



Ecozone Reclamation Plans
Cedar Hills South Unit Lateral
Pipeline

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RECLAMATION PLAN

BADLANDS ECOZONE SITES

SITE DESCRIPTION

The Badlands Ecozone occurs in uplands on barren shoulders and backslopes of ridges and bluffs, as well as topographically low areas including alluvial fans and stream terraces. This ecozone covers approximately 9 acres of the Cedar Hills South Unit Lateral Pipeline Project. The Badlands Ecozone typically consists of moderately steep to steep slopes greater than 25 percent and can contain a restrictive layer in soil depths less than 10 inches. Soil formation is minimal with variable soil texture and high erosion potential. The Badlands Ecozone includes rocky outcrops with three percent or more of the ground surface covered by rock and contains little to no vegetative cover. Additionally, this ecozone can include fine textured soils (clay loams and clays) with characteristically elevated soil electrical conductivity (EC) and soil sodium adsorption ratio (SAR). These sites will be returned to similar pre-disturbance land use following construction.

A recommended seed mix is provided for the Badlands Ecozone in Table 1 and 2. The Badlands grass seed mix and shrub seed mix were developed using 60 and 10 pure live seeds (PLS) per square foot, respectively. This seed mix considers seed availability, original site composition, and desirable species for quick stabilization in erosive, shallow soils. These seed mixes were developed in consultation with regional USDA-NRCS guidelines and Montana State University Extension.

Key obstacles for reclamation in the Badlands Ecozone are steep slopes with high potential for erosion and shallow soils with potentially elevated soil salinity and soil attributes associated with sodic soils (soil dispersion, poor soil structure, hard surface crust formation, and reduced infiltration) and low water holding potential. Ecozone appropriate erosion control measures, seedbed preparation methods, suitable seed mixes, seeding practices, and a site specific Integrated Weed Management Plan (IWMP) should help expedite reclamation success. The Badlands Ecozone reclamation plan is provided on Page 2.

Table 1. Cedar Hills South Unit Lateral - Badlands Ecozone Sites Grass Seed Mix Recommendation for Year One Seeding.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Blue grama	<i>Bouteloua gracilis</i>	0.10	2	3%
Inland Saltgrass	<i>Distichlis spicata</i>	0.45	5	9%
Western Wheatgrass	<i>Pascopyrum smithii</i>	10.0	25	42%
Needle-and-Thread	<i>Hesperostipa comata</i>	4.09	11	18%
Indian Ricegrass	<i>Achnatherum hymenoides</i>	3.5	11	19%
Slender Wheatgrass	<i>Elymus trachycaulus</i>	1.5	5	9%
Total	--	19.6	60	100%

Table 2. Cedar Hills South Unit Lateral - Badlands Ecozone Shrub Seed Mix Recommendation for Year Two or Three Seeding.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Big Sagebrush	<i>Artemisia tridentata</i>	0.2	10	100%
Total	--	0.2	10	100%

Notes:

1. Seed mix was developed for badlands soil conditions and fine to medium soil textures based on vegetation data. Seed mix may be adjusted based landowner preferences.
2. PLS = Pure Live Seed



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BADLANDS ECOZONE SITES

(1) SOIL AMENDMENTS

Soil amendment recommendations are based on recent soil chemical analysis. It is recommended that 125 lb/acre MAP (11-52-0) be applied to areas within the Badlands Ecozone.

- Nitrogen – 14 pounds per acre
- P₂O₅ – 65 pounds per acre
- K₂O - 0 pounds per acre

(2) SEEDBED PREPARATION

These recommended seedbed preparation steps will aid in successful reclamation. Steps may be omitted, conducted in different order, or changed to optimize success and efficiency depending on field conditions, sub-soil properties, and local terrain.

