Pintail Lateral Reclamation Plan, Remediation Project 28892 Weld County, Colorado

APRIL 2024

PREPARED FOR

Taproot Rockies Midstream, LLC

PREPARED BY

SWCA Environmental Consultants

PINTAIL LATERAL RECLAMATION PLAN, REMEDIATION PROJECT 28892 WELD COUNTY, COLORADO

Prepared for

Taproot Rockies Midstream, LLC
555 17th Street, Suite 800
Denver, Colorado 80202

Prepared by

SWCA Environmental Consultants
295 Interlocken Boulevard, Suite 300
Broomfield, Colorado 80021
(303) 487-1183
www.swca.com

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1 INTRODUCTION

SWCA Environmental Consultants (SWCA), on behalf of Taproot Rockies Midstream, LLC (Taproot Midstream), has prepared and is submitting this reclamation plan (Plan) to the Colorado Energy and Carbon Management Commission (ECMC) in accordance with ECMC Rule 913c. This Plan describes the site-specific conditions and reclamation practices that will be employed at Taproot Midstream's Pintail Lateral (Project) site in Weld County, Colorado. An unplanned release occurred in October 2022 at the Project site that resulted in elevated soil salinity and sodicity. Soil salts, particularly sodium, is considered limiting to successful reclamation processes following oil and gas operations because they may deteriorate soil structure and interrupt normal soil-plant-water relationships. In such cases, under ECMC Rule 915b, operators are required to "provide a detailed reclamation plan that includes, but is not limited to, soil analysis from adjacent undisturbed lands, revegetation techniques, site stabilization, and details of seeded species."

The purpose of this Plan is to describe the remediation and reclamation activities for the Project in accordance with ECMC Rule 913c. Ecological conditions at the Project site and within the surrounding area were assessed on October 17, 2022, during the initial release response and again from October18 through 20, 2022, during confirmation sampling and excavation activities. Additional confirmation sampling and excavation activities occurred from December 20 through 21, 2022, and final confirmation sampling for vertical and spatial delineation of impacts was conducted on February 9, 2023. SWCA visited the site on April 8, 2024, to gather final information (see Section 3, Ecological Conditions) to inform development of the Plan. Specifications regarding ecological conditions at the Project site and surrounding area, remediation and reclamation procedures and best management practices (BMPs), monitoring, and reporting are discussed in the sections below. This document may be revised based on site conditions documented during remediation activities or as new information becomes available through reclamation efforts (see Section 5.1.1, Adaptive Management).

2 PROJECT OVERVIEW

The Project site is located approximately 13.8 miles northwest of Raymer, Colorado, in Weld County (NW¼ of the NW¼ of Section 35, Township 9 North, Range 60 West) and consists of a produced water transfer system (PWTS) with other ancillary facilities/infrastructure. A PWTS moves water produced from oil and gas activities between different oil and gas locations and is a network of interconnected off-location water flowlines proceeding from multiple well sites or production facilities (ECMC 2022). On October 17, 2022, a release was discovered and reported at the Project site due to a failure of the PWTS. The release occurred entirely on private property and was reported immediately to the surface owner (Figures 1 and 2). Following discovery of the release, impacted soil was visually delineated within the PWTS, excavated to various depths based on the observed depth of seepage, removed from the site, and disposed of at an approved facility. An Initial Spill/Release Report (Form 19) was submitted by Taproot Midstream to ECMC on October 19, 2022 (Appendix A). Approximately 0.30 acres within the Project footprint will be reclaimed resulting from the release (Table 1).

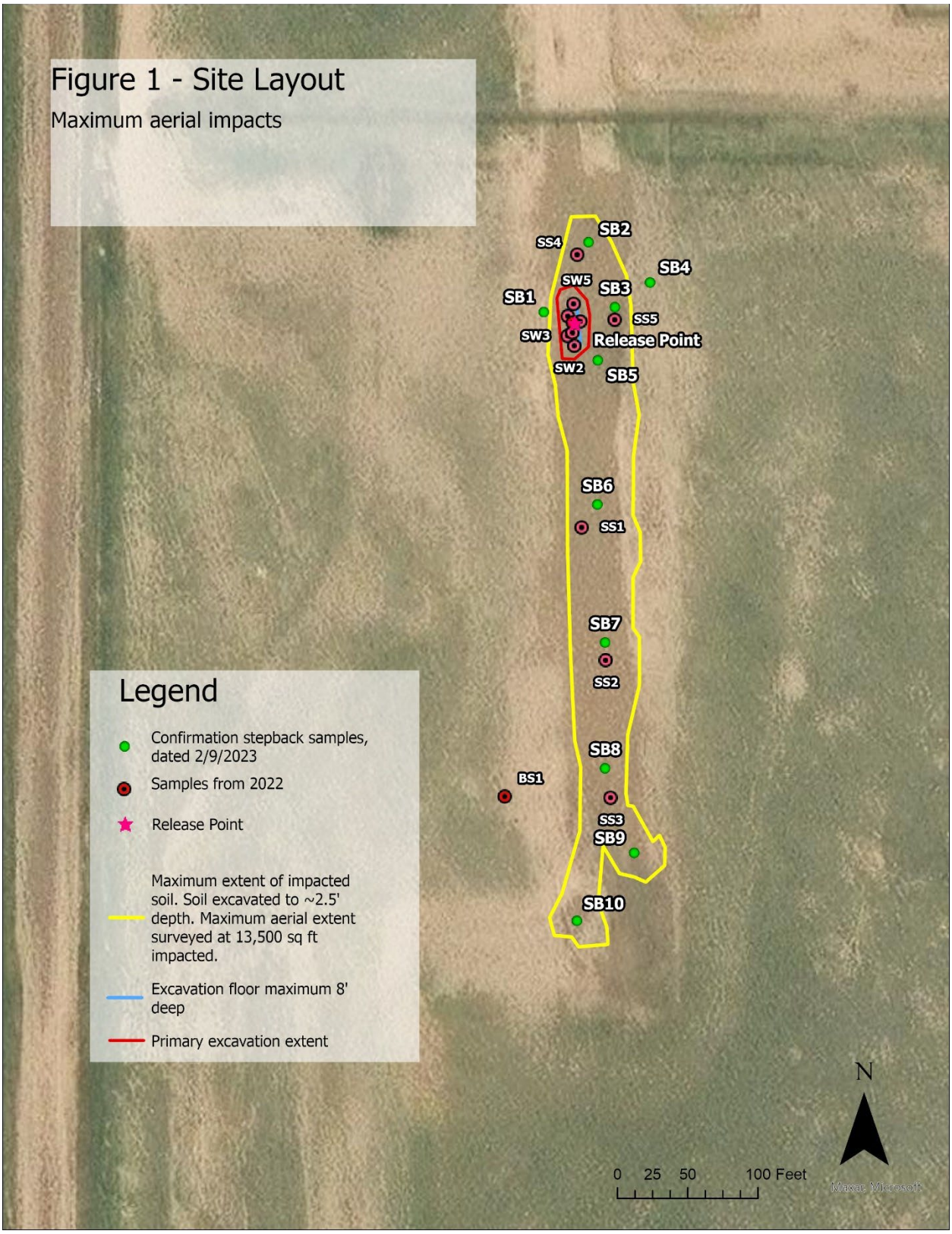

Figure 1. Soil sample locations for the Pintail Lateral PWTS release.

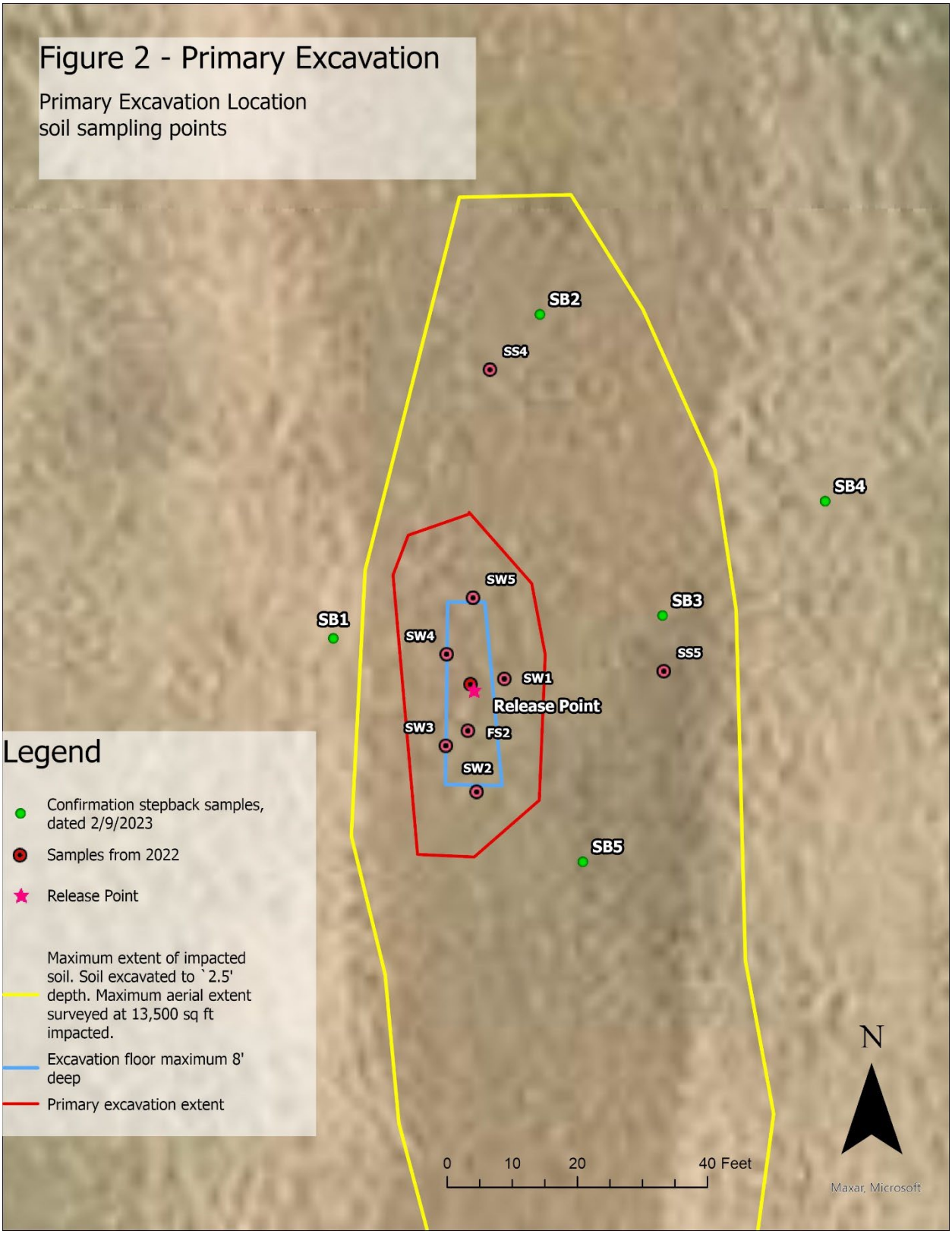

Figure 2. Soil sample locations for the Pintail Lateral PWTS release – primary excavation.

