FOUR POINTS
SURVEYING ENGINEERING

Ph: 970-871-6772 · Fax: 970-879-8023 · P.O. Box 775966 · Steamboat Springs, Colorado 80477

Final Drainage Letter
for
Richey Construction Live/Work
Lot 3 Copper Ridge Business Park Subdivision F4
Steamboat Springs, Colorado

Draft Drainage Letter: June 25, 2022
Revised: October 28, 2022

Prepared by: Matthew McLeod, P.E.
Four Points Surveying & Engineering

P.O. Box 775966
Steamboat Springs, Colorado 80477
(970) 819-1161

Introduction

This drainage letter presents an analysis of a proposed outdoor storage and paved access drive with parking to be completed on Lot 3 Copper Ridge Business Park Subdivision Filing 4. The existing lot was platted on December 2002 and contains 0.32 acres. The site is located at 1716 Copper Ridge Spur.

Drainage reports reviewed as a part of this letter include the Copper Ridge Business Park Final Drainage Report dated July 2002 and prepared by Civil Design Consultants (CDC).

Drainage Criteria, Design Criteria, and Methodology Used

Design rainfall: NOAA Atlas 14, Volume 8, Version 2 for Steamboat Springs, CO.

- Minor Event (5-year) 24-hour rainfall depth: 1.59 inches
- Major Event (100-year) 24-hour rainfall depth: 2.91 inches

This report was prepared in accordance with the most recent version of the City of Steamboat Springs Drainage Criteria. Effects of the proposed development on storm runoff were determined for the 5- year (minor) and 100-year (major) storm events using the Rational Method, Q= CiA, where Q is the design flow rate, i is the storm intensity, A is the basin area, and C is the runoff coefficient. Stormwater detention volume and release rate calculations were performed per City of Steamboat Springs Drainage Criteria Section 5.11.

Existing Conditions

Lot 3 Copper Ridge Business Park is currently vacant with an approved outdoor storage development under DPA-21-01 which has yet to be constructed. There is a shared access easement with Lot 4 to the north which has gravel access to that lot with a culvert along Copper Ridge Spur across it. The site is primarily covered in native grasses and weeds. Site drainage is fairly uniform, sheet flowing from northeast to southwest collecting in an existing drainage swale offsite from the southwest corner. The swale is part of the existing Copper Ridge Business Park drainage infrastructure which conveys flow out to the Yampa River. Flows eventually enter the Yampa River. The capacities of the existing drainage infrastructure were designed by CDC. NRCS soils are primarily impass silty clay loam. FEMA flood map 08107C0713D was reviewed and the site is located in Zone X, and area of minimal flood hazard.

Proposed Conditions

The proposed use of this site includes the development of two ~1,300 square foot live/work units with a paved access and parking. The developed site will sheet flow off of the proposed pavement at two locations, design point (DP)1 and DP2, filtered through grass buffers and out to the existing swales along the west and south property lines (DP3 and DP4 respectively) . The culvert across the proposed paved access will be reinstalled with riprap control at the inverts, which currently do not exist. A cut off grass lined swale directing flow coming from Lot 4 into the existing ditch to the west will be installed along the north side of the outdoor storage area with level spreader. The basin characteristic summery is outlined below with calculations in the Appendix.

Lot 3 % Impervious
Proposed

BASIN CHARACTERISTICS			
	Area, ac	% imp	Soil Type
Landscape	0.13	2%	C
Asphalt Parking & Walkways	0.01	100%	
Roof	0.00	90%	P2
Gravel	0.18	40%	
Other	0.00	0%	
	0.32	26%	

Table 1: Summary Table for the 5- and 100-year storms

Basin	Area (acres)	% Imperviousness	Q5 (cfs)	Q100 (cfs)
EB1	**0.32**	**4%**	**0.16**	**1.00**
DB1	**0.32**	**63%**	**0.56**	**1.68**

Detention and Water Quality

The proposed flows will be increased from historic peak flows. The increase will be managed by an existing detention facility downstream of the Coper Ridge Business Park development and will not have an adverse impact on downstream properties. Water quality for the site will be handled by the installation of a grass buffers along the northwest (DP1) and southeast corners of the pavement where sheet from the gravel outdoor storage area flows to. The grass buffers are designed to remove the required TSS from the anticipated run-off. Expected contaminants are vehicle leakage and sediment from outdoor storage area. A level spreader where the cut off ditch and existing ditch intersect will be installed. The proposed cut off swale along the north property line will be constructed as a grass lined water quality swale for the purpose of treated the expected snow storage. See calculations in the Appendix.

Conclusions

In conclusion, drainage from proposed outdoor storage area will be directed toward the existing discharge point designated as design point 1 (DP1). Runoff will be treated by a grass buffer along the southwest corner of the lot. The proposed flow is less than peak historic flow, on site detention is not required. This development complies with the City of Steamboat Springs drainage criteria and needs no variances.

References

WRC, Engineering, Inc., September 2007, Updated July 2019. *City of Steamboat Springs Engineering Standards, Section 5.0 Drainage Criteria*. Prepared for City of Steamboat Springs, Department of Public Works. September.

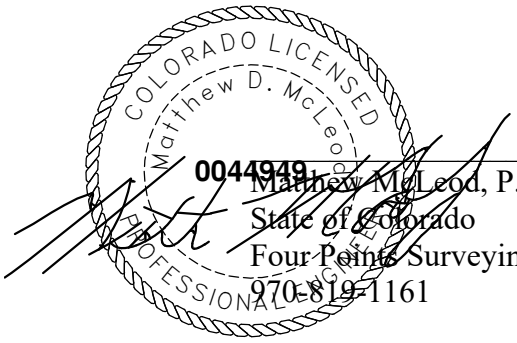
Urban Storm Drainage Criteria Manual, Volume 3 Urban Drainage and Flood Control District, November 2010

The City of Steamboat Springs Stormwater Master Plan, June 2013

Copper Ridge Business Park (CRBP) Final Drainage Report Civil Design Consultants, Inc, July 2002

Certification Statement

I, hereby affirm that this drainage letter and plan for Lot 3 Copper Ridge Business Park Subdivision was prepared by me (or under my direct supervision) for the owners thereof and is, the best of my knowledge, in accordance with the provisions of the City of Steamboat Springs Drainage Criteria and approved variances. I understand that the City of Steamboat Springs does not and will not assume liability for drainage facilities designed by others.



Matthew McLeod, P.E.
State of Colorado
Four Points Surveying and Engineering
970-819-1161

Appendices

- Drainage Exhibit - DR1 (Existing and Proposed Conditions)
- Drainage Exhibit – DR2 (Water Quality)
- Drainage Basin Calculations using Rational Method
- FEMA Map
- USDA NRCS Web Soil Survey
- TSS Calculations
- Design Procedure Form – Grass Buffer
- Grass Swale Calculation
- Design Procedure Form – Grass Swale
- Standard Form No. 1 – Drainage Letter Checklist
- Standard Form No. 4 – Stormwater Quality Plan Checklist
- O&M Plan
- Project Sheet – Base Design Standards
- Approved Scope Approval Form