- When topographical slope allows, shallow rip subsurface soil prior to topsoil application to the maximum depth allowed to reduce soil compaction and improve drainage.
- Apply topsoil and soil amendments, discussed above, to supplement soil nutrients.
- Finally, till the site to a depth of 4.0 to 6.0 inches to create a seedbed conducive to seedling establishment (disk and harrow, field cultivator, vibra-shank, or other alternative suitable to site conditions). Tillage is dependent on topographical slope. If slopes are too steep, implement minimal till practices.

(3) SEEDING

Seeding should be conducted in a two-stage process to establish shrubs on the ROW. Seeding should be completed within 45-days of reclamation using the grass seed mix and rate provided in Table 1. Establishment of resilient grass species will be critical in managing weed populations and improving soil conditions for shrub and forb growth. Manage and monitor weedy species establishment within the first two years from seeding. After grass establishment, seed using the recommended seed mix to achieve desired shrub species. Grass seeding should be conducted using a drill seeder suitable for the location's soils and capable of direct seed placement. Drill seeding should occur on the contour using a drill equipped with an agitator and double disc opener with a wheel press and depth bands to mix seed and ensure proper seeding depths. Seeds should be planted to the depth specified by the vendor to ensure proper germination and emergence. It is recommended that the seed be placed $\frac{1}{8}$ to $\frac{1}{2}$ inch deep.

Broadcast seed shrubs at the recommended rates in Table 2 in the second or third year to achieve the desired plant community. Dormant seeding shrubs is preferred for greatest success. In Montana, shrubs should be seeded between November 1st and March 15th and immediately following snowfall. A snow base of less than 8 inches is ideal to help settle the seed into the soil. If the seeding conditions are not met in year two, shrubs should be planted in year 3. On non-BLM land shrubs should only be seeded when requested by the landowner. The Badlands Ecozone seed mixes and rates are provided in Table 1 and 2.

(4) EROSION CONTROL

Because of steep slope gradients and high erosion potential, all disturbances in the Badlands Ecozone should be hydro-mulched using a bonded fiber matrix (BFM) or flexible growth medium (FGM). Hydro-mulch application will stabilize slopes during reclamation and protect seed until vegetation can successfully establish. A synthetic polymer product, such as polyacrylamide (PAM), could be added to the hydro-mulch solution to encourage soil aggregation and further reduce erosion potential. In areas with limited available soil material a Biotic Soil Media (BSM) can be used to improve grass establishment.

Additional erosion control devices (ECDs) appropriate for specific site conditions should be installed and maintained during all construction and reclamation activities through final site stabilization. Implementing ECDs will minimize erosion of disturbed soils and prevent the transportation of sediment outside the construction ROW and into environmentally sensitive areas such as wetlands, waterbodies, and agricultural lands. Erosion control devices should be employed as needed.

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BADLANDS ECOZONE SITES



(5) WEED MANAGEMENT

Regular inspection of the pipeline ROW and other soil disturbance areas prior to construction will aid in noxious/invasive weed control. Weed management should be diligent within the first one to two years to prevent infestation and allow for native species establishment. A site-specific Integrated Weed Management Plan should be developed once weedy species can be identified. Sites could be mowed prior to flowering and seed head production of weedy species. Mowing will reduce competition with desirable species and allow greater opportunity for reclamation success. In addition to mowing, herbicides appropriate for the identified weedy species should be implemented into the weed management plan to eradicate any problematic species. Application timing and rates should follow the manufacturer's recommendations. Herbicide applications should be selective and avoid desirable native grass, forb, and shrub species. It is recommended to avoid overgrazing during the establishment period to minimize competitive weedy species establishment. All disturbed sites should be promptly seeded following construction to minimize the window of opportunity for new weed invasion.

RECLAMATION PLAN

CULTIVATED CROP ECOZONE SITES



SITE DESCRIPTION

The Cultivated Cropland Ecozone is comprised primarily of managed forage and hay crops. The Cultivated Crop Ecozone makes up approximately 25 acres of the Cedar Hills South Unit Lateral Pipeline Project. Following construction, the land will be returned to productive cropland. The Cultivated Crop Ecozone contains primarily loams, with slopes generally less than 10 percent. Soils are predominately fine textured loams and neutral to slightly alkaline. One key factor in reclaiming the Cultivated Crop Ecozone sites will be the preservation of topsoil, which has the soil properties necessary for agricultural production. This ecozone should present minimal challenges for reclamation due to desirable ecozone characteristics.