Table 1. Acres of Disturbance as Constructed

Disturbance Type	Area of Disturbance (acres)	Area to be Reclaimed (acres)
PWTS	0.30	0.30
Access Roads	0.00	0.00
Ancillary Facilities	0.00	0.00
Total	**0.30**	**0.30**

3 ECOLOGICAL CONDITIONS

Identification of ecological characterizations of the land is important for reclamation planning as developing ecological site-specific reclamation procedure will increase the likelihood that revegetation is successful (see Section 4.2, Revegetation) and that reclamation success standards are met (see Section 5.1, Monitoring). Major Land Resource Areas (MLRAs) are geographically associated land resource units developed by the Natural Resources Conservation Service (NRCS) to provide regionally specific information on geology, climate, water, soils, and biological resources (NRCS 2022; Stringham et al. 2016). MLRAs are effective planning tools on a regional scale while ecological site descriptions, which are refined geographical units within MLRAs, can be used to describe the physiographic setting, soils, vegetation, hydrology, and ecology at a site-specific scale. The Project falls within the Clayey Plains (R067BY042CO) and the Salt Flat (R067BY033CO) ecological sites of the Central High Plains, Southern Part MLRA (MLRA 067B).

The Clayey Plains ecological site is largely associated with mixed-grass prairie (short- and midgrass species) and a minor component of forbs and shrubs. The Clayey Plains ecological site occurs in an upland position on nearly level to gently sloping plains. Average annual precipitation ranges from 13 inches to over 18 inches depending on location. Livestock grazing is common across this ecological site (NRCS 2023a).

The Salt Flat ecological site is primarily associated with warm-season bunchgrasses with secondary cool-season midgrasses. Shrubs are of secondary importance and a variety of forbs occur in minor amounts. The Salt Flat ecological site occurs on fans and terraces on dissected plains. Slick spots and hummocks are common. Average annual precipitation ranges from 13 inches to over 18 inches, depending on location. Livestock grazing is common across the ecological site (NRCS 2023b).

3.1 Plant Communities

The site falls within both the Clayey Plains and Salt Flat ecological sites as described above. The Clayey Plains ecological site is correlated with mixed-grass prairie and plant community composition and is generally about 70-90% grasses and grass-likes (graminoids), 5-15% forbs, and 5-15% woody plants (NRCS 2023a). Dominant grasses include western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella viridula*), and blue grama (*Bouteloua gracilis*). Other grasses and grass-like plants that occur in minor amounts are buffalograss (*Bouteloua dactyloides*), sideoats grama (*Bouteloua curtipendula*), and sun sedge (*Carex inops*). Significant forbs are American vetch (*Vicia americana*), purple prairie clover (*Dalea purpurea*), and scarlet globemallow (*Sphaeralcea coccinea*). Dominant shrubs that occupy this community are fourwing saltbush (*Atriplex canescens*) and winterfat (*Krascheninnikovia lanata*) (NRCS 2023a).

The Salt Flat ecological site consists mainly of mid warm- and cool-season grasses. The Reference Plant Community is about 75-90% grasses and grass-likes (graminoids), 5-10% forbs, and 5-15% woody plants (NRCS 2021a). The principle dominant plants are alkali sacaton (*Sporobolus airoides*), western wheatgrass, and blue grama. Grasses of secondary importance are green needlegrass and inland saltgrass (*Distichlis spicata*). Forbs and shrubs such as American vetch, leafy false goldenweed (*Oonopsis foliosa*), fourwing saltbush, and winterfat are significant (NRCS 2023b).

A qualified SWCA ecologist conducted a site assessment on April 8, 2024, to ground-truth ecological conditions and to conduct a quantitative vegetation assessment at the Project site and within adjacent reference sites (Appendix C, Table C1). The quantitative vegetation assessment used visual assessment to estimate vegetation cover properties.

No recent evidence of grazing or livestock was observed at the Project site or in reference sites, though the area has been historically grazed. Due to the unintended release and impacted material excavation, vegetation is not established at the Project site and ground cover consists mostly of bare ground with little natural recruitment of native grasses and plains pricklypear (*Opuntia polyacantha*) observed as well as early germination of burningbush (*Bassia scoparia*). At the reference sites immediately adjacent to the Project site, native vegetation consistent with shortgrass prairie is present. Sites were assessed and native vegetation was primarily blue grama with a small presence of alkali sacaton, thickspike wheatgrass (*Elymus lanceolatus*), and plains pricklypear. Results of the vegetation assessment are provided in Appendix C.

3.2 Soils

Based on the NRCS soil survey the Project site consists predominantly of the Nunn clay loam, 0 to 6 percent slopes (85%). The Nunn clay loam soil series is the dominant soil type within the Project site and is associated with the Clayey Plains ecological site (UC Davis 2019). Other minor soil series include the Manzanst loam (10%), also associated with the Clayey Plains ecological site, and the Avar fine sandy loam (5%) associated with the Salt Flat ecological site (UC Davis 2019).

Soils identified at the Project site are typical of the Clayey Plains and Salt Flat ecological sites and are very deep, well drained soils that formed from alluvium and loess. Surface textures can be highly variable and may range from heavy clay loam to fine sandy loam. As the fineness of soil texture increases, there is generally more available moisture storage from sands to loams to clays (NRCS 2023a and b). Soil structure defines the process in which soil particles are aggregated and support vegetation and healthy aeration. Surface soil structure for the Clayey Plains ecological site is granular to subangular blocky, and structure below the surface is prismatic or subangular blocky (NRCS 2023a). Surface soil structure for the Salt Flat ecological site is platy, buy may include granular; and structure below the surface is columnar, but may include prismatic or subangular blocky (NRCS 2023b). Both the Clayey Plains and Salt Flat ecological soil types are susceptible to erosion by wind and water. The potential for water erosion accelerates with increasing slope.

The Nunn clay loam soil series comprises the majority of (85%) the soil map unit and is typically found on terraces or alluvial fans, and in drainageways. The parent material consists of loess and mixed alluvium. These soils are smectitic (i.e., comprised of expansible 2:1 phyllosilicate minerals). Nunn soils are very deep, well drained soils with negligible to very high runoff depending on slope and moderately slow or slow permeability. Depth to a restrictive feature is greater than 80 inches.

A typical pedon for the Nunn clay loam soil series is described in Table 2 (Soil Survey Staff 2002). These well-drained soils typically have negligible to very high runoff potential, depending on slope. These soils have a slight susceptibility to wind erosion and a moderate susceptibility to water erosion, especially if

unprotected (i.e., no vegetation cover) and/or on steeper slopes (Soil Survey Staff 2019). The soil susceptibility to compaction is medium which indicates that the potential for compaction is significant. The growth rate of seedlings may be reduced following compaction.

Table 2. Typical Pedon and Horizon Descriptions of the Nunn Soil Series

Horizon	Depth (inches)	Description*
A	0–6	Grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable; neutral (pH 7.2); clear smooth boundary. (4 to 8 inches thick)
BA	6–10	Grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, sticky and plastic; few faint clay films on faces of peds; neutral (pH 7.2); clear smooth boundary. (0 to 6 inches thick)
Bt	10–24	Pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; many distinct clay films on faces of peds; slightly alkaline (pH 7.6); clear smooth boundary. (6 to 24 inches thick)
Btk	24–29	Pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; very hard, firm, very plastic; few faint clay films on faces of peds; visible calcium carbonate occurring as small concretions; strongly effervescent; moderately alkaline (pH 8.0); gradual smooth boundary. (0 to 10 inches thick)
Bk1	29–47	Light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, sticky and plastic; visible calcium carbonate occurring as concretions, thin seams and streaks; strongly effervescent; moderately alkaline (pH 8.2); gradual smooth boundary. (6 to 20 inches thick)
Bk2	47–60	Light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; massive; very hard, firm, sticky and plastic; some visible calcium carbonate but less than in the horizon above; slightly effervescent; moderately alkaline (pH 8.2)

Source: Soil Survey Staff 2002.

3.2.1 Affected Soils Analysis

From October18 through 20, 2022, a qualified geologist from Environmental Works, Inc. (EWI), collected soil samples at the Project site and within immediately adjacent, non-impacted areas to assess the overall impact of the unplanned release on soil resources to assist in development of this Plan (Figures 1 and 2). EWI collected 17 discrete soil samples at depths ranging from 0 to 6 inches (surface samples) and up to 8.0 feet (floor samples) across the impacted area of the unintended release location to evaluate the nature and extent of soil contamination. Due to preliminary laboratory results indicating residual impacts of the release, soils were sampled again below initial sampling depths to confirm effective removal of impacted materials prior to topsoil import, grading, and reclamation. On February 9, 2023, EWI collected an additional 19 discrete soil samples at depths ranging from 4 to 13 feet (subsurface samples). No produced water sample was collected from the site for analysis. If further soil impacts were confirmed, the analytical results would be used to establish soil amendment rates or excavation depths for additional remediation efforts.

Discrete soil samples were collected at 36 locations along the observed area of impact (3 background samples and 33 impacted samples) and submitted to Origins Laboratory, LLC (Denver, Colorado) for analysis. Three background samples [BS1 (0 to 0.5 and 3 to 3.5 feet) and SB4-8] were collected outside of the area of impact at depths ranging from 6.0 inches to 8.0 feet for background comparison of site conditions prior to the unintended release. Two discrete floor samples (FS) were collected from the floor of the release location at a depth between 8.0 and 8.5 feet. Five discrete sidewall samples (SW) were collected from the sidewall of the release location excavation at depths ranging from 7.0 to 7.5 feet. Five discrete surface samples (SS) were collected from areas of shallow excavations within the impacted area

at depths ranging from 0 to 6.0 inches. An additional three discrete subsurface samples (SS) were collected from the impacted area at depths ranging from 3.0 to 3.5 feet. Finally on February 9, 2023, 18 final subsurface samples were collected within the impacted area below the soil excavation depth of 3.5 feet at various random depths ranging from 4.0 to 13.0 feet.

