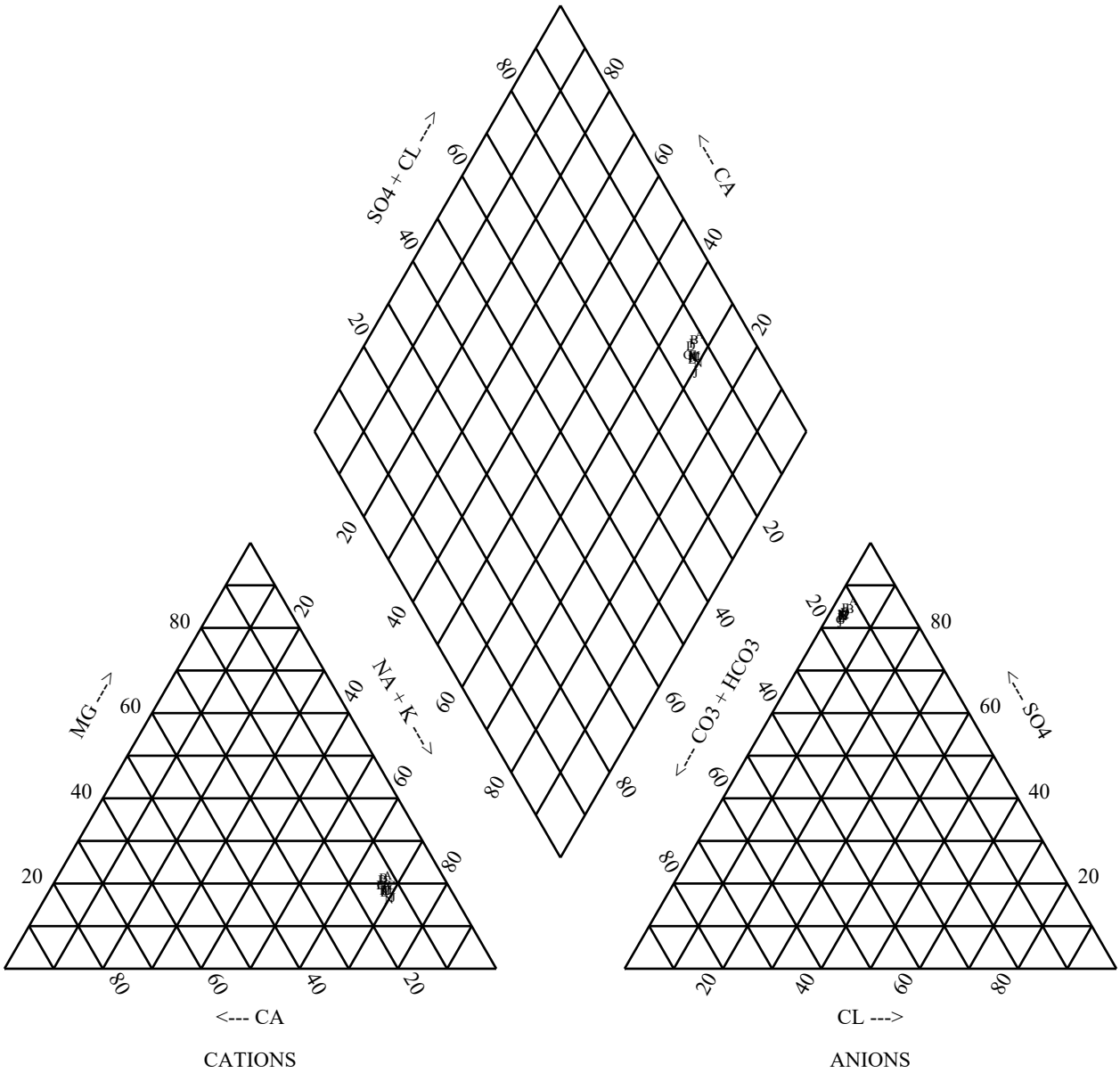
NNEPA, 2008. "Navajo Nation Surface Water Quality Standards." Navajo Nation Environmental Protection Agency, Water Quality Program, Window Rock, Arizona. [Revised and updated in May 2017 and March 2021 following triennial reviews.]

OSMRE, 2017. "Guideline to Bond Release Procedures for Permanent Program Lands".

Peabody Western Coal Company (PWCC), 2024. "2023 Annual Hydrology Report", May 2024.

ASPG192

A -- 05/15/13-15:34, TDS = 12700
B -- 07/12/13-11:15, TDS = 12200
C -- 01/29/14-13:54, TDS = 11400
D -- 07/16/14-12:30, TDS = 11500
E -- 01/21/15-14:43, TDS = 11600
F -- 03/17/16-13:41, TDS = 11100
G -- 03/20/17-13:37, TDS = 11300
H -- 03/22/18-14:15, TDS = 11100
I -- 06/03/19-11:49, TDS = 11200
J -- 05/13/20-14:46, TDS = 11100
K -- 04/12/21-14:15, TDS = 10900
L -- 04/07/22-12:11, TDS = 10500
M -- 05/15/23-11:56, TDS = 11000
N -- 04/18/24-13:14, TDS = 10300



Percent Of Total Milliequivalents Per Liter

Water Quality Report
ASPG192 - ARTIFICIAL SPRING 192
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	05/15/2013 15:34	07/12/2013 11:15	01/29/2014 13:54	07/16/2014 12:30	01/21/2015 14:43	03/17/2016 13:41	03/20/2017 13:37	03/22/2018 14:15	06/03/2019 11:49
Field Parameters										
Field Ph	S.U.	7.9600	7.8700	6.9900	7.4700	7.4900	6.6200	6.8500	6.3400	6.5200
Temperature	C	21.8000	22.1000	10.9000	19.2000	10.8000	15.2000	14.7000	16.1000	19.2000
Conductivity	UMHOS/CM	13020.0000	12440.0000	12850.0000	11960.0000	6070.0000	12190.0000	11870.0000	11990.0000	11440.0000
Field Salinity	0/00	7.6000	7.1000	7.3000	6.8000	3.3000	6.9000	6.7000	6.8000	6.5000
Laboratory Parameters										
Alk As CaCO3, Ph 4.5	MG/L	918.0000	1000.0000	1160.0000	1150.0000	1180.0000	1140.0000	1170.0000	1160.0000	1170.0000
Alk, Bicarb As CaCO3	MG/L	918.0000	1000.0000	1160.0000	1150.0000	1180.0000	1140.0000	1170.0000	1160.0000	1170.0000
Alk, Carb As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 10.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 10.0000
Aluminum, Total	MG/L	0.0900	0.1000	0.0530	B 0.0900	B 0.0300	< 0.0200	B 0.0200	< 0.0100	< 0.0500
Aluminum, Dissolved	MG/L	< 0.3000	< 0.3000	< 0.0600	< 0.3000	B 0.0900	< 0.3000	< 0.3000	< 0.3000	< 0.5000
Arsenic, Total	UG/L	B 5.0000	B 5.0000	< 1.0000	< 10.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Arsenic, Dissolved	UG/L	< 2.0000	< 2.0000	< 1.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Boron, Dissolved	UG/L	900.0000	800.0000	640.0000	510.0000	410.0000	B 300.0000	B 400.0000	B 300.0000	B 400.0000
Cadmium, Total	UG/L	< 1.0000	< 1.0000	< 0.5000	< 5.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 0.5000
Cadmium, Dissolved	UG/L	< 1.0000	< 1.0000	< 0.5000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 0.5000
Calcium, Dissolved	MG/L	416.0000	430.0000	416.0000	430.0000	416.0000	428.0000	421.0000	434.0000	421.0000
Chloride	MG/L	210.0000	210.0000	200.0000	178.0000	171.0000	160.0000	156.0000	168.0000	162.0000
Chromium, Total	UG/L	< 100.0000	< 100.0000	< 50.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000
Chromium, Dissolved	UG/L	< 100.0000	< 100.0000	< 20.0000	< 10.0000	< 10.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000
Conductivity	UMHOS/CM	13200.0000	12700.0000	12400.0000	12400.0000	12400.0000	12000.0000	11200.0000	11900.0000	11600.0000
Copper, Total	UG/L	< 100.0000	< 100.0000	< 50.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000
Copper, Dissolved	UG/L	< 5.0000	< 5.0000	< 3.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 4.0000	< 8.0000
Fluoride	MG/L	B 0.5000	0.6000	B 0.4000	0.4600	0.4400	0.4600	0.4300	0.4800	0.5000
Hardness As CaCO3	MG/L	3120.0000	2970.0000	2810.0000	2880.0000	2700.0000	2610.0000	2600.0000	2620.0000	2520.0000
Iron, Total	MG/L	< 0.2000	< 0.2000	< 0.1000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.3000
Iron, Dissolved	MG/L	< 0.2000	< 0.2000	< 0.0400	< 0.0200	< 0.0200	< 0.2000	< 0.2000	< 0.2000	< 0.3000
Lead, Total	UG/L	< 1.0000	< 1.0000	< 0.5000	< 5.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000
Lead, Dissolved	UG/L	< 1.0000	< 1.0000	< 0.5000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000
Magnesium, Dissolved	MG/L	505.0000	462.0000	431.0000	439.0000	404.0000	375.0000	376.0000	372.0000	357.0000
Manganese, Total	MG/L	1.0900	2.5100	2.5400	3.4700	4.4600	5.0100	5.3300	5.3800	5.6000
Manganese, Dissolved	MG/L	1.0500	2.5800	2.4000	3.4500	4.1700	4.8700	5.1600	5.3300	5.1000
Mercury, Total	UG/L	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	5.1000	3.9300	3.0300	2.9400	1.3400	13.0000	0.7500	0.3300	0.1500
Nitrite Nitrogen_N	MG/L	0.0600	B 0.0500	B 0.0300	B 0.0500	B 0.0300	B 0.0200	0.0700	< 0.0100	< 0.0100
NO3_NO2 Nitrogen_N	MG/L	5.2000	3.9800	3.0600	2.9900	1.3700	12.6000	0.8200	0.3300	0.1500
Ph At 25 Deg. Cent.	UNITS	8.3000	8.3000	7.9000	8.0000	7.8000	7.9000	7.9000	7.8000	7.9000
Potassium, Dissolved	MG/L	37.0000	36.0000	34.2000	38.2000	35.3000	35.0000	34.0000	35.0000	33.0000
Selenium, Total	UG/L	B 2.8000	B 2.2000	B 1.2000	B 1.9000	B 1.8000	< 1.0000	< 1.0000	< 1.0000	< 1.0000
Selenium, Dissolved	UG/L	B 2.5000								
Silica, Dissolved	MG/L	B 13.0000	B 18.0000	18.9000	16.0000	17.6000	16.0000	17.0000	17.0000	18.0000
Sodium, Dissolved	MG/L	2870.0000	2680.0000	2820.0000	2590.0000	2600.0000	2360.0000	2380.0000	2570.0000	2480.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
ASPG192 - ARTIFICIAL SPRING 192
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	05/15/2013 15:34	07/12/2013 11:15	01/29/2014 13:54	07/16/2014 12:30	01/21/2015 14:43	03/17/2016 13:41	03/20/2017 13:37	03/22/2018 14:15	06/03/2019 11:49
Laboratory Parameters										
Solids, Dissolved	MG/L	12700.0000	12200.0000	11400.0000	11500.0000	11600.0000	11100.0000	11300.0000	11100.0000	11200.0000
Solids, Suspended	MG/L	B 12.0000	< 5.0000	B 19.0000	B 15.0000	22.0000	B 7.0000	B 6.0000	B 10.0000	B 13.0000
Sulfate	MG/L	7500.0000	6860.0000	6920.0000	6950.0000	6800.0000	7390.0000	6150.0000	6530.0000	6900.0000
Vanadium, Total	UG/L	< 50.0000	< 50.0000	< 30.0000	< 50.0000	< 50.0000	< 50.0000	< 50.0000	< 50.0000	< 50.0000
Vanadium, Dissolved	UG/L	< 50.0000	< 50.0000	< 10.0000	< 5.0000	< 5.0000	< 50.0000	< 50.0000	< 50.0000	< 50.0000
Zinc, Total	MG/L	< 0.1000	< 0.1000	< 0.0500	< 0.1000	< 0.1000	< 0.1000	< 0.1000	< 0.1000	< 0.1000
Zinc, Dissolved	MG/L	< 0.1000	< 0.1000	< 0.0200	B 0.0500	0.0600	< 0.1000	< 0.1000	< 0.1000	< 0.1000
Chromium_3	UG/L	< 0.1000	< 0.1000	< 20.0000	< 10.0000	< 10.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000
Chromium_6	UG/L	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000
Bicarbonate As HCO3	MG/L	1120.0000	1220.0000	1420.0000	1400.0000	1440.0000	1400.0000	1420.0000	1410.0000	1430.0000
Carbonate As CO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 10.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 10.0000
Cation_Anion Balance	%	2.2000	2.3000	2.0000	< -0.3000	< -0.3000	< -7.6000	0.3000	0.6000	< -3.6000
SAR	%	22.6000	21.6000	23.4000	21.0000	22.0000	20.0000	21.0000	22.0000	22.0000
Solids, Diss. (Calc)	MG/L	12100.0000	11300.0000	11600.0000	11400.0000	11200.0000	11500.0000	10300.0000	10800.0000	11100.0000
Sum Of Anions	MEQ/L	182.0000	170.0000	174.0000	174.0000	171.0000	183.0000	157.0000	165.0000	173.0000
Sum Of Cations	MEQ/L	190.0000	178.0000	181.0000	173.0000	170.0000	157.0000	158.0000	167.0000	161.0000
TDS Ratio	%	1.0500	1.0800	0.9800	1.0100	1.0400	0.9700	1.1000	1.0300	1.0100
Aluminum, Acid-soluble	mg/l									