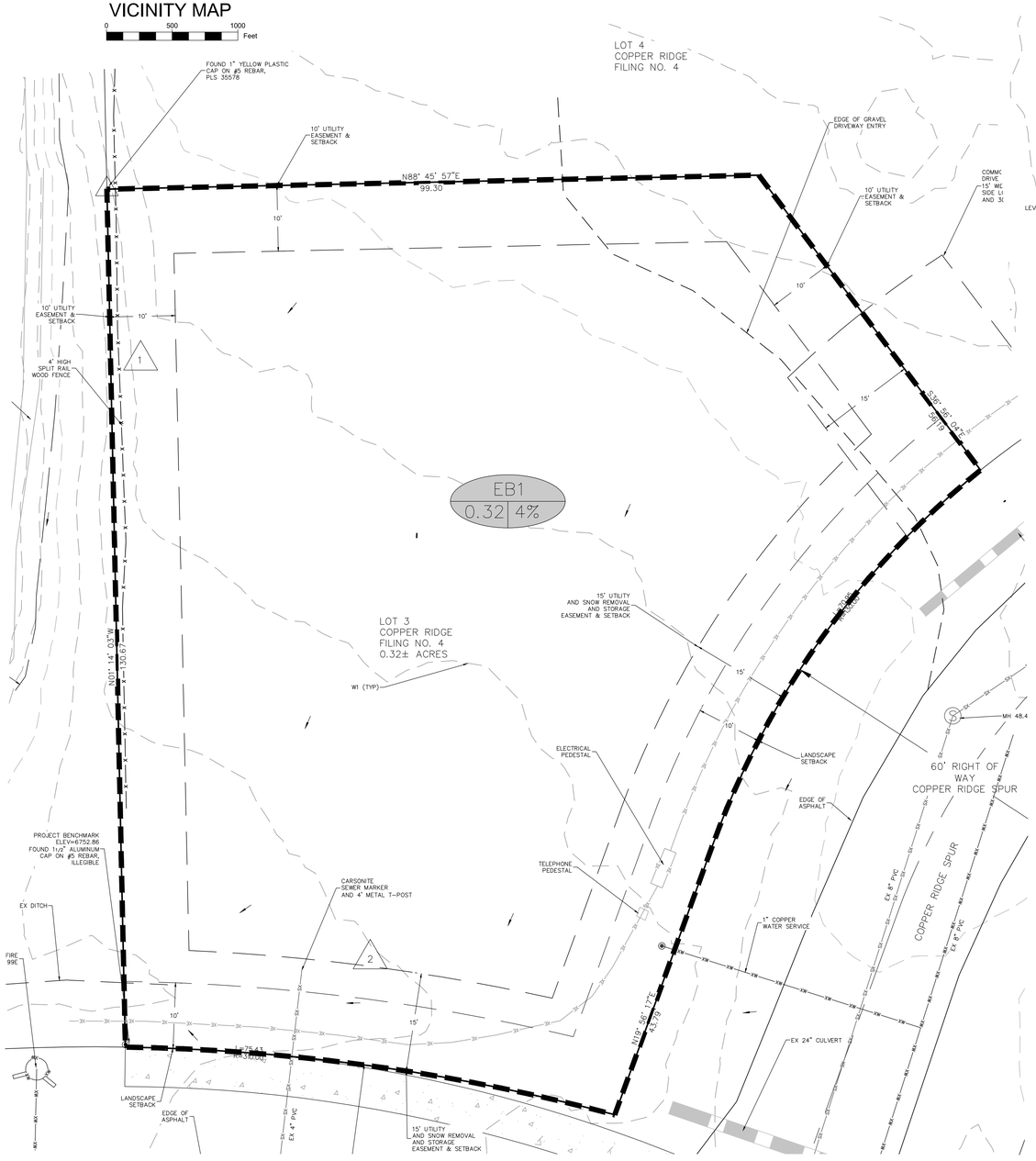
Appendix

VICINITY MAP

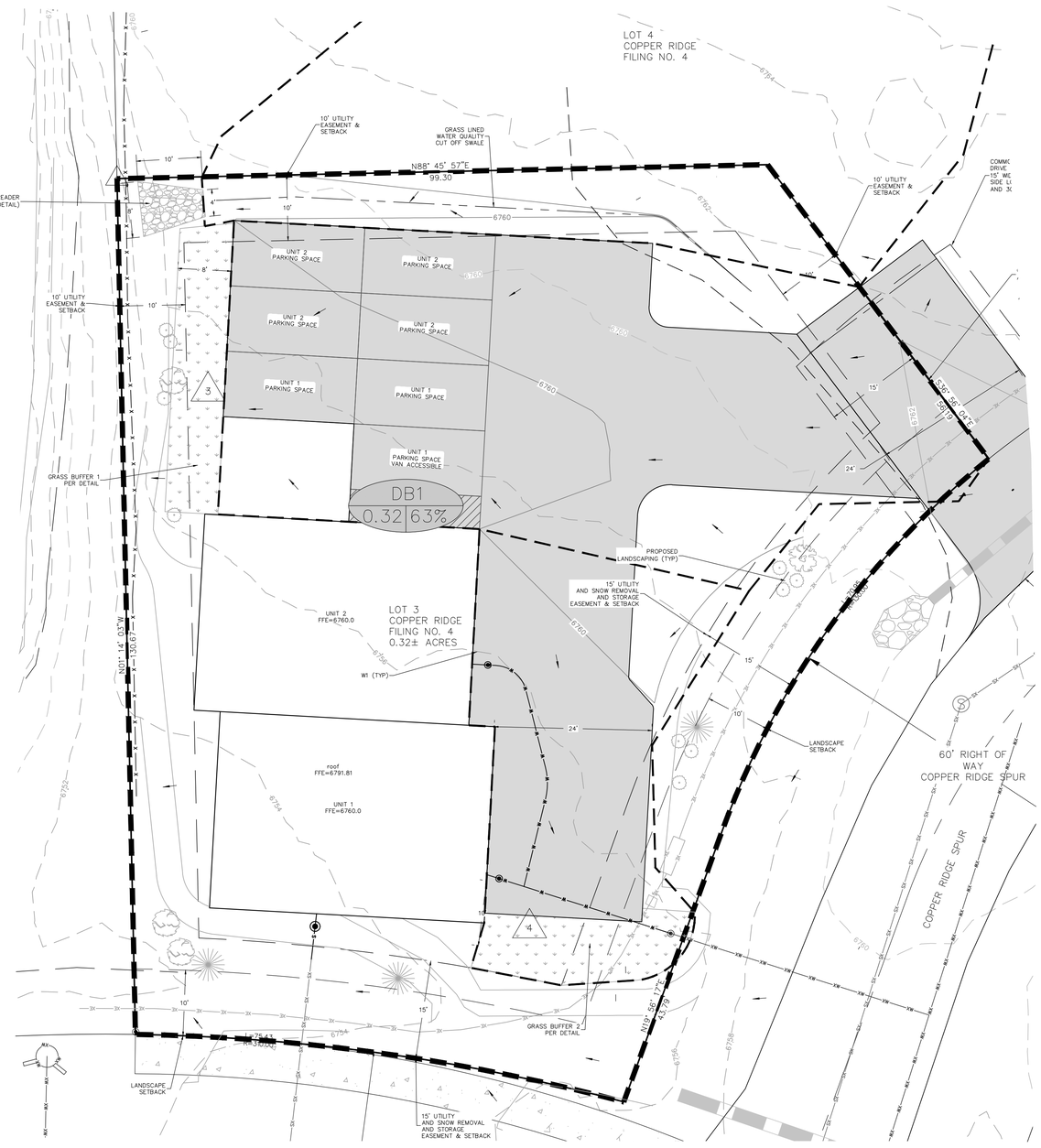
0 500 1000 Feet

LEGEND

- DRAINAGE DESIGN POINT (SEE DRAINAGE LETTER)
- DRAINAGE BASIN # / SUB-BASIN #
- ACREAGE OF BASIN
- % IMPERVIOUS
- DRAINAGE BASIN BOUNDARY
- BOUNDARY FOR AREA CONTRIBUTING TO WATER QUALITY FACILITY



EXISTING DRAINAGE CONDITIONS



PROPOSED DRAINAGE CONDITIONS

FOUR POINTS SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	8/29/2022	DRT REVIEW & RESPONSE	MDM
2	10/3/2022	DRT REVIEW & RESPONSE	MDM

RICHEY CONSTRUCTION LIVE/WORK

1716 COPPER RIDGE SPUR
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale

1" = 10'