Samples were analyzed for metals, volatile organic compounds (VOCs), semi-VOCs, total petroleum hydrocarbons (TPH), and soil suitability for reclamation parameters (i.e., saturated paste pH, sodium adsorption ratio [SAR], and specific conductance [i.e., electrical conductivity (EC)]) based on ECMC 900 Series Rules and Regulations.

All soil samples were collected using standard regulatory protocol for hydrocarbons and equipment de-contamination procedures. Soil sampling equipment was properly decontaminated between individual soil samples. Discrete soil samples were collected in sterilized glass jars acquired from the laboratory and maintained on ice until submitted for analysis. Analytical results for the soil samples are provided in Appendix D.

3.2.2 Analytical Results

Laboratory analytical results initially indicated that soil arsenic, boron, EC, and SAR were elevated across the impacted Project area and most collected samples were greater than ECMC Table 915-1 Cleanup Concentrations. Soil arsenic was also elevated in background soil samples indicating naturally elevated soil arsenic. Initial laboratory analytical results indicated saline/sodic soil conditions in samples that were collected within the area of impact from the produced water release. Saline soils, resulting from excess salt in the soil, may impact water uptake by vegetation. Sodic soils, resulting from excess sodium in the soil, impact soil structure through soil dispersion making the soil surface hard. Soil dispersion and poor soil structure may impair seed germination and seedling development.

Final laboratory analytical results (February 9, 2023) collected following soil excavation and remediation efforts across the site indicate that impacted materials were mostly removed. Three samples (SB1-8, SB5-7, and SB5-11) indicate elevated EC below 7.0 feet and sample SB10-4 indicates slightly elevated soil pH below 4 feet. Samples SB2-8 and SB5-7 indicate slightly elevated boron levels, 2.03 and 2.44 milligrams per liter, respectively. Further excavation to remove remaining exceedances is restricted by additional produced water, fresh water, and crude oil transfer lines in the area. Slightly elevated soil EC and boron in remaining materials will not cause harm to the environment and/or human health and should not limit plant establishment at the depths encountered.

3.2.2.1 SOIL PH

Soil pH is a measure of the acidity or alkaline condition, determined by measuring the hydrogen ion activity in the soil (Thorup 1984). Soil pH is considered one of the most important measurements in the soil and is often called the “master variable” (McBride 1994). Soil pH affects nutrient availability, ion exchange, dissolution/precipitation of minerals, reduction and oxidation (redox) reactions, adsorption, and other important factors in the soil system, which can greatly influence plant growth and development (McBride 1994; Thorup 1984). Soil pH between 6.4 and 8.2 is generally optimal for plant growth of agronomic crops and native grass species (Thorup 1984; Tisdale et al. 1993). As the pH increases or decreases from this ideal range, the availability of plant nutrients may limit plant growth. Additionally, ECME Table 915-1 Soil Suitability for Reclamation parameters establishes soil pH suitability levels from 6.0 to 8.3.

Soil pH in samples collected from the impacted area ranged from 7.5 to 8.4 (average of 7.9), which is similar to background samples collected outside of the impacted area (8.0 and 8.3). Only one soil sample

(SB10-4 - 4.0 to 4.5 feet), which was collected at greatest distance from the area of release, was above the Soil Suitability for Reclamation maximum level of 8.3, (Appendix D). Elevated soil pH is likely due to natural soil conditions. Elevated soil pH will not cause harm to the environment and/or human health and will not limit plant establishment at the depth encountered.

3.2.2.2 SOIL SALINITY

Electrical Conductivity (EC) is an estimate of soil salinity (Hanson et al. 1999) and is measured by the specific conductance of the saturated paste extract. EC is measured to determine the total estimated salinity of a soil. A saline soil is any soil that has an EC greater than 4.0 mmhos/cm (Ayers and Westcot 1985; Weil 2017). At elevated levels, soil salinity can negatively impact vegetative growth due to osmotic stress (Hanson et al. 1999). This osmotic stress makes it difficult for plants to extract water from the soil (Bohn et al. 1985). The ECMC Table 915-1 Soil Suitability for Reclamation maximum level for EC is 4.0 mmhos/cm.

Average EC in soil samples collected from the impacted area during the initial investigation ranged from 1.51 to 12.6 millimhos per centimeter (mmhos/cm) (average of 10.2 mmhos/cm), with many samples displaying EC that was substantially higher than the background samples (0.46 to 1.04 mmhos/cm). Fourteen samples (all collected samples except SW2) displayed EC that was higher than the Soil Suitability for Reclamation maximum level defined reporting limit of saline soil (4.0 mmhos/cm). All of these samples were collected during the initial investigation (October 2022) and prior to excavation and import efforts to delineate soil removal depth and area requirements.

Additional confirmation samples (18) were collected following the initial investigation (February 2023) from depths not previously sampled (>3.5 feet) to confirm the required depth of soil removal (Appendix D). Only three of these samples displayed EC that was higher than 4.0 mmhos/cm (SB1-8, SB5-7, and SB5-11). The collection depth of these samples ranges from 7 to 11 feet below ground surface (bgs). Soil excavation and replacement to 3.5 feet bgs should be suitable for remediation of salt impacted soils at the location. Slightly elevated soil EC will not cause harm to the environment and/or human health and should not impair vegetation establishment at the depths encountered.

3.2.2.3 SOIL SODICITY

Sodic soils are non-saline soils containing sufficient exchangeable sodium to adversely affect crop production and soil structure (Soil Science Society of America 2010). Elevated exchangeable sodium concentrations in the soil can negatively impact soil structure causing the soil to disperse, resulting in hard surface crusts, reduced infiltration rates, and reduced oxygen diffusion rates. The definition and standard for describing sodic soils based on soil chemistry are those soils that have a SAR greater than 13, an EC less than 4.0 mmhos/cm, and pH between 8.5 and 10.0. However, the ECMC Table 915-1 Soil Suitability for Reclamation maximum level for SAR is 6.0.

Average SAR in soil samples collected from the impacted area during the initial investigation ranged from 1.70 to 41.7 (average of 15.5), with many samples displaying SAR that was substantially higher than the background samples (0.60 to 2.59). Nine samples displayed SAR that was higher than the Soil Suitability for Reclamation maximum level of 6.0 (Appendix D). All of these samples were collected during the initial investigation (October 2022) and prior to excavation and import efforts to delineate soil removal depth and area requirements. Soil samples FS1, SW2, SW3, SS1 – 3.0 to 3.5 feet, SS2 – 3.0 to 3.5 feet, and SS3 – 3.0 to 3.5 feet had SAR values that were below 6.0 (Appendix D).

Additional confirmation samples (18) were collected following the initial investigation (February 2023) from depths not previously sampled (>3.5 feet) to confirm the required depth of soil removal (Appendix

D). None of these samples displayed SAR that was higher than 6.0. The collection depth of these samples ranges from 4 to 13 feet bgs. Soil excavation and replacement to 3.5 feet bgs should be suitable for remediation of sodium impacted soils at the location as final confirmation sampling analytical results below the excavation depth do not contain elevated sodium levels.

3.2.2.4 ADDITIONAL ANALYTES (METALS, VOCS, AND TPH)

Soil laboratory analytical results indicate that arsenic levels are elevated above the Table 915-1 Residential Soil Screening Level (RSSL) cleanup concentration for all samples analyzed within the impact area (CO ECMC 2021:900-38–900-40). Arsenic is elevated above the RSSL of 0.68 milligrams per kilogram (mg/kg) in all samples measured, but comparable to background levels indicating that arsenic is naturally elevated in soils at the location. Soil sample analytical results indicate that VOCs and semi-VOCs are all below RSSL cleanup concentrations. TPH levels are below laboratory detection levels and within Table 915-1 cleanup concentrations (CO ECMC 2021:900-38–900-40) for samples within the impacted area.

3.2.3 Justifications

Produced water releases from oil and gas infrastructure may have potential impacts on existing plant communities as produced water can penetrate the soil profile resulting in degraded soil quality due to various pollutants (Pichtel 2016). The depth of contamination varies depending on the amount of produced water released, the chemical makeup of the produced water, and the soil properties (Pichtel 2016). Native vegetation and the wildlife and livestock that browse and graze these plant species may experience the harmful impacts of soil contamination from produced water releases (Bamberger and Oswald 2012; Pichtel 2016).

Soil analytics indicate EC and SAR levels are below ECMC Table 915-1 Soil Suitability for Reclamation maximum levels in all confirmation samples collected below the excavated soil depth of 3.5 feet excluding SB1-8 (4.3 mmhos/cm), SB5-7 (9.4 mmhos/cm), and SB5-11 (5.6 mmhos/cm) for soil EC. Slightly elevated soil EC below the functional root zone is not expected to impair vegetation establishment (see Section 3.2.3.1).

3.2.3.1 ROOT DEPTH ANALYSIS

Direct and indirect processes may influence seed germination and native plant reestablishment in soils potentially impacted from produced water releases ranging from soil chemical and physical effects to biological effects (Green et al. 2020). The effects of produced water on seed germination and plant growth can persist for decades, if not remediated, and impacted soil often requires that remediation take place and vegetation be restored in some capacity. In-situ (e.g., amendments, natural attenuation, leaching, etc.) and ex-situ (e.g., excavation and disposal, washing and scrubbing, etc.) remediation strategies can be employed to ameliorate the negative or deleterious impacts to vegetation, essentially potential impacts in the active root zone (Green et al. 2020). Through excavation and disposal alone, the immediate removal of impacted topsoil and subsoil immediately below topsoil layers (i.e., to the extent of produced water contamination) can remove the harmful contaminants and provide a suitable growth medium soon after topsoil replacement.

Understanding the approximate rooting depth of the native plant species that occur at these locations help inform remediation actions and BMPs for reclamation work, especially regarding excavation and reseeding efforts. Plant species surrounding the Project site are typical of short- to mid-grass prairies of Northern Colorado, where approximately 60-70% of the vegetation biomass is composed of perennial grasses. There is variation in the root characteristics and rooting depths for the plant species that will be

used for revegetation. For this Plan the functional root zone of a plant is the portion of the root mass where most of the root functions occur including water and nutrient uptake. For the perennial grasses the functional root zone is most likely to occur within the top 24 to 30 inches of the root zone (Table 3). For the seed mix species, it is reasonable to estimate that most of the reseeded vegetation root structure and water/nutrient uptake (approximately 90%) is likely to occur within the top 24 to 30 inches of the soil surface. Although roots may extend to greater depths, the magnitude of impacts from potential contaminants are likely negligible because of the reduced function of roots at these depths.

