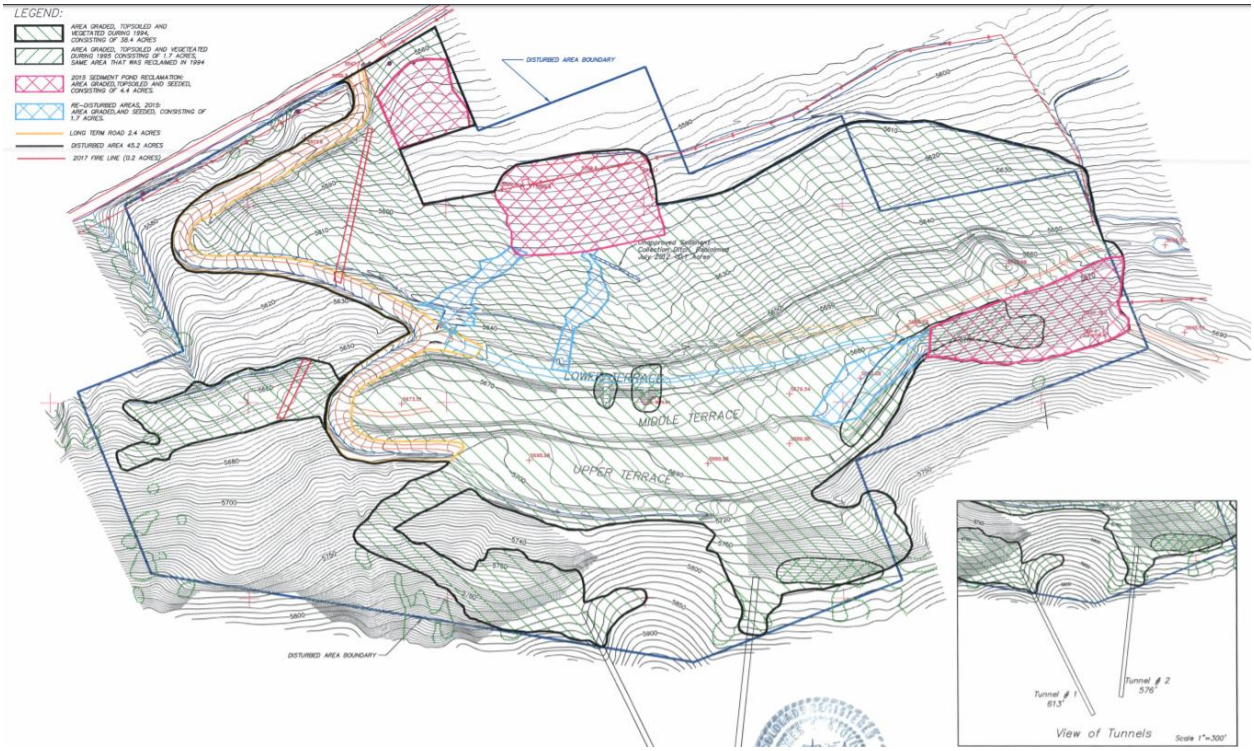
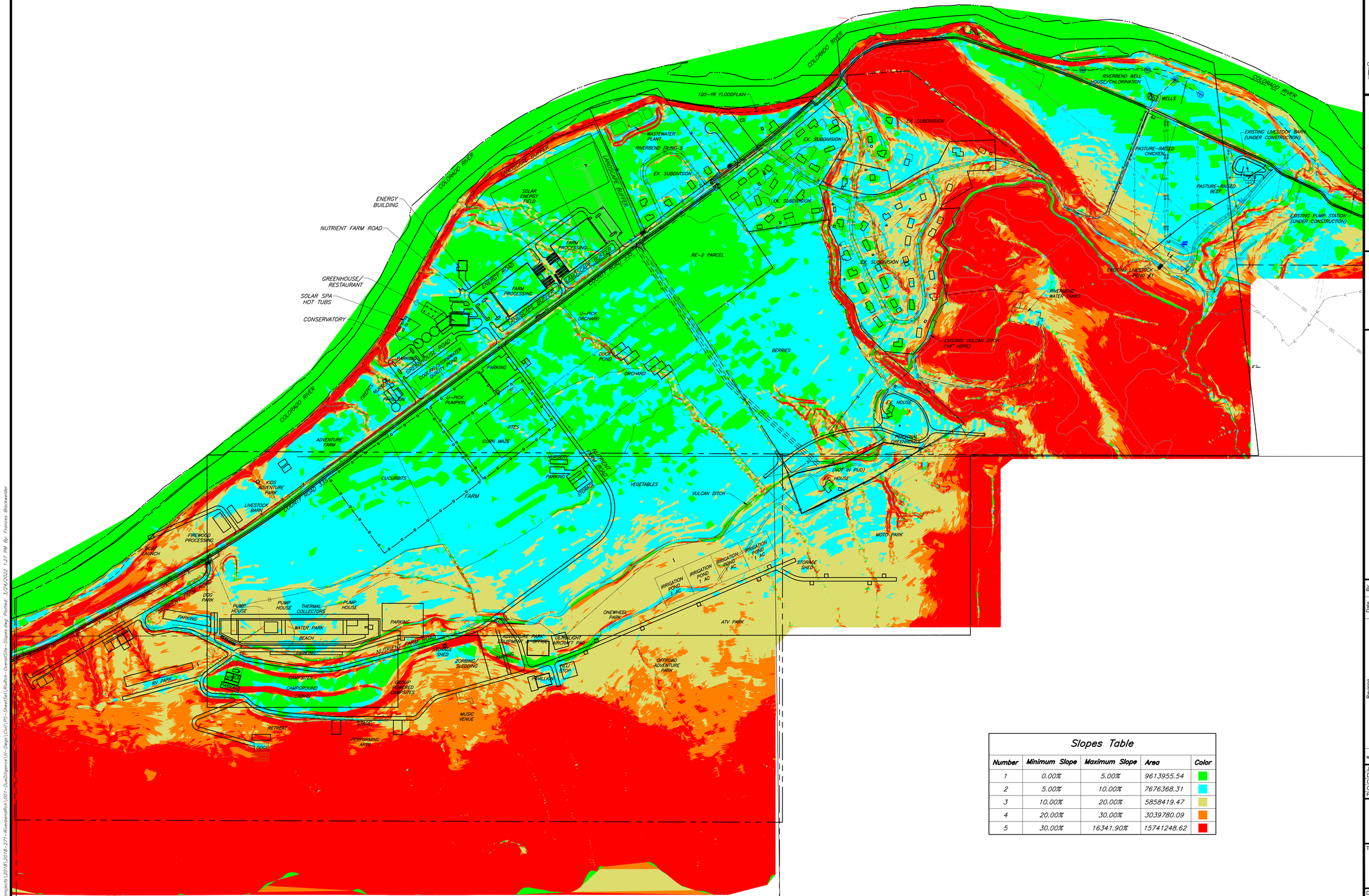
Figure 1 – SL-03 Map





Slopes Table

Number	Minimum Slope	Maximum Slope	Area	Color
1	0.00%	5.00%	9613955.54	
2	5.00%	10.00%	7676368.31	
3	10.00%	20.00%	5858419.47	
4	20.00%	30.00%	3039780.09	
5	30.00%	16341.90%	15741248.62	

Graphic Scale
0 150 300 600
In Feet: 1" = 300'

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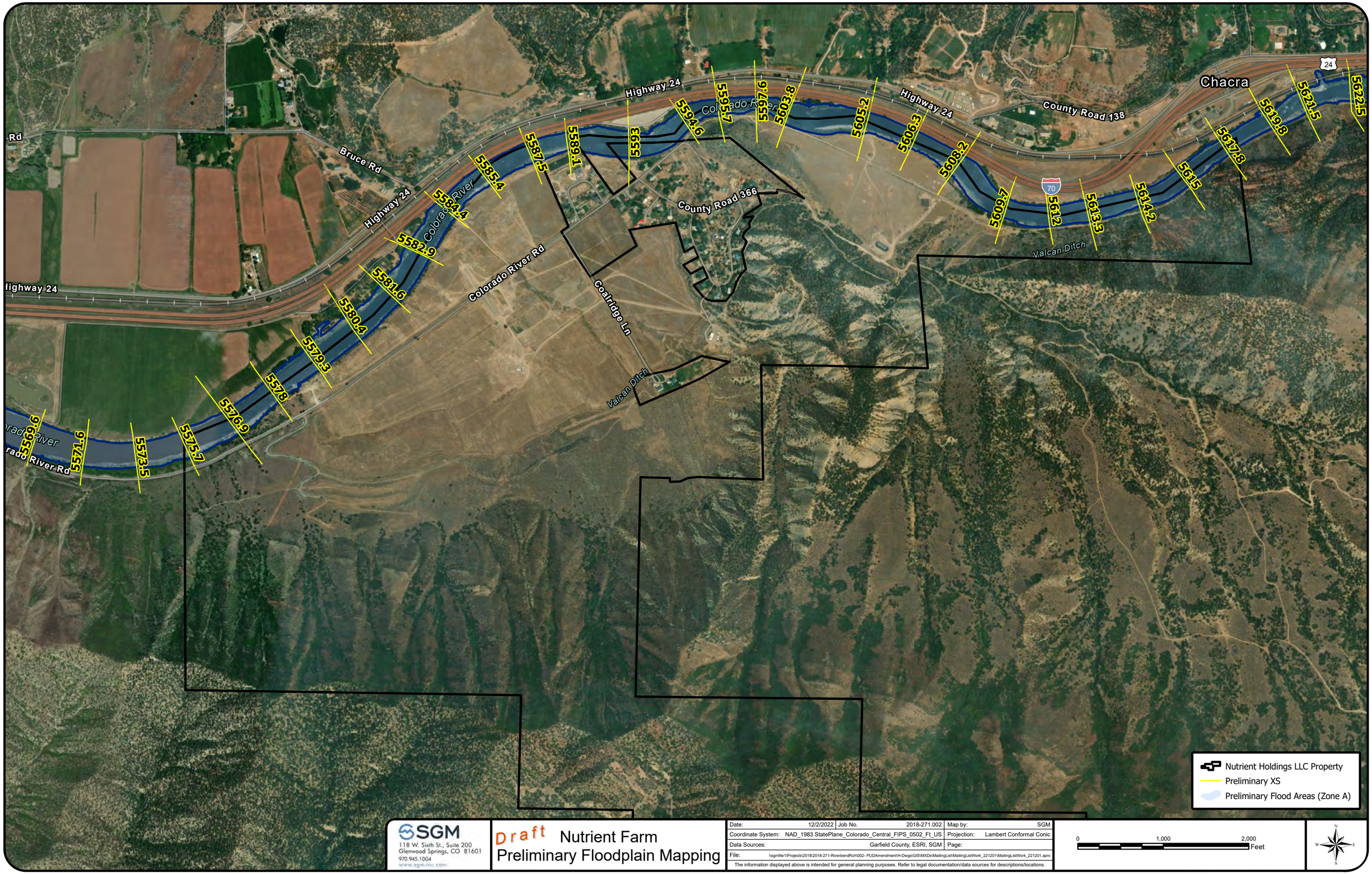
Nutrient Farm
Garfield County, Colorado

#	Revision	Date	By
1	Project Milestone: Preliminary Not For Construction		

Job No.	2018-271.002
Drawn by:	FJB
Date:	3.24.22
QC: DMK	PE: DMK
File:	RivRch-OverallSite-Slopes

Title:
Slope Analysis Map

Dwg No.
1
Of : 1



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Draft

Nutrient Farm
Preliminary Floodplain Mapping

Date:	12/2/2022	Job No.	2018-271.002
Coordinate System:	NAD_1983 StatePlane_Colorado_Central_FIPS_0502_Ft_US	Projection:	Lambert Conformal Conic
Data Sources:	Garfield County, ESRI, SGM	Page:	
File:	\\sgmfile1\Projects\2018\2018-271-RiverbendRch\002- PUDAmendment\H-Dwgs\GIS\MXDs\MailingList\MailingListWork_221201\MailingListWork_221201.aprx	Map by:	SGM

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 1,000 2,000 Feet

N W E S

Nutrient Farm

Weed Management Plan

Nutrient Farm PUD

Garfield County, Colorado

May 4, 2020

Prepared for:

Nutrient Holdings, LLC
520 River View Drive, #506
New Castle, CO 81647

Prepared by:

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Appendix

1.0 SUMMARY

This Weed Management Plan was prepared at the request of Nutrient Farm PUD to fulfill the submittal requirements of the Land Use and Development Code (LUDC). Nutrient Farm is proposing to develop the existing pastures and associated ranch infrastructure, and the shrubby hillsides at the toe of the Grand Hogback into a multi-use agricultural, residential and recreational-amenity area. The proposed development is located in Garfield County, Colorado in Sections 33, 34, and 35, Township 5 South, Range 90 West (6th Principal Meridian), and Sections 5 and 6, Township 6 South, Range 90 West (6th Principal Meridian) (**Figure 1**).