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
ASPG192 - ARTIFICIAL SPRING 192
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	05/13/2020 14:46	04/12/2021 14:15	04/07/2022 12:11	05/15/2023 11:56	04/18/2024 13:14
Field Parameters						
Field Ph	S.U.	7.6200	6.6800	6.6100	7.7600	7.4400
Temperature	C	17.9000	17.0000	15.1000	20.8000	21.1000
Conductivity	UMHOS/CM	11410.0000	10060.0000	9560.0000	11276.0000	11338.0000
Field Salinity	0/00	6.5000	5.6000	5.3000	6.4000	6.4500
Laboratory Parameters						
Alk As CaCO3, Ph 4.5	MG/L	1130.0000	1170.0000	1200.0000	1180.0000	1050.0000
Alk, Bicarb As CaCO3	MG/L	1110.0000	1170.0000	1200.0000	1150.0000	1050.0000
Alk, Carb As CaCO3	MG/L	22.5000	< 2.0000	< 2.0000	28.5000	< 2.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L	< 0.0500	< 0.0500	< 0.0500		
Aluminum, Dissolved	MG/L	< 0.5000	< 0.5000	< 0.5000	B 0.0670	< 0.5000
Arsenic, Total	UG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 10.0000
Arsenic, Dissolved	UG/L	< 2.0000	< 1.0000	< 2.0000	< 2.0000	< 10.0000
Boron, Dissolved	UG/L	B 400.0000	B 301.0000	B 391.0000	394.0000	B 341.0000
Cadmium, Total	UG/L	< 0.5000	< 0.5000	< 0.5000	B 0.5420	< 2.5000
Cadmium, Dissolved	UG/L	< 0.5000	B 0.2650	< 0.5000	< 0.5000	< 2.5000
Calcium, Dissolved	MG/L	407.0000	418.0000	425.0000	413.0000	400.0000
Chloride	MG/L	159.0000	157.0000	163.0000	166.0000	146.0000
Chromium, Total	UG/L	< 100.0000	< 200.0000	< 200.0000	< 200.0000	< 200.0000
Chromium, Dissolved	UG/L	< 100.0000	< 200.0000	< 200.0000	< 20.0000	< 200.0000
Conductivity	UMHOS/CM	11900.0000	11300.0000	11800.0000	11600.0000	11900.0000
Copper, Total	UG/L	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000
Copper, Dissolved	UG/L	< 8.0000	< 4.0000	< 8.0000	< 8.0000	< 40.0000
Fluoride	MG/L	0.6000	0.6000	0.5300	0.5600	0.5100
Hardness As CaCO3	MG/L	2390.0000	2490.0000	2460.0000	2540.0000	2220.0000
Iron, Total	MG/L	< 0.6000	< 0.6000	< 0.6000	< 0.6000	< 0.6000
Iron, Dissolved	MG/L	< 0.6000	< 0.6000	< 0.6000	< 0.3000	< 0.6000
Lead, Total	UG/L	< 1.0000	< 1.0000	< 1.0000	B 2.8500	< 5.0000
Lead, Dissolved	UG/L	< 1.0000	< 0.5000	< 1.0000	< 2.0000	< 5.0000
Magnesium, Dissolved	MG/L	334.0000	351.0000	340.0000	367.0000	297.0000
Manganese, Total	MG/L	B 0.2000	5.3700	5.4600	3.1700	3.0900
Manganese, Dissolved	MG/L	< 0.1000	5.2200	5.3100	3.0400	2.8500
Mercury, Total	UG/L	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	2.7300	B 0.0800	0.1070	2.1300	1.8000
Nitrite Nitrogen_N	MG/L	< 0.0100	< 0.0100	< 0.0100	B 0.0290	B 0.0270
NO3_NO2 Nitrogen_N	MG/L	2.7300	B 0.0830	0.1070	2.1600	1.8300
Ph At 25 Deg. Cent.	UNITS	8.3000	7.7000	7.8000	8.3000	7.9000
Potassium, Dissolved	MG/L	40.0000	34.1000	33.3000	34.4000	32.9000
Selenium, Total	UG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Selenium, Dissolved	UG/L					
Silica, Dissolved	MG/L	19.0000	18.0000	19.0000	18.8000	17.0000
Sodium, Dissolved	MG/L	2610.0000	2400.0000	2400.0000	2500.0000	2350.0000
Solids, Dissolved	MG/L	11100.0000	10900.0000	10500.0000	11000.0000	10300.0000
Solids, Suspended	MG/L	B 11.0000	B 11.0000	B 6.0000	B 11.0000	< 5.0000
Sulfate	MG/L	5710.0000	6660.0000	6500.0000	6850.0000	6080.0000
Vanadium, Total	UG/L	< 100.0000	< 100.0000	< 100.0000	< 100.0000	< 100.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
ASPG192 - ARTIFICIAL SPRING 192
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	05/13/2020 14:46	04/12/2021 14:15	04/07/2022 12:11	05/15/2023 11:56	04/18/2024 13:14
Laboratory Parameters						
Vanadium, Dissolved	UG/L	< 100.0000	< 100.0000	< 100.0000	< 10.0000	< 100.0000
Zinc, Total	MG/L	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Zinc, Dissolved	MG/L	< 0.2000	< 0.2000	< 0.2000	B 0.0420	< 0.2000
Chromium_3	UG/L	< 100.0000	< 200.0000	< 200.0000	< 20.0000	< 200.0000
Chromium_6	UG/L	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000
Bicarbonate As HCO3	MG/L	1360.0000	1430.0000	1460.0000	1400.0000	1280.0000
Carbonate As CO3	MG/L	B 13.5000	< 2.0000	< 2.0000	B 17.1000	< 2.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%	5.5000	< -3.4000	< -2.8000	< -3.0000	< -1.3000
SAR	%	24.0000	21.0000	21.0000	22.0000	22.0000
Solids, Diss. (Calc)	MG/L	9990.0000	10800.0000	10600.0000	11100.0000	9970.0000
Sum Of Anions	MEQ/L	147.0000	168.0000	165.0000	172.0000	153.0000
Sum Of Cations	MEQ/L	164.0000	157.0000	156.0000	162.0000	149.0000
TDS Ratio	%	1.1100	1.0100	0.9900	0.9900	1.0300
Aluminum, Acid-soluble	mg/l				B 0.0670	< 0.2500

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
CG78 - DINNEBITO UNAFFECT
01/01/1987-00:00 to 12/31/2024-23:59

Parameters	Units	03/01/1990 11:25	04/07/1997 13:40	01/26/1998 14:40	07/29/1999 13:35
Field Parameters					
Field Ph	S.U.		7.7200	B 8.1800	8.3900
Temperature	C		11.5000	0.1000	29.9000
Conductivity	UMHOS/CM		4274.0000	3460.0000	4210.0000
Field Salinity	0/00		2.3000	< 1.6000	2.2000
Field Nitrite	MG/L		0.0040		
Laboratory Parameters					
Acidity	MG/L	0.0000			
Alk As CaCO3, Ph 4.5	MG/L	74.0000	256.0000	143.0000	153.0000
Alk, Bicarb As CaCO3	MG/L		256.0000	143.0000	153.0000
Alk, Carb As CaCO3	MG/L		< 2.0000	< 2.0000	< 2.0000
Alk, Hydrox As CaCO3	MG/L		< 2.0000	< 2.0000	< 2.0000
Aluminum, Dissolved	MG/L	< 0.0500			
Antimony, Dissolved	UG/L	< 1.0000			
Arsenic, Dissolved	UG/L	< 1.0000			
Barium, Dissolved	UG/L	40.0000			
Boron, Dissolved	UG/L	60.0000	130.0000	120.0000	170.0000
Cadmium, Dissolved	UG/L	< 5.0000			
Calcium, Dissolved	MG/L	341.0000	533.0000	285.0000	406.0000
C.O.D.	MG/L	195.0000			
Chloride	MG/L	55.0000	62.0000	45.0000	46.0000
Chromium, Dissolved	UG/L	< 10.0000			
Conductivity	UMHOS/CM	3230.0000	4160.0000	3120.0000	3580.0000
Copper, Dissolved	UG/L	< 10.0000			
Fluoride	MG/L	0.7500	0.5000	0.5000	0.9000
Hardness As CaCO3	MG/L	2238.0000	2510.0000	1750.0000	2000.0000
Iron, Total	MG/L	78.0000	< 0.0300	11.4000	0.2200
Iron, Dissolved	MG/L	< 0.0200	< 0.0500	< 0.0200	B 0.0500
Lead, Dissolved	UG/L	< 20.0000			
Magnesium, Dissolved	MG/L	338.0000	286.0000	253.0000	239.0000
Manganese, Total	MG/L	1.0500	B 0.0700	0.2000	B 0.0400
Manganese, Dissolved	MG/L	0.0500	B 0.0800	0.0500	B 0.0300
Mercury, Dissolved	UG/L	< 0.1000			
Molybdenum, Dissolved	UG/L	9.0000			
Nickel, Dissolved	UG/L	< 20.0000			
Ammonia Nitrogen_N	MG/L	0.2400			
Nitrate Nitrogen_N	MG/L	1.2200	1.4600	0.7300	1.2600
Nitrite Nitrogen_N	MG/L	< 0.0100	B 0.0100	B 0.0100	0.0500
NO3_NO2 Nitrogen_N	MG/L	1.2200	1.4700	0.7400	1.3100
Ph At 25 Deg. Cent.	UNITS	7.8000	8.0000	7.8000	8.2000
Phosphorus, Orthophos	MG/L	0.0290			
Potassium, Dissolved	MG/L	8.0000	13.9000	15.0000	11.7000
Selenium, Dissolved	UG/L	< 1.0000			

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
CG78 - DINNEBITO UNAFFECT
01/01/1987-00:00 to 12/31/2024-23:59