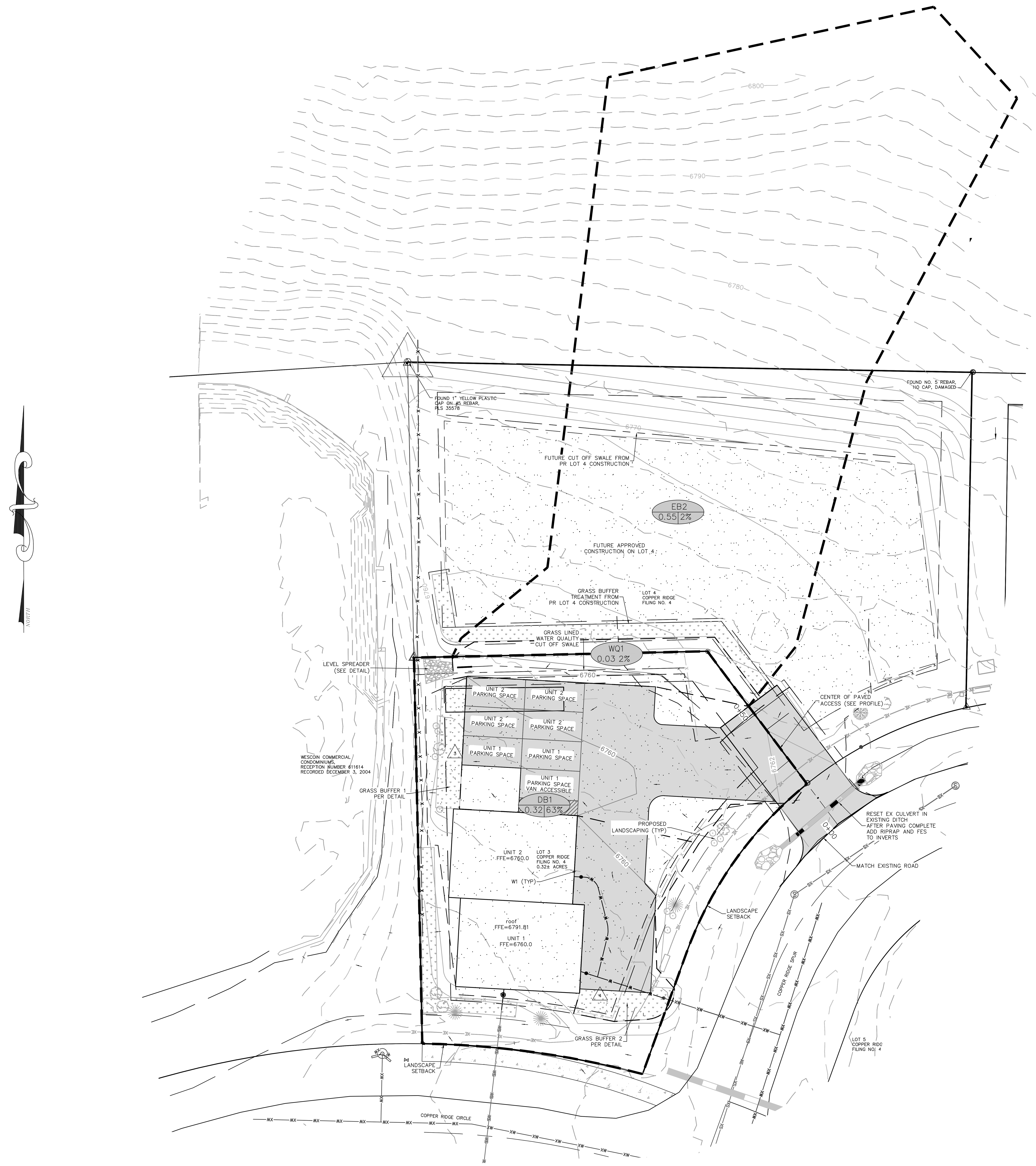
Contour Interval = 2 ft

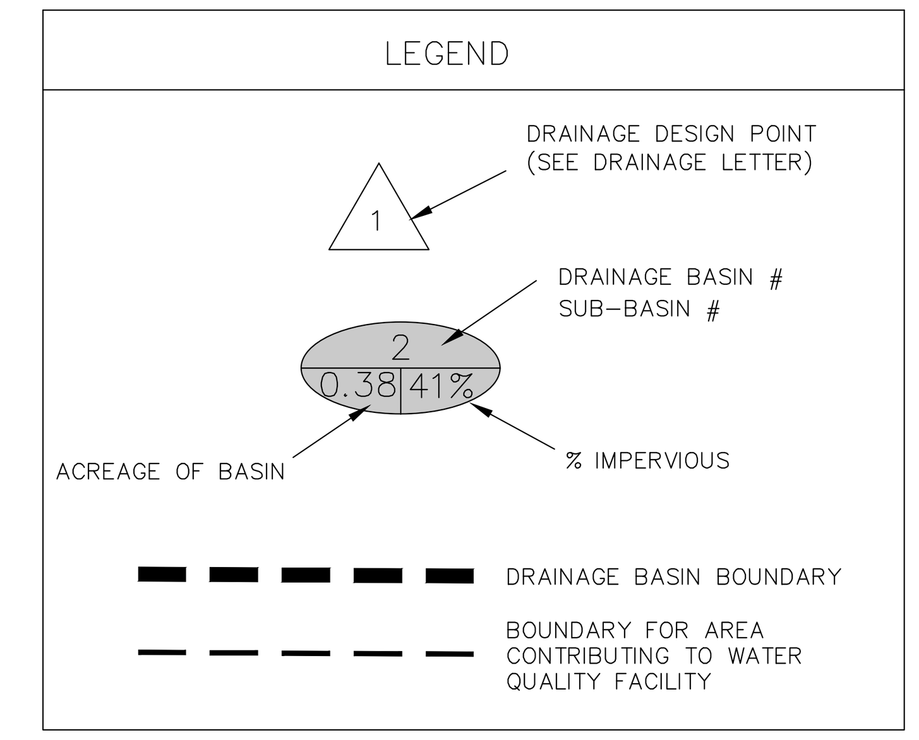
DATE: 6-21-2022
JOB #: 1647-007
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: FPSE

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24" X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING: DRAINAGE EXHIBIT #1

SHEET # DR1





FOUR POINTS
SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	8/29/2022	DRT REVIEW & RESPONSE	MDM
2	10/3/2022	DRT REVIEW & RESPONSE	MDM
3	10/25/2022	WATER QUALITY UPDATES	MDM

RICHEY CONSTRUCTION LIVE/WORK

1716 COPPER RIDGE SPUR
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale

10' 0 5' 10'

1" = 10'

Contour Interval = 2 ft

DATE: 6-21-2022
JOB #: 1647-007
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: FPSE

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24" X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING:

DRAINAGE EXHIBIT #2

SHEET #

DR2

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1647	Date:	April 24, 2022
Job Name	Lot 3 Copper Ridge BP F4	Revised:	October 25, 2022
Designed by:	MDM		

Existing Basin 1 (EB1)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.30	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.07	1.3	0.32	0.03
Asphalt Parking & Walkways	0.00	100%		Length, ft	153	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.07	1.9	0.32	0.04
Roof	0.00	90%	P2	Slope, percent	7.1000	Slope, percent	2.0000	Slope, ft/ft	2.0000	5.0	5-YR	0.18	2.8	0.32	0.16
Gravel	0.02	40%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.15	Conveyance Coefficient	20	Final	10-YR	0.27	3.5	0.32	0.31
Other	0.00	0%						Velocity, ft/s	28.3	Tc, min	25-YR	0.39	4.5	0.32	0.57
	0.32	4%		Ti, min=	10.9	Ti, min=	0.0	Tt, min=	0.0	**10.9**	**100-YR**	**0.52**	**6.1**	**0.32**	**1.00**

Development Basin 1 (DB1)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.11	2%	C	Surface Imperviousness	1	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.43	1.7	0.32	0.24
Asphalt Parking & Walkways	0.14	100%		Length, ft	107	Length, ft	13	Length, ft	0	Tc, min	2-YR	0.43	2.5	0.32	0.34
Roof	0.06	90%	P2	Slope, percent	2.8000	Slope, percent	30.0000	Slope, ft/ft	2.0000	5.0	5-YR	0.47	3.7	0.32	0.56
Gravel	0.01	40%	1.4	Runoff Coefficient	0.9	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.52	4.7	0.32	0.79
Other	0.00	0%						Velocity, ft/s	28.3	Tc, min	25-YR	0.58	6.1	0.32	1.14
	0.32	63%		Ti, min=	2.6	Ti, min=	2.0	Tt, min=	0.0	**5.0**	**100-YR**	**0.64**	**8.2**	**0.32**	**1.68**

Water Quality Swale Basin (WQ1)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.03	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	1.3	0.03	0.002
Asphalt Parking & Walkways	0.00	100%		Length, ft	230	Length, ft	0	Length, ft	80	Tc, min	2-YR	0.06	1.9	0.03	0.00
Roof	0.00	90%	P2	Slope, percent	16.0000	Slope, percent	2.0000	Slope, ft/ft	0.0200	5.0	5-YR	0.16	2.8	0.03	0.01
Gravel	0.00	40%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.26	3.5	0.03	0.03
Other	0.00	0%						Velocity, ft/s	2.1	Tc, min	25-YR	0.38	4.6	0.03	0.05
	0.03	2%		Ti, min=	10.2	Ti, min=	0.0	Tt, min=	0.6	**10.8**	**100-YR**	**0.51**	**6.1**	**0.03**	**0.09**