The cover crop seed mixes provided in Table 1 and 2 should be seeded on all cultivated cropland when establishment of the crop will not occur within 45 days of reclamation activities. Cover crops will protect the soil from wind and water erosion, increase soil stabilization, improve soil structure, suppress weed establishment, and improve overall reclamation success. The cover crop seed mixes below were developed to provide cover due to a quick germination rate and aid in accelerated soil stabilization by helping to prevent the migration of topsoil during periods of freeze/thaw and rain events. Cool season cover crops should be used mid-March to mid-May and August through September. Cover crop seed mix recommendations for immediate vegetation cover are provided in Tables 1 and 2. The reclamation plan is provided on Page 2.

Table 1. Recommended cool season (March 15 to May 15 or August 15 to October 1) cover crop seed mix.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Barley	<i>Hordeum vulgare</i>	60	18	100
Total	--	60		100%

Table 2. Recommended warm season (May 15 to August 15) cover crop seed mix.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Pearl Millet	<i>Pennisetum glaucum</i>	20	28	100%
Total	--	20		100%

Notes:

1. Seed mix was developed for cultivated row crops. Seed mix may be adjusted based on landowner preferences.
2. PLS = Pure live seed



RECLAMATION PLAN

CULTIVATED CROP ECOZONE SITES

(1) SOIL AMENDMENTS

It is recommended that 125 lb/acre of MAP (11-52-0) fertilizer be added at the time of cover crop seeding to fields within the Cultivated Crop Ecozone sites.

- Nitrogen - 14 pounds per acre
- P₂O₅ – 65 pounds per acre
- K₂O - 0 pounds per acre

(2) SEEDBED PREPARATION

These recommended seedbed preparation steps will aid in successful reclamation. Steps may be omitted, conducted in different order, or changed to optimize success and efficiency depending on field conditions, sub-soil properties, and local terrain.

- Rip subsurface soil, prior to topsoil spreading, to a minimum of 16 inches to reduce soil compaction and improve drainage. The shanks on the back of a grader or dozer should NOT be used to alleviate soil compaction. Do not smooth the ROW with a dozer once ripped it is beneficial to have an irregular surface to help tie the topsoil and subsoil horizons together. Tillage can be used to break soil clods apart prior to topsoil application.
- Apply topsoil and soil amendments, discussed above, to improve the soil physical and chemical characteristics and to supplement soil nutrients.
- Finally, till the site to a depth of 4.0 to 6.0 inches to incorporate soil amendments and to create a seedbed conducive to seedling establishment (disk and harrow, field cultivator, vibra-shank, or other alternative suitable to site conditions).

(3) SEEDING

Seeding should be conducted using a drill seeder suitable for the location's soils and capable of direct seed placement. Drill seeding should occur on the contour using a drill equipped with an agitator and double disc opener with a wheel press and depth bands to mix seed and ensure proper seeding depths. Seeds should be planted to the depth specified by the vendor to ensure proper germination and emergence. It is recommended that the seed be placed $\frac{1}{8}$ to $\frac{1}{2}$ inch deep. The Cultivated Crop Ecozone seed mixes and rates are provided in Tables 1 and 2.

(4) STRAW MULCHING

Application of straw mulch is recommended to reduce potential water and wind erosion on sandy soils. 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 percent of the ground surface prior to crimping. Once applied the straw mulch should be crimped into the soil using a straight disc crimper with 8.0 inches spaced tines. Upon successful crimping the straw mulch should be standing vertically with approximately 40 to 60 percent 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 applied based on landowner preference in cultivated areas.