SGM was retained by Nutrient Farm PUD to conduct a noxious weed survey to fulfill requirements of Garfield County's LUDC and Vegetation Management department. A field survey documenting and mapping noxious weeds was conducted on April 8th, 2020, by Rachel Kattnig, SGM Environmental Consultant II.

Both Garfield County's noxious weed list and the State of Colorado's noxious weed list were utilized for survey efforts (**Appendix A** and **B**). To summarize, surveys found the following State and Garfield County listed noxious weeds:

Table 1 – Noxious Weeds Present on Property

Noxious Weeds			
Common Name	**Scientific Name**	**Colorado Listed Species**	**Garfield County Listed Species**
Cheatgrass	*Anisantha* (*Bromus*) *tectorum*	Yes (List C)	-
Common mullein	*Verbascum thapsus*	Yes (List C)	-
Curley dock	*Rumex crispus*	-	Yes
Hoary cress	*Lepidium draba*	Yes (List B)	Yes
Houndstongue	*Cynoglossum officianale*	Yes (List B)	Yes
Russian knapweed	*Acroptilon repens*	Yes (List B & C)	Yes
Russian olive	*Elaeagnus angustifoilia*	Yes (List B)	Yes
Salt cedar	*Tamarix* sp.	Yes (List B)	Yes
Scotch thistle	*Onopordum acanthium*	Yes (List B)	Yes

2.0 DESCRIPTION OF SURVEY AREA

The property generally has four separate vegetation types. The majority of the property, including the majority of the area proposed for development, is dominated by grazed pasture areas with gently sloping topography, located on alluvial/colluvial material which has been leveled by deposition and tilling. Pasture areas are dominated by agricultural cultivars including smooth brome (*Bromus inermis*), orchardgrass (*Dactylis glomerata*), western wheatgrass (*Pascopyrum smithii*), as well as some native fescues (*Festuca* spp.) and rabbitbrush (*Ericameria nauseosa*). The steep slopes above the pastures are dominated by sparse pinyon-juniper woodlands (*Pinus edulis* and *Sabina osteosperma*) with mixed shrub component of Gambel oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus montanus* and *C. ledifolius*) and Utah serviceberry (*Amelanchier utahensis*); these areas have minimal understory vegetation. The transitional areas between the mixed mountain shrublands and pastures contain remnant stands of sagebrush shrublands (*Artemisia tridentata ssp. bonvillensis*). The portion of the property immediately adjacent to the Colorado River supports sparse and discontinuous wetland/riparian vegetation on the banks of the river; vegetation is predominantly Chinese elm (*Ulmus parvifolia*), an invasive exotic tree species. Other notable species include narrowleaf cottonwood (*Populus angustifolia*), serviceberry, coyote willow (*Salix exigua*), and dogwood (*Cornus stolonifera*). No wetlands extend beyond the immediate boundaries of the river's channel.

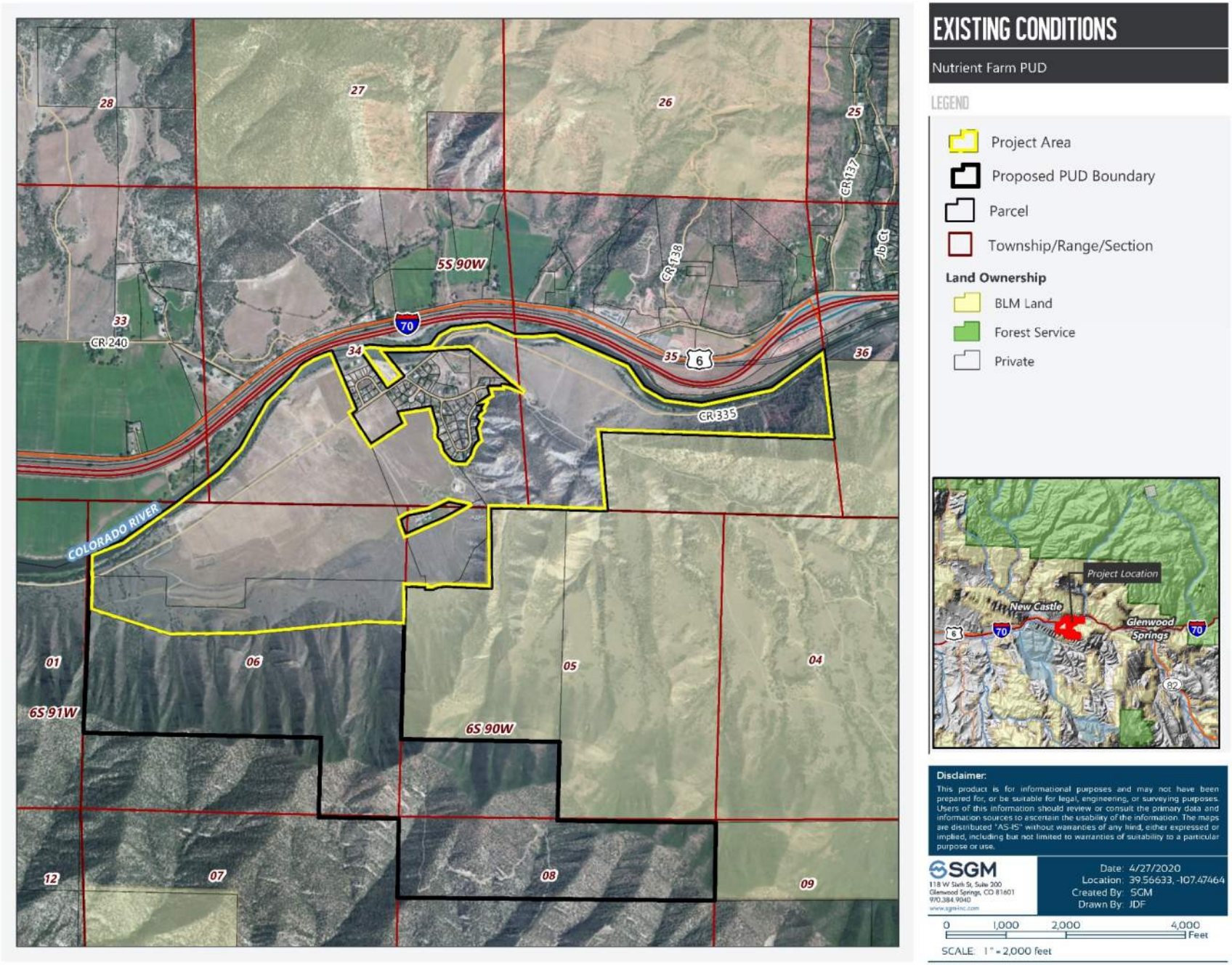
Typical conditions in pasture areas.

Typical conditions in sparse pinyon-juniper woodlands on steep slopes.

Typical conditions in transitional areas of sagebrush shrublands.

Typical conditions in riparian areas along the Colorado River.

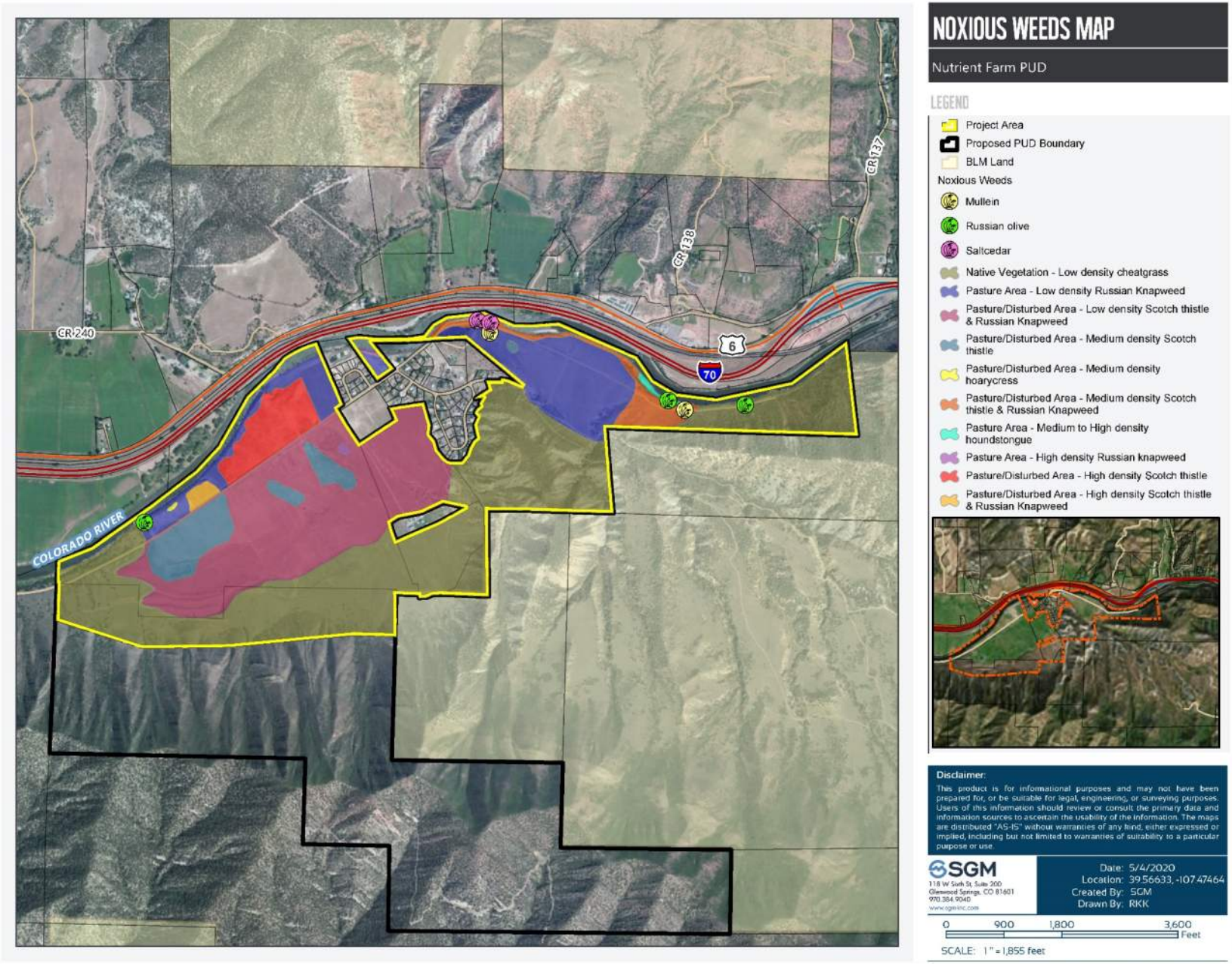
Figure 1 – Project Area Overview



3.0 RESULTS OF SURVEYS

The most common noxious weeds found within the project area include: cheatgrass (*Anisantha tectorum*), Scotch thistle (*Onopordum acanthium*), and Russian knapweed (*Acroptilon repens*). The banks of the Vulcan Ditch were noted as an area with a high concentration of weeds, particularly Russian knapweed. The pasture areas have widespread, low to high densities of Scotch thistle, low densities of knapweed, and some isolated areas of hoary cress (*Lepidium draba*). Areas dominated by Gambel oak shrub communities along the banks of the Colorado River have low to medium densities of houndstongue (*Cynoglossum officianale*). Cheatgrass is present in low to high densities throughout the project area, in pastures, along the Vulcan Ditch, near existing structures, and within native pinion-juniper shrublands. Individuals of salt cedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifoilia*), common mullein (*Verbascum thapsus*), and curley dock (*Rumex crispus*) occur in pasture areas or along the banks of the Colorado River. **Figure 2** shows the areas of noxious weed infestations and relative densities. Redstem filaree (*Erodium cicutarium*) and field bindweed (*Convolvulus arvensis*) are likely to be present but were not observed during the April site visit. **Appendix C** is a photo log documenting the noxious weed presence and densities throughout the project area.