Parameters	Units	03/01/1990 11:25	04/07/1997 13:40	01/26/1998 14:40	07/29/1999 13:35
Laboratory Parameters					
Silica, Dissolved	MG/L	3.8000	12.0000	7.6000	12.1000
Silver, Dissolved	UG/L	< 10.0000			
Sodium, Dissolved	MG/L	110.0000	292.0000	280.0000	232.0000
Solids, Dissolved	MG/L	3410.0000	4100.0000	3230.0000	3660.0000
Solids, Suspended	MG/L	750.0000	< 5.0000	488.0000	< 5.0000
Sulfate	MG/L	2321.0000	2550.0000	2060.0000	2380.0000
Vanadium, Dissolved	UG/L	< 10.0000			
Zinc, Dissolved	MG/L	< 0.0100			
Bicarbonate As HCO3	MG/L	89.0000	313.0000	174.0000	186.0000
Carbonate As CO3	MG/L	0.0000	< 2.0000	< 2.0000	< 2.0000
Hydroxide As OH	MG/L		< 2.0000	< 2.0000	< 2.0000
Phosphate As PO4	MG/L	0.1000			
Cation_Anion Balance	%	-1.9200	2.2000	0.2000	-3.9000
SAR	%	1.0200	2.5700	2.9500	2.2900
Solids, Diss. (Calc)	MG/L	3209.0000	3900.0000	3040.0000	3430.0000
Sum Of Anions	MEQ/L		60.5000	47.5000	54.5000
Sum Of Cations	MEQ/L		63.3000	47.7000	50.4000
Total Recoverable Al	MG/L	40.0000	< 0.0900	11.8000	0.6100
Total Recoverable As	UG/L	5.0000	< 1.0000	< 1.0000	< 1.0000
Total Recoverable Ba	UG/L	750.0000			
Total Recoverable Cd	UG/L	< 25.0000	< 9.0000	< 6.0000	< 6.0000
Total Recoverable Cr	UG/L	50.0000	B 30.0000	< 20.0000	< 20.0000
Total Recoverable Cu	UG/L	50.0000	B 30.0000	B 30.0000	< 20.0000
Total Recoverable Fe	MG/L	60.0000			
Total Recoverable Pb	UG/L	< 20.0000	< 200.0000	< 80.0000	< 80.0000
Total Recoverable Mn	MG/L	1.0000			
Total Recoverable Hg	UG/L	< 0.1000	< 0.2000	B 0.4000	< 0.2000
Total Recoverable Mo	UG/L	10.0000			
Total Recoverable Ni	UG/L	150.0000			
Total Recoverable Se	UG/L	< 1.0000	B 2.0000	B 2.0000	B 4.0000
Total Recoverable Ag	UG/L	< 50.0000			
Total Recoverable Zn	MG/L	0.2500	< 0.0300	B 0.0500	< 0.0200
TDS Ratio	%	1.0600	1.0500	1.0600	1.0700
Total Recoverable Sb	UG/L	2.0000			
Total Recoverable V	UG/L	100.0000	< 20.0000	B 20.0000	< 10.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J19-RA-P - PERM INT IMPOUND
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	09/07/2022 12:49	05/23/2023 14:40	02/28/2024 13:25
Field Parameters				
Field Ph	S.U.	7.9200	8.9400	8.1700
Temperature	C	26.7000	21.2000	10.6000
Conductivity	UMHOS/CM	280.0000	437.0000	494.0000
Field Salinity	0/00	0.1000	0.2000	0.2000
Laboratory Parameters				
Alk As CaCO3, Ph 4.5	MG/L	74.7000	87.8000	77.1000
Alk, Bicarb As CaCO3	MG/L	74.7000	87.8000	77.1000
Alk, Carb As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L	2.8000		
Aluminum, Dissolved	MG/L	< 0.0500	< 0.0500	< 0.0500
Arsenic, Total	UG/L	2.7700	2.0700	1.0300
Arsenic, Dissolved	UG/L	1.3800	B 1.3900	B 0.7100
Boron, Dissolved	UG/L	< 30.0000	B 44.0000	B 84.0000
Cadmium, Total	UG/L	B 0.0530	B 0.1230	B 0.0720
Cadmium, Dissolved	UG/L	< 0.0500	< 0.1000	B 0.0610
Calcium, Dissolved	MG/L	33.9000	46.9000	46.7000
Chloride	MG/L	6.8600	29.7000	30.4000
Chromium, Total	UG/L	< 20.0000	< 20.0000	< 20.0000
Chromium, Dissolved	UG/L	< 20.0000	< 20.0000	< 20.0000
Conductivity	UMHOS/CM	258.0000	441.0000	567.0000
Copper, Total	UG/L	< 10.0000	< 10.0000	< 10.0000
Copper, Dissolved	UG/L	2.1100	< 1.6000	2.5000
Fluoride	MG/L	0.3600	0.3800	0.4800
Hardness As CaCO3	MG/L	108.0000	179.0000	227.0000
Iron, Total	MG/L	2.8400	0.2370	0.8420
Iron, Dissolved	MG/L	< 0.0600	< 0.0600	< 0.0600
Lead, Total	UG/L	2.8800	0.9300	0.7100
Lead, Dissolved	UG/L	< 0.1000	< 0.2000	< 0.1000
Magnesium, Dissolved	MG/L	5.5500	15.1000	26.8000
Manganese, Total	MG/L	0.0890	0.1440	B 0.0200
Manganese, Dissolved	MG/L	B 0.0440	0.0760	< 0.0100
Mercury, Total	UG/L	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	0.2160	B 0.0460	0.1280
Nitrite Nitrogen_N	MG/L	B 0.0300	< 0.0100	< 0.0100
NO3_NO2 Nitrogen_N	MG/L	0.2460	B 0.0460	0.1280
Ph At 25 Deg. Cent.	UNITS	7.0000	8.1000	6.9000
Potassium, Dissolved	MG/L	5.5900	6.4700	11.9000
Selenium, Total	UG/L	< 2.0000	< 2.0000	< 2.0000
Silica, Dissolved	MG/L	5.8000	B 0.9000	< 0.2000
Sodium, Dissolved	MG/L	4.5100	15.0000	27.1000
Solids, Dissolved	MG/L	220.0000	300.0000	332.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J19-RA-P - PERM INT IMPOUND
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	09/07/2022 12:49	05/23/2023 14:40	02/28/2024 13:25
Laboratory Parameters				
Solids, Suspended	MG/L	< 5.0000	B 14.0000	B 14.0000
Sulfate	MG/L	38.4000	98.2000	166.0000
Vanadium, Total	UG/L	B 12.0000	< 10.0000	< 10.0000
Vanadium, Dissolved	UG/L	< 10.0000	< 10.0000	< 10.0000
Zinc, Total	MG/L	< 0.0200	< 0.0200	< 0.0200
Zinc, Dissolved	MG/L	B 0.0460	< 0.0200	< 0.0200
Chromium_3	UG/L	< 20.0000	< 20.0000	< 20.0000
Chromium_6	UG/L	< 5.0000	< 5.0000	< 5.0000
Bicarbonate As HCO3	MG/L	91.1000	107.0000	94.1000
Carbonate As CO3	MG/L	< 2.0000	< 2.0000	< 2.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%	< 0.0000	< -3.3000	0.8000
SAR	%	0.1900	0.4900	0.7900
Solids, Diss. (Calc)	MG/L	149.0000	267.0000	356.0000
Sum Of Anions	MEQ/L	2.5000	4.7000	5.9000
Sum Of Cations	MEQ/L	2.5000	4.4000	6.0000
TDS Ratio	%	1.4800	1.1200	0.9300
Aluminum, Acid-soluble	mg/l		< 0.0500	1.2800

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-A1-P - PERM INT IMPOUND J21-A1
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	10/02/2003 10:34	01/16/2004 09:18	07/14/2004 10:17	01/20/2005 11:20	07/08/2005 11:40	01/20/2006 14:55	01/16/2007 12:28	07/23/2007 14:51	01/25/2008 12:37
Field Parameters										
Field Ph	S.U.	8.2600	8.4600	8.3600	8.7100	9.0800	9.4200	7.5200	8.0100	9.7500
Temperature	C	13.1000	1.0000	21.5000	3.7000	23.8000	1.2000	0.8000	25.0000	1.9000
Conductivity	UMHOS/CM	201.0000	182.0000	305.0000	148.0000	417.0000	551.0000	322.0000	188.0000	249.0000
Field Salinity	0/00	0.1000	0.1000	0.1000	0.1000	0.2000	0.3000	0.2000	0.1000	0.1000
Laboratory Parameters										
Alk As CaCO3, Ph 4.5	MG/L	81.0000	84.0000	155.0000	52.0000	144.0000	79.0000	146.0000	59.0000	115.0000
Alk, Bicarb As CaCO3	MG/L	81.0000	84.0000	155.0000	52.0000	128.0000	70.0000	146.0000	59.0000	77.0000
Alk, Carb As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	16.0000	B 9.0000	< 2.0000	< 2.0000	38.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L									
Aluminum, Dissolved	MG/L									
Arsenic, Total	UG/L									
Arsenic, Dissolved	UG/L									
Boron, Dissolved	UG/L	B 40.0000	B 30.0000	70.0000	B 20.0000	50.0000	100.0000	B 40.0000	B 40.0000	B 40.0000
Cadmium, Total	UG/L									
Cadmium, Dissolved	UG/L									< 5.0000
Calcium, Dissolved	MG/L	33.9000	31.3000	45.6000	21.0000	54.5000	56.5000	51.8000	25.7000	44.6000
Chloride	MG/L	B 4.0000	B 4.0000	8.0000	B 3.0000	11.0000	27.0000	5.0000	6.0000	B 4.0000
Chromium, Total	UG/L									
Chromium, Dissolved	UG/L									< 10.0000
Conductivity	UMHOS/CM	213.0000	191.0000	339.0000	152.0000	418.0000	494.0000	337.0000	207.0000	265.0000
Copper, Total	UG/L									
Copper, Dissolved	UG/L									< 10.0000
Fluoride	MG/L	B 0.5000	0.5000	0.7000	B 0.3000	0.6000	0.8000	B 0.4000	0.6000	B 0.4000
Hardness As CaCO3	MG/L	107.0000	101.0000	163.0000	72.0000	193.0000	247.0000	171.0000	84.0000	144.0000
Iron, Total	MG/L	5.5000	1.8200	8.8100	2.5000	1.7000	0.5100	0.0900	14.8000	B 0.0300
Iron, Dissolved	MG/L	0.0900	0.1700	B 0.0100	0.0800	< 0.0200	< 0.0200	0.1100	0.0600	< 0.0200
Lead, Total	UG/L									
Lead, Dissolved	UG/L									< 40.0000
Magnesium, Dissolved	MG/L	5.5000	5.6000	11.9000	4.7000	13.9000	25.8000	10.1000	4.7000	7.8000
Manganese, Total	MG/L	0.1220	0.0950	0.6870	0.1120	0.1880	B 0.0290	0.1620	0.1710	0.0380
Manganese, Dissolved	MG/L	0.0450	0.0730	0.0620	< 0.0050	B 0.0080	B 0.0210	0.1690	B 0.0220	0.0390
Mercury, Total	UG/L			< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	0.7300	0.2500	< 0.0200	0.1300	< 0.0200	< 0.0200	0.1200	0.8700	B 0.0500
Nitrite Nitrogen_N	MG/L	0.0600	< 0.0100	< 0.0100	B 0.0100	< 0.0100	< 0.0100	< 0.0100	B 0.0500	< 0.0100
NO3_NO2 Nitrogen_N	MG/L	0.7900	0.2500	< 0.0200	0.1400	< 0.0200	< 0.0200	0.1200	0.9200	B 0.0500
Ph At 25 Deg. Cent.	UNITS	7.9000	7.9000	7.0000	7.7000	8.7000	8.8000	8.1000	7.6000	9.3000
Potassium, Dissolved	MG/L	4.8000	4.3000	7.1000	3.2000	6.4000	8.4000	8.3000	7.0000	6.0000
Selenium, Total	UG/L									
Silica, Dissolved	MG/L	8.6000	7.0000	4.4000	6.1000	2.1000	< 0.2000	5.8000	8.0000	6.5000
Sodium, Dissolved	MG/L	4.3000	2.8000	7.3000	4.1000	11.1000	25.4000	4.4000	4.6000	4.2000
Solids, Dissolved	MG/L	140.0000	130.0000	220.0000	100.0000	250.0000	410.0000	140.0000	130.0000	190.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-A1-P - PERM INT IMPOUND J21-A1
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	10/02/2003 10:34	01/16/2004 09:18	07/14/2004 10:17	01/20/2005 11:20	07/08/2005 11:40	01/20/2006 14:55	01/16/2007 12:28	07/23/2007 14:51	01/25/2008 12:37
Laboratory Parameters										
Solids, Suspended	MG/L	B 10.0000	< 5.0000	170.0000	28.0000	48.0000	< 5.0000	< 5.0000	210.0000	< 5.0000
Sulfate	MG/L	B 30.0000	B 20.0000	B 30.0000	B 30.0000	60.0000	190.0000	B 20.0000	B 30.0000	B 20.0000
Vanadium, Total	UG/L									
Vanadium, Dissolved	UG/L									< 5.0000
Zinc, Total	MG/L									
Zinc, Dissolved	MG/L									< 0.0100
Chromium_3	UG/L									
Chromium_6	UG/L									
Bicarbonate As HCO3	MG/L	< 2.0000	103.0000	190.0000	64.0000	156.0000	85.0000	178.0000	72.0000	94.0000
Carbonate As CO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	B 9.0000	B 6.0000	< 2.0000	< 2.0000	23.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%	0.0000	0.0000	-2.6000	0.0000	1.1000	-0.8000	4.1000	0.0000	6.7000
SAR	%	0.1800	B 0.1200	0.2500	0.2100	0.3500	0.7100	B 0.1400	0.2200	0.1500
Solids, Diss. (Calc)	MG/L	144.0000	127.0000	208.0000	104.0000	252.0000	385.0000	194.0000	126.0000	178.0000
Sum Of Anions	MEQ/L	2.4000	2.2000	3.9000	1.7000	4.4000	6.3000	3.5000	2.0000	2.8000
Sum Of Cations	MEQ/L	2.4000	2.2000	3.7000	1.7000	4.5000	6.2000	3.8000	2.0000	3.2000
Total Recoverable Al	MG/L	7.8000	5.2700	11.4000	3.6300	2.5200	0.8500	B 0.1400	20.9000	< 0.0300
Total Recoverable As	UG/L	5.2000	2.8000	6.0000	B 1.7000	B 2.3000	B 1.6000	1.6000	5.2000	2.1000
Total Recoverable Cd	UG/L	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000
Total Recoverable Cr	UG/L	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000
Total Recoverable Cu	UG/L	B 20.0000	B 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	B 20.0000	< 10.0000
Total Recoverable Pb	UG/L	< 40.0000	< 40.0000	< 40.0000	< 40.0000	< 40.0000	< 40.0000	< 40.0000	< 40.0000	< 40.0000
Total Recoverable Hg	UG/L	< 0.2000	< 0.2000							
Total Recoverable Se	UG/L	< 1.0000	< 1.0000	B 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000
Total Recoverable Zn	MG/L	0.0700	B 0.0300	B 0.0400	B 0.0100	< 0.0100	< 0.0100	< 0.0100	0.0800	< 0.0100
TDS Ratio	%	0.9700	1.0200	1.0600	0.9600	0.9900	1.0600	0.7200	1.0300	1.0700
Total Recoverable V	UG/L	B 14.0000	B 13.0000	B 18.0000	B 6.0000	< 5.0000	< 5.0000	< 5.0000	44.0000	< 5.0000
Uranium, Dissolved	UG/L									