(5) WEED MANAGEMENT

Regular inspection of the pipeline ROW and other soil disturbance areas prior to construction will aid in noxious/invasive weed control. Weed management should be diligent within the first one to two years to prevent infestation and allow for native species establishment. A site-specific Integrated Weed Management Plan should be developed once weedy species can be identified. Sites could be mowed prior to flowering and seed head production of weedy species. Mowing will reduce competition with desirable species and allow greater opportunity for reclamation success. In addition to mowing, herbicides appropriate for the identified weedy species should be implemented into the weed management plan to eradicate any problematic species. Application timing and rates should follow the manufacturer's recommendations. Herbicide applications should be selective and avoid desirable native grass, forb, and shrub species. It is recommended to avoid overgrazing during the establishment period to minimize competitive weedy species establishment. All disturbed sites should be promptly seeded following construction to minimize the window of opportunity for new weed invasion.

RECLAMATION PLAN

LOAMY ECOZONE SITES



SITE DESCRIPTION

The Loamy Ecozone consists primarily of grassland used for livestock grazing, forage production, and wildlife. This ecozone covers the majority of the Cedar Hills South Unit Lateral Pipeline Project, approximately 95 acres. The Loamy Ecozone is composed of tall and short/mid grasslands and consists of loamy soil types over varying topography. Vegetation within this ecozone consists of diverse herbaceous plant communities where 50 to 90 percent of the vegetation are grasses. Pastures consist primarily of an alfalfa/grass mix and native range is primarily native/introduced grasses and forbs. These sites will be returned to a similar pre-disturbance landuse following construction.

A recommended seed mix is provided for the Loamy Ecozone sites in Table 1 and 2. The native grass seed mix and forb/shrub seed mixes were developed using 60 and 40 pure live seed (PLS) per square foot, respectively. Seed mixes consider seed availability, original site composition, and the ability of species to thrive in this specific ecozone. These seed mixes were developed in consultation with regional USDA-NRCS guidelines and Montana State University Extension.

The Loamy Ecozone should present minimal challenges for reclamation due to desirable ecozone characteristics. Appropriate seedbed preparation methods, seeding practices, a suitable seed mix, and a site specific Integrated Weed Management Plan should help expedite reclamation success. The reclamation plan is provided on Page 2.

Table 1. Cedar Hills South Unit Lateral - Loamy Ecozone Site Grass Seed Mix Recommendation for Year One Seeding.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Sandbergs Bluegrass	<i>Poa secunda</i>	0.7	15	25%
Green Needlegrass	<i>Nassella viridula</i>	2.2	9	15%
Western Wheatgrass	<i>Pascopyrum smithii</i>	5.9	15	25%
Thickspike Wheatgrass	<i>Elymus lanceolatus</i>	1.7	6	10%
Blue grama	<i>Bouteloua gracilis</i>	0.5	9	15%
Prairie Junegrass	<i>Koeleria macrantha</i>	0.1	6	10%
Total	--	11.1	60	100%

Table 2. Cedar Hills South Unit Lateral - Loamy Ecozone Site Forb/Shrub Seed Mix Recommendation for Year Two or Three Seeding.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Forb/Shrub Mix	% of Total Mix
Scarlett Globemallow	<i>Sphaeralcea coccinea</i>	0.2	3	7%	3%
Purple Prairie Clover	<i>Dalea purpureum</i>	0.6	3	7%	3%
Two-grooved Milkvetch	<i>Astragalus bisulcatus</i>	1.4	3	7%	3%
Dotted Gayfeather	<i>Liatris punctata</i>	0.8	2	5%	2%
Greasewood	<i>Sarcobatus vermiculatus</i>	0.9	5	12%	5%
Gardner Saltbrush	<i>Atriplex gardneri</i>	2.0	5	13%	5%
Winterfat	<i>Krascheninnikovia lanata</i>	3.3	10	24%	10%
Big Sagebrush	<i>Artemisia tridentata</i>	0.2	10	25%	10%
Total	--	9.4	40	100%	40%

Notes:

1. Seed mix was developed for loamy soil conditions and fine to medium soil textures based on vegetation data. Seed mix may be adjusted based landowner preferences.
2. PLS = Pure Live Seed

RECLAMATION PLAN

LOAMY ECOZONE SITES



(1) SOIL AMENDMENTS

Soil amendment recommendations are based on recent soil chemical analysis, when available. It is recommended that 125 lb/acre MAP (11-52-0) be applied to areas within the Loamy Ecozone.