Table 3. Root Characteristics and Approximate Functional Rooting Depths for Seed Mix Species

Common Name	Scientific Name	Root Growth Habit	General Root Orientation	Approximate Functional Root Zone (inches)	Approximate Root Mass in Functional Root Zone (%)	Other Notes	References
Blue Grama	*Bouteloua gracilis*	Fibrous root system, can produce tillers but not rhizomes or solons	Vertical/Horizontal	0-18	~85%	Roots can extend horizontally 1 foot from center of the roots depending on the soil type/composition	Anderson 2003 Smith et al 2004 Lee & Lauenroth 1994
Thickspike Wheatgrass	*Elymus lanceolatus*	Extensive creeping rhizome system	Horizontal/Vertical	0-15	~100	Most of the root mass is confined to the upper 8 inches of soil	Scher 2002
Western Wheatgrass	*Pascopyrum smithii*	Deep rooting with shallow rhizomatous roots	Horizontal/Vertical	0-30	~90%	Deep roots and rhizomes are profusely branched	Tirmenstein 1999 Weaver 1942
Alkali Sacaton	*Sporobolus airoides*	Extensive fibrous root system	Vertical/Horizontal	0-16	NA	Capable of thriving on saline and sodic soils	USDA, NRCS 2022
Squirreltail	*Elymus elymoides*	Deep rooting with branching lateral roots extending 16 inches	Vertical/Horizontal	0-40	100%	Depths greater than 40 inches are possible, bedrock limited root depth in cited study	Reynolds & Fraley 1999

Revegetation seed mixes are designed based on native species composition that is typical of the reclamation site. The following species are included in SWCA's reclamation seed mix and are representative of native plant communities in Northern Colorado's shortgrass prairies: blue grama, thickspike wheatgrass, green needlegrass, alkali sacaton, and squirreltail (*Elymus elymoides*) (Table 4). Given that the functional root zone of selected revegetation species is within the top 36 inches (Table 3), elevated soil EC below 36 inches is not expected to impair vegetation establishment.

3.2.3.2 GROUNDWATER

The average groundwater depth across the Project site is greater than 50 feet bgs, based on local topography and nearby well data. Additionally, boring logs collected during sampling indicate dry, dense claystone at 9.0 to 13 feet bgs acting as a natural aquitard and preventing vertical migration of produced water immediately following the release. All hazardous analytes were within Table 915-1 cleanup concentrations and/or below RSSLs. Furthermore, all visually impacted soils have been excavated and removed from the Project site and confirmation sampling conducted; therefore, these analytes are not a concern at the time of analysis and will not cause harm to the environment and/or human health or should not limit plant establishment at the time of reclamation (see Appendix D).

4 REMEDIATION/RECLAMATION PROCEDURES AND BEST MANAGEMENT PRACTICES

Based on the most recent results of the environmental site investigation of the Project location (February 9, 2023), the following site-specific soil remediation/reclamation procedures have been established for the impacted area of the Pintail Lateral PWTS. The specific details of the reclamation plan are provided in sections 4.1 through 4.6.

4.1 Soil Excavation and Import

Excavation of impacted materials and import of suitable topsoil resources has been implemented. Impacted soil resources have been excavated to the depth of impact (based on visual observation and confirmation sampling) and replaced with suitable topsoil resources of similar physicochemical properties (i.e., soil pH, soil EC/SAR, SOM, soil texture). Confirmation sampling was conducted following all excavation efforts to verify that impacted soil resources were properly removed (Appendix D).

4.2 Revegetation

Revegetation measures and BMPs include the following measures.

4.2.1 Seedbed Preparation

Seedbed preparation maximizes seeding efficiency and improves reclamation success. Seedbed preparation includes topsoil replacement and surface roughening techniques such as scarifying and/or discing. As needed, soil conditioning (i.e., soil amendments), decompaction, and topsoil protection measures must be implemented to successfully reestablish vegetation and to protect the seedbed and soil resources until revegetation and stabilization are effective. A good seedbed is uniformly firm with various micro-habitats and/or light mulch on the surface to prevent erosion and protect seed.

Topsoil Placement

1. Evaluate the compaction of subsoil prior to the respread of topsoil and deep rip accordingly, depending on ecological site and type of equipment used for topsoil replacement. Ripping should occur to a minimum depth of 24 inches using a parabolic ripper or equivalent equipment to reduce soil compaction and improve drainage. The shanks on the back of a grader or dozer should NOT be used to reduce soil compaction.
2. Apply subsoil followed by topsoil evenly across prepared subsoil surface.
3. Disk applied topsoil to a depth of 4.0 to 6.0 inches. Disking should be conducted using a disk and harrow, field cultivator, vibra-shank, or other alternative suitable to site conditions. Identify with the appropriate signage when leaving topsoil in place for more than one month prior to seeding.

Additional erosion-control BMPs will be added to minimize erosion and control sediment transport, as needed (see Section 4.3).

Prior to Seeding (i.e., no more than 2.0 to 4.0 weeks prior to seeding)

1. Perform primary disking/tillage of topsoil to break up clods.
2. Continue to till and aerate until clods are reduced to less than 4.0 inches and the overall density of cloddiness is reduced to less than 50% of the disturbance extent. Tillage must be no deeper than the depth of the replaced topsoil.
3. As applicable, till across slopes or perpendicular to the aspect of the slope to reduce erosive forces and avoid channelization from sheet flow and/or wind whenever possible.
4. Once topsoil is applied and prepared for seeding, adequately identify with signage to prevent equipment from unnecessarily driving on and/or compacting applied topsoil.
5. Prior to or during seeding, perform a final tillage to break up any remaining clods and produce a firm seed bed.
6. Suspend site preparation when soils are too wet to support equipment without significant rutting or soil mixing.

4.2.2 Seeding

Appropriate revegetation practices provide the species composition, diversity, structure, and total ground cover to promote the reestablishment of the desired plant community. The reclamation contractor is encouraged to provide suggestions for deviations from this Plan to Taproot Midstream based on their experience in implementing these techniques in similar areas. A site-specific, semi salt-tolerant seed mix will be used to reclaim and stabilize disturbed soils across the Project site (Table 4).

In Colorado, seeding is most successfully implemented during the spring or fall prior to late fall/early winter freeze and precipitation events. When possible, seeding will occur prior to anticipated precipitation events to increase the likelihood of germination and vegetation establishment.

Seeding Schedule

1. Seeding should occur within ideal seeding windows for greatest success. In Colorado, this is from spring thaw to June 1 for spring seeding or after October 1 for late fall, dormant seeding (preferred).
2. If reclamation is completed outside of the ideal seeding season, a sterile cover crop should be seeded to provide quick vegetation establishment and more immediate ground cover and

protection [e.g., oats (*Avena sativa*) or sterile triticale (*Triticum aestivum x Secale cereal)* at 30 lbs per acre]. Cover crops should only include species that are non-invasive, non-persistent, and non-competitive.

3. The actual end date will be based on the current weather patterns and ground conditions. No seeding is allowed outside of the recommended window without prior approval from Taproot Midstream.
4. Seeding within the recommended window should be conducted in consideration of the current and anticipated weather conditions. Soil temperatures of around 40 degrees Fahrenheit are ideal.

The appropriate seeding technique and equipment must be used in consideration of site conditions and terrain. Drill seeding is the primary seeding method for the Project site and will be implemented across the site. Drill seeding is preferred as it improves seed-to-soil contact. Weather and site conditions must be suitable for the selected seeding method to ensure an adequate seeding rate and to minimize soil clodding or mixing. The reclamation contractor is expected to use its expertise in recommending modifications to the proposed seed applications and methods.

Drill Seeding

1. Inspect and calibrate drill seeder prior to seeding.
2. Drill seeding should occur using a drill equipped with an agitator and depth bands to mix seed and ensure proper seeding depths.
3. Seed tubes, packer wheels, and depth bands must be in proper functioning condition.
4. Proper seeding depths must be established and calibrated prior to seeding; 0.25 to 0.50 inch for grasses and large-seeded forbs and less than 0.125 inch for small-seeded shrubs and forbs, when practicable.
5. Adequately mix seed hopper each time seed is added.
6. Prior to seeding, disc topsoil surface with scarifier and/or disc, or cultipacker, or harrow as needed to loosen seedbed and aerate surface (see Section 4.2.1).
7. Maintain an appropriate speed during drill seeding to ensure appropriate seed spacing and seed depth. The speed must be appropriate to site conditions, typically less than 5.0 miles per hour for flat conditions.
8. Apply certified noxious “weed-free” mulch and/or other erosion-control devices/BMPs as specified following seeding (see Section 4.3).

4.2.2.1 SEED MIX

The reclamation seed mix was designed to achieve species composition and diversity for the desired plant community, ecological setting, and current soil properties based on pre-disturbance vegetation characteristics described in Section 3.1, Plant Communities. Species for the reclamation seed mix were selected for their likelihood of occurring in the Project site, wildlife and forage value, erosion control capabilities, and commercial availability. Table 4 provides a list of selected species by pure live seed (PLS) per square foot and pounds per acre. Final selection of seed mixes will be dependent on seed availability.

Seed Mix

1. The reclamation contractor must purchase “Certified Seed” (blue tagged) or “Source Identified” (yellow tagged) seeds from a reputable seller. Certified Seed is certified by the State Department

of Agriculture to contain 0% weed seed and no more than six seeds per pound of "restricted" weed seeds.

2. The reclamation contractor must follow proper seed handling guidelines, including storage temperature and humidity.
3. To increase the likelihood of successful reclamation, locally adapted native plant materials should be selected when possible.
4. Seeding rates are specified in Table 4 and are specific to drill seeding applications ***(i.e., seed rates would double for broadcast or hydroseeding applications***). The seed mix should provide approximately 60 PLS per square foot and should contain a mycorrhizal inoculum at the rate of 5.0 pounds per acre. The reclamation contractor must procure and apply seed at the specified rate for the seeding method selected.
5. Seed mix should a sterile cover crop to provide quick vegetation establishment and more immediate ground cover and protection [e.g., oats (*Avena sativa*) or sterile triticale (*Triticum aestivum x Secale cereal*) at 30 lbs per acre]. Cover crops should only include species that are non-invasive, non-persistent, and non-competitive.
6. Contractor must retain all seed tags (labels) and provide the original seed tags along with documentation of the application location in a timely manner to Taproot Midstream.