Figure 2 – Noxious Weed Occurrences



4.0 NOXIOUS WEED MANAGEMENT RECOMMENDATIONS

To meet the requirements of the Colorado Noxious Weed Act and Garfield County guidance, the developer shall conduct prescribed management techniques for noxious weeds included on one of three State weed lists: List A – designated for statewide eradication; List B – managed to prevent further spread and, for selected species, designated for eradication in large areas; and List C – of more localized concern, but for which the State will provide education, research, and biological control assistance to jurisdictions that choose to manage the species. The current State list is available in **Appendix A**.

If populations of List A species are present in the project area, every population shall be eradicated prior to seed development. To stop the spread of List B species, populations of every species designated for eradication in a particular county shall be eliminated prior to seed development.

Additionally, to meet reclamation objectives, the operator should eliminate or minimize those noxious and invasive weeds designated as "undesirable species". Undesirable species include redstem filaree, all List C species (e.g., cheatgrass and field bindweed), and invasive species that commonly colonize disturbed or reclaimed land and impede or prevent establishment of desirable species (e.g., kochia [*Kochia sieversiana*, *K. iranica, K. scoparia*] and Russian thistle [*Salsola australis, S. iberica, S. kali*]).

Control of invasive species is a difficult task and requires on-going control measures. Care must be taken to avoid negatively impacting desirable plant communities and inviting infestation by other pioneer invaders. Weed management is best achieved by employing aggressive control early on, and persistent control efforts over several growing seasons, including direct treatments, prevention through best management practices, monitoring of treatment efficacy, and subsequent detection efforts. Weed management is often limited to controlling existing infestations and prevention of further infestations, rather than eradication, but through effective weed management practices and eradication can be possible in small to medium sized weed populations.

As Nutrient Farm PUD is planning to be a Certified Organic facility, use of chemicals to control noxious weeds is limited. Therefore, the following methods are recommended to manage noxious weeds, per Colorado State University's Extension program. The Garfield County Vegetation Management Program and the Garfield County Noxious Weed Management Plan should be reviewed for additional guidance.

Preventive:
The first and the most important step in a weed control program and probably the most cost-effective method of weed control is prevention. Methods include maintaining healthy pastures, using weed-free crop seed, weed-free manure and hay, and clean harvesting and tillage equipment, as well as the elimination of weed infestations in areas bordering cropland, and in irrigation ditches and canals.

Cultural:
Methods include: Establishing and managing an adequate population of desirable vegetation to compete with the weeds; utilizing livestock (cattle, goats, sheep) when possible; mulching; burning; and even plastic weed barriers.

Mechanical:
Methods include: Hand-pull, hoe, mow and tillage.

Biological:
Biological weed control involves the utilization of natural enemies for the control of specific weed species. This method can take many years to result in weed control and is often not 100% effective. However, this method can dramatically help reduce weed densities and when combined with other methods can be very beneficial. Methods include grazing, introduction of registered insects or diseases. Contact the **Palisade Insectary** for more information.

APPENDIX A – COLORADO LISTED NOXIOUS WEEDS

Colorado Noxious Weeds (including Watch List), effective June, 2020

List A Species (25)

Common	*Scientific*
African rue	*(Peganum harmala)*
Bohemian knotweed	*(Fallopia x bohemicum)*
Camelthorn	*(Alhagi maurorum)*
Common crupina	*(Crupina vulgaris)*
Cypress spurge	*(Euphorbia cyparissias)*
Dyer's woad	*(Isatis tinctoria)*
Elongated mustard	*(Brassica elongata)*
Flowering rush	*(Butomus umbellatus)*
Giant knotweed	*(Fallopia sachalinensis)*
Giant reed	*(Arundo donax)*
Giant salvinia	*(Salvinia molesta)*
Hairy willow-herb	*(Epilobium hirsutum)*
Hydrilla	*(Hydrilla verticillata)*
Japanese knotweed	*(Fallopia japonica)*
Meadow knapweed	*(Centaurea x moncktonii)*
Mediterranean sage	*(Salvia aethiopis)*
Medusahead	*(Taeniatherum caput-medusae)*
Myrtle spurge	*(Euphorbia myrsinites)*
Orange hawkweed	*(Hieracium aurantiacum)*
Parrotfeather	*(Myriophyllum aquaticum)*
Purple loosestrife	*(Lythrum salicaria)*
Rush skeletonweed	*(Chondrilla juncea)*
Squarrose knapweed	*(Centaurea virgata)*
Tansy ragwort	*(Senecio jacobaea)*
Yellow starthistle	*(Centaurea solstitialis)*

List B Species (38)

Common	*Scientific*
Absinth wormwood	*(Artemisia absinthium)*
Black henbane	*(Hyoscyamus niger)*
Bouncingbet	*(Saponaria officinalis)*
Bull thistle	*(Cirsium vulgare)*
Canada thistle	*(Cirsium arvense)*
Chinese clematis	*(Clematis orientalis)*
Common tansy	*(Tanacetum vulgare)*
Common teasel	*(Dipsacus fullonum)*
Cutleaf teasel	*(Dipsacus laciniatus)*
Dalmatian toadflax, broad-leaved	*(Linaria dalmatica)*
Dalmatian toadflax, narrow-leaved	*(Linaria genistifolia)*
Dame's rocket	*(Hesperis matronalis)*
Diffuse knapweed	*(Centaurea diffusa)*
Eurasian watermilfoil	*(Myriophyllum spicatum)*
Hoary cress	*(Cardaria draba)*
Houndstongue	*(Cynoglossum officinale)*

List B Species Continued (38)

Common	*Scientific*
Jointed goatgrass	*(Aegilops cylindrica)*
Leafy spurge	*(Euphorbia esula)*
Mayweed chamomile	*(Anthemis cotula)*
Moth mullein	*(Verbascum blattaria)*
Musk thistle	*(Carduus nutans)*
Oxeye daisy	*(Leucanthemum vulgare)*
Perennial pepperweed	*(Lepidium latifolium)*
Plumeless thistle	*(Carduus acanthoides)*
Russian knapweed	*(Rhaponticum repens)*
Russian-olive	*(Elaeagnus angustifolia)*
Salt cedar	*(Tamarix. ramosissima)*
Salt cedar	*(T. chinensis)*
Scentless chamomile	*(Tripleurospermum inodorum)*
Scotch thistle	*(Onopordum acanthium)*
Scotch thistle	*(O. tauricum)*
Spotted knapweed	*(Centaurea stoebe L. ssp. micranthos)*
Spotted x diffuse knapweed hybrid	*(Centaurea x psammogena)*
Sulfur cinquefoil	*(Potentilla recta)*
Wild caraway	*(Carum carvi)*
Yellow nutsedge	*(Cyperus esculentus)*
Yellow toadflax	*(Linaria vulgaris)*
Yellow x Dalmatian toadflax hybrid	*(Linaria vulgaris x L. dalmatica)*

List C Species (16)

Common	*Scientific*
Bulbous bluegrass	*(Poa bulbosa)*
Chicory	*(Cichorium intybus)*
Common burdock	*(Arctium minus)*
Common mullein	*(Verbascum thapsus)*
Common St. Johnswort	*(Hypericum perforatum)*
Downy brome, cheatgrass	*(Bromus tectorum)*
Field bindweed	*(Convolvulus arvensis)*
Halogeton	*(Halogeton glomeratus)*
Johnsongrass	*(Sorghum halepense)*
Perennial sowthistle	*(Sonchus arvensis)*
Poison hemlock	*(Conium maculatum)*
Puncturevine	*(Tribulus terrestris)*
Quackgrass	*(Elymus repens)*
Redstem filaree	*(Erodium cicutarium)*
Velvetleaf	*(Abutilon theophrasti)*
Wild proso millet	*(Panicum miliaceum)*

Colorado Noxious Weeds (including Watch List), effective June, 2020

Watch List Species (19)

Common	*Scientific*
Baby's breath	*(Gypsophila paniculata)*
Caucasian bluestem	*(Bothriochloa bladhii)*
Common bugloss	*(Anchusa officinalis)*
Common reed	*(Phragmites australis)*
Garden loosestrife	*(Lysimachia vulgaris)*
Garlic mustard	*(Alliaria petiolata)*
Himalayan blackberry	*(Rubus armeniacus)*
Hoary alyssum	*(Berteroa incana L.)*
Meadow hawkweed	*(Hieracium caespitosum)*
Onionweed	*(Asphodelus fistulosus)*
Siberian elm	*(Ulmus pumila)*
Scotch broom	*(Cytisus scoparius)*
Swainsonpea	*(Sphaerophysa salsula)*
Syrian beancaper	*(Zygophyllum fabago)*
Tree of Heaven	*(Ailanthus altissima)*
Ventenata grass	*(Ventenata dubia)*
White bryony	*(Bryonia alba)*
Yellow bluestem	*(Bothriochloa ischaemum)*
Yellow flag iris	*(Iris pseudacorus)*

APPENDIX B – GARFIELD COUNTY LISTED NOXIOUS WEEDS

Garfield County Listed Species (40)

Common	*Scientific*
Absinth wormwood	(*Artemesia absinthium*)
Black henbane	(*Hyoscyamus niger)*
Bouncingbet	(*Saponaria officinalis*)
Bull thistle	(*Cirsium vulgare*)
Canada thistle	(*Cirsium arvense*)
Chicory	(*Cichorium intybus*)
Chinese clematis	(*Clematis orientalis*)
Common burdock	(*Arctium minus*)
Common tansy	(*Tanacetum vulgare*)
Common teasel	(*Dipsacus fullonum*)
Corn chamomile	(*Anthemis arvensis*)
Curly dock	(*Rumex crispus*)
Cutleaf teasel	(*Dipsacus laciniatus*)
Cypress spurge	(*Euphorbia cyparissias*)
Dalmatian toadflax	(*Linaria dalmatica*)
Dame's rocket	(*Hesperis matronalis*)
Diffuse knapweed	(*Centaurea diffusa*)
Hoary cress	(*Cardaria draba*)
Houndstongue	(*Cynoglossum officinale*)
Jointed goatgrass	(*Aegilops cylindrica*)
Leafy spurge	(*Euphorbia esula*)
Mayweed chamomile	(*Anthemis cotula*)
Meadow knapweed	(*Centaurea pratensis*)
Mediterranean sage	(*Salvia aethiopsis*)
Musk thistle	(*Carduus nutans*)
Myrtle spurge	(*Euphorbia myrsinites*)
Oxeye daisy	(*Chrysanthemum leucantheum*)
Perennial pepperweed	(*Lepidium latifolium*)
Plumeless thistle	(*Carduus acanthoides*)
Poison hemlock	(*Conium maculatum*)
Purple loosestrife	(*Lythrum salicaria*)
Russian knapweed	(*Acroptilon repens*)
Russian olive	(*Elaeagnus angustifolia*)
Salt cedar	(*Tamarix parviflora, Tamarix ramosissima*)
Scentless chamomile	(*Tripleurospermum perforatum*)
Scotch thistle	(*Onopordum acanthium*)
Spotted knapweed	(*Centaurea maculosa*)
Sulfur cinquefoil	(*Potentilla recta*)
Yellow starthistle	(*Centaurea solstitalis*)
Yellow toadflax	(*Linaria vulgaris*)

APPENDIX C - PHOTO DOCUMENTATION

SGM

PHOTO LOG

Project Name:	Site Location:	Date:
Nutrient Farm PUD - Noxious Weed Survey	Nutrient Farm PUD - New Castle, CO	Apr 8, 2020

Photo Point 1 (P1)

Cheatgrass & Scotch thistle within a transitional zone.

Photo Point 2 (P2)

Russian knapweed in a pasture area.