- Nitrogen – 14 pounds per acre
- P₂O₅ – 65 pounds per acre
- K₂O - 0 pounds per acre

(2) SEEDBED PREPARATION

These recommended seedbed preparation steps will aid in successful reclamation. Steps may be omitted, conducted in different order, or changed to optimize success and efficiency depending on field conditions, sub-soil properties, and local terrain.

- Rip subsurface soil, prior to topsoil application, to a minimum of 18 inches 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. Do not smooth the ROW with a dozer once ripped it is beneficial to have an irregular surface to help tie the topsoil and subsoil horizons together. Tillage can be used to break soil clods apart prior to topsoil application.
- Apply topsoil and soil amendments, discussed above, to improve the soil physical and chemical characteristics and to supplement soil nutrients.
- Finally, till the site to a depth of 4.0 to 6.0 inches to incorporate soil amendments and to create a seedbed conducive to seedling establishment (disk and harrow, field cultivator, vibra-shank, or other alternative suitable to site conditions).

(3) SEEDING

Seeding should be conducted in a two-stage process to establish forbs and shrubs on the ROW. Seeding should be completed within 45-days of reclamation using the grass seed mix and rate provided in Table 1. Establishment of resilient grass species will be critical in managing weed populations and improving soil conditions for shrub and forb growth. Manage and monitor weedy species establishment within the first two years from seeding. After grass establishment, seed using the recommended seed mix to achieve desired forb and shrub species. Grass seeding should be conducted using a drill seeder suitable for the location's soils and capable of direct seed placement. Drill seeding should occur on the contour using a drill equipped with an agitator and double disc opener with a wheel press and depth bands to mix seed and ensure proper seeding depths. Seeds should be planted to the depth specified by the vendor to ensure proper germination and emergence. It is recommended that the seed be placed $\frac{1}{8}$ to $\frac{1}{2}$ inch deep.

Broadcast seed forbs and shrubs at the recommended rates in Table 2 in the second or third year to achieve the desired plant community. Dormant seeding forbs and shrubs is preferred for greatest success. In Montana, forbs and shrubs should be seeded between November 1st and March 15th and immediately following snowfall. A snow base of less than 8 inches is ideal to help settle the seed into the soil. If the seeding conditions are not met in year two, forbs and shrubs should be planted in year 3. On non-BLM land forbs and shrubs should only be seeded when requested by the landowner. The Loamy Ecozone seed mixes and rates are provided in Table 1 and 2.

(4) STRAW MULCHING

Application of straw mulch is recommended to reduce potential water and wind erosion on sandy soils. 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 percent of the ground surface prior to crimping. Once applied the straw mulch should be crimped into the soil using a straight disc crimper with 8.0 inches spaced tines. Upon successful crimping the straw mulch should be standing vertically with approximately 40 to 60 percent 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.

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LOAMY ECOZONE SITES



(5) WEED MANAGEMENT

Regular inspection of the pipeline ROW and other soil disturbance areas prior to construction will aid in noxious/invasive weed control. Weed management should be diligent within the first one to two years to prevent infestation and allow for native species establishment. A site-specific Integrated Weed Management Plan should be developed once weedy species can be identified. Sites could be mowed prior to flowering and seed head production of weedy species. Mowing will reduce competition with desirable species and allow greater opportunity for reclamation success. In addition to mowing, herbicides appropriate for the identified weedy species should be implemented into the weed management plan to eradicate any problematic species. Application timing and rates should follow the manufacturer's recommendations. Herbicide applications should be selective and avoid desirable native grass, forb, and shrub species. It is recommended to avoid overgrazing during the establishment period to minimize competitive weedy species establishment. All disturbed sites should be promptly seeded following construction to minimize the window of opportunity for new weed invasion.