Table 4. Recommended Seed Mix for Revegetation Activities at the Pintail Project Site, Weld County, Colorado

Common Name	Scientific Name	PLS+ (pounds per acre)	PLS+ per square foot	Composition (%)
Blue Grama	*Bouteloua gracilis*	0.95	18	30%
Thickspike Wheatgrass	*Elymus lanceolatus*	2.5	9	15%
Western Wheatgrass	*Pascopyrum smithii*	3.6	9	15%
Alkali Sacaton	*Sporobolus airoides*	0.22	9	15%
Squirreltail	*Elymus elymoides*	2.0	9	15%
Scarlett Globemallow	*Sphaeralcea coccinea*	0.26	3	5%
Common Yarrow	*Achillea millefolium*	0.05	3	5%
Total*		**9.6**	**60**	**100%**

+PLS = pure live seed

*Totals may not be exact due to rounding

4.3 Site Stabilization

Site stabilization applications and erosion-control devices (ECDs) will be installed, as needed, following reclamation activities and in accordance with the Project's stormwater management plan. Following reclamation actions, apply and crimp straw mulch into surface soils to reduce potential water and wind erosion. Recommended straw mulch application rates are between 1.5 to 2.0 tons per acre. This will provide ground coverage of approximately 80% to 90% of the ground surface prior to crimping. Once applied the straw mulch should be crimped into the soil. Upon successful crimping, the straw mulch should be standing vertically with approximately 40% to 60% of the ground surface covered. Straw mulch should be at least 6.0 inches in length. Straw mulch should be crimped sufficiently to cause vertical cover that will not be dislodged by light breezes. Straw mulch should be certified "weed-free".

4.4 Noxious and Invasive Species Management

The primary goal of noxious and invasive species management is to prevent and minimize the establishment and spread of state- and/or county-listed noxious weeds and/or invasive species due to Project disturbance and/or activities. The establishment and spread of these species are a threat to the overall health of the ecosystem as unfavorable effects may include diminished habitat and quality of forage for wildlife and livestock, diminished native plant communities, and increased fuel load for wildfires. Noxious and invasive species management will occur within the Project site and focus on areas where reclamation and remediation activities have occurred. Any noxious and invasive species that occur outside of the Project site as the result of Project activities will be monitored and/or controlled by Taproot Midstream in coordination with the surface owner.

Areas most susceptible to noxious and invasive species infestations or occurrences include recently disturbed soils, roadsides, pipeline rights-of-way, drainages, and agricultural improvements. Noxious and invasive species management will be a cooperative effort between Taproot Midstream and the surface owner.

Mowing

1. The site should be periodically mowed during the growing season to manage undesirable species establishment.
2. Mowing should occur prior to flowering and seed head production of undesirable species or when their height exceeds 18 inches, whichever comes first.
3. Mower deck should be placed between 8 and 12 inches to protect native species.
4. Mowing will reduce competition with desirable species and allow greater opportunity for native species success.

Herbicide Application

1. All herbicide applications will be completed or supervised by a state-licensed pesticide applicator.
2. All herbicide label requirements must be followed. Deviations are not allowed.
3. All herbicide application on the Project site will be made with the appropriate spraying equipment (as determined by weed species, selected herbicide, terrain, infestation level, etc.).
4. Do not conduct treatments during precipitation events or when precipitation is expected within 24 hours.
5. Apply herbicides in favorable weather conditions to minimize drift. Herbicide applications will only be conducted when average wind speeds are below 10 miles per hour.
6. Complete herbicide treatment records during herbicide application will be collected by Taproot Midstream for each treated area and maintained.

No state- and/or county-listed noxious weed species were observed during SWCA's site inspection in April 2024.

4.5 Fencing Installation

Fencing options will be determined in coordination with the surface owner and current land use management. If no grazing activities are planned during site reclamation, fencing will not be installed. If,

during the first two growing seasons, grazing is planned, fencing should be installed per the preference and/or recommendation of the surface owner and may include wildlife-friendly three-wire fencing or temporary hotwire fencing to discourage grazing impacts to reclamation and revegetation efforts.

4.6 Reclamation Timing

Planned reclamation actions will be determined prior to site reclamation. Final reclamation for the Project site (i.e., the PWTS) is planned to occur during spring 2024 by Taproot Midstream. A schedule template for planned reclamation activities is included in Appendix E and will be completed prior to reclamation and additional remediation actions at the Project site.

5 MONITORING AND REPORTING

5.1 Monitoring

The purpose of monitoring is to gather information for evaluating the outcome of reclamation and remediation efforts. Establishing a strong monitoring program that can be easily followed and repeated will greatly assist in future efforts to make appropriate management decisions. As described in ECMC's Reclamation Regulations 1000 Series, Rule 1004.d "final reclamation of all disturbed areas shall be considered complete when all activities disturbing the ground have been completed, and all disturbed areas have been either built upon, compacted, covered, paved, or otherwise stabilized in such a way as to minimize erosion, or a uniform vegetative cover has been established that reflects pre-disturbance or reference area forbs, shrubs, and grasses with total percent plant cover of at least eighty percent (80%) of pre-disturbance or reference area levels, excluding noxious weeds, or equivalent permanent, physical erosion reduction methods have been employed" (ECMV 2021:1000-8). As such, annual monitoring should occur for a minimum of two growing seasons and until vegetative cover of at least 80 percent of reference area levels has been met or exceeded and will document plant vegetation establishment as well as composition and percent surface cover within reclaimed areas to evaluate the overall success of reclamation and remediation activities and inform further prevention and management techniques.

5.1.1 Adaptive Management

In an adaptive management strategy, the outcome of management may vary and these outcomes may require that changes in methods for reclamation be made. Adaptive management greatly increases the potential for reclamation success by providing early detection of problems and the opportunity to implement remedial actions to address these problems. No single management technique is applicable or effective for all situations, and multiple management actions may be required for effective management. Effective monitoring is an essential element of adaptive management because it provides reliable feedback on the effects of reclamation actions. If it has been determined that adaptive measures are necessary, monitoring data will provide information on target areas and species, such as poor seedling establishment or noxious and invasive species, that may require varied or more intensive treatments.

5.2 Reporting

Reclamation results will be described in annual reports for a minimum of two growing seasons and until vegetative cover of at least 80 percent of reference area levels has been met or exceeded. Annual reports will include documentation of overall areas reclaimed, conditions associated with the Project site and reclaimed areas, and additional strategies to meet success criteria described above if necessary. The

results of annual monitoring and reporting will determine if these areas require additional remedial action and treatment (see Section 5.1.1, Adaptive Management).

6 CONCLUSION

SWCA was retained by Taproot Midstream to investigate site conditions following a produced water release during the fall of 2022 at the Pintail Lateral PWTS, approximately 13.8 miles northwest of Raymer, Colorado. Soils at the Project site were sampled from October 18 through 20, 2022 (immediately following discovery of the release), and again on February 9, 2023 (post-excavation of impacted soils). Preliminary discrete soil samples collected from various impact areas and soil depths across the location indicated that the location soils were saline-sodic throughout the impacted area. Discrete soil samples collected post-excavation of impacted soils indicate that excavation and topsoil import has been successful and materials containing elevated EC and SAR have been successfully removed from the site and replaced with suitable resources.

Using field observations and collected analytical data, SWCA developed this Plan to propose various options for revegetation (e.g., seedbed preparation, seeding, noxious weed control, monitoring, adaptive management) following appropriate remediation actions. Site preparation and seeding should occur in spring or late fall/early winter with a suitable seed mix that will achieve species composition and diversity for the desired plant community, ecological setting, and current soil properties based on pre-disturbance vegetation characteristics. A seed mix recommendation is available in Table 4. SWCA further recommends that follow-up monitoring occur for a minimum of two growing seasons to verify remediation effectiveness and desirable revegetation.

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APPENDIX A

Initial Spill/Release Report (Form 19)

FORM 19 Rev 03/21

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203
Phone: (303) 894-2100 Fax: (303) 894-2109

Document Number: 403202349
Date Received: 10/19/2022

Spill report taken by:

Spill/Release Point ID:

SPILL/RELEASE REPORT (INITIAL)

This form is to be submitted by the party responsible for the oil and gas spill or release. Refer to COGCC Rule 912.b. for reporting requirements of spills or releases of E&P Waste, produced Fluids, or unauthorized Releases of natural gas. Submit a Site Investigation and Remediation Workplan (Form 27) if Rule 913.c. applies.

OPERATOR INFORMATON

Name of Operator: TAPROOT ROCKIES MIDSTREAM LLC Operator No: 10718

Address: 555 17TH STREET SUITE 800

City: DENVER State: CO Zip: 80202

Contact Person: Dave Brazeal

Phone Numbers

Phone: ( )

Mobile: (701) 509-2063

Email: dbrazeal@taprootep.com

INITIAL SPILL/RELEASE REPORT

Initial Spill/Release Report Doc# 403202349

Initial Report Date: 10/19/2022 Date of Discovery: 10/17/2022 Spill Type: Recent Spill

Spill/Release Point Location:

QTRQTR NW SE SEC 35 TWP 9N RNG 60W MERIDIAN 6

Latitude: 40.711719 Longitude: -104.067736

`Municipality (if within municipal boundaries): County: WELD

Enter Lat./long measurement of the actual Spill/Release Point. Lat./Long. Data shall meet standards of Rule 216.

Reference Location:

Facility Type: PRODUCED WATER TRANSFER SYSTEM

[X] Facility/Location ID No 467382

Spill/Release Point Name: Pintail Lateral Release

[ ] Well API No. (Only if the reference facility is well) 05- -

[ ] No Existing Facility or Location ID No.

Estimated Total Spill Volume: use same ranges as others for values

Estimated Oil Spill Volume(bbl): 0

Estimated Condensate Spill Volume(bbl): 0

Estimated Flow Back Fluid Spill Volume(bbl): 0

Estimated Produced Water Spill Volume(bbl): >=100

Estimated Other E&P Waste Spill Volume(bbl): 0

Estimated Drilling Fluid Spill Volume(bbl): 0

Specify:

Has the subject Spill/Release been controlled at the time of reporting? Yes

Land Use:

Current Land Use: NON-CROP LAND Other(Specify):

Weather Condition: Sunny 75 degrees

Surface Owner: FEE Other(Specify):

Describe what is known about the spill/release event (what happened -- including how it was stopped, contained, and recovered):

A Release was observed around 1:15 PM on 10/17/22 by the oil and gas operator to the northeast of the Site. water had pooled at the surface and began flowing south, parallel to the produced water line. By 5:00 PM the maximum surficial extents were delineated and surveyed. The line was shut down immediately, and vacuum excavation began at 8:00 AM on 10/18/2022. The ruptured 6" thermoflex pipe was daylighted around 9:00 AM on 10/18, had buckled upwards, and a dime sizred hole was observed. Excavation activities continued, including shallow excavation of impacted surface soils, confirmation sampling, and vacuum excavation of the line to emove any additional fluid.