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-A1-P - PERM INT IMPOUND J21-A1
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	08/15/2008 10:15	02/06/2009 14:40	03/22/2010 14:05	08/18/2021 11:11
Field Parameters					
Field Ph	S.U.	7.8800	9.1800	8.4900	7.9600
Temperature	C	20.8000	1.3000	18.8000	20.1000
Conductivity	UMHOS/CM	213.0000	322.0000	274.0000	210.0000
Field Salinity	0/00	0.1000	0.1000	0.1000	0.1000
Laboratory Parameters					
Alk As CaCO3, Ph 4.5	MG/L	79.0000	137.0000	61.0000	104.0000
Alk, Bicarb As CaCO3	MG/L	79.0000	123.0000	58.0000	104.0000
Alk, Carb As CaCO3	MG/L	< 2.0000	B 14.0000	B 3.0000	< 2.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L				17.0000
Aluminum, Dissolved	MG/L	B 0.0400		B 0.0500	< 0.0500
Arsenic, Total	UG/L				6.5500
Arsenic, Dissolved	UG/L				2.1100
Boron, Dissolved	UG/L	B 40.0000	60.0000	B 40.0000	< 30.0000
Cadmium, Total	UG/L				0.3330
Cadmium, Dissolved	UG/L			< 5.0000	B 0.0590
Calcium, Dissolved	MG/L	31.2000	50.5000	41.7000	42.2000
Chloride	MG/L	B 4.0000	B 5.0000	< 1.0000	3.1000
Chromium, Total	UG/L				B 45.0000
Chromium, Dissolved	UG/L	< 10.0000		< 10.0000	< 20.0000
Conductivity	UMHOS/CM	232.0000	330.0000	292.0000	229.0000
Copper, Total	UG/L				< 20.0000
Copper, Dissolved	UG/L	< 10.0000		< 10.0000	3.3600
Fluoride	MG/L	B 0.5000	0.7000	B 0.5000	0.4700
Hardness As CaCO3	MG/L	106.0000	173.0000	136.0000	125.0000
Iron, Total	MG/L	6.1700	< 0.0200	0.2300	14.5000
Iron, Dissolved	MG/L	B 0.0400	< 0.0200	< 0.0200	< 0.0600
Lead, Total	UG/L				14.1000
Lead, Dissolved	UG/L			< 40.0000	< 0.1000
Magnesium, Dissolved	MG/L	6.7000	11.3000	7.7000	4.6600
Manganese, Total	MG/L	0.0810	< 0.0050	B 0.0120	0.4370
Manganese, Dissolved	MG/L	B 0.0210	< 0.0050	< 0.0050	0.2260
Mercury, Total	UG/L	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	0.6900	B 0.0900	1.0400	B 0.0600
Nitrite Nitrogen_N	MG/L	B 0.0300	< 0.0100	B 0.0500	B 0.0300
NO3_NO2 Nitrogen_N	MG/L	0.7200	B 0.0900	1.0900	B 0.0850
Ph At 25 Deg. Cent.	UNITS	8.3000	8.8000	8.5000	8.0000
Potassium, Dissolved	MG/L	5.4000	5.8000	5.6000	7.2600
Selenium, Total	UG/L				< 2.0000
Silica, Dissolved	MG/L	6.5000	3.8000	3.1000	8.5000
Sodium, Dissolved	MG/L	4.7000	5.9000	3.6000	2.8700
Solids, Dissolved	MG/L	180.0000	210.0000	190.0000	550.0000
Solids, Suspended	MG/L	B 14.0000	< 5.0000	< 5.0000	B 8.0000
Sulfate	MG/L	34.0000	33.0000	65.0000	< 1.0000
Vanadium, Total	UG/L				B 50.0000
Vanadium, Dissolved	UG/L	< 5.0000			< 10.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-A1-P - PERM INT IMPOUND J21-A1
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	08/15/2008 10:15	02/06/2009 14:40	03/22/2010 14:05	08/18/2021 11:11
Laboratory Parameters					
Zinc, Total	MG/L				B 0.0750
Zinc, Dissolved	MG/L	< 0.0100		< 0.0100	< 0.0200
Chromium_3	UG/L				< 20.0000
Chromium_6	UG/L				< 5.0000
Bicarbonate As HCO3	MG/L	96.0000	150.0000	71.0000	127.0000
Carbonate As CO3	MG/L	< 2.0000	B 8.0000	< 2.0000	< 2.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%	0.0000	2.7000	5.3000	12.0000
SAR	%	0.2000	0.1900	B 0.1300	0.1100
Solids, Diss. (Calc)	MG/L	144.0000	204.0000	171.0000	135.0000
Sum Of Anions	MEQ/L	2.4000	3.6000	2.7000	2.2000
Sum Of Cations	MEQ/L	2.4000	3.8000	3.0000	2.8000
Total Recoverable Al	MG/L	9.6300	B 0.0400	0.6700	
Total Recoverable As	UG/L	3.6000	B 1.0000	< 1.0000	
Total Recoverable Cd	UG/L	< 5.0000	< 5.0000	< 5.0000	
Total Recoverable Cr	UG/L	< 10.0000	< 10.0000	< 10.0000	
Total Recoverable Cu	UG/L	< 10.0000	B 20.0000	< 10.0000	
Total Recoverable Pb	UG/L	< 40.0000	< 40.0000	< 40.0000	
Total Recoverable Hg	UG/L				
Total Recoverable Se	UG/L	< 1.0000	< 1.0000	< 1.0000	
Total Recoverable Zn	MG/L	B 0.0200	< 0.0100	< 0.0100	
TDS Ratio	%	1.2500	1.0300	1.1100	4.0700
Total Recoverable V	UG/L	B 19.0000	< 5.0000	< 5.0000	
Uranium, Dissolved	UG/L			1.7000	

Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	08/28/1995 12:05	09/07/1999 16:30	09/17/1999 14:50	07/31/2006 13:45	08/31/2006 08:40	10/10/2006 12:40	10/26/2006 11:55	08/20/2007 12:30	08/22/2007 13:50
Field Parameters										
Field Ph	S.U.	7.4900							8.1700	8.1600
Temperature	C	21.3000							21.5000	25.5000
Conductivity	UMHOS/CM								373.0000	379.0000
Field Salinity	0/00								0.2000	0.2000
Laboratory Parameters										
Alk As CaCO3, Ph 4.5	MG/L									
Alk, Bicarb As CaCO3	MG/L									
Alk, Carb As CaCO3	MG/L									
Alk, Hydrox As CaCO3	MG/L									
Aluminum, Total	MG/L									
Aluminum, Dissolved	MG/L									
Arsenic, Total	UG/L									
Arsenic, Dissolved	UG/L									
Boron, Dissolved	UG/L									
Cadmium, Total	UG/L									
Cadmium, Dissolved	UG/L									
Calcium, Dissolved	MG/L									
Chloride	MG/L									
Chromium, Total	UG/L									
Chromium, Dissolved	UG/L									
Conductivity	UMHOS/CM									
Copper, Total	UG/L									
Copper, Dissolved	UG/L									
Fluoride	MG/L									
Hardness As CaCO3	MG/L									
Iron, Total	MG/L	9.5100	0.4400	0.5100	5.1900	3.2900	5.3200	5.4000	3.3100	2.8700
Iron, Dissolved	MG/L									
Lead, Total	UG/L									
Lead, Dissolved	UG/L									
Magnesium, Dissolved	MG/L									
Manganese, Total	MG/L									
Manganese, Dissolved	MG/L									
Mercury, Total	UG/L									
Nitrate Nitrogen_N	MG/L									
Nitrite Nitrogen_N	MG/L									
NO3_NO2 Nitrogen_N	MG/L									
Ph At 25 Deg. Cent.	UNITS									
Potassium, Dissolved	MG/L									
Selenium, Total	UG/L									
Selenium, Dissolved	UG/L									
Silica, Dissolved	MG/L									
Sodium, Dissolved	MG/L									

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	08/28/1995 12:05	09/07/1999 16:30	09/17/1999 14:50	07/31/2006 13:45	08/31/2006 08:40	10/10/2006 12:40	10/26/2006 11:55	08/20/2007 12:30	08/22/2007 13:50
Laboratory Parameters										
Solids, Dissolved	MG/L									
Solids, Suspended	MG/L		26.0000	24.0000	50.0000	< 5.0000	56.0000	28.0000	66.0000	62.0000
Sulfate	MG/L									
Vanadium, Total	UG/L									
Vanadium, Dissolved	UG/L									
Zinc, Total	MG/L									
Zinc, Dissolved	MG/L									
Chromium_3	UG/L									
Chromium_6	UG/L									
Bicarbonate As HCO3	MG/L									
Carbonate As CO3	MG/L									
Hydroxide As OH	MG/L									
Cation_Anion Balance	%									
SAR	%									
Solids, Diss. (Calc)	MG/L									
Sum Of Anions	MEQ/L									
Sum Of Cations	MEQ/L									
Total Recoverable Al	MG/L									
Total Recoverable As	UG/L									
Total Recoverable Cd	UG/L									
Total Recoverable Cr	UG/L									
Total Recoverable Cu	UG/L									
Total Recoverable Pb	UG/L									
Total Recoverable Se	UG/L									
Total Recoverable Zn	MG/L									
TDS Ratio	%									
Total Recoverable V	UG/L									
Aluminum, Acid-soluble	mg/l									