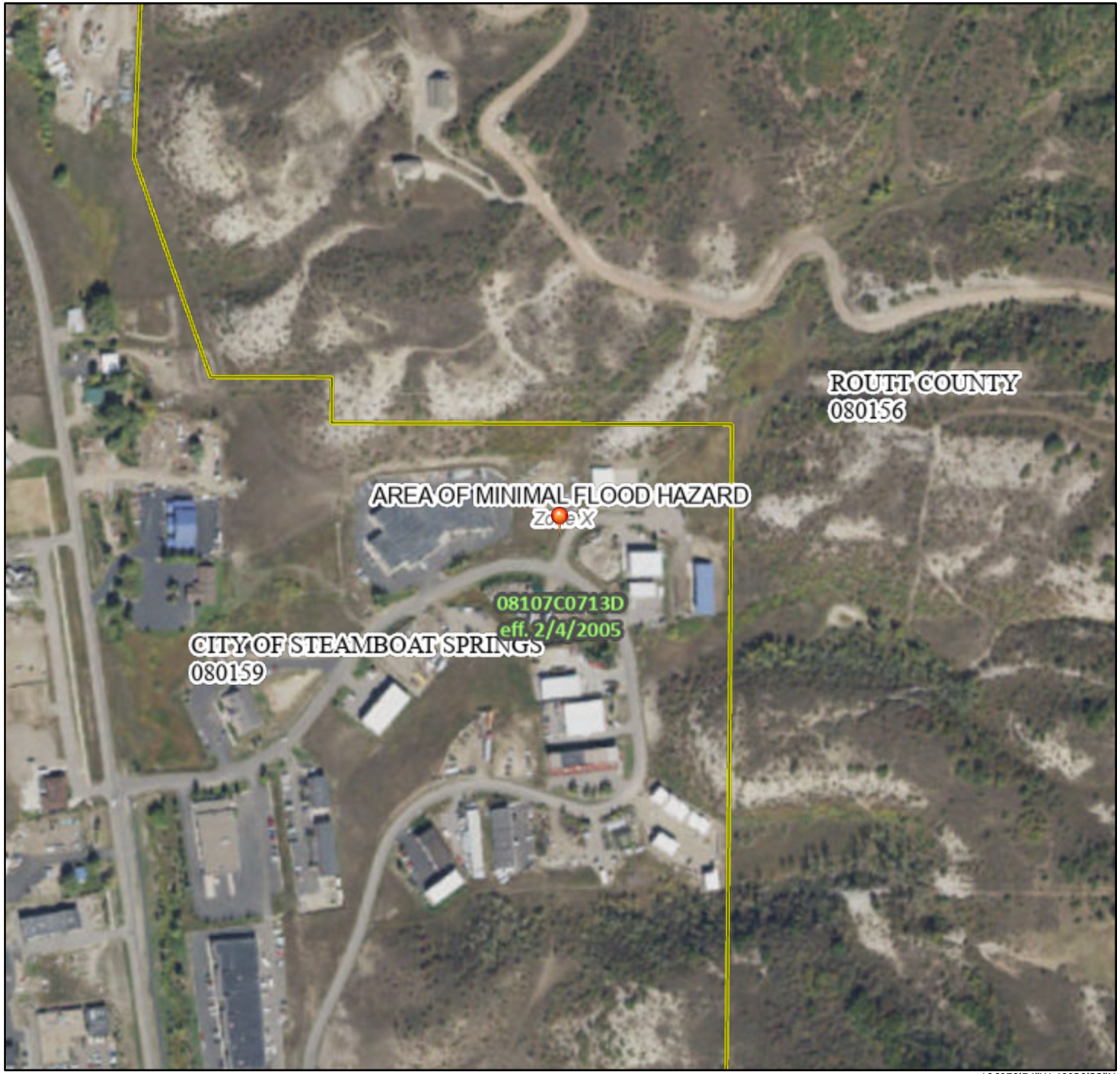
Existing Basin 2 (EB2)

BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	0.55	2%	C	Surface Imperviousness	0.02	Surface Imperviousness	0.02	Land Surface	Grassed Waterways	Minimum	1.25 YR	0.06	1.3	0.55	0.04
Asphalt Parking & Walkways	0.00	100%		Length, ft	230	Length, ft	0	Length, ft	80	Tc, min	2-YR	0.06	1.9	0.55	0.06
Roof	0.00	90%	P2	Slope, percent	16.0000	Slope, percent	2.0000	Slope, ft/ft	0.0200	5.0	5-YR	0.16	2.8	0.55	0.25
Gravel	0.00	40%	1.4	Runoff Coefficient	0.162	Runoff Coefficient	0.162	Conveyance Coefficient	15	Final	10-YR	0.26	3.5	0.55	0.51
Other	0.00	0%						Velocity, ft/s	2.1	Tc, min	25-YR	0.38	4.6	0.55	0.95
	0.55	2%		Ti, min=	10.2	Ti, min=	0.0	Tt, min=	0.6	**10.8**	**100-YR**	**0.51**	**6.1**	**0.55**	**1.70**

National Flood Hazard Layer FIRMette

FEMA

106°51'31"W 40°30'59"N



106°50'54"W 40°30'32"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/14/2021 at 4:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Routt Area, Colorado, Parts of Rio Blanco and Routt Counties

Lot 3 Copper Ridge

July 9, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:380 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
Survey Area Data: Version 10, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 8, 2012—Oct 5, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
C10	Impass silty clay loam, 3 to 12 percent slopes	0.6	100.0%
Totals for Area of Interest		**0.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Routt Area, Colorado, Parts of Rio Blanco and Routt Counties

C10—Impass silty clay loam, 3 to 12 percent slopes

Map Unit Setting

National map unit symbol: k0ky
Elevation: 6,560 to 7,870 feet
Mean annual precipitation: 20 to 24 inches
Mean annual air temperature: 38 to 41 degrees F
Frost-free period: 30 to 70 days
Farmland classification: Not prime farmland

Map Unit Composition

Impass and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Impass

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Slope alluvium derived from sandstone and shale

Typical profile

A - 0 to 4 inches: silty clay loam
Bss - 4 to 18 inches: silty clay
Bkss - 18 to 25 inches: silty clay
Bk1 - 25 to 45 inches: silty clay
Bk2 - 45 to 60 inches: silty clay

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.07 to 0.21 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): 6c
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R048BY296CO
Hydric soil rating: No

Minor Components

Gourley

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R048AY247CO
Hydric soil rating: No

Routtskin

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R048AY247CO
Hydric soil rating: No

Eckmanpark

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R048BY296CO
Hydric soil rating: No

TSS Removal

BMP Designation Grass Buffer 1

Event Mean TSS Per Table 5.12.3

150 mg/L

Variable	Value	Unit	
n	1	-	(Turbulance Factor: 1=bad, 5=good)
V_s	0.0059	ft/sec	(Settling Velocity of Particles)
Q	0.36	ft^3/sec	(Applied Flow Rate,1.25 year)
A	357	ft^2	(Area of Treatment)
R	**0.85**	-	(Fraction of solids removed)

TSS Concentration After Treatment

21.90 mg/L (Event Mean - (Event Mean*R))

80% reducton needed

TSS Removal

BMP Designation Grass Buffer 2

Event Mean TSS Per Table 5.12.3

150 mg/L

Variable	Value	Unit	
n	1	-	(Turbulance Factor: 1=bad, 5=good)
V_s	0.0059	ft/sec	(Settling Velocity of Particles)
Q	0.36	ft^3/sec	(Applied Flow Rate,1.25 year)
A	304	ft^2	(Area of Treatment)
R	**0.83**	-	(Fraction of solids removed)

TSS Concentration After Treatment

25.07 mg/L (Event Mean - (Event Mean*R))

80% reducton needed

Table 5.12.3. Event Mean TSS Concentrations in Urban Runoff by Land Use

Land Use	Event Mean TSS (mg/L)	Land Use	Event Mean TSS (mg/L)
High Density Residential*	140	Municipal	140
All Other Residential	120	Commercial	140
Transportation	135	Industrial	150
Open Space**	80	Institutional	120

*High Density Residential includes RR, MF, T4, T5, and any mixed use that includes residential

**Open Space value from query of results from International Stormwater Database Query Builder Tool for median value TSS (mg/L) from data points identified as open space from all EPA rain zones

$$R = 1 - \left[1 + \frac{1}{n} * \frac{V_s}{Q/A}\right]^{-n} \quad (2)$$

Where:

R = fraction of solids removed

V_s = settling velocity of particles

Q/A = rate of applied flow divided by surface area

n = turbulence parameter

The turbulence factor offers a way to factor in poor performance caused by turbulence and short circuiting, with n=1 representing very poor performance and n=5 or more indicating very good performance. With n equal to infinity, removal efficiency is linked to detention time. This equation is useful in areas without enough relief to drain a pond that could hold the entire WQCV, or to design basins in series or those receiving inflow that may have already been partially treated by a different type of upstream treatment facility.