RECLAMATION PLAN

SALINE ECOZONE SITES



SITE DESCRIPTION

The Saline Ecozone consists of land used primarily for forage production and grazing. The Saline Ecozone makes up approximately 45 acres of the Cedar Creek Pipeline Project. This ecozone occurs in topographically low areas, including alluvial fans and stream terraces, as well as on hillslopes. This ecozone consists of fine textured soils (clay loams and clays) with characteristically elevated soil electrical conductivity (EC) and soil sodium adsorption ratio (SAR). Soils are moderately deep to deep (> 20 inches) and slope typically ranges from 0 to 8 percent. Vegetation of the Saline Ecozone is predominantly native/introduced rangeland grasses. These sites will be returned to a similar pre-disturbance land use following construction.

A recommended seed mix is provided for the Saline Ecozone in Table 1 and 2. The grass and forb/shrub seed mixes were developed using 80 and 10 pure live seeds (PLS) per square foot, respectively. It is recommended that an additional 20 pounds per acre of barley (*Hordeum vulgare*) or Sterile Triticale (*Triticale hexaploide*) be added as nurse crop for immediate stabilization. This seed mix considers inherent soil properties and includes saline tolerant grass species to improve reclamation success.

One key obstacle in reclaiming the Saline Ecozone sites will be the elevated soil salinity and potential soil attributes associated with sodic soils (soil dispersion, poor soil structure, hard surface crust formation, and reduced infiltration). Ecozone appropriate soil amendments, seedbed preparation methods, seeding practices, a suitable seed mix, and a site specific Integrated Weed Management Plan should help expedite reclamation success. The reclamation plan is provided on Page 2.

Table 1. Cedar Hills South Unit Lateral – Saline Ecozone Site Grass Seed Mix Recommendation for Year One Planting.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Bottlebrush Squirreltail	<i>Elymus elymoides</i>	4.5	20	25%
Inland Saltgrass	<i>Distichlis spicata</i>	1.7	20	25%
Western Wheatgrass	<i>Pascopyrum smithii</i>	6.3	16	20%
Nuttall's alkalgrass	<i>Puccinellia nuttalliana</i>	0.2	12	15%
Slender Wheatgrass	<i>Elymus trachycaulus</i>	3.3	12	15%
Total	--	16.1	80	100%

Table 2. Cedar Hills South Unit Lateral – Saline Ecozone Site Shrub Seed Mix Recommendation for Year Two or Three Planting.

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	% of Mix
Big Sagebrush	<i>Artemisia tridentata</i>	0.2	10	100%
Total	--	0.2	10	100%

Notes:

1. Seed mix was developed for saline soil conditions and fine to medium soil textures based on vegetation data. Seed mix may be adjusted based landowner preferences.
2. PLS = Pure Live Seed



RECLAMATION PLAN

SALINE ECOZONE SITES

(1) SOIL AMENDMENTS

Soil amendments are recommended to expedite reclamation success and create conditions that can better support seed germination and plant growth. To improve soil structure and to reduce potential soil dispersion of saline/sodic soils, it is recommended that 1.5 tons/acre gypsum be applied to soils within the Saline Ecozone. To expedite plant growth, it is recommended that 100 lb/acre MAP (11-52-0) and 80 lb/acre Urea (46-0-0) be applied and incorporated post topsoil application to a depth of 4.0 to 6.0 inches.

- Gypsum – 1.5 tons per acre
- Nitrogen – 48 pounds per acre
- P₂O₅ – 52 pounds per acre

(2) SEEDBED PREPARATION

These recommended seedbed preparation steps will aid in successful reclamation. Steps may be omitted, conducted in different order, or changed to optimize success and efficiency depending on field conditions, sub-soil properties, and local terrain.