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	02/17/2008 09:20	02/27/2008 09:40	08/12/2008 10:30	06/23/2015 07:18	08/18/2015 12:03	03/18/2016 14:35	09/09/2016 11:33	08/03/2017 13:14	07/25/2018 11:54
Field Parameters										
Field Ph	S.U.	8.5600	8.3800	7.9100	8.0400	8.0400	9.0700	7.9400	7.7800	8.1600
Temperature	C	0.4000	1.3000	20.2000	19.1000	18.0000	13.8000	22.8000	26.0000	17.7000
Conductivity	UMHOS/CM	341.0000	190.0000	342.0000	1394.0000	307.0000	211.0000	286.0000	229.0000	228.0000
Field Salinity	0/00	0.2000	0.1000	0.2000	0.7000	0.1000	0.0000	0.1000	0.1000	0.1000
Laboratory Parameters										
Alk As CaCO3, Ph 4.5	MG/L		76.0000	58.0000	87.8000	108.0000	98.0000	106.0000	98.4000	95.3000
Alk, Bicarb As CaCO3	MG/L		76.0000	58.0000	87.8000	108.0000	91.2000	106.0000	98.4000	95.3000
Alk, Carb As CaCO3	MG/L		< 2.0000	< 2.0000	< 2.0000	< 2.0000	B 6.8000	< 2.0000	< 2.0000	< 2.0000
Alk, Hydrox As CaCO3	MG/L		< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L				5.8400	7.0700	0.0270	7.2700	14.2000	18.2000
Aluminum, Dissolved	MG/L			B 0.0400	B 0.1100	B 0.0600	< 0.0300	B 0.0400	B 0.1300	B 0.1800
Arsenic, Total	UG/L				4.6000	5.4000	B 0.8000	3.3000	5.7000	7.0000
Arsenic, Dissolved	UG/L				B 1.0000	2.4000	B 0.8000	1.2000	B 1.0000	1.8000
Boron, Dissolved	UG/L		B 10.0000	B 40.0000	B 20.0000	B 40.0000	B 30.0000	B 40.0000	B 40.0000	B 30.0000
Cadmium, Total	UG/L				B 0.2000	B 0.2000	< 0.1000	B 0.2000	0.9000	< 0.5000
Cadmium, Dissolved	UG/L		< 5.0000		< 0.1000	< 0.1000	< 0.1000	< 0.1000	B 0.2000	< 0.1000
Calcium, Dissolved	MG/L		28.5000	34.7000	26.6000	35.4000	27.5000	37.5000	28.6000	30.1000
Chloride	MG/L		5.0000	B 5.0000	3.0000	5.1000	2.4000	2.5000	7.3000	3.2000
Chromium, Total	UG/L				< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	B 20.0000
Chromium, Dissolved	UG/L		< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000
Conductivity	UMHOS/CM		279.0000	455.0000	254.0000	308.0000	217.0000	287.0000	406.0000	218.0000
Copper, Total	UG/L				< 10.0000	< 10.0000	< 10.0000	< 10.0000	B 20.0000	< 10.0000
Copper, Dissolved	UG/L		< 10.0000	< 10.0000	4.5000	B 2.5000	B 3.0000	B 2.2000	5.0000	3.4000
Fluoride	MG/L		B 0.3000	0.6000	0.4900	0.3900	B 0.2800	0.3400	0.3600	0.4000
Hardness As CaCO3	MG/L		106.0000	121.0000	93.0000	122.0000	93.0000	123.0000	105.0000	95.0000
Iron, Total	MG/L	5.5100	3.7100	3.7500	5.7300	6.4600	< 0.0200	4.3200	10.5000	15.5000
Iron, Dissolved	MG/L		0.1200	0.0700	0.1100	B 0.0500	< 0.0200	< 0.0200	0.2300	0.1600
Lead, Total	UG/L				7.6000		< 0.1000	5.2000	11.7000	14.7000
Lead, Dissolved	UG/L		< 40.0000		B 0.3000	B 0.2000	< 0.1000	< 0.1000	B 0.2000	B 0.3000
Magnesium, Dissolved	MG/L		8.4000	8.4000	6.5000	8.2000	5.8000	7.2000	8.2000	4.8000
Manganese, Total	MG/L		0.0580	0.0520	0.0690	0.2530	< 0.0050	0.3420	0.1910	0.3190
Manganese, Dissolved	MG/L		B 0.0080	B 0.0100	B 0.0060	0.0960	< 0.0050	0.2260	0.0490	0.1160
Mercury, Total	UG/L		< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L		1.4700	1.2300	B 0.0300	0.3600	< 0.0200	B 0.0400	0.2300	< 0.0200
Nitrite Nitrogen_N	MG/L		B 0.0400	B 0.0500	< 0.0100	B 0.0200	< 0.0100	< 0.0100	< 0.0100	< 0.0100
NO3_NO2 Nitrogen_N	MG/L		1.5100	1.2800	B 0.0300	0.3800	< 0.0200	B 0.0400	0.2400	< 0.0200
Ph At 25 Deg. Cent.	UNITS		8.2000	8.2000	8.1000	8.3000	8.7000	8.3000	7.7000	8.1000
Potassium, Dissolved	MG/L		4.5000	5.9000	4.5000	6.1000	5.2000	6.8000	6.1000	6.1000
Selenium, Total	UG/L				< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000	< 1.0000
Selenium, Dissolved	UG/L					7.2000				
Silica, Dissolved	MG/L		6.1000	4.8000	6.1000	7.1000	1.4000	6.7000	7.2000	7.6000
Sodium, Dissolved	MG/L		14.1000	37.9000	12.6000	11.3000	5.1000	5.8000	8.9000	4.3000
Solids, Dissolved	MG/L		210.0000	270.0000	228.0000	296.0000	132.0000	290.0000	484.0000	640.0000
Solids, Suspended	MG/L	112.0000	94.0000	< 5.0000	< 5.0000	31.0000	< 5.0000	< 5.0000	B 48.0000	70.0000
Sulfate	MG/L		78.0000	118.0000	39.9000	37.2000	19.4000	42.3000	131.0000	14.2000
Vanadium, Total	UG/L				B 23.0000	B 22.0000	< 5.0000	B 15.0000	32.0000	42.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	02/17/2008 09:20	02/27/2008 09:40	08/12/2008 10:30	06/23/2015 07:18	08/18/2015 12:03	03/18/2016 14:35	09/09/2016 11:33	08/03/2017 13:14	07/25/2018 11:54
Laboratory Parameters										
Vanadium, Dissolved	UG/L		< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000
Zinc, Total	MG/L				B 0.0300	0.2800	< 0.0100	B 0.0200	0.0600	0.3600
Zinc, Dissolved	MG/L		< 0.0100	0.0600	< 0.0100	0.0600	< 0.0100	< 0.0100	< 0.0100	B 0.0300
Chromium_3	UG/L				< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000
Chromium_6	UG/L				< 5.0000	< 5.0000	< 5.0000	< 5.0000	B 6.0000	< 5.0000
Bicarbonate As HCO3	MG/L		92.0000	70.0000	107.0000	132.0000	111.0000	129.0000	120.0000	116.0000
Carbonate As CO3	MG/L		< 2.0000	< 2.0000	< 2.0000	< 2.0000	B 4.1000	< 2.0000	< 2.0000	< 2.0000
Hydroxide As OH	MG/L		< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%		-9.7000	3.7000	< -1.9000	< 0.0000	< -6.4000	< -3.3000	< -29.9000	< 0.0000
SAR	%		0.6000	1.5100	0.5700	0.4500	0.2300	0.2300	0.3800	0.1900
Solids, Diss. (Calc)	MG/L		197.0000	256.0000	155.0000	181.0000	127.0000	176.0000	261.0000	131.0000
Sum Of Anions	MEQ/L		3.4000	3.9000	2.7000	3.1000	2.5000	3.1000	5.0000	2.3000
Sum Of Cations	MEQ/L		2.8000	4.2000	2.6000	3.1000	2.2000	2.9000	2.7000	2.3000
Total Recoverable Al	MG/L		6.8500	8.1500						
Total Recoverable As	UG/L		1.4000	3.0000						
Total Recoverable Cd	UG/L		< 5.0000	< 5.0000						
Total Recoverable Cr	UG/L		< 10.0000	< 10.0000						
Total Recoverable Cu	UG/L		< 10.0000	< 10.0000						
Total Recoverable Pb	UG/L		< 40.0000	< 40.0000						
Total Recoverable Se	UG/L		< 1.0000	B 2.0000						
Total Recoverable Zn	MG/L		B 0.0400	0.1300						
TDS Ratio	%		1.0700	1.0500	1.4700	1.6400	1.0400	1.6500	1.8500	4.8900
Total Recoverable V	UG/L		B 21.0000	B 27.0000						
Aluminum, Acid-soluble	mg/l									

"B" -- Between MDL and PQL, "<" -- Less than detection limit

Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	04/05/2019 16:35	03/02/2020 14:42	07/29/2020 12:17	08/18/2021 11:35	07/28/2022 13:08	03/27/2023 09:58
Field Parameters							
Field Ph	S.U.	8.4800	9.4600	8.2100	8.0600	8.1800	8.4600
Temperature	C	9.2000	10.2000	20.0000	20.9000	20.7000	4.2000
Conductivity	UMHOS/CM	29.0000	238.0000	264.0000	332.0000	309.0000	248.0000
Field Salinity	0/00	0.1000	0.1000	0.1000	0.2000	0.1000	0.1000
Laboratory Parameters							
Alk As CaCO3, Ph 4.5	MG/L	90.8000	94.1000	106.0000	157.0000	137.0000	107.0000
Alk, Bicarb As CaCO3	MG/L	87.6000	79.9000	106.0000	157.0000	137.0000	107.0000
Alk, Carb As CaCO3	MG/L	B 3.3000	B 14.1000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Alk, Hydrox As CaCO3	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Aluminum, Total	MG/L	4.1000	B 0.0130	4.7000	2.6500	18.3000	3.5900
Aluminum, Dissolved	MG/L	B 0.1900	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Arsenic, Total	UG/L	2.1000	B 0.8000	4.2000	3.2200	7.8500	2.0500
Arsenic, Dissolved	UG/L	B 1.0000	B 1.0000	1.7000	2.1000	2.5800	B 0.7100
Boron, Dissolved	UG/L	< 20.0000	B 30.0000	B 30.0000	B 48.0000	< 30.0000	< 30.0000
Cadmium, Total	UG/L	B 0.1000	< 0.0500	0.6100	B 0.1090	0.3640	B 0.1450
Cadmium, Dissolved	UG/L	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Calcium, Dissolved	MG/L	29.6000	31.3000	33.9000	46.6000	46.3000	34.7000
Chloride	MG/L	B 1.9000	4.2000	3.6000	3.5700	5.2600	2.7400
Chromium, Total	UG/L	< 10.0000	< 10.0000	< 10.0000	< 40.0000	B 30.0000	< 20.0000
Chromium, Dissolved	UG/L	< 10.0000	< 10.0000	< 10.0000	< 20.0000	< 20.0000	< 20.0000
Conductivity	UMHOS/CM	225.0000	338.0000	265.0000	364.0000	385.0000	250.0000
Copper, Total	UG/L	< 10.0000	< 10.0000	< 10.0000	< 20.0000	B 21.0000	< 10.0000
Copper, Dissolved	UG/L	2.4000	6.2000	3.5000	B 1.8400	3.6700	2.4100
Fluoride	MG/L	B 0.7000	B 0.4000	B 0.8000	0.5300	< 4.5000	B 0.2700
Hardness As CaCO3	MG/L	104.0000	112.0000	110.0000	155.0000	156.0000	128.0000
Iron, Total	MG/L	2.7100	< 0.0300	4.7300	2.3300	13.0000	3.3600
Iron, Dissolved	MG/L	0.0700	< 0.0300	< 0.0600	< 0.0600	< 0.0600	< 0.0600
Lead, Total	UG/L	3.3000	< 0.1000	5.6000	2.4100	12.9000	2.9000
Lead, Dissolved	UG/L	< 0.1000	< 0.1000	< 0.1000	< 0.1000	< 0.1000	< 0.1000
Magnesium, Dissolved	MG/L	7.4000	8.3000	6.1000	9.3800	9.7500	10.1000
Manganese, Total	MG/L	0.1700	< 0.0100	0.1900	0.5830	0.6860	0.0530
Manganese, Dissolved	MG/L	0.0660	< 0.0100	0.1300	0.4450	0.4280	B 0.0380
Mercury, Total	UG/L	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000	< 0.2000
Nitrate Nitrogen_N	MG/L	0.5500	< 0.0200	< 0.0200	B 0.0800	B 0.0470	0.6790
Nitrite Nitrogen_N	MG/L	B 0.0200	< 0.0100	< 0.0100	B 0.0130	B 0.0230	B 0.0120
NO3_NO2 Nitrogen_N	MG/L	0.5700	< 0.0200	< 0.0200	B 0.0920	B 0.0700	0.6910
Ph At 25 Deg. Cent.	UNITS	8.4000	9.0000	8.1000	8.0000	7.9000	6.9000
Potassium, Dissolved	MG/L	4.3000	7.4000	6.2000	7.3000	6.9600	4.3400
Selenium, Total	UG/L	< 1.0000	< 1.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Selenium, Dissolved	UG/L						
Silica, Dissolved	MG/L	4.5000	2.1000	7.6000	9.8000	10.2000	4.8000
Sodium, Dissolved	MG/L	5.8000	8.2000	9.3000	6.2000	11.6000	12.4000
Solids, Dissolved	MG/L	216.0000	230.0000	244.0000	310.0000	620.0000	248.0000
Solids, Suspended	MG/L	B 9.0000	< 5.0000	49.0000	B 6.0000	120.0000	22.0000
Sulfate	MG/L	52.5000	< 1.0000	36.9000	< 1.0000	51.2000	123.0000
Vanadium, Total	UG/L	B 7.0000	B 6.0000	< 10.0000	< 20.0000	42.0000	< 10.0000