Particle settling velocity is calculated as the submerged weight of a particle minus the drag. This calculation requires the minimum particle size of interest be specified. It also requires the viscosity of water, which varies with temperature. For the TSS design standard a spherical particle with a diameter of 60 microns may be assumed. A water temperature of 40 degrees Fahrenheit may be assumed, having a viscosity of 1.664×10^{5} ft^2/s.

Given the site effluent TSS concentration from Table 5.12.3, an appropriate treatment train composed of any types of permanent treatment facilities discussed herein may be designed using the equation above to achieve the TSS goal concentration of 30 mg/L. Grass buffers and grass swales are especially helpful at the upstream end of a treatment train. Each of the treatment facilities in the treatment train must include physical components in accordance with these standards and with the manufacturer's recommendations for permeable pavement, if applicable. An example calculation of a treatment train is included as Appendix B to this section.

Design Procedure Form: Grass Buffer (GB)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer: Matthew McLeod
Company: Four Points Surveying and Engineering
Date: June 27, 2022
Project: Richey Construction Work/Live
Location: Lot 3 Copper Ridge Business Park, Steamboat Springs, CO

1. Design Discharge A) 2-Year Peak Flow Rate of the Area Draining to the Grass Buffer	Q_2 = 0.34 cfs
2. Minimum Width of Grass Buffer	W_G = 7 ft
3. Length of Grass Buffer (14' or greater recommended)	L_G = 5 ft (increased length will improve treatment)
4. Buffer Slope (in the direction of flow, not to exceed 0.1 ft / ft)	S_G = 0.010 ft / ft
5. Flow Characteristics (sheet or concentrated) A) Does runoff flow into the grass buffer across the entire width of the buffer? B) Watershed Flow Length C) Interface Slope (normal to flow) D) Type of Flow Sheet Flow: $F_L * S_I \leq 1$ Concentrated Flow: $F_L * S_I > 1$	Choose One: ○ Yes ○ No F_L = 107 ft S_I = 0.010 ft / ft
6. Flow Distribution for Concentrated Flows	Choose One: ○ None (sheet flow) ○ Slotted Curbing ○ Level Spreader ○ Other (Explain):
7 Soil Preparation (Describe soil amendment)	
8 Vegetation (Check the type used or describe "Other")	Choose One: ○ Existing Xeric Turf Grass ○ Irrigated Turf Grass ○ Other (Explain):
9. Irrigation (*Select None if existing buffer area has 80% vegetation AND will not be disturbed during construction.)	Choose One: ○ Temporary ○ Permanent ○ None*
10. Outflow Collection (Check the type used or describe "Other")	Choose One: ○ Grass Swale ○ Street Gutter ○ Storm Sewer Inlet ○ Other (Explain):

Notes:

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 3 2022

Water Quality Swale in WQ1 - 100 year

Triangular

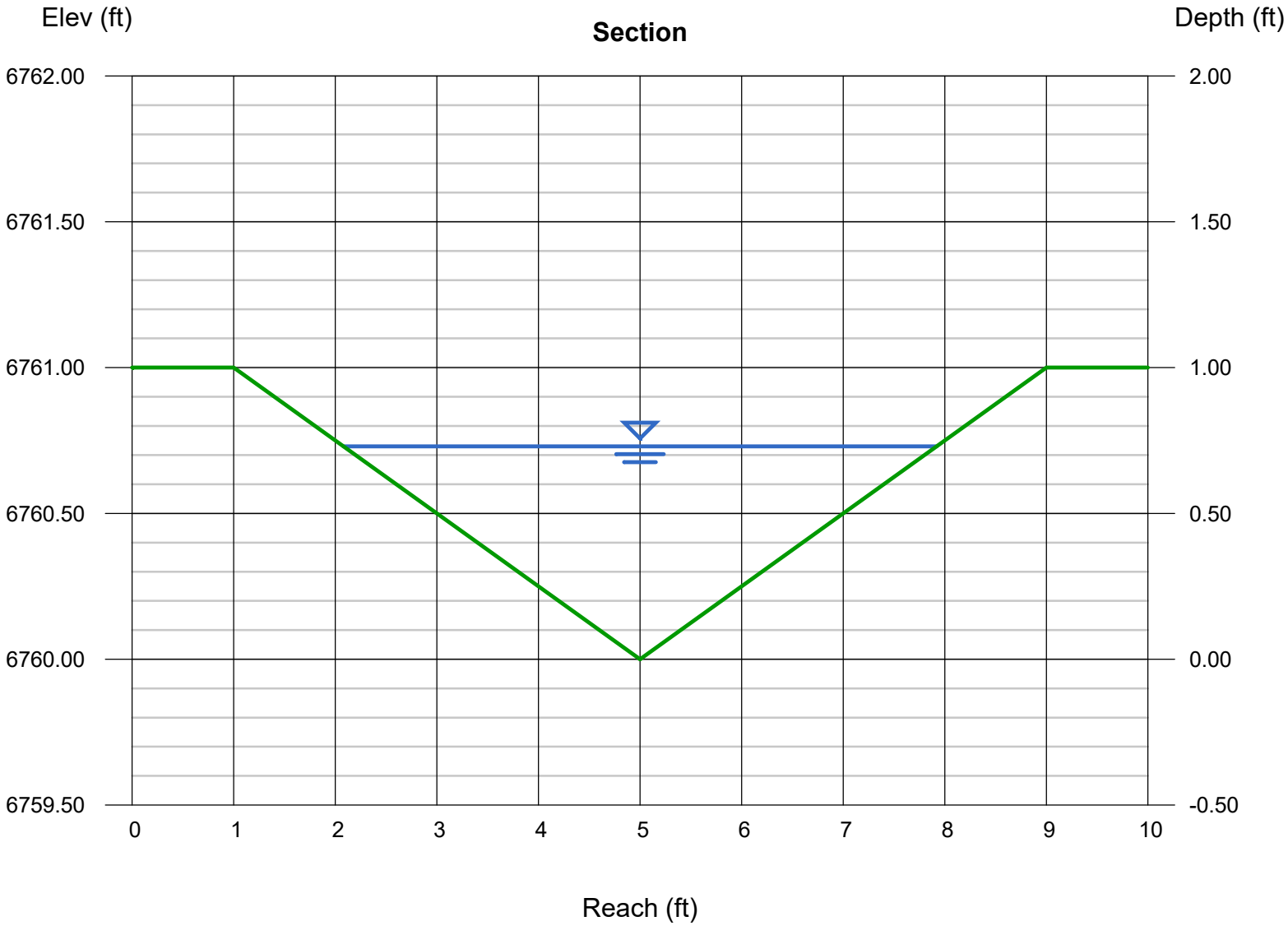
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 6760.00
Slope (%)	= 2.00
N-Value	= 0.130

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.70

Highlighted

Depth (ft)	= 0.73
Q (cfs)	= 1.700
Area (sqft)	= 2.13
Velocity (ft/s)	= 0.80
Wetted Perim (ft)	= 6.02
Crit Depth, Yc (ft)	= 0.41
Top Width (ft)	= 5.84
EGL (ft)	= 0.74



Design Procedure Form: Grass Swale (GS)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer: Matthew McLeod
Company: Four Points Surveying and Engineering
Date: October 25, 2022
Project: Lot 3 Copper Ridge
Location:

1. Design Discharge for 2-Year Return Period	Q_2 = 0.002 cfs
2. Hydraulic Residence Time	
A) : Length of Grass Swale	L_S = 2.0 ft
B) Calculated Residence Time (based on design velocity below)	T_{HR} = 24.0 minutes
3. Longitudinal Slope (vertical distance per unit horizontal)	
A) Available Slope (based on site constraints)	S_{avail} = 0.020 ft / ft
B) Design Slope	S_D = 0.020 ft / ft
4. Swale Geometry	
A) Channel Side Slopes (Z = 4 min., horiz. distance per unit vertical)	Z = 4.00 ft / ft
B) Bottom Width of Swale (enter 0 for triangular section)	W_B = 0.00 ft
5. Vegetation A) Type of Planting (seed vs. sod, affects vegetal retardance factor)	Choose One: ○ Grass From Seed ◉ Grass From Sod
6. Design Velocity (0.007 ft / s maximum for desirable 5-minute residence time)	V_2 = 0.00 ft / s
7. Design Flow Depth (1 foot maximum)	D_2 = 0.60 ft
A) Flow Area	A_2 = 1.4 sq ft
B) Top Width of Swale	W_T = 4.8 ft
C) Froude Number (0.50 maximum)	F = 0.00
D) Hydraulic Radius	R_H = 0.29
E) Velocity-Hydraulic Radius Product for Vegetal Retardance	VR = 0.00
F) Manning's n (based on SCS vegetal retardance curve D for sodded grass)	n = 0.132
G) Cumulative Height of Grade Control Structures Required	H_D = 0.00 ft
8. Underdrain (Is an underdrain necessary?)	Choose One: ○ YES ◉ NO
9. Soil Preparation (Describe soil amendment)	
10. Irrigation	Choose One: ◉ Temporary ○ Permanent

Notes:

Design Procedure Form: Grass Swale (GS)

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer: Matthew McLeod
Company: Four Points Surveying and Engineering
Date: October 25, 2022
Project: Lot 3 Copper Ridge - with flow from Lot 4 Consturction
Location:

1. Design Discharge for 2-Year Return Period	Q_2 = 0.302 cfs
2. Hydraulic Residence Time	
A) : Length of Grass Swale	L_S = 2.0 ft
B) Calculated Residence Time (based on design velocity below)	T_{HR} = 0.2 minutes
3. Longitudinal Slope (vertical distance per unit horizontal)	
A) Available Slope (based on site constraints)	S_{avail} = 0.020 ft / ft
B) Design Slope	S_D = 0.020 ft / ft
4. Swale Geometry	
A) Channel Side Slopes (Z = 4 min., horiz. distance per unit vertical)	Z = 4.00 ft / ft
B) Bottom Width of Swale (enter 0 for triangular section)	W_B = 0.00 ft
5. Vegetation A) Type of Planting (seed vs. sod, affects vegetal retardance factor)	Choose One: ○ Grass From Seed ◉ Grass From Sod
6. Design Velocity (0.007 ft / s maximum for desirable 5-minute residence time)	V_2 = 0.21 ft / s
7. Design Flow Depth (1 foot maximum)	D_2 = 0.60 ft
A) Flow Area	A_2 = 1.4 sq ft
B) Top Width of Swale	W_T = 4.8 ft
C) Froude Number (0.50 maximum)	F = 0.07
D) Hydraulic Radius	R_H = 0.29
E) Velocity-Hydraulic Radius Product for Vegetal Retardance	VR = 0.06
F) Manning's n (based on SCS vegetal retardance curve D for sodded grass)	n = 0.132
G) Cumulative Height of Grade Control Structures Required	H_D = 0.00 ft
8. Underdrain (Is an underdrain necessary?)	Choose One: ○ YES ◉ NO
9. Soil Preparation (Describe soil amendment)	
10. Irrigation	Choose One: ◉ Temporary ○ Permanent

Notes:

Standard Form No. 1 Drainage Letter Checklist

Instructions:

1. The applicant shall identify with a "check mark" if information is provided with letter. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation.
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

___✓___ A. Typed and legible in 8½ x 11" format.
___✓___ B. Drawings that are 8½" x 11" or 11 x 17 bound within letter, larger drawings (up to 24 x 36) included in a pocket attached to the letter. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Title Page

___✓___ A. Type of Letter.
___✓___ B. Project Name, Subdivision, Original Date, Revision Date.
___✓___ C. Preparer's name, firm, address, and phone number.
___✓___ D. Certifications, PE stamp, signature and date from licensed Colorado PE (for FINAL letter).
___✓___ E. "DRAFT" for 1st Submittal and revisions; "FINAL" once approved.
___✓___ F. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

III. Introduction

___✓___ A. Description of site location, size in acres, existing and proposed land use, and any pertinent background info.
___✓___ B. Identify drainage reports for adjacent development.

IV. Drainage Criteria and Methodology Used

___✓___ A. Identify design rainfall and storm frequency.
___✓___ B. Identify runoff calculation method used.

V. Existing Conditions (Pre-Development/Historic)

___✓___ A. Indicate ground cover, imperviousness, topography, and size of site (acres).
___✓___ B. Describe existing stormwater system (sizes, materials, etc.).
___✓___ C. Describe other notable features (canals, major utilities, etc.).
___✓___ D. Note site outfall locations and ultimate outfall location (typically Yampa River).
___✓___ E. Note capacity of existing system and identify any constraints.
___✓___ F. Identify NRCS soil type.
___✓___ G. Identify the FEMA Map reviewed, if site is in floodplain/way, and zone designation.

VI. Proposed Conditions

✓ A. Indicate ground cover, imperviousness, topography, and disturbed area (acres).
✓ B. Describe proposed stormwater system (sizes, materials, etc.).
✓ C. Describe proposed outlets, and indicate historic and proposed flow for each.
✓ D. Include calculations for all pipes, inlets, culverts, ditches, ponds, etc. in appendix.
✓ E. Include a summary table for the 5- and 100-year events showing historic flow and proposed flow for total site and each basin.
✓ F. Include a summary of proposed water quality measures to be constructed.

VII. Conclusions

✓ A. Provide general summary.
✓ B. Note if site does or does not comply with criteria and any variances to criteria.
✓ C. Indicate if peak proposed flow is less than, equal to, or greater than peak historic flow for each outfall, design point, and for the total site.
✓ D. Indicate proposed stormwater quality system.

VIII. References

✓ A. Provide a reference list of all criteria, master plans, drainage reports and technical information used.

IX. Figures

✓ A. Vicinity Map.
✓ B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
C. Existing conditions.
✓ 1. Delineate existing basin boundaries.
✓ 2. Show existing runoff flow arrows.
✓ 3. Show existing topography.
✓ 4. Show existing stormwater features (structures, sizes, materials, etc.).
n/a 5. Show floodplain limits and information.
✓ 6. For each basin, show bubble with basin number, acreage and percent impervious or provide information in summary table or figure.
x 7. For each outlet show bubble with acreage and historic flow and proposed flow or provide information in summary table on figure.
D. Proposed Conditions
✓ 1. Delineate proposed basin boundaries.
✓ 2. Show proposed runoff flow arrows.
✓ 3. Show existing and proposed topography at an interval of at least 5-ft.
✓ 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
x ✓ 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
n/a 6. Show floodplain limits and information.
✓ 7. Show proposed stormwater system (components, sizes, materials, & slopes).
✓ 8. Show property lines and easements.
✓ 9. Show any new easements required.

X. Appendices

✓ A. Runoff Calculations
n/a B. Culvert Calculations
n/a C. Pond Calculations.
✓ D. Other Calculations

Acknowledgements:

Standard Form No. 1 was prepared by: Matthew McLeod, P.E. 6/21/2022
Date

Standard Form No. 4 Stormwater Quality Plan Checklist

This list is not an exhaustive list of every possible item that may be required or requested in a Stormwater Quality Plan but provides a general guideline for preparation of the Stormwater Quality Plan.

Instructions:

1. The applicant shall identify with a "check mark" if information is provided within the Stormwater Quality Plan. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation. If information is included with the associated drainage letter or study, indicated with a "D."
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

x A. Report typed and legible in 8½" x 11" format.
x B. Report bound (comb, spiral, or staple – no notebook) and in digital PDF format.
x C. Drawings that are 11" x 17" bound within letter, larger drawings (up to 24" x 36") included in a pocket attached to the letter, and a digital PDF copy. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Cover

x A. Report Type – Stormwater Quality Plan.
x B. Project Name, Subdivision or Development, Original Date, Revision Date.
x C. Preparer's name, firm, address, and phone number.
x D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

n/a A. Table of Contents.
____ B. Certification, PE Stamp, signature and date from licensed Colorado PE (for Final).
x C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

IV. Introduction and Background

x A. Description of site location, study limits, size in acres, existing and proposed land use, soil data, permeability of the site, drainage patterns, and any pertinent background info.
x B. State purpose and goal of Stormwater Quality Plan and report along with any special requirements of the desired outcome.
n/a C. List any project stakeholders and/or requestors.
n/a D. Describe the background of the flooding source and any previous studies.