- Rip subsurface soil, prior to topsoil application, to a minimum of 16 inches to reduce soil compaction and improve drainage. Ripping should be conducted using a double pass with a straight-shank agricultural ripper or parabolic ripper. The shanks on the back of a grader or dozer should NOT be used to alleviate soil compaction. Do not smooth the ROW with a dozer once ripped it is beneficial to have an irregular surface to help tie the topsoil and subsoil horizons together. Tillage can be used to break soil clods apart prior to topsoil application.
- Apply topsoil and soil amendments, discussed above, to improve the soil physical and chemical characteristics and to supplement soil nutrients.
- Finally, till the site to a depth of 4.0 to 6.0 inches to incorporate soil amendments and to create a seedbed conducive to seedling establishment (disk and harrow, field cultivator, vibra-shank, or other alternative suitable to site conditions).

(3) SEEDING

Seeding should be conducted in a two-stage process to establish forbs and shrubs on the ROW. Seeding should be completed within 45-days of reclamation using the seed mix and rate provided in Table 1. Establishment of resilient grass species will be critical in managing weed populations and improving soil conditions for shrub and forb growth. Manage and monitor weedy species establishment within the first two years from seeding. After grass establishment, seed using the recommended seed mix to achieve desired shrub species. Grass seeding should be conducted using a drill seeder suitable for the location's soils and capable of direct seed placement. Drill seeding should occur on the contour using a drill equipped with an agitator and double disc opener with a wheel press and depth bands to mix seed and ensure proper seeding depths. Seeds should be planted to the depth specified by the vendor to ensure proper germination and emergence. It is recommended that the seed be placed 1/8 to 1/2 inch deep.

Broadcast seed shrubs at the recommended rates in Table 2 in the second or third year to achieve the desired plant community. Dormant seeding shrubs is preferred for greatest success. In Montana, shrubs should be seeded between November 1st and March 15th and immediately following snowfall. A snow base of less than 8 inches is ideal to help settle the seed into the soil. If the seeding conditions are not met in year two, shrubs should be planted in year three. On non-BLM land shrubs should only be seeded when requested by the landowner. The Saline Ecozone seed mixes and rates are provided in Table 1 and 2.

(4) STRAW MULCHING

Application of straw mulch is recommended 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 percent of the ground surface prior to crimping. Once applied the straw mulch should be crimped into the soil using a straight disc crimper with 8.0 inches spaced tines. Upon successful crimping the straw mulch should be standing vertically with approximately 40 to 60 percent 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.

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SALINE ECOZONE SITES



(5) WEED MANAGEMENT

Regular inspection of the pipeline ROW and other soil disturbance areas prior to construction will aid in noxious/invasive weed control. Weed management should be diligent within the first one to two years to prevent infestation and allow for native species establishment. A site-specific Integrated Weed Management Plan should be developed once weedy species can be identified. Sites could be mowed prior to flowering and seed head production of weedy species. Mowing will reduce competition with desirable species and allow greater opportunity for reclamation success. In addition to mowing, herbicides appropriate for the identified weedy species should be implemented into the weed management plan to eradicate any problematic species. Application timing and rates should follow the manufacturer's recommendations. Herbicide applications should be selective and avoid desirable native grass, forb, and shrub species. It is recommended to avoid overgrazing during the establishment period to minimize competitive weedy species establishment. All disturbed sites should be promptly seeded following construction to minimize the window of opportunity for new weed invasion.