List of Agencies and Other Parties Notified Pursuant to Rule 912.b.(7)-(11):

OTHER NOTIFICATIONS

Date	Agency/Party	Contact	Phone	Response
10/19/2022	Weld County	Online Spill Reporting	-	
10/17/2022	Landowner	Mike Shull	-	understanding

REPORT CRITERIA

Rule 912.b.(1) Report to the Director (select all criteria that apply):

No — Rule 912.b.(1).A: A Spill or Release of any size that impacts or threatens to impact any Waters of the State, Public Water System, residence or occupied structure, livestock, wildlife, or publicly-maintained road.

Waters of the State: n/a
Public Water System: n/a
Residence or Occupied Structure: n/a
Livestock: n/a
Wildlife: n/a
Publicly-Maintained Road: n/a

Yes — Rule 912.b.(1).B: A Spill or Release in which 1 barrel or more of E&P Waste or produced fluids is spilled or released outside of berms or other secondary containment.

Yes — Rule 912.b.(1).C: A Spill or Release of 5 barrels or more of E&P Waste or produced Fluids regardless of whether the Spill or Release is completely contained within berms or other secondary containment.

No — Rule 912.b.(1).D: Within 6 hours of discovery, a Grade 1 Gas Leak. For a Grade 1 Gas Leak from a Flowline, the Operator also must submit the Form 19 – Initial, document number on a Form 44, Flowline Report, for the Grade 1 Gas Leak

Enter the approximate time of discovery _____ (HH:MM)

Enter the Document Number of the Grade 1 Gas Leak Report, Form 44 _____

Was there a reportable accident associated with either a Grade 1 Gas Leak or an E&P waste spill or release? _____

Enter the Document Number of the Initial Accident Report, Form 22 _____

Was there damage during excavation? _____

Was CO 811 notified prior to excavation? _____

Yes — Rule 912.b.(1).E: The discovery of 10 cubic yards or more of impacted material resulting from a current or historic Spill or Release. Discovery and reporting will not be contingent upon confirmation samples demonstrating exceedance of Table 915-1 standards.

Estimated Volume of Impacted Solids (cu. yd.): 500

No — Rule 912.b.(1).F: The discovery of impacted Waters of the State, including Groundwater. Discovery and reporting will not be contingent upon confirmation samples demonstrating exceedance of Table 915-1 standards. The presence of free product or hydrocarbon sheen on Groundwater or surface water is reportable. The presence of contaminated soil in contact with Groundwater or surface water is reportable. Check all that apply:

- ☐ The presence of free product or hydrocarbon sheen Surface Water
- ☐ The presence of free product or hydrocarbon sheen on Groundwater
- ☐ The presence of contaminated soil in contact with Groundwater
- ☐ The presence of contaminated soil in contact with Surface water

Yes	Rule 912.b.(1).G: A suspected or actual Spill or Release of any volume where the volume cannot be immediately determined, including a spill or release of any volume that daylights from the subsurface.
No	Rule 912.b.(1).H: Spill or Release resulting in vaporized hydrocarbon mists that leave the Oil and Gas Location or Off-Location Flowline right of way from an Oil and Gas Location and impacts or threatens to impact off-location property.

☐ Areas offsite of Oil & Gas Location ☐ Off-Location Flowline right of way

No	Rule 912.b.(1).I: A Release of natural gas that results in an accumulation of soil gas or gas seeps.
No	Rule 912.b.(1).J: A Release that results in natural gas in Groundwater.

OPERATOR COMMENTS:

Spill investigation is on going, but all Thermoflex Piping is planned for replacement with Flexsteel over the next 6 months.

I hereby certify all statements made in this form are to the best of my knowledge true, correct, and complete.

Signed: Print Name: Dale Hunt

Title: VP of Engineering Date: 10/19/2022 Email: Dhunt@taprootep.com

COA Type	Description

0 COA

Attachment List

Att Doc Num	Name
403203067	SITE MAP

Total Attach: 1 Files

General Comments

User Group	Comment	Comment Date
		Stamp Upon Approval

Total: 0 comment(s)

APPENDIX B

Assessment Photos

Photo: 1 **Description:** Release location looking east. Photo taken at 8:00 AM 11/18.	

Photo: 2 **Description:** Release location looking southwest.	

Photo: 3 **Description:** South end of the impacted area looking north towards the release location. Maximum extents were determined by wet soil and surveyed by a professional surveyor.	

Photo: 4 **Description:** Impacted are looking south from the release location.	

Photo: 5 **Description:** Hydro excavator working in the primary excavation area to locate the pipeline failure.	

Photo: 6 **Description:** The failure in the pipeline. Deformed Thermoflex 6" pipe.	

Photo: 7 **Description:** Surface scrapping of impacted area to remove visible wet soil.	

Photo: 8 **Description:** Surface scraping of impacted area.	

Photo: 9 **Description:** Looking south at the primary and secondary excavation areas on 11/18	

Photo: 10 **Description:** Primary excavation area after exposing failed pipeline. Day 2 of hydroexcavation 10/19/22.	

Photo: 11 **Description:** Secondary excavation area after surface scrape looking south.	

Photo: 12 **Description:** Secondary excavation area after surface scrape looking southeast.	

Photo: 13 **Description:** Secondary excavation looking South. Following impacts with visual observations of impacts, as well as with a soil conductivity meter. Impacted soil was observed >4.0 mmhos/cm on the darker soil on the right, and <0.5mmhos/cm in the lighter soil on the left. 12/20/22	

Photo: 14 **Description:** Excavation and disposal of impacted soil on 12/20/22.	

Photo: 15 **Description:** Final Site Conditions following excavation of 1,150 tons of soil on 12/20 and 12/21.	
Photo: 16 **Description:** Drilling investigation completed 2/9/2023	

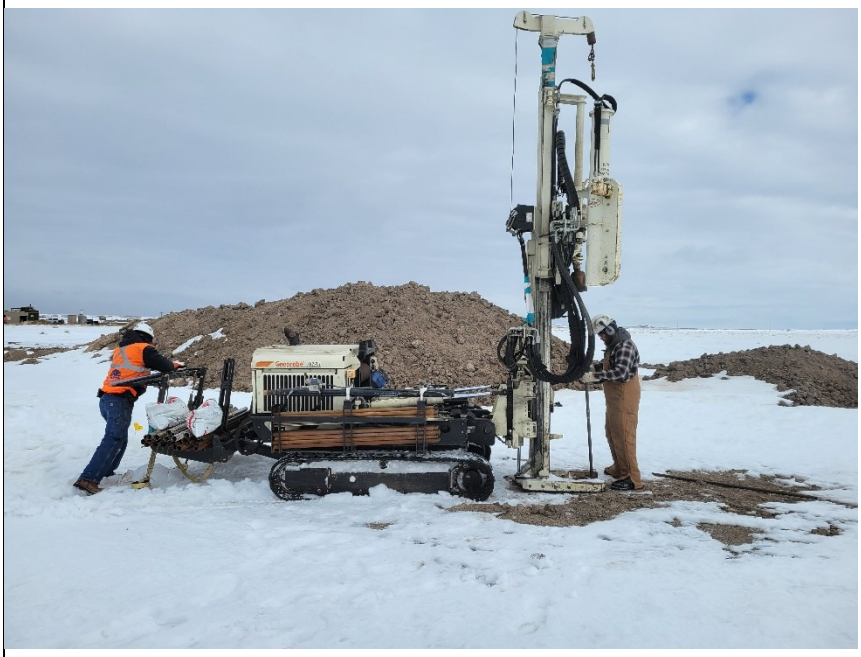
Photo: 17 **Description:** Drilling investigation completed 2/9/2023	
Photo: 18 **Description:** Drilling investigation completed 2/9/2023. Borings advanced to refusal in dense, dry claystone.	

Photo: 19 **Description:** Drilling investigation completed 2/9/2023. Borings advanced to refusal in dense, dry claystone.	
Photo: 20 **Description:**	

APPENDIX C

Vegetation Assessment Results

Table C1. Results of the April 8, 2024, Vegetation Site Assessment for the Pintail Lateral Project, Weld County, Colorado

Site*	Surface Cover								
	Blue Grama (*Bouteloua gracilis*)	**Alkali Sacaton (*Sporobolus airoides*)**	**Thickspike Wheatgrass (*Elymus lanceolatus*)**	**Plains Pricklypear (*Opuntia polyacantha*)**	**Burningbush (*Bassia scoparia*)**	**Litter (Native Vegetation)**	**Rock**	**Bare Ground**	**Total**
	Cover (%)								
IMPACTED	-	-	2.0	1.0	5.0	15	2.0	75	**100**
ADJACENT	60	3.0	3.0	2.0	-	3.0	-	29	**100**

Note: Cover percent is a general estimate of the surface cover each species is occupying based on visual observation.
* IMPACTED is representative of ecological conditions within the Project site and ADJACENT is representative of ecological conditions immediately adjacent to the Project site.
- = Not Observed.