PHOTO LOG

Project Name:	Site Location:	Date:
Nutrient Farm PUD - Noxious Weed Survey	Nutrient Farm PUD - New Castle, CO	Apr 8, 2020

Photo Point 3 (P3)

Houndstongue at edge of a pasture area near the bank of the Colorado River.

Photo Point 4 (P4)

Houndstongue & Scotch thistle along edge of pasture area.

PHOTO LOG

Project Name:	Site Location:	Date:
Nutrient Farm PUD - Noxious Weed Survey	Nutrient Farm PUD - New Castle, CO	Apr 8, 2020

Photo Point 5 (P5)

Common mullein found in pasture area.

Photo Point 6 (P6)

Salt cedar along the Colorado River.

PHOTO LOG

Project Name:	Site Location:	Date:
Nutrient Farm PUD - Noxious Weed Survey	Nutrient Farm PUD - New Castle, CO	Apr 8, 2020

Photo Point 7 (P7)

Hoarycress in pasture/disturbed area.

Photo Point 8 (P8)

Pasture/disturbed area with high density Scotch thistle.

PHOTO LOG

Project Name:	Site Location:	Date:
Nutrient Farm PUD - Noxious Weed Survey	Nutrient Farm PUD - New Castle, CO	Apr 8, 2020

Photo Point 9 (P9)

Russian olive tree along the Colorado River.

Photo Point 10 (P10)

Cheatgrass and Russian knapweed along the Vulcan Ditch.

Nutrient Farm

Reclamation Plan

Nutrient Farm PUD

Garfield County, Colorado

April 2020

Prepared for:

Nutrient Holdings, LLC
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Prepared by:

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1.0 Executive Summary

This Reclamation Plan was prepared at the request of Nutrient Farm PUD and Garfield County, Colorado. Nutrient Farm is proposing to develop the existing pastures and associated ranch infrastructure, and the shrubby hillsides at the toe of the Grand Hogback into a multi-use residential, agricultural, and recreational-amenity area. The proposed development is located in Garfield County, Colorado in Sections 33, 34, and 35, Township 5 South, Range 90 West (6th Principal Meridian), and Sections 5 and 6, Township 6 South, Range 90 West (6th Principal Meridian) (**Figure 1**).

While the flat pasturelands have good soils for reclamation and would not need extra management, the steep slopes are derived from poor shaley soil types and given these poor soils and slope steepness (which can reduce soil moisture), reclaiming these areas will be challenging. Unfortunately, simply scattering seed in disturbance areas will likely be relatively ineffective for reclamation and would end up being a waste of time and money. Even with using soil amendments, mulch, and a site-specific seed mix, it is also important to realize that given the existing soil conditions and background vegetation on steeper, shaley soils, reclamation and establishment of grasses, shrubs and native forbs can be expected to take up to 3 years, and will likely match background native plant community types in that cover can be relatively sparse, and dominated by only a few species.

Noxious weeds (Russian knapweed and cheatgrass) are also common in the area, and without aggressive annual treatment (early summer spraying/treatment, and possibly an early winter treatment for cheatgrass), then they could become extremely difficult to control; Garfield County requires that noxious weeds are managed and controlled (see **Noxious Weed Inventory Report**).

The purpose of this document is to provide recommended prescriptions to stabilize and revegetate disturbance areas. A similar report has been prepared for reclamation efforts along the Vulcan Ditch (SGM 2019).

1.1 Summary of Reclamation Activities

- The PUD would occur in four primary vegetation types.
    - Pasturelands dominated by agricultural cultivars
    - Sagebrush shrublands
    - Mixed mountain shrublands, dominated by mountain mahogany and other species
    - Oakbrush
- Soil conditions.
    - Most soil types across the PUD would not need soil amendments
    - Mancos shale-derived soils will be difficult to revegetate without some soil amendments; soil samples were collected and tested by CSU Ag extension for recommended amendments.
- Soil roughening- will be needed to help reduce erosion and increase soil moisture.
- Application of seed mix by either drill seeder or by hand application.
- Application of mulch- given dry conditions, mulch should be used to reduce erosion and improve seedling establishment.
- Annual noxious weed control- knapweed, Scotch thistle and cheatgrass are common in the area and are within the seedbank; annual aggressive treatment will be needed to prevent a full infestation.

Figure 1. PUD Plan - West

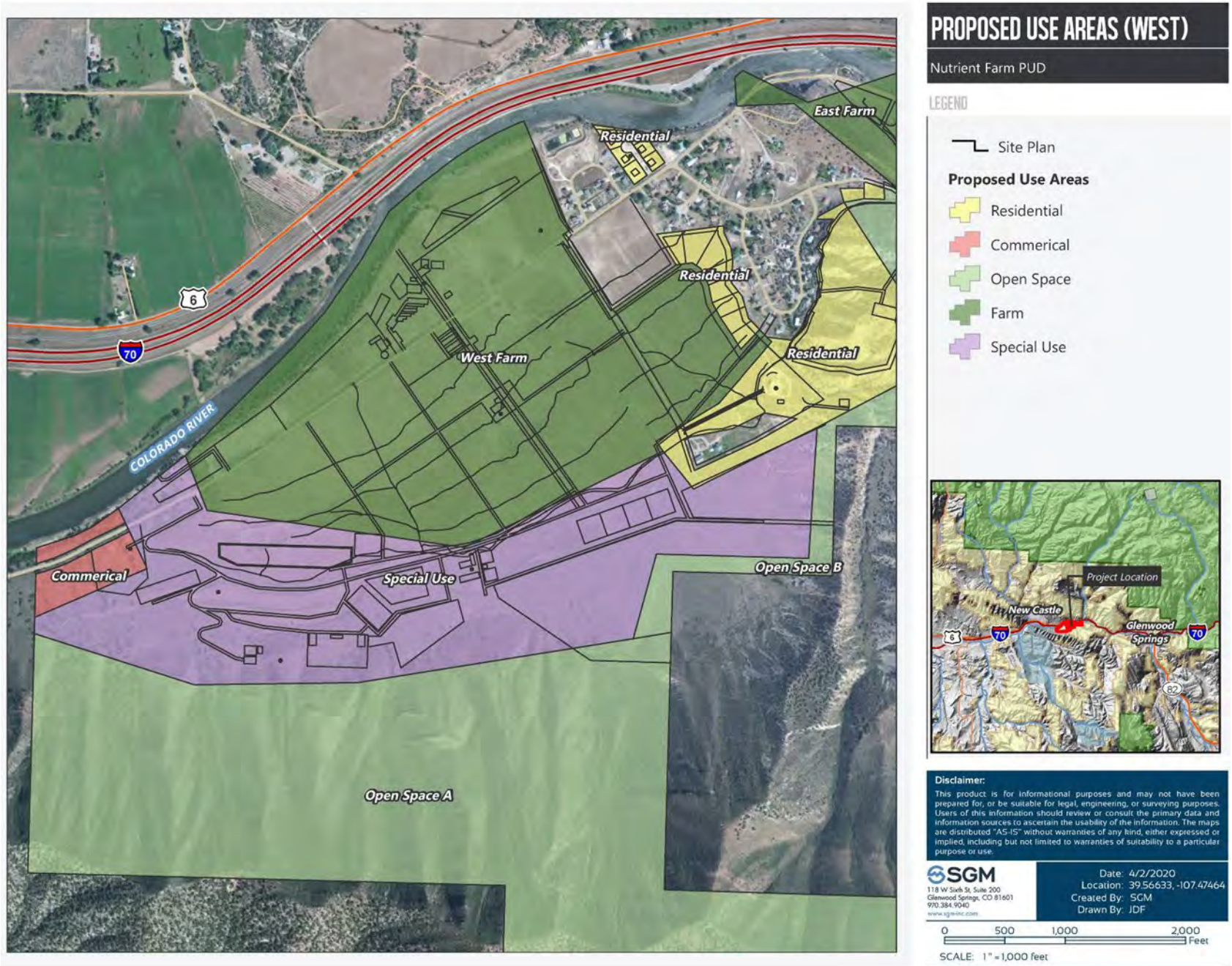
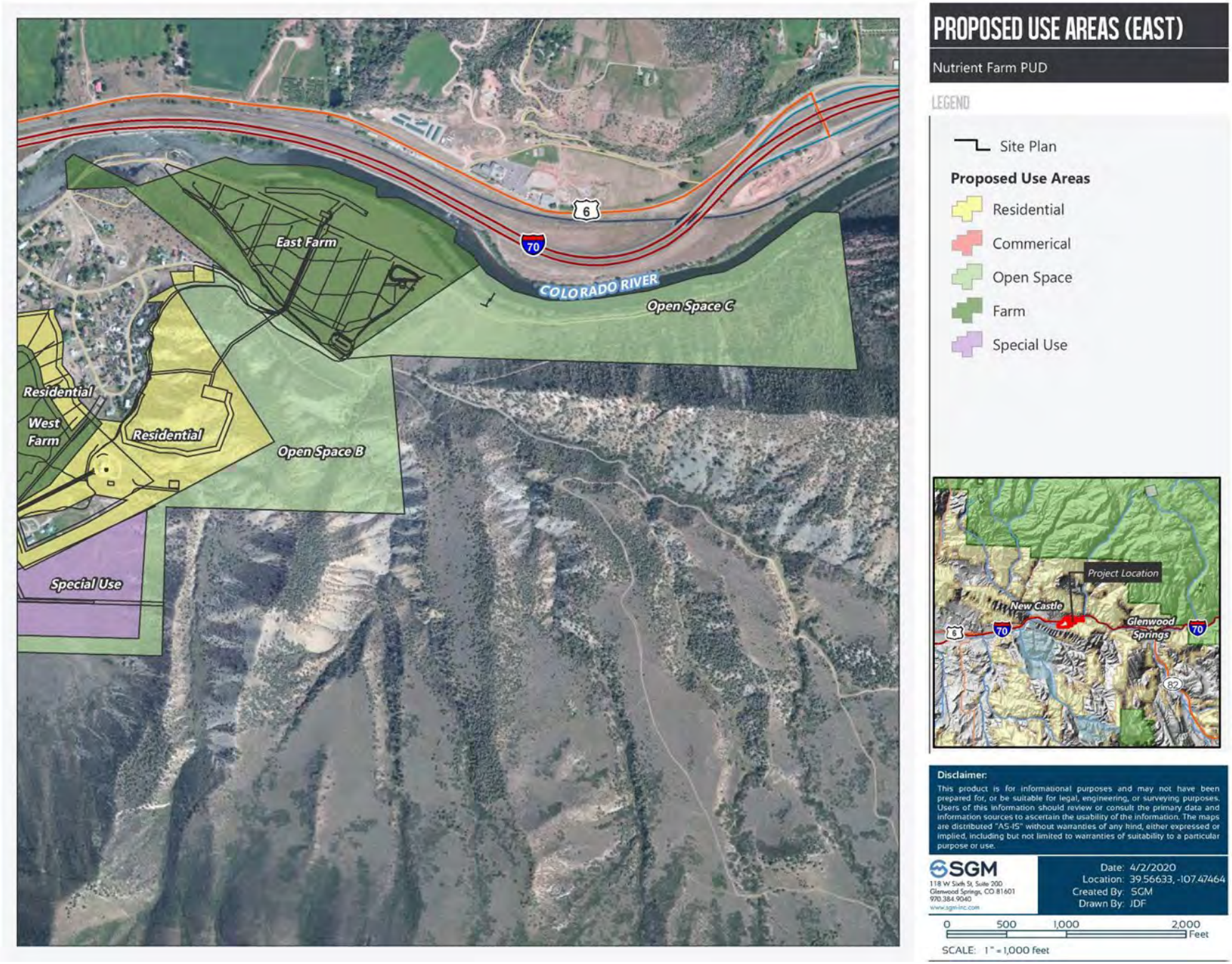


Figure 2. PUD Plan - East



2.0 Site Characterization

Nutrient Farm would be an approximately 1,140-acre, agriculturally oriented mixed-use PUD that revolves around the use and enjoyment of community-based working farms with multi-use entertainment and recreational facilities (Nutrient Farm PUD Guide 2020). The PUD would include two working farms, a mix of residential homes, a commercial/industrial area, outdoor adventure parks with outdoor entertainment/ music venue, a campground, lodge, motorized and non-motorized trails, and a retreat/spa facility.