"B" -- Between MDL and PQL, "<" -- Less than detection limit

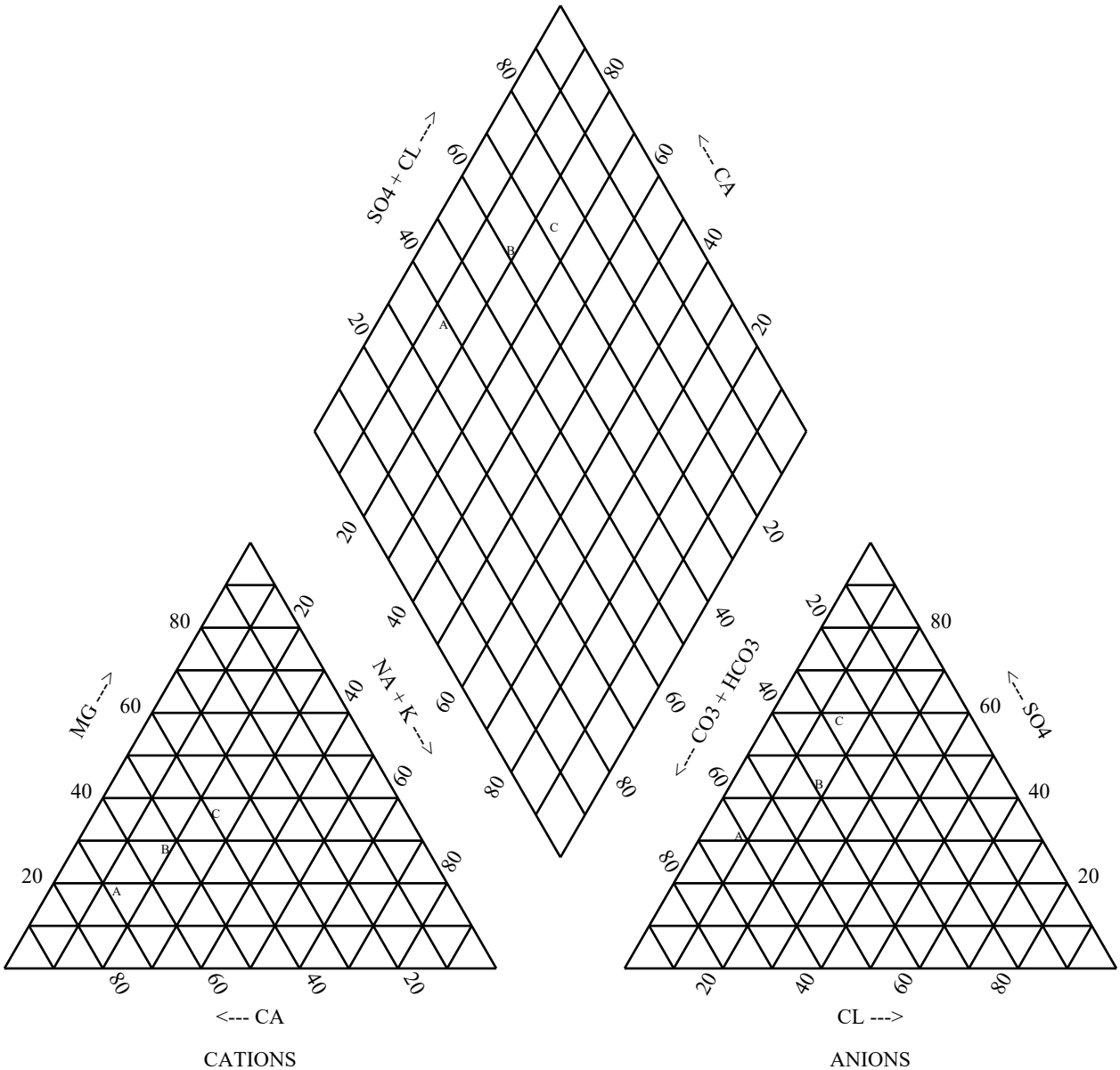
Water Quality Report
J21-C-P - PERM INT IMPOUND J21-C
01/01/1989-00:00 to 12/31/2024-23:59

Parameters	Units	04/05/2019 16:35	03/02/2020 14:42	07/29/2020 12:17	08/18/2021 11:35	07/28/2022 13:08	03/27/2023 09:58
Laboratory Parameters							
Vanadium, Dissolved	UG/L	< 5.0000	< 5.0000	< 10.0000	< 10.0000	< 10.0000	< 10.0000
Zinc, Total	MG/L	0.1500	< 0.0100	0.1500	< 0.0400	0.1910	0.0770
Zinc, Dissolved	MG/L	0.0700	< 0.0100	B 0.0400	< 0.0200	< 0.0200	B 0.0420
Chromium_3	UG/L	< 10.0000	< 10.0000	< 10.0000	< 20.0000	< 20.0000	< 20.0000
Chromium_6	UG/L	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000	< 5.0000
Bicarbonate As HCO3	MG/L	107.0000	97.5000	129.0000	192.0000	167.0000	130.0000
Carbonate As CO3	MG/L	< 2.0000	B 8.5000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Hydroxide As OH	MG/L	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000	< 2.0000
Cation_Anion Balance	%	< -10.7000	16.7000	< -3.4000	4.3000	< -2.6000	< -20.0000
SAR	%	0.2500	0.3400	0.3900	0.2200	0.4100	0.4800
Solids, Diss. (Calc)	MG/L	166.0000	120.0000	171.0000	183.0000	228.0000	259.0000
Sum Of Anions	MEQ/L	3.1000	2.0000	3.0000	3.3000	4.0000	4.8000
Sum Of Cations	MEQ/L	2.5000	2.8000	2.8000	3.6000	3.8000	3.2000
Total Recoverable Al	MG/L						
Total Recoverable As	UG/L						
Total Recoverable Cd	UG/L						
Total Recoverable Cr	UG/L						
Total Recoverable Cu	UG/L						
Total Recoverable Pb	UG/L						
Total Recoverable Se	UG/L						
Total Recoverable Zn	MG/L						
TDS Ratio	%	1.3000	1.9200	1.4300	1.6900	2.7200	0.9600
Total Recoverable V	UG/L						
Aluminum, Acid-soluble	mg/l						< 0.0500

"B" -- Between MDL and PQL, "<" -- Less than detection limit

J19-RA-P

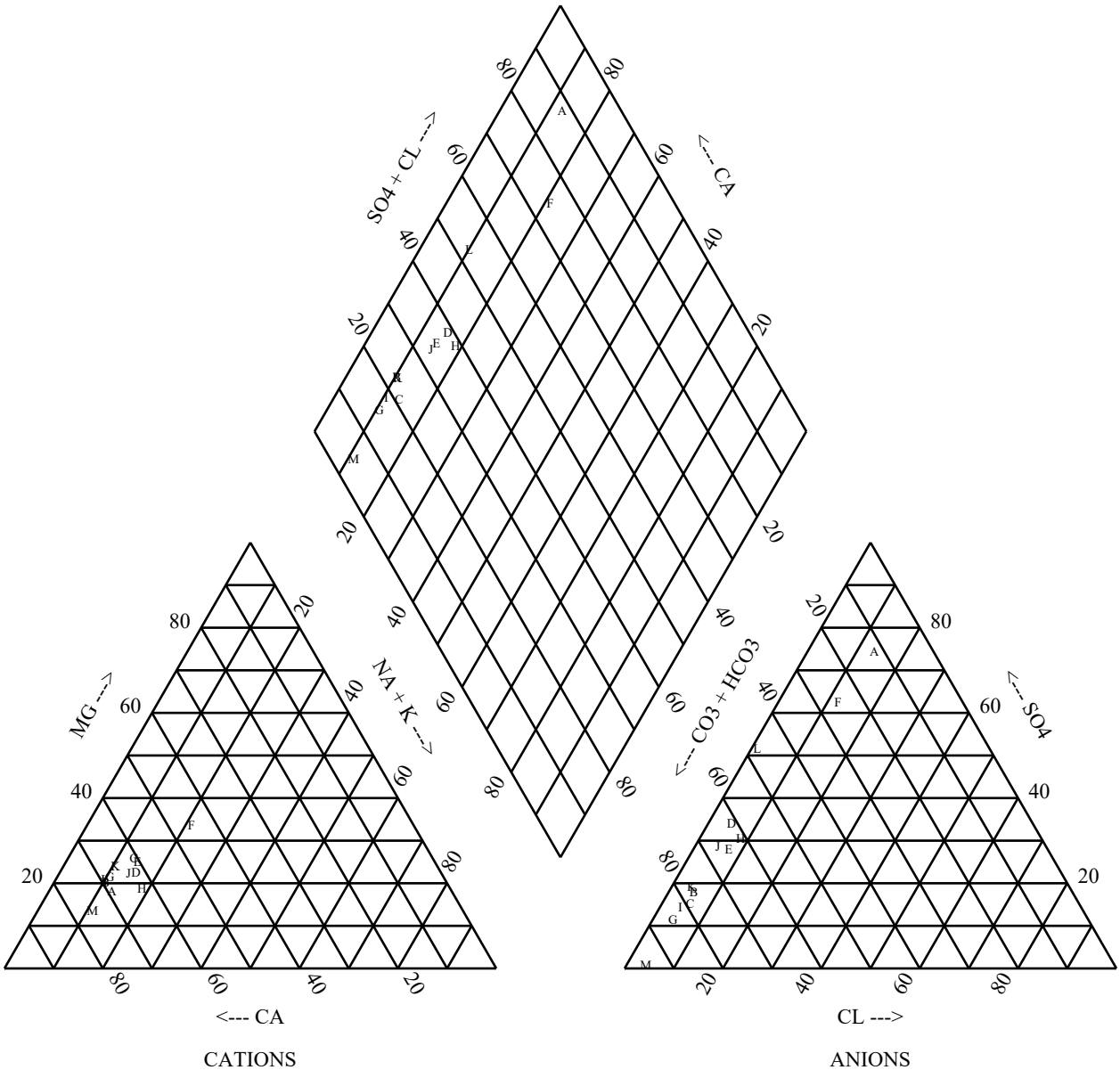
A -- 09/07/22-12:49, TDS = 220
B -- 05/23/23-14:40, TDS = 300
C -- 02/28/24-13:25, TDS = 332