V. Design Criteria and Methodology Used

X A. Identify design rainfall and storm frequency used to design permanent stormwater treatment facilities.

X B Identify the runoff calculation method used to design permanent stormwater treatment facilities.

X C. Identify the standard the design will meet and the means and methodologies by which it will use to meet the standard.

X D. Provide all details supporting the use of the selected design standard.

VI. Proposed Conditions

X A. Identify total site area, total site imperviousness, area to be treated, and impervious area to be treated. Include justification for treating less than the total site area.

X B. Describe potential site contaminant sources including sediment.

X C. Identify source and quantity of on-site and off-site stormwater flows that need to be managed and how they will be managed.

X D. For each permanent treatment facility, identify the design standard, MDCIA level (if applicable), area treated (& percentage of total), imperviousness of area treated, C values of area treated, soil types, and all pertinent data for design.

X E. Volume based facilities: Provide total storage pond volume, WQCV, drain time, release rate, sediment storage, outlet & overflow structures, area and depth of pond, micropool, forebays, etc. (include all calculations in the appendix).

n/a F. Flow based facilities: Provide design flow rate and all treatment calculations and how flows larger than the water quality design flow rate will be handled. If proprietary facilities are proposed, provide the justification and sizing requirements from manufacturer.

X G. If stormwater detention is provided, discuss how water quality is provided within the detention facility. No underground detention is allowed.

VII. Operation and Maintenance Plan Requirements

See template O&M plan and guidance document.

X A. Describe general project information, facility description, ROW and access information, vegetation management, hydraulic design parameters, environmental permitting, snow and ice control, and additional pertinent information in the notes.

X B. Indicate, describe, and detail the permanent stormwater treatment facilities.

x C Include section details where necessary of the permanent treatment facilities.

x D. Provide an inspection and maintenance schedule and procedure of permanent treatment facilities and who is responsible for them.

X E. Identify design specifications for construction.

Acknowledgements

Standard Form No. 4 prepared by: Matthew McLeod 6/23/22
Date

Include appropriate Project Sheet(s) and Design Checklist(s) (See Section 5.12)
Include this form as part of the Stormwater Quality Plan.

GRASS BUFFER AND GRASS SWALE WATER QUALITY FEATURES FOR RICHEY CONSTRUCTION LIVE/WORK OWNERSHIP AND MAINTENANCE PLAN

1. GENERAL PROJECT INFORMATION

A. 1716 COPPER RIDGE SPUR, STEAMBOAT SPRINGS, ROUTT COUNTY, COLORADO.

2. GENERAL FACILITY DESCRIPTION

THIS FACILITY IS A GRASS BUFFER AND GRASS SWALE WATER QUALITY (WQ) FEATURE THAT IS CAPABLE OF TREATING RUNOFF FOR TOTAL SUSPENDED SOLIDS (TSS) AND OTHER POLLUTANTS THAT COMMONLY ORIGINATE FROM VEHICLES AND MOTORIZED EQUIPMENT.

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

THE FOLLOWING TABLE PROVIDES A MAINTENANCE SCHEDULE FOR THE PROPOSED GRASS BUFFER AND GRASS SWALE:

Grass Swale, Grass Buffer	
Activity	Required Frequency
Inspection for uniform cover, sediment accumulation, rill and gully development, and impacts from foot or vehicle traffic; maintain as necessary. Debris and litter removal.	Twice annually
Aeration	Annually
Mowing	As needed to maintain ~6" height
Irrigation and application of fertilizer, herbicide, and pesticide	As needed to maintain vegetative health

4. EQUIPMENT, STAFFING AND VEGETATION MANAGEMENT

A. GENERAL LANDSCAPING TOOLS SUCH AS LAWNMOWER, WEED WHACKER

B. STAFFING: TBD BY OWNER

C. SEEDING: TBD

D. MOWING: VEGETATION HEALTH SHOULD BE MAINTAINED IN THE BUFFER AREA WITH REGULAR MOWING AND/OR WEEDEATING. THE REQUIRED MOW AREA POST-CONSTRUCTION WAS ESTIMATED TO BE 0.01 ACRES.

E. UNDESIRABLE VEGETATION AND WEEDS: UNDESIRABLE VEGETATION AND NOXIOUS WEEDS SHOULD BE REMOVED REGULARLY BY THE LANDSCAPING STAFF. WEEDS SHOULD BE MOWED OR REMOVED.

5. SNOW AND ICE CONTROL

THE GRASS BUFFER AND GRASS SWALE MAY SERVE AS A SNOW STORAGE AREA DURING THE WINTER MONTHS. SNOW CAN BE PLOWED INTO THE BUFFER PLOW OPERATORS SHALL TAKE CARE NOT TO DAMAGE THE GRASS BUFFER..

6. RIGHT-OF-WAY, ADJACENT OWNERSHIP & ACCESS

A. ACCESS INFORMATION AND DETAILS: ACCESS FROM COPPER RIDGE SPUR.

B. MAINTENANCE OPERATIONS WILL REQUIRE TEMPORARY OBSTRUCTION OF THE COPPER RIDGE SPUR RIGHT OF WAY WITHIN THE CUL-DE-SAC FOR MAINTENANCE OPERATIONS. A RIGHT-OF-WAY PERMIT SHOULD NOT BE REQUIRED FOR TEMPORARY OBSTRUCTIONS. MAINTENANCE CREWS SHOULD PLACE MUTCD APPROVED TRAFFIC CONTROL DEVICES (ORANGE CONES AND/OR BARRICADES) AROUND ALL VEHICLES AND EQUIPMENT THAT ARE TEMPORARILY WITHIN THE RIGHT OF WAY.

7. HYDRAULIC DESIGN

A. FLOWRATES (CFS)

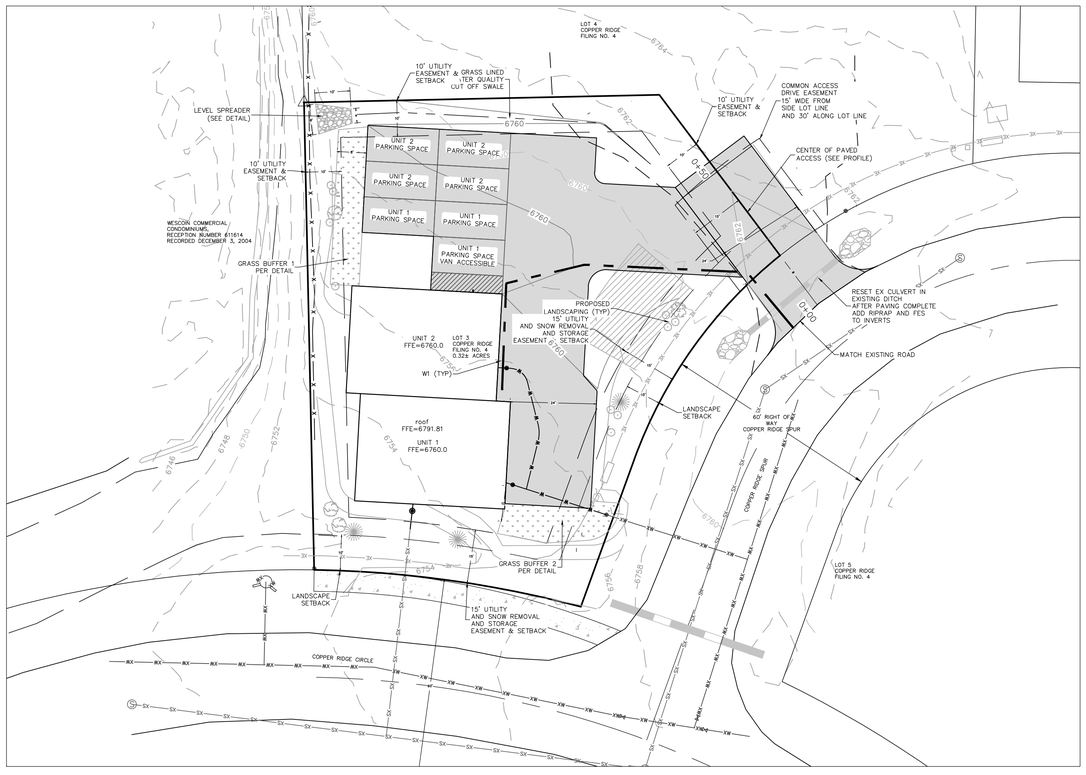
A.A.	DESIGN EVENT (1.25 YEAR)	0.36	CFS
A.B.	MINOR EVENT (5-YEAR)	0.56	CFS
A.C.	MAJOR EVENT (100-YEAR)	1.68	CFS