In summary, the PUD would include 17 new single-family residences with allowances for accessory dwelling units, occupying approximately 53 acres (or 4.7 percent) of the PUD area. One single family/ranch home already exists on the property. Approximately 24 percent of the PUD area would support agricultural operations, including future bunkhouses which could seasonally house employees working on the farms. Approximately 1 percent of the PUD would support a commercial industrial area, which could be used to support agricultural operations, commercial uses, and industrial uses; on-site employee housing units would be allowed within the remaining portions of the PUD. Approximately 14 percent of the PUD area would support an outdoor adventure park, which would contain motorized and non-motorized tracks, an outdoor entertainment and music area, a campground, a lodge and a spa/retreat facility.

The project would entail approximately 297.62 acres of surface impacts. Most of the development would occur within pastures (69 percent of impacts would occur within pastures. Further, most of the development within the pastures would also be from agricultural activities, either in the form of orchards, fields, or other similar land uses. New impacts to native habitats and vegetation communities would primarily occur within the Sagebrush Shrubland habitat type, primarily through the conversion to recreational activity areas, roads/transportation, and buildings. Please see the PUD

2.1 Soils

The PUD would occur within eleven soil types, listed below. The soils on this site consist of various types of clay material. Conditions that were recorded in the geotechnical report indicated that the first 20 to 30 feet consisted of a low plasticity clay. The Natural Resources Conservation Service (NRCS) Soils Map shows the area soil types. The following soil units are within the proposed PUD include:

10 – Begay sandy loam, 1 to 6 percent slopes: These soil units are deep, well drained, moderately sloping, hilly, to steep soils found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,500 feet. These soils formed from alluvium derived from sandstone and shale. This soil is well drained and can be classified as prime farmland if irrigated.

11 – Begay sandy loam, 6 to 12 percent slopes: These soil units are deep, well drained, moderately sloping found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,500 feet. These soils formed from alluvium derived from sandstone and shale. These soils are not hydric and are not classified as prime farmland.

14 – Chilton channery loam, 6 to 12 percent slopes: These soil units are deep, well drained, moderately sloping found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,500 feet. These soils formed from alluvium derived from sandstone and shale. These soils are not hydric and are not classified as prime

29 – Heldt clay loam, 3 to 6 percent slopes: These soil units are deep, well drained, moderately sloping found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,000 feet. These soils formed from fine-textured alluvium derived from sandstone and shale. These soils are not hydric and are classified as Farmland of statewide importance.

30 – Heldt clay loam, 6 to 12 percent slopes: These soil units are deep, well drained, moderately sloping found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,000 feet. These soils

formed from fine-textured alluvium derived from sandstone and shale. These soils are not hydric and are classified as Farmland of statewide importance.

47 – Nihill channery loam, 6 to 25 percent slopes: These soil units are deep, well drained, moderately sloping, hilly, to steep soils found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,500 feet. These soils formed from alluvium derived from sandstone and shale. This soil is well drained, non-hydric, and not prime farmland.

51 – Olney loam, 6 to 12 percent slopes: These soil units are deep, well drained, moderately sloping found on valley sides and alluvial fans with elevations ranging from 5,000 to 6,500 feet. These soils formed from fine-textured alluvium derived from sandstone and shale. These soils are not hydric and are classified as Farmland of statewide importance.

65 – Torrifluents nearly level: These soil units are found in flat areas, primarily around rivers and floodplains around 5,000 to 7,000 feet. These are well-drained, and the water table can be reached within 12 to 36 inches. These soils occasionally flood. These soils are not classified as prime farmland.

66 – Torriorthents-Camborthids-Rock outcrop complex, steep: These soil units are shallow, well drained, and found on steep mountainsides around 5,000 to 8,500 feet. These soils formed as stony, basaltic alluvium derived from sandstone and shale. These soils are not hydric and are not classified as prime farmland.

67 – Torriorthents-Rock outcrop complex, steep: These soil units are shallow, well drained, and found on steep mountainsides around 5,800 to 8,500 feet. These soils formed as stony, basaltic alluvium derived from sandstone and shale. These soils are not hydric and are not classified as prime farmland.

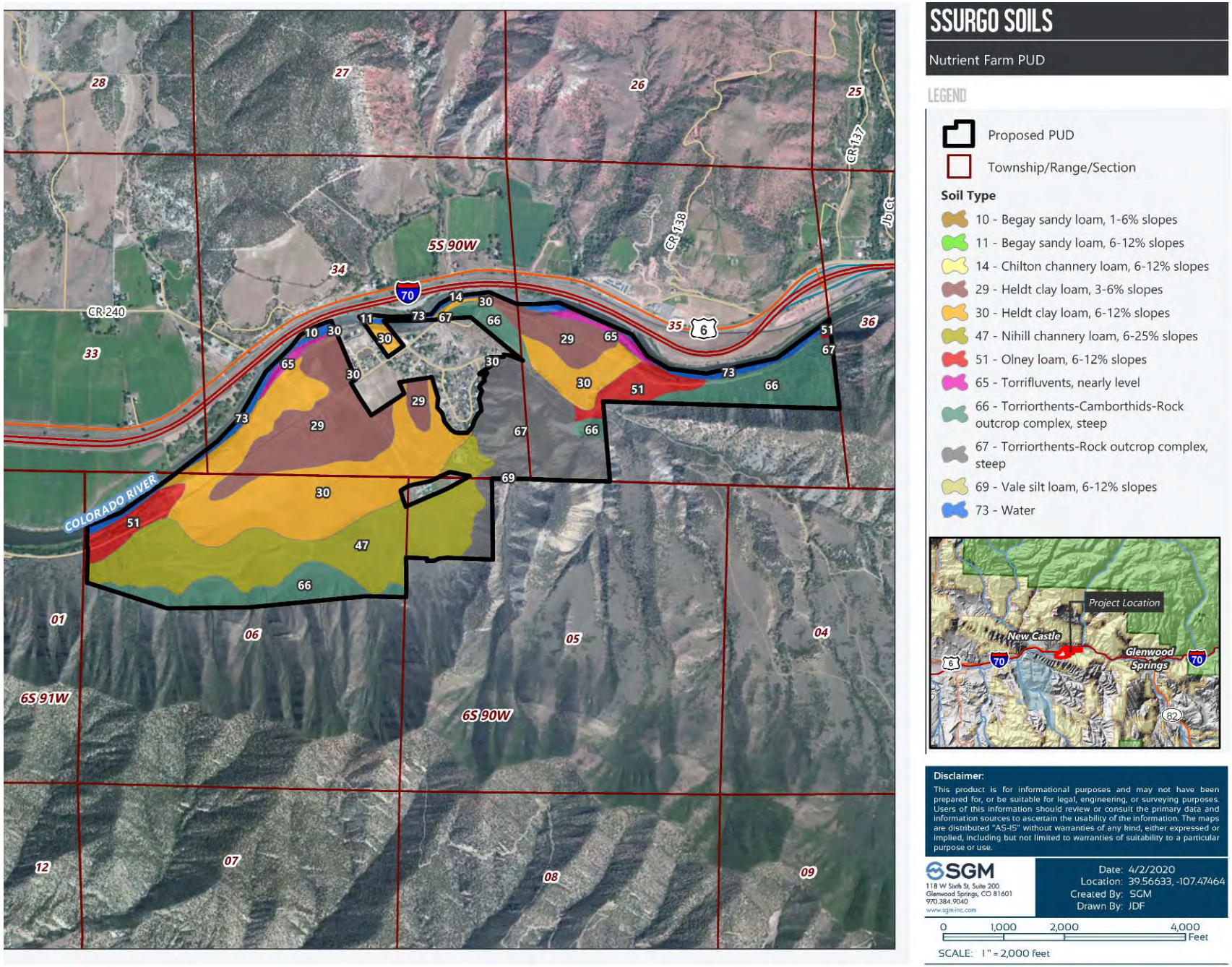
69 – Vale silt loam, 6 to 12 percent slopes: These soil units are deep, well drained, and found on alluvial fans, benches, and mesas at 5,000 to 7,200 feet. The parent material of these soils consists of calcareous eolian deposits. These are not hydric soils and they are classified as Farmland of statewide importance.

2.1.1 Soil Sample Results

Two different soil samples were taken for soils derived from Mancos Shale parent material. These samples were collected and sent to Colorado State University's agricultural extension office for analysis. Please see **Appendix A - Agricultural Test Report**.

- **Sample #1** – This sample is from north-facing steeper slopes. The soil type in this area is Torriorthents and Camborthids, with a more well-developed O and A horizon.
    - Soils are very highly basic (pH 8.1), with very high clay content. Organic matter is very low (1.9%). Supplemental nitrogen (30 lbs/ac) and phosphorus (40 lbs/ac) is recommended. Use of local, native species for reclamation is highly recommended given site-specificity issues.
- **Sample #2** – This sample is from south-facing slopes of exposed shale (torriorthents).
    - Soils are highly basic (pH 7.8), with high clay content. Organic matter is very low (4.2%). Supplemental nitrogen (40 lbs/ac) and phosphorus (40 lbs/ac) is recommended. Use of local, native species for reclamation is highly recommended given site-specificity issues.

Figure 3. Soil Types



2.2 Vegetation

The property generally has four separate, dominant vegetation types. The majority of the property, including the areas proposed for development, is dominated by grazed pasture areas with gently sloping topography, located on alluvial/colluvial material which has been leveled by deposition and tilling. The steep slopes above the pastures are dominated by sparse pinyon-juniper woodlands and mixed mountain shrublands with minimal understory vegetation, derived from Mancos shale; in the transitional areas between the mixed mountain shrublands and pastures there are remnant stands of sagebrush shrublands. The portion of the property immediately adjacent to the Colorado River supports sparse and discontinuous wetland/riparian vegetation on the banks of the river. No wetlands extend beyond the immediate boundaries of the river's channel. Each of the vegetation types is described below in more detail.

Pastures. The pasture portions of the property are dominated by agricultural cultivars including smooth brome (*Bromus inermis*), orchardgrass (*Dactylis glomerata*), western wheatgrass (*Pascopyrum smithii*), as well as some native fescues (*Festuca* spp.) and rabbitbrush (*Ericameria nauseosa*). The noxious weed cheatgrass (*Anisantha tectorum*) is common, and weedy adventitious species such as tumble mustard (*Sisymbrium* spp.) are also prevalent. In the spring, the introduced purple mustard (*Chorispora tenella*) and storkbill filaree (*Erodium cicutarium*) are also common. The site was grazed at the time of investigation, and additional pasture grasses are likely present and identifiable earlier in the grazing season. The condition of the pastures is typical of grazed or dryland pasture sites, with low levels of ground coverage and minimal diversity.

Typical conditions in the pasture areas.

Typical conditions in ungrazed terrace areas, seen in center midground from the upgradient slope.

Historically (pre-settlement) this site would have supported a more diverse assemblage of native forbs, with a significant shrub component (likely sagebrush [*Artemisia tridentata*] and rabbitbrush) and isolated stands of conifers, oakbrush (*Quercus gambelii*) or cottonwoods depending on groundwater availability.

Some areas of the flat terrace on the property are not grazed or irrigated and support a sparse coverage of sagebrush that is likely representative of original conditions.

Mixed Mountain Shrublands. The steep slopes on the south side of the property are composed of Mancos shale which has been uplifted and deformed by the Grand Hogback monocline, which passes through the property. Mancos shale typically supports limited plant diversity and lower density of vegetation, due to challenging growing conditions associated with the formation's high salt content, poor water infiltration, and high erodibility. In lower elevations, Mancos shale can support a salt-desert scrub community with a high percentage of endemic plant species. However, at the elevations found on this property, and in the general area surrounding the Project, Mancos shale soil types support sparse pinyon-juniper woodland (*Pinus edulis – Sabina osteosperma*) with mixed shrub component of Gambel oak (*Quercus gambelii*),

mountain mahogany (*Cercocarpus montanus* and *C. ledifolius*) and Utah serviceberry (*Amelanchier utahensis*). The shrub component is dense in some areas on north-facing slopes with high moisture availability, and sparse or absent on south-facing slopes. The steepest south-facing slopes of Mancos shale are largely bare of vegetation.