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APPENDIX D

Soil Sampling Analytical Results

Table D1. Summary of Soil Sample Analytical Results

Station Name	Units	RSSL†	BS1*	BS1*	FS1*	FS2*	SW1*	SW2*	SW3*	SW4*	SW5*	SS1*	SS1*	SS2*	SS2*
Sample Date			**10/18/22**	**10/18/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/18/22**	**10/18/22**	**10/18/22**	**10/18/22**
Sample Depth			**0 – 0.5 feet**	**3 – 3.5 feet**	**8 feet**	**8 feet**	**7 feet**	**7 feet**	**7 feet**	**7 feet**	**7 feet**	**0 – 0.5 feet**	**3 – 3.5 feet**	**0 – 0.5 feet**	**3 – 3.5 feet**
Metals															
ARSENIC	mg/kg	0.68	3.59	3.49	3.64	4.08	4.24	3.67	3.57	4.16	4.09	3.43	3.75	3.61	3.80
BARIUM	mg/kg	15,000	186	215	400	175	136	173	123	257	180	191	200	145	400
CADMIUM	mg/kg	71	0.157	0.134	<0.0959	<0.0963	<0.0994	0.122	<0.0987	<0.0974	0.126	0.173	0.127	0.147	0.127
COPPER	mg/kg	3,100	13.1	11.1	10.2	10.1	12.7	10.7	10.7	11.2	11.4	10.7	10.3	10.6	10.6
CHROMIUM (VI)	mg/kg	0.30	<1.22	<0.244	<0.248	<0.245	<0.246	<0.248	<0.244	<0.244	<0.25	<1.22	<0.488	<0.488	<0.251
LEAD	mg/kg	400	14.2	15.9	15.4	15.1	<9.94	11.4	<9.87	14.8	13.4	14.3	20.5	11.6	11.4
NICKEL	mg/kg	1,500	<9.53	<9.13	<9.59	<9.63	<9.94	<9.48	<9.87	<9.74	<9.78	<9.95	<8.79	<9.15	<9.70
SELENIUM	mg/kg	390	0.158	<0.0913	<0.0959	<0.0963	<0.0994	0.107	<0.0987	<0.0974	<0.0978	0.115	0.112	0.137	<0.0970
SILVER	mg/kg	390	<0.0953	<0.0913	<0.0959	<0.0963	<0.0994	<0.0948	<0.0987	<0.0974	<0.0978	<0.0995	<0.0879	<0.0915	<0.0970
ZINC	mg/kg	23,000	<95.3	<91.3	<95.9	<96.3	<99.4	<94.8	<98.7	<97.4	<97.8	<99.5	<87.9	<91.5	<97.0
VOCs															
BENZENE	mg/kg	1.2	<0.00200	<0.00200	0.172	0.134	<0.00200	<0.00200	<0.00200	0.00842	0.0742	<0.00200	<0.00200	0.00374	<0.00200
ETHYLBENZENE	mg/kg	5.8	<0.00200	<0.00200	0.00256	0.00276	<0.00200	<0.00200	<0.00200	<0.00200	0.00444	<0.00200	<0.00200	<0.00200	<0.00200
TOLUENE	mg/kg	490	<0.00200	<0.00200	0.0886	0.0390	<0.00200	<0.00200	<0.00200	0.00200	<0.00200	<0.00200	<0.00200	0.00536	<0.00200
XYLENES, TOTAL	mg/kg	58	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	0.00218	<0.00200	0.00316	<0.00200
1,2,4-TRIMETHYLBENZENE	mg/kg	30	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	0.00478	<0.00200	<0.00200	<0.00200	<0.00200
1,3,5-TRIMETHYLBENZENE	mg/kg	27	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
Semi-VOCs															
1-METHYLNAPHTHALENE	mg/kg	18	<0.000364	<0.000364	0.00108	<0.00182	<0.000364	<0.000364	<0.000364	<0.00182	0.00348	0.00586	<0.000364	<0.00182	<0.000364
2-METHYLNAPHTHALENE	mg/kg	24	<0.000645	<0.000645	0.000726	<0.00323	<0.000645	<0.000645	<0.000645	<0.00323	<0.00323	<0.00323	<0.000645	<0.00323	<0.000645
ACENAPHTHENE	mg/kg	360	<0.000304	<0.000304	<0.000304	<0.00152	<0.000304	<0.000304	<0.000304	<0.00152	<0.00152	<0.00152	<0.000304	<0.00152	<0.000304
ANTHRACENE	mg/kg	1,800	<0.000334	<0.000334	<0.000334	<0.00167	<0.000334	<0.000334	<0.000334	<0.00167	<0.00167	< 0.00167	<0.000334	< 0.00167	<0.000334
BENZO(A)ANTHRACENE	mg/kg	1.1	<0.000493	<0.000493	<0.000493	<0.00247	<0.000493	<0.000493	<0.000493	<0.00247	<0.00247	< 0.00247	<0.000493	< 0.00247	<0.000493
BENZO(A)PYRENE	mg/kg	0.11	<0.000468	<0.000468	<0.000468	<0.00234	<0.000468	<0.000468	<0.000468	<0.00234	<0.00234	0.00278	<0.000468	0.00332	<0.000468
BENZO(B)FLUORANTHENE	mg/kg	1.1	<0.000585	<0.000585	<0.000585	<0.00293	<0.000585	<0.000585	<0.000585	<0.00293	<0.00293	< 0.00293	<0.000585	< 0.00293	<0.000585
BENZO(K)FLUORANTHENE	mg/kg	11	<0.000437	<0.000437	<0.000437	<0.00219	<0.000437	<0.000437	<0.000437	<0.00219	<0.00219	< 0.00219	<0.000437	< 0.00219	<0.000437
CHRYSENE	mg/kg	110	<0.000624	<0.000624	<0.000624	<0.00312	<0.000624	<0.000624	<0.000624	<0.00312	<0.00312	< 0.00312	<0.000624	< 0.00312	<0.000624
DIBENZ (A,H) ANTHRACENE	mg/kg	0.11	<0.000614	<0.000614	<0.000614	<0.00307	<0.000614	<0.000614	<0.000614	<0.00307	<0.00307	<0.00307	<0.000614	<0.00307	<0.000614
FLUORANTHENE	mg/kg	240	<0.000394	<0.000394	<0.000394	<0.00197	<0.000394	<0.000394	<0.000394	<0.00197	<0.00197	<0.00197	<0.000394	<0.00197	<0.000394
FLUORENE	mg/kg	240	<0.000286	<0.000286	<0.000286	<0.00143	0.000367	<0.000286	<0.000286	<0.00143	<0.00143	<0.00143	<0.000286	<0.00143	<0.000286
INDENO(1,2,3-CD) PYRENE	mg/kg	1.1	<0.000627	<0.000627	<0.000627	<0.00314	<0.000627	<0.000627	<0.000627	<0.00314	<0.00314	<0.00314	<0.000627	<0.00314	<0.000627
NAPHTHALENE	mg/kg	2.0	<0.000484	<0.000484	<0.000484	<0.00242	<0.000484	<0.000484	<0.000484	<0.00242	<0.00242	<0.00242	<0.000484	<0.00242	<0.000484
PYRENE	mg/kg	180	<0.000643	<0.000643	<0.000643	<0.00322	<0.000643	<0.000643	<0.000643	<0.00322	<0.00322	<0.00322	<0.000643	<0.00322	<0.000643

Station Name	Units	RSSL[↑]	BS1*	BS1*	FS1*	FS2*	SW1*	SW2*	SW3*	SW4*	SW5*	SS1*	SS1*	SS2*	SS2*
Sample Date			**10/18/22**	**10/18/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/20/22**	**10/18/22**	**10/18/22**	**10/18/22**	**10/18/22**
Sample Depth			**0 – 0.5 feet**	**3 – 3.5 feet**	**8 feet**	**8 feet**	**7 feet**	**7 feet**	**7 feet**	**7 feet**	**7 feet**	**0 – 0.5 feet**	**3 – 3.5 feet**	**0 – 0.5 feet**	**3 – 3.5 feet**
TPH															
C6-C12 GASOLINE RANGE	mg/kg	500	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
C10-C28 DIESEL RANGE	mg/kg	500	<25	<25	<25	<25	<25	<25	<25	<25	<25	< 25	< 25	< 25	<25
C28-C40 RESIDUAL RANGE	mg/kg	500	<100	<100	<100	<100	<100	<100	<100	<100	<100	< 100	< 100	< 100	<100
Soil Suitability for Reclamation															
BORON	mg/l	2.0	0.889	0.915	2.49	5.58	8.47	1.92	2.10	11.4	9.35	6.93	0.685	4.33	1.49
PH	s.u.	6.0 – 8.3	8.0	8.3	7.8	7.7	8.1	8.1	7.7	8.0	8.0	7.7	7.5	7.7	7.8
SODIUM ADSORPTION RATIO	--	6.0	0.602	2.59	3.47	6.49	33.3	3.18	3.67	41.7	25.9	29.1	1.7	20.6	4.48
ELECTRICAL CONDUCTIVITY	mmhos/cm	4.0	0.536	0.458	11.0	11.8	9.43	1.51	7.63	11.4	11.9	11.8	9.29	12.6	7.46

Notes:

RSSL = Residential soil screening levels; NA = Not applicable; NS = Not sampled; '–' = No standard established

'BS' indicates a background sample; 'FS' indicates a sample collected from the floor of an excavation; 'SW' indicates a sample collected from the sidewall of an excavation; 'SS' indicates a surface sample collected from the area of shallow excavation with limited impact from produced water.

Shaded cells indicate an exceedance of residential soil screening levels (RSSLs).

[↑] Where RSSL or protection of groundwater screening level is not present, Table 915-1 cleanup concentrations are used.

* Indicates samples collected during the initial release response.