Percent Of Total Milliequivalents Per Liter

J21-A1-P

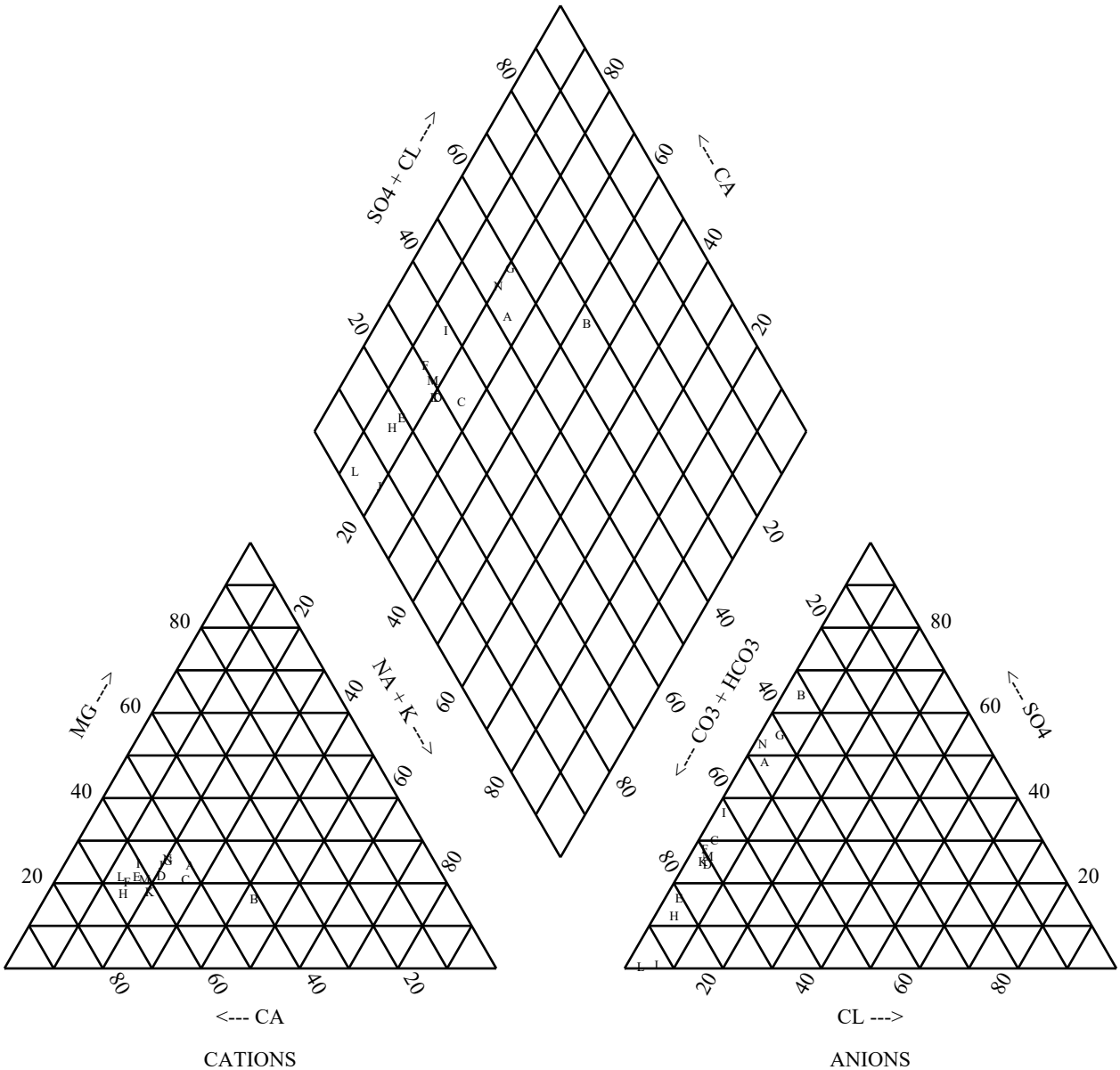
A -- 10/02/03-10:34, TDS = 140
B -- 01/16/04-09:18, TDS = 130
C -- 07/14/04-10:17, TDS = 220
D -- 01/20/05-11:20, TDS = 100
E -- 07/08/05-11:40, TDS = 250
F -- 01/20/06-14:55, TDS = 410
G -- 01/16/07-12:28, TDS = 140
H -- 07/23/07-14:51, TDS = 130
I -- 01/25/08-12:37, TDS = 190
J -- 08/15/08-10:15, TDS = 180
K -- 02/06/09-14:40, TDS = 210
L -- 03/22/10-14:05, TDS = 190
M -- 08/18/21-11:11, TDS = 550



Percent Of Total Milliequivalents Per Liter

J21-C-P

A -- 02/27/08-09:40, TDS = 210
B -- 08/12/08-10:30, TDS = 270
C -- 06/23/15-07:18, TDS = 228
D -- 08/18/15-12:03, TDS = 296
E -- 03/18/16-14:35, TDS = 132
F -- 09/09/16-11:33, TDS = 290
G -- 08/03/17-13:14, TDS = 484
H -- 07/25/18-11:54, TDS = 640
I -- 04/05/19-16:35, TDS = 216
J -- 03/02/20-14:42, TDS = 230
K -- 07/29/20-12:17, TDS = 244
L -- 08/18/21-11:35, TDS = 310
M -- 07/28/22-13:08, TDS = 620
N -- 03/27/23-09:58, TDS = 248



Percent Of Total Milliequivalents Per Liter

Table F.1 Comparisons of NNEPA Livestock Watering Standards (NNEPA, 2008) with ASPG192 Water Quality Data

Analyte	Standard	Sites	Sites	Exceedence Frequency	Exceedence Date Range	Exceedence Value Range	Median
NAVAJO LIVESTOCK WATERING STANDARDS -- NNEPA (3/17/21)							
Arsenic, Total	0.00 - 200.00	0	none				
Boron, Dissolved	0.00 - 5000.00	0	none				
Cadmium, Total	0.00 - 50.00	0	none				
Chromium, Total	0.00 - 1000.00	0	none				
Copper, Dissolved	0.00 - 500.00	0	none				
Field Ph	6.50 - 9.00	1	ASPG192	1/0/0/14	3/22/18-3/22/18	6.34 - 6.34	6.34
Fluoride	0.00 - 2.00	0	none				
Lead, Total	0.00 - 100.00	0	none				
Mercury, Total	0.00 - 10.00	0	none				
NO3_NO2 Nitrogen_N	0.00 - 100.00	0	none				
Ph At 25 Deg. Cent.	6.50 - 9.00	0	none				
Selenium, Total	0.00 - 50.00	0	none				
Total Recoverable As	0.00 - 200.00	0	none				
Total Recoverable Cd	0.00 - 50.00	0	none				
Total Recoverable Cr	0.00 - 1000.00	0	none				
Total Recoverable Hg	0.00 - 10.00	0	none				
Total Recoverable Pb	0.00 - 100.00	0	none				
Total Recoverable Se	0.00 - 50.00	0	none				
Total Recoverable V	0.00 - 100.00	0	none				
Total Recoverable Zn	0.00 - 25.00	0	none				
Vanadium, Dissolved	0.00 - 100.00	0	none				
Vanadium, Total	0.00 - 100.00	0	none				
Zinc, Total	0.00 - 25.00	0	none				

Frequency = uncensored/between MDL&PQL/censored/no. samples, (B) = Between MDL&PQL range, (<) = Censored range

Table F.2

Maximum Pond Water Depths and Volumes by Year

Pond J19-RA

Year	Maximum Depth (feet)	Maximum Volume (acre-feet)
2005	4.0	6.1
2006	13.0	29.0
2007	10.2	15.3
2008	15.8	38.5
2009	1.8	1.6
2010	11.8	22.1
2011	3.4	3.0
2012	7.8	10.2
2013	14.8	33.7
2014	0.5	0.4
2015	1.0	1.6
2016	1.0	1.6
2017	1.2	1.9
2018	2.1	3.4
2019	6.9	12.5
2020	10.7	25.5
2021	4.0	6.9
2022	14.7	49.8
2023	3.5	6.3

Table F.3

Maximum Pond Water Depths and Volumes by Year

Pond J21-A1

Year	Maximum Depth (feet)	Maximum Volume (acre-feet)
2003	5.9	3.2
2004	5.8	3.8
2005	6.3	4.5
2006	3.5	2.0
2007	12.4	12.4
2008	4.0	2.8
2009	2.7	1.6
2010	6.8	5.8
2011	4.0	2.8
2012	10.5	11.1
2013	9.0	9.8
2014	3.0	2.1
2015	0.3	0.3
2016	0.4	0.3
2017	Dry	Dry
2018	2.1	3.4
2019	5.1	5.0
2020	6.5	6.8
2021	6.0	6.0
2022	8.8	10.3
2023	4.8	5.1

Table F.4

Maximum Pond Water Depths and Volumes by Year

Pond J21-C

Year	Maximum Depth (feet)	Maximum Volume (acre-feet)
2003	2.9	0.2
2004	5.6	0.6
2005	5.4	0.7
2006	6.2	1.2
2007	13.1	9.4
2008	5.8	1.9
2009	1.0	0.1
2010	2.7	0.3
2011	0.8	0.1
2012	14.4	14.7
2013	16.6	9.3
2014	1.5	0.2
2015	1.0	0.4
2016	2.6	1.4
2017	14.1	21.4
2018	2.3	1.4
2019	4.3	3.5
2020	12.6	18.6
2021	12.0	18.7
2022	2.9	2.4
2023	0.7	0.5

Table F.5

Means and Concentration Ranges for Select Parameters Measured at

SWS Sites, Main Channel SW Sites and Permanent Impoundments J19-RA, J21-A1 and J21-C

M = mean R = range ; All values in mg/L except Se, which is in ug/L

		Ca	Mg	Na	SO_4	HCO_3	TDS	NO_3	Se
SWS Sites Concentration Means and Ranges (Reclaimed areas)									
FLUM227	M	26	6	3	40	88	120	0.67	1
	R	14-40	4-9	2-4	19-62	73-102	74-190	0.12-2.4	<1-1
FLUM228	M	7	6	2	41	127	129	0.28	N/A
	R	<5-7	2-10	<1-5	8-109	115-139	42-240	0.01-0.9	<1-<1
FLUM267	M	34	8	6	43	105	171	1.01	N/A
	R	23-48	3-11	4-10	21-64	71-134	100-200	0.22-2.1	<1-<1
FLUM268	M	28	4	1	35	77	35	0.30	<1
	R	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FLUM277	M	41	8	3	68	85	188	0.75	6.5
	R	7-66	4-14	1-5	21-140	66-110	64-320	0.5-1.1	<1-11
Main Channel SW Sites Concentration Means and Ranges[1,2]									
SW25	M	162	96	140	910	194	1711	2.3	13.7
	R	23-491	4.5-557	5.4-780	17-4880	66-1240	200-7750	0.16-20	2-37
SW26	M	111	45	61	452	141	925	2.1	7.5
	R	18-505	5-278	14-283	50-2700	68-1410	190-3635	0.07-15	1-21
SW34	M	88	23	21	289	128	1159	2.1	15.7
	R	16-348	4-103	5-70	48-1270	73-311	252-3300	0.94-3.3	5.4-55
CG78 Baseflow and Permanent Impoundments Concentration Means and Ranges[2,3]									
CG78	M	391	279	229	2328	191	3600	1.17	N/A[4]
	R	285-533	239-338	110-292	2060-2550	89-313	3230-4100	0.73-1.5	<1[3]
J19-RA	M	43	16	16	101	97	284	0.13	N/A[4]
	R	34-47	6-27	4.5-27	38-166	91-107	220-332	.05-0.22	<2.0
J21-A1	M	41	9.3	6.6	47	116	219	0.4	N/A[4]
	R	21-57	5-26	3-25	20-190	64-190	100-550	<.02-1	<2.0
J21-C	M	34	8	11	62	121	316	0.5	N/A[4]
	R	27-47	5-10	4-38	14-131	70-192	132-640	<.02-1.5	<1-<2

Notes: Mean Se values and ranges reported for SWS Sites are for the dissolved analytical form.

[1] Means and ranges provided for Main Channel SW Sites are from water samples collected in rainfall runoff only.

[2] Selenium means and ranges are derived from uncensored total analytical results.

[3] Means and ranges derived from baseflow at Site CG78 in Upper Dinnebito Wash 1990 and 1997 - 1999

[4] All analytical values censored.

Table F.6 Comparisons of NNEPA Livestock Watering Standards (NNEPA, 2008) with Ponds J19-RA, J21-A1 and J21-C Water Quality Data

Analyte	Standard	No. Sites	Sites	Exceedence Frequency	Exceedence Date Range	Exceedence Value Range	Median
NAVAJO LIVESTOCK WATERING STANDARDS -- NNEPA (3/17/21)							
Arsenic, Total	0.00 - 200.00	0	none				
Boron, Dissolved	0.00 - 5000.00	0	none				
Cadmium, Total	0.00 - 50.00	0	none				
Chromium, Total	0.00 - 1000.00	0	none				
Copper, Dissolved	0.00 - 500.00	0	none				
Field Ph	6.50 - 9.00	2	J21-A1-P J21-C-P	4/0/0/13 2/0/0/18	07/08/05-02/06/09 03/18/16-03/02/20	9.08 - 9.75 9.07 - 9.46	9.30 9.26
Fluoride	0.00 - 2.00	1	J21-C-P	0/0/1/14	07/28/22-07/28/22	(<)4.50 - 4.50	4.50
Lead, Total	0.00 - 100.00	0	none				
Mercury, Total	0.00 - 10.00	0	none				
NO3_NO2 Nitrogen_N	0.00 - 100.00	0	none				
Ph At 25 Deg. Cent.	6.50 - 9.00	1	J21-A1-P	1/0/0/13	01/25/08-01/25/08	9.30 - 9.30	9.30
Selenium, Total	0.00 - 50.00	0	none				
Total Recoverable As	0.00 - 200.00	0	none				
Total Recoverable Cd	0.00 - 50.00	0	none				
Total Recoverable Cr	0.00 - 1000.00	0	none				
Total Recoverable Hg	0.00 - 10.00	0	none				
Total Recoverable Pb	0.00 - 100.00	0	none				
Total Recoverable Se	0.00 - 50.00	0	none				
Total Recoverable V	0.00 - 100.00	0	none				
Total Recoverable Zn	0.00 - 25.00	0	none				
Vanadium, Dissolved	0.00 - 100.00	0	none				
Vanadium, Total	0.00 - 100.00	0	none				
Zinc, Total	0.00 - 25.00	0	none				

Frequency = uncensored/between MDL&PQL/censored/no. samples, (B) = Between MDL&PQL range, (<) = Censored range

CERTIFICATION

PEABODY WESTERN COAL COMPANY
KAYENTA MINE, J19 and J21 COAL RESOURCE AREAS, PHASE III BOND RELEASE APPLICATION
NAVAJO COUNTY, ARIZONA

I HEREBY CERTIFY that, to the best of my knowledge and belief, all applicable reclamation activities described in the attached Phase III Bond Release Application, dated January 30, 2025 have been accomplished in accordance with the reclamation requirements of the Act, the regulatory program, and the approved reclamation plan contained in the AZ-0001F Permit. The bond release parcel is free from enforcement actions.