Typical conditions on the Mancos slopes. Note sparse shrub coverage on the south-facing slope (center middle view), with greater abundance on the north-facing slopes (left middle view).

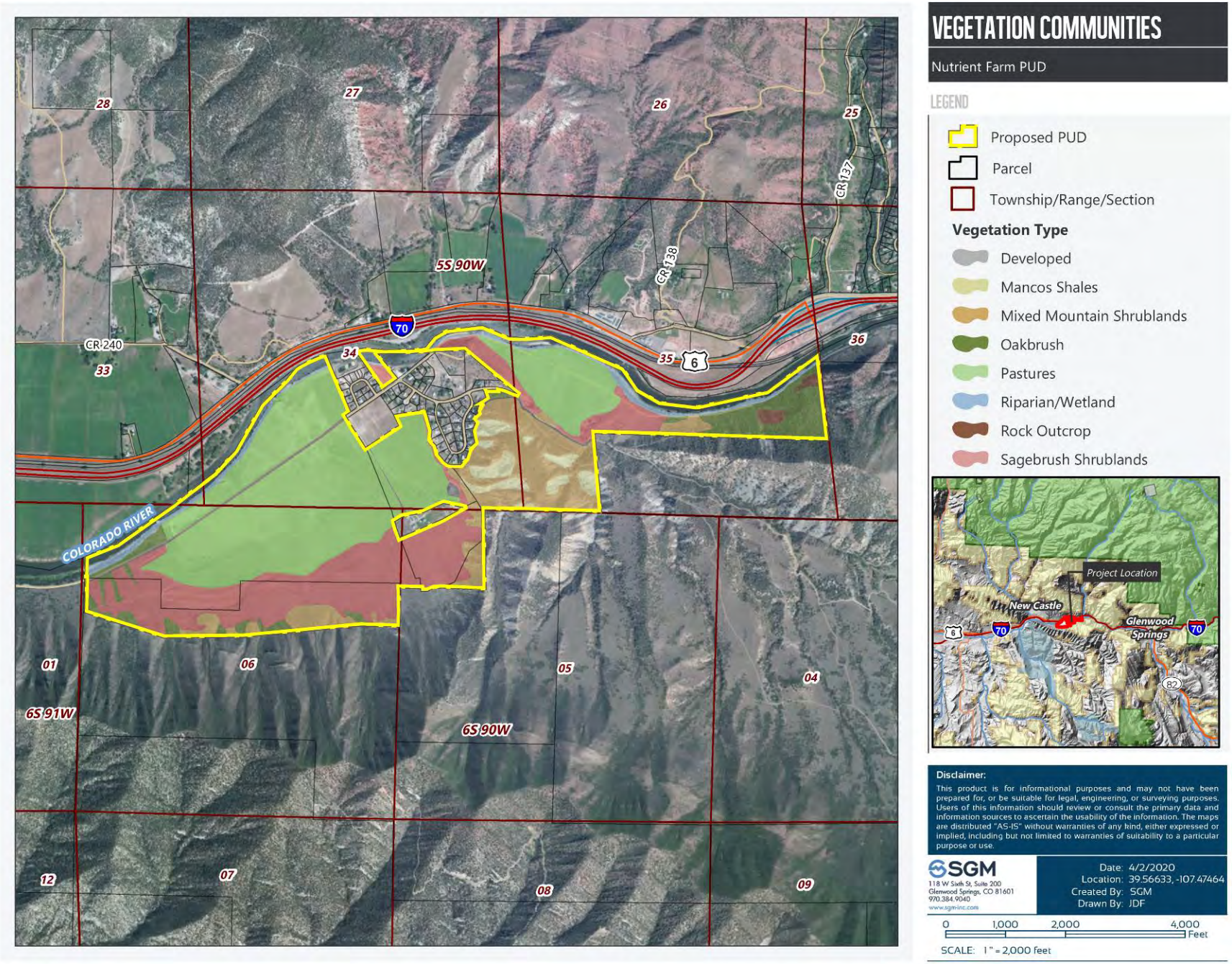
Sagebrush Shrublands. Around the edges of the previously cleared and tilled pastures there are small remnant stands of sagebrush (*Artemisia tridentata* ssp. *bonvillensis*) shrublands. Along washes and in more well drained soils, great basin sagebrush (*A. t.* ssp. *tridentata*) can also be found. Understory vegetation is often compromised by cheatgrass (*Anisantha tectorum*), but native grasses and forbs include smooth brome, western wheatgrass, Indian ricegrass (*Oryzopsis hymenoides*), and needle and thread grass (*Hesperostipa comata*).

Typical conditions in remnant sagebrush shrublands.

Riparian/Wetlands. Within the channel of the Colorado River, isolated and discontinuous patches of riparian and wetland vegetation occur on point bars and sheltered eddy banks. Vegetation is predominantly Chinese elm (*Ulmus parvifolia*), an invasive exotic tree species. Other notable species include narrowleaf cottonwood (*Populus angustifolia*), serviceberry, and dogwood (*Cornus stolonifera*). The banks are generally composed of large-diameter cobble material which is well-drained and limits the extent of fringe wetland conditions. However, in protected eddy zones enough silt has collected to support small stands of coyote willow (*Salix exigua*) which suggest the presence of wetland conditions. There are also small occurrences of the noxious weed species Russian olive (*Elaeaganus angustifolia*) and tamarisk (*Tamarix chinensis*). The riparian habitat is in poor condition, with minimal continuous canopy coverage over the river and a high percentage of exotics, likely due to historic grazing pressure.

Willows dominate in small backwater reaches, adjacent to grazed pasture (right foreground).

Figure 4. Vegetation



2.3 Climate Data

The nearest weather recording station relative to the project area is the NOAA Glenwood Springs #2 station (053359), which is approximately 15 miles to the east. The month with the greatest average precipitation is April and September, with 1.59 inches of precipitation; the other months see around 1.2 inches of precipitation on average. Average snowfall is 59.3 inches, with most of the snow occurring in January. The average maximum temperature of 88.5°F occurs in July, and the average minimum temperature of 36.9°F occurs in January (Western Regional Climate Center: http://www.wrcc.dri.edu).

These climate data show that the project area occurs in a temperate and semi-arid location, and the reclamation plans presented in this document have been developed for maximum likelihood of successful revegetation in this challenging environment.

3.0 Proposed Reclamation Activities

3.1 Pre-Construction Weed Control

Prior to soil disturbing activities, it is strongly advised that noxious weeds be treated. This will greatly help reduce the need for noxious weed treatments in the long-term. The landowner is pursuing holistic removal methods such as mechanical (goats, shovels, mini-backhoe, etc.) or natural herbicides (vinegar, salts, or other compounds). Knapweeds and cheatgrass are very tough plants to control, and the landowner is reminded that persistent treatments will be needed to achieve control.

3.2 Vegetation Removal

Cleared vegetation should be stockpiled, shredded or broken up, and mixed with topsoil or used for reclamation. Material should be placed in a manner to help protect reclamation areas and provide micro-climate growing conditions, and help improve soil moisture, shading, and reduce wind scour. Excess cut vegetation should be removed to reduce visual impacts, as needed.

3.3 Erosion Control

The project would be covered by a Stormwater Construction Permit, as there would be more than one acre of disturbance. Standard erosion controls (Best Management Practices; BMP) such as straw wattles will be utilized and maintained during the life of the reclamation efforts. Waterbars, slope breakers, erosion control blankets, fencing, mulch, straw bales, and rolls may also be used to manage soil erosion. Soil erosion control will be accomplished on steep areas (greater than 3:1). Per CDPHE requirements, the project will:

- Re-construct and stabilize water courses and drainage features.
- Re-construct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
- Re-construct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
- There shall be no evidence of down cutting or aggradation in drainages adjacent to the reclaimed area as a result of the project.

If possible, reclamation work and any associated soil stockpiling should be done in small enough areas to be completed prior to the next rain event. If soil stockpiles need to be left for an extended period or during rain events, erosion and/or sediment controls will be installed.

Modifications to BMPs and erosion control measures would need to be updated in the SWMP; these modifications would be updated with coordination through the Proponent to ensure compliance with the SWPPP is maintained through the reclamation process.

3.4 Soil Storage

The salvaged topsoil shall be stored separately from subsoil or other excavated materials. Windrowing or stockpiling of topsoil and subsoil separately shall be implemented whenever topography allows. Topsoil must not be mixed or covered with subsoil material and should not be used as backfill. Dry drainages or washes that cross disturbed areas should not be blocked with topsoil or subsoil piles. Specifically, topsoil and subsoil should be placed outside of drainages. Gaps should be left at regular intervals in the windrowed or stockpiled topsoil to avoid ponding and diversion of natural runoff during storm events.

3.5 Soil Replacement

After subgrade or grading work, backfilling and recontouring would occur. Subsoils should be graded to final topography, and then topsoil may be placed back on the surface. Any excess excavated materials or materials unfit for backfill should either be utilized elsewhere or shallowly mounded on large fill areas (to help avoid settling issues) and then covered with topsoil, as described below.

Cut and fill slopes should be left very rough. Dirt should have large divots and soil humps being approximately 1-foot deep or tall. Recontouring to a rough texture helps trap broadcast seed and moisture and helps match the surrounding landscape.

A minimum of 6-8 inches of topsoil would be replaced unless site conditions preclude this depth. Topsoil should also be left very rough. Soils should not be worked when wet to avoid mixing, loss of topsoil, and erosion issues.

3.6 Soil Amendments

Based on desired establishment of reclamation species, soil samples were submitted for standard agronomic testing in April 2019. The tests evaluated texture, pH, organic matter, cation exchange capacity (CEC), alkalinity, salinity, and basic nutrients (nitrogen, phosphorus, potassium [NPK]; **Appendix A**). The reclamation contractor will acquire and apply soil amendments. Based on the existing soil conditions and desired reclamation success, the following is recommended for application to needed areas (see **Figure 3**).

- Triagenics Biotic Soil Media (BSM) in Torriorthent soil types.
    - Fertilizer (1:1:0) would be mixed in with BSM. 30-40 lbs/ac N, 40 lbs/ac P, 0 K (see **Figure 3** and **Appendix A**).

Given the poor soil conditions, seed germination may be very poor in these areas, and to establish vegetation some amendments would be needed. This mix can be sprayed on the soil surface.

3.7 Seeding

3.7.1 Temporary Seed Mix

Final seeding is best done in the late fall; therefore, if construction occurs in the summer, it may be desirable to apply a temporary seed mix to the area to help minimize erosion and provide some site stabilization. Temporary seed mixes are relatively inexpensive, and the large seeds germinate quickly. Seeding can occur at a rate of around 20 lbs. per acre.

Two recommended varieties include:

- Annual rye (*Lolium multiflorum*)
- Regreen (a wheat and wheatgrass cross)

3.7.2 Long-term/Permanent Seed Mixes

Seeding should occur in the late fall to avoid seeds from germinating in the summer or fall, and then either desiccating or freezing. Drill seeding could be utilized on pastures and more level terrain, but broadcast seeding would likely be needed on steeper slopes. Drill seeding will be the preferred method where equipment access is feasible; seed would be placed in direct contact with the soil at an average depth of 0.5 inch. For drill seeding applications, small seeds shall be packaged separately to allow for separate application, unless drill seeder has segregated bins. Small seeds should be planted no deeper than 0.25 inch or should be broadcast.

Broadcast seeding would be employed in areas where drill seeding is not possible. Seed would be uniformly applied over the disturbed areas with manually operated cyclone-bucket spreaders or mechanical spreaders. Broadcast seeding rates should be approximately 120 pure live seeds (PLS) per square foot if broadcasted. For pasturelands, typical irrigated (or dryland) cultivar mixes would be appropriate, seeded at rates of approximately 15 lbs/acre.

The following seed mixes are relatively "simple" mixes, additional native species may be added. see **Figure 3** for seeding locations.