Table D2. Summary of Soil Sample Analytical Results

Station Name	Units	RSSL[↑]	SS3*	SS3*	SS4*	SS5*	SB1-5	SB1-8	SB1-13	SB2-4	SB2-8	SB3-5	SB3-9	SB4-8[±]	SB5-7	SB5-11
Sample Date			**10/18/22**	**10/18/22**	**10/18/22**	**10/18/22**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**
Sample Depth			**0 – 0.5 feet**	**3 – 3.5 feet**	**0.5 feet**	**0.5 feet**	**5 feet**	**8 feet**	**13 feet**	**4 feet**	**8 feet**	**5 feet**	**9 feet**	**8 feet**	**7 feet**	**11 feet**
Metals																
ARSENIC	mg/kg	0.68	3.53	4.78	3.36	3.07	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BARIUM	mg/kg	15,000	141	211	202	157	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CADMIUM	mg/kg	71	0.139	0.116	0.112	0.155	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
COPPER	mg/kg	3,100	11.6	10.0	10.5	12.2	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CHROMIUM (VI)	mg/kg	0.30	<1.26	<0.244	<0.488	<2.47	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
LEAD	mg/kg	400	12.0	16.7	12.9	12.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NICKEL	mg/kg	1,500	<9.79	<9.72	<9.76	<9.58	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SELENIUM	mg/kg	390	0.128	<0.0972	<0.0976	0.187	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SILVER	mg/kg	390	<0.0979	<0.0972	<0.0976	<0.0958	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
ZINC	mg/kg	23,000	<97.9	<97.2	<97.6	<95.8	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
VOCs																
BENZENE	mg/kg	1.2	<0.00200	0.00522	0.0498	0.108	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200	<0.00200
ETHYLBENZENE	mg/kg	5.8	<0.00200	<0.00200	<0.00200	<0.00200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
TOLUENE	mg/kg	490	<0.00200	0.00282	0.0159	<0.00200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
XYLENES, TOTAL	mg/kg	58	<0.00200	<0.00200	<0.00200	<0.00200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,2,4-TRIMETHYLBENZENE	mg/kg	30	<0.00200	<0.00200	<0.00200	<0.00200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-TRIMETHYLBENZENE	mg/kg	27	<0.00200	<0.00200	<0.00200	<0.00200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Semi-VOCs																
1-METHYLNAPHTHALENE	mg/kg	18	<0.000364	<0.00182	<0.00182	0.000465	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-METHYLNAPHTHALENE	mg/kg	24	<0.000645	<0.00323	<0.00323	<0.000645	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
ACENAPHTHENE	mg/kg	360	<0.000304	<0.00152	<0.00152	<0.000304	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
ANTHRACENE	mg/kg	1,800	<0.000334	< 0.00167	<0.00167	<0.000334	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(A)ANTHRACENE	mg/kg	1.1	<0.000493	< 0.00247	<0.00247	<0.000493	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(A)PYRENE	mg/kg	0.11	<0.000468	<0.00234	<0.00234	<0.000468	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(B)FLUORANTHENE	mg/kg	1.1	<0.000585	< 0.00293	<0.00293	<0.000585	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(K)FLUORANTHENE	mg/kg	11	<0.000437	< 0.00219	<0.00219	<0.000437	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CHRYSENE	mg/kg	110	<0.000624	< 0.00312	<0.00312	<0.000624	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DIBENZ (A,H) ANTHRACENE	mg/kg	0.11	<0.000614	<0.00307	<0.00307	<0.000614	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
FLUORANTHENE	mg/kg	240	<0.000394	<0.00197	<0.00197	<0.000394	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
FLUORENE	mg/kg	240	<0.000286	<0.00143	<0.00143	<0.000286	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
INDENO(1,2,3-CD) PYRENE	mg/kg	1.1	<0.000627	<0.00314	<0.00314	<0.000627	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
NAPHTHALENE	mg/kg	2.0	<0.000484	<0.00242	<0.00242	0.00108	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
PYRENE	mg/kg	180	<0.000643	<0.00322	<0.00322	<0.000643	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Station Name	Units	RSSL[↑]	SS3*	SS3*	SS4*	SS5*	SB1-5	SB1-8	SB1-13	SB2-4	SB2-8	SB3-5	SB3-9	SB4-8[±]	SB5-7	SB5-11
Sample Date			**10/18/22**	**10/18/22**	**10/18/22**	**10/18/22**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**
Sample Depth			**0 – 0.5 feet**	**3 – 3.5 feet**	**0.5 feet**	**0.5 feet**	**5 feet**	**8 feet**	**13 feet**	**4 feet**	**8 feet**	**5 feet**	**9 feet**	**8 feet**	**7 feet**	**11 feet**
TPH																
C6-C12 GASOLINE RANGE	mg/kg	500	<0.200	<0.200	<0.200	<0.200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C10-C28 DIESEL RANGE	mg/kg	500	<25	<25	<25	<25	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C28-C40 RESIDUAL RANGE	mg/kg	500	<100	<100	<100	<100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Soil Suitability for Reclamation																
BORON	mg/l	2.0	3.27	0.669	3.23	9.04	0.709	0.848	<0.0992	0.864	2.03	1.76	0.548	2.03	2.44	0.762
PH	s.u.	6.0 - 8.3	7.8	7.8	7.9	7.9	8.3	7.7	8.1	7.7	7.9	8.3	8.0	8.1	7.7	7.7
SODIUM ADSORPTION RATIO	--	6.0	13.5	4.41	15.3	26.0	3.31	2.83	3.05	2.96	2.57	2.38	2.82	3.08	3.18	2.77
ELECTRICAL CONDUCTIVITY	mmhos/cm	4.0	12.1	11.8	11.7	11.9	0.507	4.34	0.834	0.958	2.11	0.628	0.847	1.04	9.37	5.62

Notes:

RSSL = Residential soil screening levels; NA = Not applicable; NS = Not sampled; '–' = No standard established

'BS' indicates a background sample; 'FS' indicates a sample collected from the floor of an excavation; 'SW' indicates a sample collected from the sidewall of an excavation; 'SS' indicates a surface sample collected from the area of shallow excavation with limited impact from produced water.

Shaded cells indicate an exceedance of residential soil screening levels (RSSLs).

[↑] Where RSSL or protection of groundwater screening level is not present, Table 915-1 cleanup concentrations are used.

* Indicates samples collected during the initial release response.

[±] Indicates sample collected as additional background sample.

Table D3. Summary of Soil Sample Analytical Results

Station Name	Units	RSSL[1]	SB6-6	SB6-10	SB7-5	SB7-9	SB8-5	SB8-8	SB9-5	SB9-11	SB10-4
Sample Date			**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**
Sample Depth			**6 feet**	**10 feet**	**5 feet**	**9 feet**	**5 feet**	**8 feet**	**5 feet**	**11 feet**	**4 feet**
Metals											
ARSENIC	mg/kg	0.68	NS	NS	NS	NS	NS	NS	NS	NS	NS
BARIUM	mg/kg	15,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
CADMIUM	mg/kg	71	NS	NS	NS	NS	NS	NS	NS	NS	NS
COPPER	mg/kg	3,100	NS	NS	NS	NS	NS	NS	NS	NS	NS
CHROMIUM (VI)	mg/kg	0.30	NS	NS	NS	NS	NS	NS	NS	NS	NS
LEAD	mg/kg	400	NS	NS	NS	NS	NS	NS	NS	NS	NS
NICKEL	mg/kg	1,500	NS	NS	NS	NS	NS	NS	NS	NS	NS
SELENIUM	mg/kg	390	NS	NS	NS	NS	NS	NS	NS	NS	NS
SILVER	mg/kg	390	NS	NS	NS	NS	NS	NS	NS	NS	NS
ZINC	mg/kg	23,000	NS	NS	NS	NS	NS	NS	NS	NS	NS
VOCs											
BENZENE	mg/kg	1.2	NS	NS	NS	NS	NS	NS	NS	NS	NS
ETHYLBENZENE	mg/kg	5.8	NS	NS	NS	NS	NS	NS	NS	NS	NS
TOLUENE	mg/kg	490	NS	NS	NS	NS	NS	NS	NS	NS	NS
XYLENES, TOTAL	mg/kg	58	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,2,4-TRIMETHYLBENZENE	mg/kg	30	NS	NS	NS	NS	NS	NS	NS	NS	NS
1,3,5-TRIMETHYLBENZENE	mg/kg	27	NS	NS	NS	NS	NS	NS	NS	NS	NS
Semi-VOCs											
1-METHYLNAPHTHALENE	mg/kg	18	NS	NS	NS	NS	NS	NS	NS	NS	NS
2-METHYLNAPHTHALENE	mg/kg	24	NS	NS	NS	NS	NS	NS	NS	NS	NS
ACENAPHTHENE	mg/kg	360	NS	NS	NS	NS	NS	NS	NS	NS	NS
ANTHRACENE	mg/kg	1,800	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(A)ANTHRACENE	mg/kg	1.1	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(A)PYRENE	mg/kg	0.11	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(B)FLUORANTHENE	mg/kg	1.1	NS	NS	NS	NS	NS	NS	NS	NS	NS
BENZO(K)FLUORANTHENE	mg/kg	11	NS	NS	NS	NS	NS	NS	NS	NS	NS
CHRYSENE	mg/kg	110	NS	NS	NS	NS	NS	NS	NS	NS	NS
DIBENZ (A,H) ANTHRACENE	mg/kg	0.11	NS	NS	NS	NS	NS	NS	NS	NS	NS
FLUORANTHENE	mg/kg	240	NS	NS	NS	NS	NS	NS	NS	NS	NS
FLUORENE	mg/kg	240	NS	NS	NS	NS	NS	NS	NS	NS	NS
INDENO(1,2,3-CD) PYRENE	mg/kg	1.1	NS	NS	NS	NS	NS	NS	NS	NS	NS
NAPHTHALENE	mg/kg	2.0	NS	NS	NS	NS	NS	NS	NS	NS	NS
PYRENE	mg/kg	180	NS	NS	NS	NS	NS	NS	NS	NS	NS

Station Name	Units	RSSL[↑]	SB6-6	SB6-10	SB7-5	SB7-9	SB8-5	SB8-8	SB9-5	SB9-11	SB10-4
Sample Date			**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**	**2/9/23**
Sample Depth			**6 feet**	**10 feet**	**5 feet**	**9 feet**	**5 feet**	**8 feet**	**5 feet**	**11 feet**	**4 feet**
TPH											
C6-C12 GASOLINE RANGE	mg/kg	500	NS	NS	NS	NS	NS	NS	NS	NS	NS
C10-C28 DIESEL RANGE	mg/kg	500	NS	NS	NS	NS	NS	NS	NS	NS	NS
C28-C40 RESIDUAL RANGE	mg/kg	500	NS	NS	NS	NS	NS	NS	NS	NS	NS
Soil Suitability for Reclamation											
BORON	mg/l	2.0	1.64	1.58	0.315	0.926	1.51	0.332	1.73	0.133	1.53
PH	s.u.	6.0 - 8.3	7.9	8.2	7.7	8.0	8.0	7.8	8.2	8.0	8.4
SODIUM ADSORPTION RATIO	--	6.0	3.33	3.79	3.94	3.83	3.49	3.51	3.35	3.22	2.03
ELECTRICAL CONDUCTIVITY	mmhos/cm	4.0	2.66	0.780	1.32	1.63	2.95	1.69	1.11	0.876	0.573

Notes:

RSSL = Residential soil screening levels; NA = Not applicable; NS = Not sampled; '–' = No standard established

'BS' indicates a background sample; 'FS' indicates a sample collected from the floor of an excavation; 'SW' indicates a sample collected from the sidewall of an excavation; 'SS' indicates a surface sample collected from the area of shallow excavation with limited impact from produced water.

Shaded cells indicate an exceedance of residential soil screening levels (RSSLs).

[↑] Where RSSL or protection of groundwater screening level is not present, Table 915-1 cleanup concentrations are used.

APPENDIX E

Reclamation Schedule Template

Table E1. Reclamation Schedule*

Reclamation Action	Date
Soil sampling (include past dates)	
Initial soil sampling	December 18 through 20, 2022
Pre-reclamation soil sampling	February 9, 2023
Impacted soil removal/disposal	December 20, 2022
Initial stabilization measures	February 2023
Seed mixture consultation	TBD
Stormwater BMP installation	TBD
Soil movement and recontouring	February 2023
Decompaction	NA
Topsoil placement	February 2023
Soil amendments	NA
Seedbed preparation	Spring 2024
Seeding	Spring 2024
Seedbed stabilization	Spring 2024
Monitoring	Two growing seasons post-reclamation
Reporting	Annually (until reclamation standards achieved)

* To be completed prior to reclamation and additional remediation actions.
TBD = to be determined
NA = Not Applicable

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