Peabody Western Coal Company - Kayenta Mine

By: _____

Randy Lehn
Director Operations Support - Kayenta Mine

STATE OF ARIZONA

COCONINO COUNTY

Signed or attested before me this 28th day of January 2025, by Randy Lehn, Director Operations Support of Kayenta Mine owned by Peabody Western Coal Company, a Delaware Corporation, on behalf of said Kayenta Mine.

SUSIE CRANK
Notary Public - Arizona
Navajo County
Commission # 664886
My Comm. Expires Apr 5, 2028

_____

Notary Public

My commission expires:

April 5, 2028

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Bureau of Indian Affairs
Navajo Area Office
Mr. Deborah Shirley, Acting Regional Director
P.O. Box 1060
301 West Hill Street
Gallup, New Mexico 87305-1060

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Stevens:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release areas are in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

This Phase III application documents the permit, reclamation and management history, protection of the hydrologic balance, and a postmine land use summary for the release area. Mining within the release parcel was completed between 1985 and 2015 while revegetation was completed between 1986 and 2015. All reclamation activities were conducted in accordance with the Surface Mining Control and Reclamation Act (SMCRA) and the requirements of the OSM Permit AZ-0001F PAP approved October 3, 2017. Reclamation activities are documented in annual reports submitted previously to OSMRE.

The application and permit are available for public review and/or inspection at:

The Navajo Nation Minerals Department
Office of Surface Mining
Window Rock Boulevard
Window Rock, AZ 86515

Forest Lake Chapter House
Navajo Route 41
17 miles north of Pinon
Pinon, AZ 86510

Peabody Western Coal Company
Kayenta Mine
Mesa Central Warehouse Office Complex
8 Miles from Hwy 160 and Route 41 Junction
Kayenta, Arizona 86033

OSMRE Website: https://www.osmre.gov/news/archive/kayentaBlack Mesa

If you have questions, comments, or wish to request a hearing or informal conference regarding this bond release application, please contact:

Ms. Amy Ryser
Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental
Kayenta Mine

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Bureau of Land Management
Arizona State Office
Mr. Peter Godfrey, Native American Minerals Lead
One North Central Ave., Suite 800
Phoenix, Arizona 85004

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Godfrey:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

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Office of Surface Mining Reclamation & Enforcement
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One Federal Center, Building 41
Lakewood, CO 80225-0065
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Respectfully,

Marie Shepherd
Senior Manager Environmental
Kayenta Mine

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Chilchinbeto Chapter
Mr. Paul Madson, President
P.O. Box 1681
Kayenta, Arizona 86033

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Madson:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

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Western Region Office
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P. O. Box 25065
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Lakewood, CO 80225-0065
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Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Forest Lake Chapter
Ms. Mae Gilene Begay, President
P.O. Box 441
Pinon, Arizona 86510

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Ms. Begay:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

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Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

The Hopi Tribe
Office of Mining and Minerals
Attn: Dr. Carrie Joseph
P.O. Box 123
Kykotsmovi, AZ 86039

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Dr. Joseph:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

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Lakewood, CO 80225-0065
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Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Kayenta Chapter
Mr. Dalton Singer, President
P.O. Box 1088
Kayenta, Arizona 86033

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Singer:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

This Phase III application documents the permit, reclamation and management history, protection of the hydrologic balance, and a postmine land use summary for the release area. Mining within the release parcel was completed between 1985 and 2014 while revegetation was completed between 1986 and 2015. All reclamation activities were conducted in accordance with the Surface Mining Control and Reclamation Act (SMCRA) and the requirements of the OSM Permit AZ-0001F PAP approved October 3, 2017. Reclamation activities are documented in annual reports submitted previously to OSMRE.

The application and permit are available for public review and/or inspection at:

The Navajo Nation Minerals Department
Office of Surface Mining
Window Rock Boulevard
Window Rock, AZ 86515

Forest Lake Chapter House
Navajo Route 41
17 miles north of Pinon
Pinon, AZ 86510

Peabody Western Coal Company
Kayenta Mine
Mesa Central Warehouse Office Complex
8 Miles from 160 and Route 41 Junction
Kayenta, Arizona 86033

OSMRE Website: https://www.osmre.gov/news/archive/kayentaBlackMesa

If you have questions, comments, or wish to request a hearing or informal conference regarding this bond release application, please contact:

Ms. Amy Ryser
Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Navajo Nation
Minerals Department
Ms. Rowena L. Cheromiah
P.O. Box 1910
Window Rock, AZ 86515

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Ms. Cheromiah:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

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Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Navajo Nation Environmental Protection Agency
Navajo Area Office
Mr. Stephen B. Etsitty, Executive Director
P.O. Box 339
Admin Building No. 2695 Window Rock Blvd
Window Rock, Arizona 86515-0339

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Etsitty:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release area is in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

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The Navajo Nation Minerals Department
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Window Rock, AZ 86515

Forest Lake Chapter House
Navajo Route 41
14 miles north of Pinon
Pinon, AZ 86510

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Kayenta Mine
Mesa Central Warehouse Office Complex
8 Miles from Hwy 160 and Route 41 Junction
Kayenta, Arizona 86033

OSMRE Website: https://www.osmre.gov/news/archive/kayentaBlack Mesa

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Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Navajo Tribal Utility Authority
Mr. Walter W. Haase, P.E., General Manager
P.O. Box 170
Fort Defiance, Arizona 86504-0170

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Haase:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release areas are in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

This Phase III application documents the permit, reclamation and management history, protection of the hydrologic balance, and a postmine land use summary for the release area. Mining within the release parcel was completed between 1985 and 2014 while revegetation was completed between 1986 and 2015. All reclamation activities were conducted in accordance with the Surface Mining Control and Reclamation Act (SMCRA) and the requirements of the OSM Permit AZ-0001F PAP approved October 3, 2017. Reclamation activities are documented in annual reports submitted previously to OSMRE.

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Window Rock, AZ 86515

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Navajo Route 41
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Kayenta, Arizona 86033

OSMRE Website: https://www.osmre.gov/news/archive/kayentaBlackMesa

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Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PEABODY WESTERN

Peabody Western Coal Company

January 30, 2025

Shonto Chapter
Mr. Roland Smallcanyon, President
P. O. Box 7800
Shonto, AZ 86054

RE: Notice of Application for Phase III Bond Release, J19 and J21 Coal Resource Areas, Kayenta Mine

Dear Mr. Smallcanyon:

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for Phase III bond release on portions of the J19 and J21 Coal Resource Areas. The release areas are in the southeastern portion of the PWCC lease area. PWCC is seeking release from Phase III bond liability for those surety bonds currently held with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release areas are located within the Kayenta Mine Permanent Program permit area (AZ-0001F PAP) in the southeastern portion of the PWCC lease area. PWCC is seeking a reduction of the total J19 and J21 bond amount of $6,696,206 at this time by gaining regulatory approval for release of lands described in the application from Phase III bond liability. The total area sought for release includes 3,654 acres of disturbed land. Phase III is the final bond release step and, once approved, will allow for the planned return of these lands to the Navajo Nation. Until that time, PWCC will continue to control and manage reclaimed lands in the release areas described.

This Phase III application documents the permit, reclamation and management history, protection of the hydrologic balance, and a postmine land use summary for the release area. Mining within the release parcel was completed between 1985 and 2014 while revegetation was completed between 1986 and 2015. All reclamation activities were conducted in accordance with the Surface Mining Control and Reclamation Act (SMCRA) and the requirements of the OSM Permit AZ-0001F PAP approved October 3, 2017. Reclamation activities are documented in annual reports submitted previously to OSMRE.

The application and permit are available for public review and/or inspection at:

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Window Rock Boulevard
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OSMRE Website: https://www.osmre.gov/news/archive/kayentaBlackMesa

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Ms. Amy Ryser
Western Region Office
Office of Surface Mining Reclamation & Enforcement
P. O. Box 25065
One Federal Center, Building 41
Lakewood, CO 80225-0065
WR Permitting Information Line, 1-866-847-7362

Please direct your questions about this application to me at 928.280.7091 or email them to me at mshepherd2@peabodyenergy.com.

Respectfully,

Marie Shepherd
Senior Manager Environmental - Kayenta Mine
Peabody Western Coal Company

C: Amy Ryser (OSMRE-WRO)

PUBLIC NOTICE

Peabody Western Coal Company (PWCC) has filed an application with the Office of Surface Mining Reclamation and Enforcement (OSMRE) for bond release on a portion of the lands in the J19 and J21 Coal Resource Area (CRA) within the Kayenta Mine Permit AZ-0001F. PWCC is seeking a release of Phase III bond liability for portions of the J19 and J21 area currently under surety bonds with Zurich American, Liberty Mutual, and SiriusPoint America Insurance and one Letter of Credit with Goldeman Sachs Bank, USA. PWCC is seeking a reduction of $6,696,206 under the Phase III application. The total combined bond for Kayenta Mine is $107,171,138.

The Phase III bond release application consists of information currently contained in the AZ-0001F permit application package (PAP) approved October 3, 2017. The PAP outlines PWCC's reclamation operations on Permanent Program Lands. The area in J19 and J21 requested for Phase III release is 3,654 acres. Reclamation was completed between 1986 and 2015. Reclamation activities and results were completed in accordance with the approved PAP. The Phase III application documents the permit, reclamation, and management history, protection of the hydrologic balance, and a postmine land use summary for the release area. The Kayenta Mine permit for the release areas is under Navajo Tribal Coal Lease 14-20-0603-9910 and Hopi Tribal Coal Lease 14-20-0450-5743 and operates pursuant to Code of Federal Regulations (CFR), Title 30; Subchapter E, Part 750; Subchapter G, Parts 773 and 774; and Subchapter K, Parts 810 and 816. This notice is hereby given that:

1. The name and business address of the applicant is:

   Peabody Western Coal Company
   Kayenta Mine
   P.O. Box 650
   Kayenta, AZ 86033

2. The mine permit area is located approximately 18 miles south southwest of Kayenta, Arizona. The permit area for the Phase III bond release areas is in USGS 7.5-minute quadrangle maps "Yucca Hill" and "Cliff Rose Hill" within the following lands of Navajo County, Arizona that are described relative to the Gila and Salt River Base Meridian as:

   A total of 3,654 acres of land located within the J19 and J21 CRA. The computer-generated centroid location is Latitude 36º26'54.0" N and Longitude 110º17'10.8" W.

3. Locations of where copies of the application and permit are available for public review and/or inspection are:

The Navajo Nation Minerals Department
Office of Surface Mining
Window Rock Boulevard
Window Rock, AZ 86515

Forest Lake Chapter House
Navajo Route 41
17 miles north of Pinon
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8 Miles from Hwy 160 and Route 41 Junction
Kayenta, Arizona 86033

OSMRE Website: https://www.osmre.gov/programs/regulating-active-coal-mines/indian-lands

4. The name and address of the OSMRE-WRO representative where written comments, objections, requests for a public hearing, or requests for an informal conference may be submitted on or before 5:00 p.m., March 31, 2025 thirty (30) days after the last publication date are:

   Ms. Amy Ryser
   Western Region Office
   Office of Surface Mining Reclamation & Enforcement
   P. O. Box 25065
   One Federal Center, Building 41
   Lakewood, CO 80225-0065

   WR Permitting Information Line, 1-866-847-7362

5. Interested persons may obtain more information concerning the bond release by contacting Marie Shepherd, Sr. Manager Environmental for PWCC at 928.280.7091.

6. The application has been filed with OSMRE and will be acted upon pursuant to the Permanent Regulatory Program (30 CFR Parts 750 and 774) approved by the Secretary of the Interior under Title V of the Surface mining Control and Reclamation Act of 1977.