Table 1. Pinyon-Juniper/Sagebrush Seed Mix

Common Name	Scientific Name	Variety	PLS lbs/acre
Shrubs			
Fourwing saltbush	*Atriplex canescens*	VNS	1
Sagebrush	*Artemisia tridentata*	Collect from site	See below
Grasses			
Bluebunch wheatgrass	*Pseudorogneria spicata (Agropyron spicatum)*	Anatone, Goldar	3
Bottlebrush squirreltail	*Elymus elymoides*	State Bridge, Little Sahara	3
Western wheatgrass	*Pasopyrum smithii*	UP Colorado, Rosana	5
Muttongrass	*Poa fendleriana*	UP Ruin Canyon, NVS	1
Forbs			
Arrowleaf balsamroot	*Balsamorhiza sagittate*		NA
Patterson's milvetch	*Astragalus pattersonii*		NA
Scarlet globemallow	*Sphaeralcea coccinea*		NA
Sulphur flower	*Eriogonum umbellatum*		NA

Note: forbs should be approximately 10% of mix, as available.

Table 2. Mixed Mountain Shrublands/Oakbrush Seed Mix

Common Name	Scientific Name	Variety	PLS lbs/acre
Shrubs			
Utah serviceberry	*Amelanchier utahensis*	VNS	1
Mountain mahogany	*Cercocarpus montanus*	VNS	1
Grasses			
Bluebunch wheatgrass	*Pseudorogneria spicata (Agropyron spicatum)*	Anatone, Goldar	3
Bottlebrush squirreltail	*Elymus elymoides*	State Bridge, Little Sahara	3
Western wheatgrass	*Pasopyrum smithii*	UP Colorado, Rosana	3
Muttongrass	*Poa fendleriana*	UP Ruin Canyon, NVS	1
Sandberg bluegrass	*Poa sandbergii, Poa secunda*	UP Colorado, VNS	1
Forbs			
Arrowleaf balsamroot	*Balsamorhiza sagittate*		NA
Patterson's milvetch	*Astragalus pattersonii*		NA
Scarlet globemallow	*Sphaeralcea coccinea*		NA
Sulphur flower	*Eriogonum umbellatum*		NA

Note: forbs should be approximately 10% of mix, as available.

3.7.3 Sagebrush Seeding

Recently, local BLM offices have been recommending the local collection of seeds from sagebrush plants, and hand broadcasting during a late fall seeding. In 2017-2019, we have participated in seed collection and seeding efforts, and based on our experience, this method is very effective, and relatively easy.

Ripe sagebrush seed is stripped by hand from remaining sagebrush plants. The seed is stripped immediately into bags in late October and is then scattered over target reclamation areas.

Collection effort should be concentrated on individual plants that had large numbers of fertilized, mature seed. Plants that were not mature or had already dropped seed can be avoided.

Seed fertility and abundance was verified in the field visually, or by examining the endosperm with hand lens and tweezers in uncertain cases.

Collected seed can be gathered in pouches/bags and immediately applied by hand-broadcasting to the right-of-way. A little snow is acceptable, but consistent snow coverage is not likely ideal.

This method is recommended for use at Nutrient Farm; purchasing of other sagebrush seed to conduct reclamation in the PUD may not produce desirable results, given the site-specific soil conditions.

3.8 Mulching

In steeper areas and on south facing slopes, we recommend the use of mulching to maximize moisture retention, reduce wind and water erosion, and improve the chances for revegetation success. Hydromulch should be applied after soil amendments and seeding has occurred; sometimes seed can also be mixed in with the hydromulch, but not more than 10% of the seed. Hydromulch should be applied evenly on steeper slope areas, at a rate of 3,000 to 3,500 lbs/acre.

Attached to this document is a specification sheet for EcoMatrix, available from Triton Environmental in Grand Junction.

Erosion control blankets (ECB) may also be used for steeper slopes. ECBs should not have plastic mesh netting, even if it is claimed that they are "biodegradable". Use ECBs with cotton string netting to prevent wildlife entrainment. Utilization of ECB best management practice installation specification sheets should be utilized, per the Stormwater Management Plan.

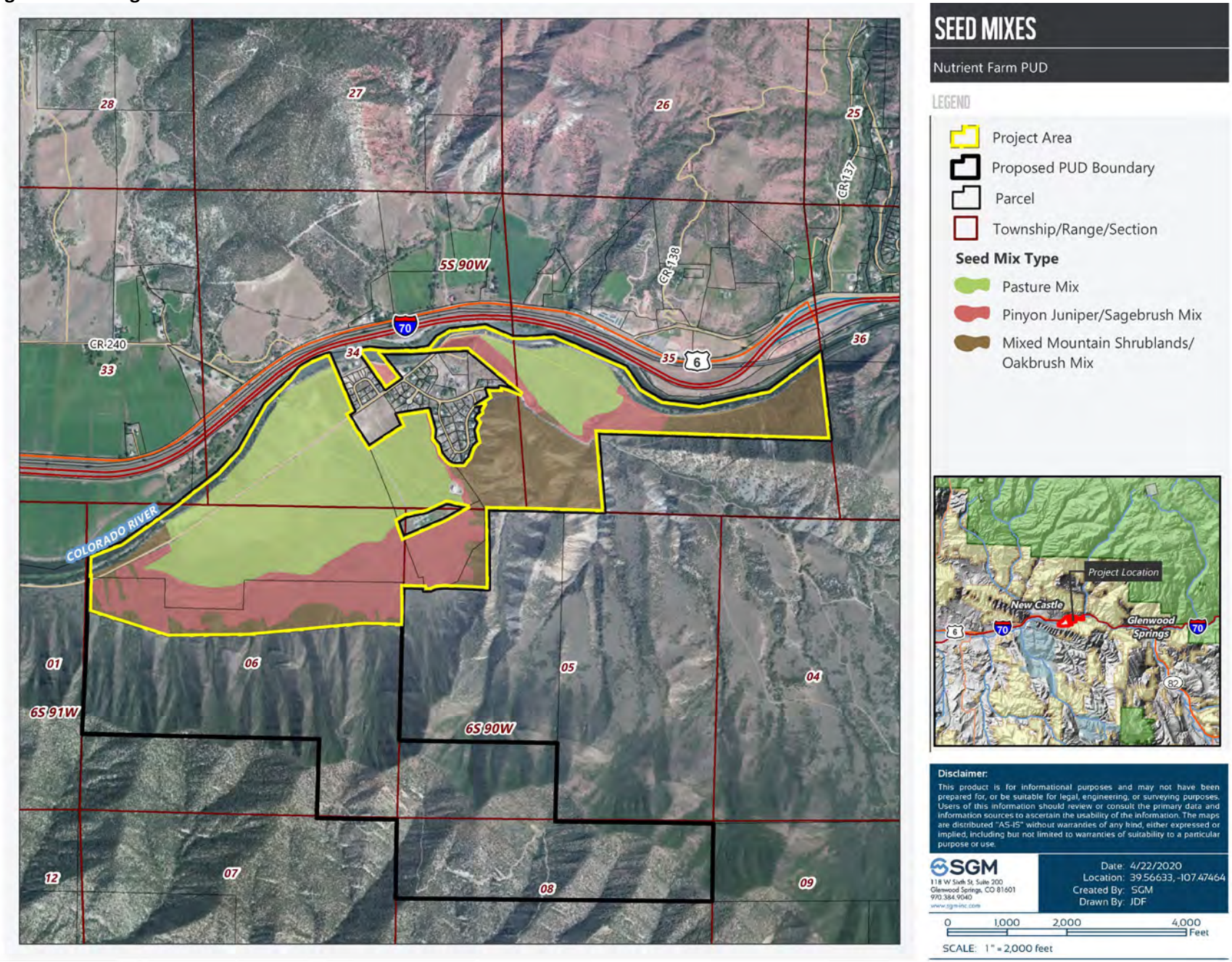
3.9 Touch Up Seeding/Monitoring

Given some areas with steep slopes and poor soils, the landowner should monitor the reclamation area for erosion issues, patches where seed failed to germinate, and other issues. While using native seed mixes provide the best chance for long term site reclamation, native seeding projects often take two to three years before good establishment is realized. During that time, if there are areas where there is no obvious seed germination, additional "spot seeding" should be considered in the fall.

3.1 Noxious Weeds

A Weed Management Plan has been prepared for this project; please see that report for detailed information on noxious weeds.

Figure 5. Seeding Areas



4.0 Appendix A. Soil Test Results

Rachel Katting
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118 W 6th St Ste 200

Glenwood Springs CO 81601

Colorado State University Extension
SOIL, WATER & PLANT TESTING LABORATORY
FORT COLLINS, COLORADO 80523-1120
Phone 970-491-5061 Fax 970-491-2930

AGRICULTURAL TEST REPORT

NUMBER OF SAMPLES 2
DATE RECEIVED 4/8/2019
DATE REPORTED 4/27/2019
COUNTY Garfield

IDENTIFICATION		ROUTINE SOIL TEST RESULTS																	
METHOD USED:					Estimate	Estimate			Modified Walkley Black	AB-DTPA Extract	$NaHCO_3$ Extract	AB-DTPA Extract						Hot Water	AB-DTPA Extract
Lab No.	Sample ID	Sample Depth	pH	EC Salts mmhos/cm	Excess Lime	Texture Estimate	SAR	Gyp meq 100g	Organic Matter %	Nitrate N ppm	Phosphorus P ppm	Phosphorus P ppm	Potassium K ppm	Zinc Zn ppm	Iron Fe ppm	Manganese Mn ppm	Copper Cu ppm	Boron B ppm	Sulfur S ppm
F1021a	Sample 1		8.1	0.2	very high	clay			1.9	11	8.9	4.6	239	0.7	10.1	2.0	1.7	0.21	10.3
F1022b	Sample 2		7.8	0.5	high	sandy clay loam			4.2	1	10.2	5.5	437	0.9	12.6	2.0	2.7	0.23	21.0

FERTILIZER RECOMMENDATIONS:

I. D.	FIELD INFORMATION								POUNDS OF ACTUAL NUTRIENT PER ACRE									
Lab No.	Sample ID	Acres	Irrigation	Proposed Crop	Yield Goal	Lime (T/A) to raise pH to: 6.0	6.5	7.0	N lbs/A	P_2O_5 lbs/A	K_2O lbs/A	Zn lbs/A	Fe lbs/A	Mn lbs/A	Cu lbs/A	Boron lbs/A	Sulfur lbs/A	Gypsum T/A
F1021a	Sample 1		yes	native vegetation	variable				30	40	0	0	0	0	0	0	0	N/A
F1022b	Sample 2		unknown	native vegetation	variable				40	40	0	0	0	0	0	0	0	N/A

SPECIAL COMMENTS AND SUGGESTIONS:
The pH's and salts are at levels that are suitable for plant growth.

Web site: http://www.soiltestinglab.colostate.edu APPROVED _____ James Self, Ph.D./Extension Soil Test Specialist

Reclamation Plan
Vulcan Ditch/Nutrient Farm PUD
Garfield County, Colorado

April 2019

Prepared for:

Nutrient Farm PUD
5670 Brentwood Drive
Hoffman Estates, IL 60192

Prepared by:

SGM
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1.0 Executive Summary

Nutrient Farm PUD (the "Proponent") proposes to reconstruct and realign segments of the existing Vulcan Ditch (ditch), located on the south side of the Colorado River between New Castle and Glenwood Springs (**Figure 1**). The ditch has been out of service for approximately 10 years, and some portions of the ditch are being proposed for new piping and burial. This will require creating a working platform for construction, approximately 15-feet wide, and then subsequent recontouring and reclamation.