ATTACHMENT A

Soil Data Cedar Hills South Unit Lateral Pipeline

Pipeline	Sample ID	pH	ECe dS/m	SAR	Ca ppm	Mg ppm	Na ppm	N lb/acre	P-O ppm	K ppm	OM %	Ecozone
CHSU	1	7.8	0.15	0	2536	127	17	1	3	223	2	Loamy
CHSU	4	8.2	0.25	0	2927	316	19	2	2	109	1	Loamy
CHSU	13	6.7	0.31	0.28	1496	239	19	3	2	181	3.5	Loamy
CHSU	17	7.9	0	0.40	1374	217	19	1	4	124	1.1	Loamy
CHSU	23	8.2	0.71	1.14	3384	630	81	2	14	308	2.6	Loamy
CHSU	26	7.6	0.18	0.03	1715	417	17	3	2	173	2.6	Loamy
CHSU	28	7.6	0	3.13	1046	290	59	1	4	151	2.1	Loamy
CHSU	31	8.9	1.62	17.8	2368	362	625	1	35	244	0.8	Saline
CHSU	37	7.7	0.37	0.28	1819	381	25	2	3	250	1.9	Loamy
CHSU	42	7.4	0	3.01	941	215	48	3	2	103	1.8	Loamy
CHSU	45	7.4	0.12	0	1775	310	14	4	4	304	3.9	Loamy
CHSU	50	8.0	0.06	1.14	1014	237	28	1	4	295	1.6	Loamy
CHSU	55	7.5	0	0.40	878	201	14	3	5	211	1.1	Loamy
CHSU	60	7.8	0	0.52	967	190	16	4	4	243	1.3	Crop
CHSU	65	6.7	0	0.77	972	216	20	1	3	144	1	Loamy
CHSU	69	6.7	0.03	0.15	1420	270	16	4	2	293	2.9	Loamy
CHSU	72	6.7	0.15	0.03	1460	290	16	4	3	267	2.2	Loamy
CHSU	79	7.6	0.31	1.76	1802	263	58	10	12	397	2.5	Crop
CHSU	84	7.6	0	0.52	1114	330	21	3	2	159	1.5	Saline
CHSU	88	7.3	0.31	0.40	1312	456	23	1	2	206	2.9	Saline
CHSU	91	7.9	7.20	0.65	12677	515	183	2	2	345	2.9	Saline
CHSU	96	7.7	0.09	10.2	800	385	175	1	3	253	2.3	Loamy
CHSU	100	7.0	0.12	0.15	1576	530	22	2	2	276	3.5	Loamy
CHSU	103	7.5	0.12	0	1727	484	16	2	2	274	3.4	Loamy
CHSU	107	7.5	0.28	0	1994	488	16	1	3	283	3.9	Loamy
CHSU	111	7.6	13.1	20.6	6619	1017	2040	3	2	405	1.9	Saline
CHSU	114	7.6	1.93	0.15	6215	273	55	17	21	487	21.3	Saline

Pipeline	Sample ID	pH	ECe dS/m	SAR	Ca ppm	Mg ppm	Na ppm	N lb/acre	P-O ppm	K ppm	OM %	Ecozone
CHSU	119	5.1	11.5	21.3	4373	981	1592	1	31	377	1.7	Saline
CHSU	124	6.9	6.80	16.7	2471	932	815	4	31	411	2.1	Saline
Crop	Average	7.7	0.2	1.1	1385	227	37.0	7.0	8.0	320	1.9	
	MIN	7.6	0	0.52	967	190	16	4	4	243	1.3	
	MAX	7.8	0.3	1.8	1802	263	58	10	12	397	2.5	
Loamy	Average	7.5	0.2	1.1	1624	329	33.7	2.2	3.5	222	2.3	
	MIN	6.7	0	0	800	127	14	1	2	103	1	
	MAX	8.2	0.7	10.2	3384	630	175	4	14	308	3.9	
Saline	Average	7.4	5.3	9.8	4644	608	669	4.0	15.8	329	4.4	
	MIN	5.1	0	0.15	1114	273	21	1	2	159	0.8	
	MAX	8.9	13.1	21.3	12677	1017	2040	17	35	487	21.3	

Notes:

1. Soil sample analytical results from soil samples collected during the fall of 2019.
2. Red highlighted cells could potentially impair reclamation success.