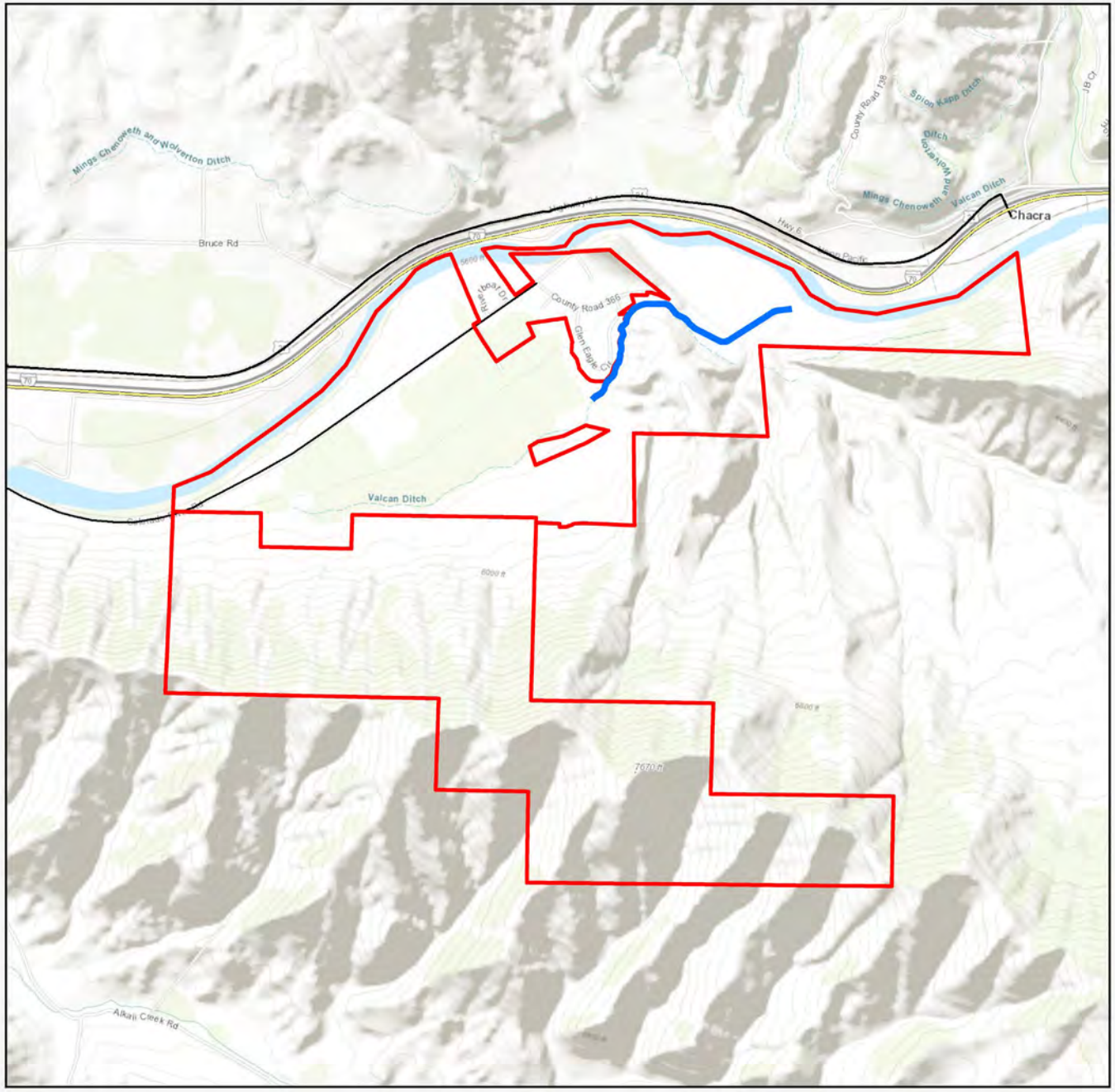
While the flat pasturelands have good soils for reclamation and would not need extra management, the steep slopes are derived from poor shaley soil types and given these poor soils and slope steepness (which can reduce soil moisture), reclaiming the ditch area will be challenging. Unfortunately, simply scattering some seed along the construction corridor will likely be relatively ineffective for reclamation and would end up being a waste of time and money. However, even with using soil amendments, mulch, and a site-specific seed mix, it is also important to realize that given the soil conditions and background vegetation, creating a green swath of grasses along the ditch corridor is also unrealistic; reclamation and establishment of grasses, shrubs and native forbs can be expected to take up to 3 years, and will likely match background native plant community types in cover and species richness.

Noxious weeds (Russian knapweed and cheatgrass) are also common in the area, and without aggressive annual treatment (early summer spraying/treatment, and possibly an early winter treatment for cheatgrass), then they will overrun the ditch area; Garfield County requires that noxious weeds are managed and controlled.

The purpose of this document is to provide recommended prescriptions to stabilize and revegetate the ditch within proposed disturbance areas. This report only addresses the ditch on the southern side of the Colorado River.

1.1 Summary of Reclamation Activities

- The ditch will cross three primary vegetation types;
    - Pasturelands dominated by agricultural cultivars,
    - Mixed mountain shrublands, dominated by mountain mahogany and other species,
    - Mancos shale breaks dominated by very sparse mountain mahogany and individual grasses and forbs.
- Evaluate soil conditions
    - Mancos shale formations will be difficult to revegetate without some soil amendments; soil samples will be collected and tested by CSU Ag extension for recommended amendments.
- Soil roughening- will be needed to help reduce erosion and increase soil moisture.
- Application of seed mix by either drill seeder or by hand application.
- Application of mulch- given dry conditions, mulch should be used to reduce erosion and improve seedling establishment.
- Annual noxious weed control- knapweed and cheatgrass are common in the area and are within the seedbank; annual aggressive spraying will be needed to prevent a full infestation.



Vicinity Map

Nutrient Farm - Riverbend Ranch

Vulcan Ditch Reconstruction

LEGEND

- Proposed Pipe Alignment
- Subject Property
- Municipality
- Interstate
- Highway/Road

Disclaimer:
This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. The maps are distributed "AS-IS" without warranties of suitability to a particular purpose or use.

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Date: 4/3/2019
Version: 01
Coor. System: NAD 83 UTM Zone 13N
Created by: SGM
Map by: RKK

0 500 1,000 2,000 Feet

1 in = 2,010 ft

N

2.0 Site Characterization

The Proponent is proposing to realign and reconstruction approximately 4,338 feet (0.82 mile) of the Vulcan Ditch. The new buried 18-inch HDPE (high density polyethylene) pipeline would require an approximate 15-foot wide construction corridor, which may extend up to 30 feet in some areas due to cut and fill and laying back slopes to minimize long-term erosion issues. Larger disturbance areas would mostly be on the up-hill side of the ditch.

2.1 Soils

The ditch will cross five soil types, listed below, starting from east to west:

- Torriorthents-Camborthids-Rock outcrop complex, steep. This soil type occurs on steep slopes, immediately south of the flume crossing the Colorado River, and along the Mancos shale outcrop area, just east of the existing homes. It is derived from stony, basaltic alluvium derived from sandstone and shale. The upper layer is variable but is mostly fine sandy loams and clay loams with shallow unweathered bedrock. It is well drained, but given the shallow lithic bedrocks, runoff can be high. It is non-saline to slightly saline.
- Olney loam, 6 to 12 percent slopes. This soil type occurs in alluvium and in the deposition zone of the unnamed drainage along the eastern irrigated hay fields. This soil occurs in alluvium derived from sandstone and shale, with calcium carbonates up to 15%, and is nonsaline to very slightly saline. It is well drained, and the upper profile is loam and sandy clay loams.
- Heldt clay, 6 to 12 percent slopes. This is the dominant soil type in the irrigated pasturelands. It is derived from fine-textured alluvium from sandstone and shales, with the upper soil profiles being clay loams. It is nonsaline to very slightly saline.
- Nihill channery loam, 6 to 25 percent slopes. This soil type occurs at the toe of steeper slopes, primarily towards the western end of the ditch. It occurs in alluvium derived from sandstone and shales. The soil profile is dominated by channery and very channery loams and is well drained.

2.1.1 Soil Sample Results

Two soil samples were collected and sent to Colorado State University's agricultural extension office for analysis.

- Sample #1 – This sample is from north-facing steeper slopes. The soil type in this area is Torriorthents and Camborthids, with a more well-developed O and A horizon.
    - Results will be presented once available from CSU.
- Sample #2 – This sample is from south-facing slopes of exposed shale (torriorthents).
    - Results will be presented once available from CSU.

2.2 Vegetation

In summary, the site is characterized by variably dense, shrubby vegetation on very poor soil types; the density and diversity of vegetation is primarily driven by slope and aspect. Of concern, is that some areas are on shale breaks, that normally support very sparse vegetation profiles. In these areas, reclamation will be very challenging.

2.2.1 Pasturelands

These previously irrigated pastures still support some agricultural cultivars but is slowly transitioning to more drought-tolerant and weedy species, given a cessation in irrigation waters. Vegetation is currently dominated by the noxious weed cheatgrass (*Anisantha* [*Bromus*] *tectorum*), crested wheatgrass (*Agropyron cristatum*), Kentucky bluegrass (*Poa pratensis*), purple mustard (*Chorispora tenella*), flixweed (*Descurania sophia*), tumble mustard (*Sisymbrium altissimum*), kochia (*Kochia* spp.). small patches of smooth brome (*Bromus inermis*), and individual sagebrush (Artemisia tridentata tridentata) and rabbitbrush (*Ericamerica nauseosus*).

2.2.2 Mixed Mountain Shrublands

Mixed mountain shrublands describes the dominant vegetation type on north-facing slopes, where soil moistures are higher, and there is more development of the soil profile. These sites support sometimes very dense stands of mountain mahogany (*Cercocarpus montanus*), with individual Utah serviceberry (*Amelanchier utahensis*), pinyon pine (*Pinus edulis*), Utah juniper (*Sabina osteosperma*), Indian ricegrass (*Oryzopsis hymenoides*), crested wheatgrass, cheatgrass, and western snowberry (*Symphoricarpos oreophilus*).

2.2.3 Shale Breaks

Along short sections of the route, there are steep, south facing slopes on shale breaks. In these areas, there is little to no topsoil, and vegetation is very sparse (<5 percent cover). Vegetation included individual mountain mahogany shrubs, Indian ricegrass, and slender buckwheat (*Eriogonum microthecum*).

2.3 Climate Data

The nearest weather recording station relative to the project area is the NOAA Glenwood Springs #2 station (053359), which is approximately 15 miles to the east. The month with the greatest average precipitation is April and September, 1.59 inches; the other months see around 1.2 inches of precipitation on average. Average snowfall is 59.3 inches, with most of the snow occurring in January. The average maximum temperature of 88.5°F occurs in July, and the average minimum temperature of 36.9°F occurs in January (Western Regional Climate Center: http://www.wrcc.dri.edu).

These climate data show that the project area occurs in a temperate and semi-arid location, and the reclamation plans presented in this document have been developed for maximum likelihood of successful revegetation in this challenging environment.

3.0 Proposed Reclamation Activities

3.1 Pre-Construction Weed Control

Prior to soil disturbing activities, it is strongly advised that noxious weeds be treated. This will greatly help reduce the need for noxious weed treatments in the long-term. The land owner is pursuing holistic removal methods such as mechanical (goats, shovels, mini-backhoe, etc.) or natural herbicides (vinegar, salts, or other organic compounds). Knapweed is a very tough plant to kill, and the landowner is reminded that persistent treatments will be needed to achieve control.

3.2 Vegetation Removal

It is anticipated that most vegetation would be cleared from the 15-foot construction corridor and cut and fill slopes (possibly up to 30-feet in width). Cleared vegetation should be stockpiled, shredded or broken up, and mixed with topsoil or used for reclamation. Material should be placed in a manner to help protect reclamation area (on slopes). Excess cut vegetation should be removed to reduce visual impacts, as needed.

3.3 Erosion Control

The project would be covered by a Stormwater Construction Permit, as there would be more than one acre of disturbance. Standard erosion controls such as straw wattles will be utilized and maintained during the life of the reclamation efforts. Waterbars, slope breakers, erosion control blankets, fencing, mulch, straw bales, and rolls may also be used to manage soil erosion. Soil erosion control will be accomplished on steep areas (greater than 3:1). Per CDPHE requirements, the project will:

- Re-construct and stabilize water courses and drainage features.
- Re-construct drainage basins and reclaim impoundments to maintain the drainage pattern, profile, and dimension to approximate the natural features found in nearby naturally functioning basins.
- Re-construct and stabilize stream channels, drainages, and impoundments to exhibit similar hydrologic characteristics found in stable naturally functioning systems.
- There shall be no evidence of down cutting or aggradation in drainages adjacent to the reclaimed area as a result of the project.

If possible, reclamation work and any associated soil stockpiling should be done in small enough areas to be completed prior to the next rain event. If soil stockpiles need to be left for an extended period or during rain events, erosion and/or sediment controls will be installed.