8. SENSITIVE AREA, WETLANDS & PERMITS

A. NO SENSITIVE AREAS OR WETLANDS ARE PRESENT.

9. MISCELLANEOUS INFORMATION

A. PROJECT SURVEY: EXISTING CONDITIONS AND TOPOGRAPHIC SURVEY WAS PREPARED BY FOUR POINTS SURVEYING & ENGINEERING.



PROPOSED CONDITIONS SITE PLAN

GRASS LINED SWALE OPERATION AND MAINTENANCE NOTES AND REFERENCES

IRRIGATION

"Grass swales should be equipped with irrigation systems to promote establishment and survival in Colorado's semi-arid environment. Systems may be temporary or permanent, depending on the type of grass selected. Irrigation practices have a significant effect on the function of the grass swale. Overwatering decreases the permeability of the soil, reducing the infiltration capacity of the soil and contributing to nuisance baseflows. Conversely, under watering may result in delays in establishment of the vegetation in the short term and unhealthy vegetation that provides less filtering (straining) and increased susceptibility to erosion and rilling over the long term." – UDFCD USDCM MANUAL VOL. 3

SUGGESTED O&M: THE GRASS SWALES SHOULD BE REGULARLY WATERED AS NECESSARY IN ORDER TO ESTABLISH AND SUSTAIN GROWTH THROUGHOUT THE SPIRNG/SUMMER PERIODS. APPLY FERTILIZER IF NECESSARY.

MAINTENANCE

"Weed the area during the establishment of vegetation by hand or mowing. Mechanical weed control is preferred over chemical weed killer." – UDFCD USDCM MANUAL VOL. 3"

SUGGESTED O&M: INSPECT SWALES SEMI-ANNUALLY FOR INTRUSIVE WEEDS AND REMOVE BY HAND. REMOVE ANY FOREIGN DEBRIS PRESENT E.G. ROCKS AND STICKS. MOW GRASS LINED SWALES SWALES WITH A HIGH CUTTING SETTING AS NECESSARY. LONGER GRASS PROVIDES BETTER STORM WATER TREATMENT AND IS MORE DROUGHT TOLERANT.

PROTECTION

SUGGESTED O&M: PROTECT SWALES FROM FUTURE CONSTRUCTION ACTIVITIES. KEEP SWALES FREE OF OBSTRUCTIONS AND EXCESSIVE USE.

NOTE:

THE PROPERTY OWNER OR MANAGER SHALL BE RESPONSIBLE FOR OPERATION AND MAINTENANCE ACTIVITIES.

GRASS BUFFER OPERATION AND MAINTENANCE NOTES AND REFERENCES

IRRIGATION

"Grass buffer should be equipped with irrigation systems to promote establishment and survival in Colorado's semi-arid environment. Systems may be temporary or permanent, depending on the type of grass selected. Irrigation practices have a significant effect on the function of the grass buffer. Overwatering decreases the permeability of the soil, reducing the infiltration capacity of the soil and contributing to nuisance baseflows. Conversely, under watering may result in delays in establishment of the vegetation in the short term and unhealthy vegetation that provides less filtering (straining) and increased susceptibility to erosion and rilling over the long term." – UDFCD USDCM MANUAL VOL. 3

SUGGESTED O&M: THE GRASS BUFFER SHOULD BE REGULARLY WATERED AS NECESSARY IN ORDER TO ESTABLISH AND SUSTAIN GROWTH THROUGHOUT THE SPIRNG/SUMMER PERIODS. APPLY FERTILIZER IF NECESSARY.

MAINTENANCE

"Weed the area during the establishment of vegetation by hand or mowing. Mechanical weed control is preferred over chemical weed killer." – UDFCD USDCM MANUAL VOL. 3"

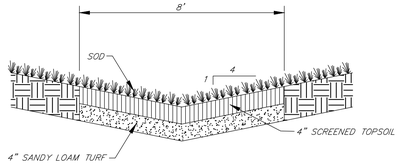
SUGGESTED O&M: INSPECT GRASS BUFFER SEMI-ANNUALLY FOR INTRUSIVE WEEDS AND REMOVE BY HAND. REMOVE ANY FOREIGN DEBRIS PRESENT E.G. ROCKS AND STICKS. MOW GRASS BUFFER WITH A HIGH CUTTING SETTING AS NECESSARY. LONGER GRASS PROVIDES BETTER STORM WATER TREATMENT AND IS MORE DROUGHT TOLERANT.

PROTECTION

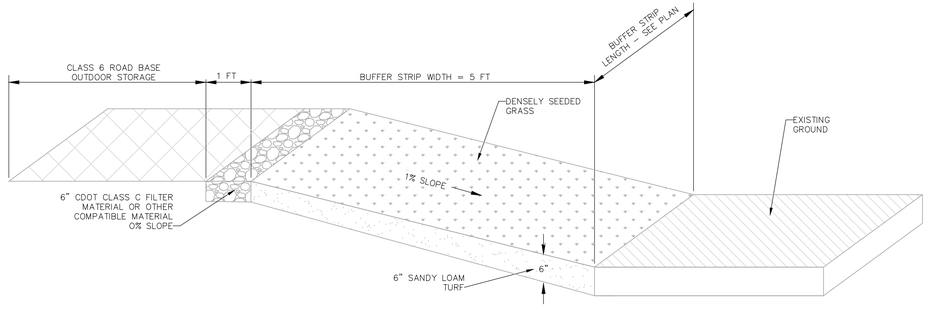
SUGGESTED O&M: PROTECT BUFFER FROM FUTURE CONSTRUCTION ACTIVITIES. KEEP BUFFER FREE OF OBSTRUCTIONS AND EXCESSIVE USE.

NOTE:

THE PROPERTY OWNER OR MANAGER SHALL BE RESPONSIBLE FOR OPERATION AND MAINTENANCE ACTIVITIES.



GRASS-LINED SWALE
N.T.S.



GRASS BUFFER
n.t.s.

FOUR POINTS SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-6772
www.fourpointsse.com

No.	DATE	REVISIONS	INT
1	8/29/2022	DRT REVIEW & RESPONSE	MDM
2	10/3/2022	DRT REVIEW & RESPONSE	MDM

RICHEY CONSTRUCTION LIVE/WORK
1716 COPPER RIDGE SPUR
STEAMBOAT SPRINGS, CO 80487

Horizontal Scale
2' 0 1' 10' 20'
1" = 20'

Contour Interval = 2 ft

DATE: 6-21-2022
JOB #: 1647-007
DRAWN BY: MDM
DESIGN BY: MDM
REVIEW BY: FPSE

IF THIS DRAWING IS PRESENTED IN A FORMAT OTHER THAN 24"X 36", THE GRAPHIC SCALE SHOULD BE UTILIZED.

DRAWING: OPERATIONS AND MAINTENANCE PLAN

SHEET #
OM

PROJECT SHEET – BASE DESIGN STANDARDS (Site is not constrained)

Complete a Project Sheet for each project that includes Permanent Stormwater Treatment Facilities.

SITE INFORMATION

Project Name: Richey Construction Outdoor Storage	
Project Location: 1716 Copper Ridge Spur, Steamboat Springs, CO	
Submitted Date: 6-28-2022	Submitted By: Matthew McLeod
Acreage Disturbed: 0.32	
Existing Impervious: 4%	New Net Impervious: 62%
Review Date:	Reviewed By:

Preparer	City	Requirements
		Design Details are included for all Treatment Facilities
		List or include a description of any source controls or other non-structural practices:

DESIGN STANDARDS

Multiple Design Standards may be used on a site, as necessary, to meet the requirements, but only one Design Standard may be used for each treatment facility's tributary area. Evaluation of suitability of permanent stormwater treatment facilities is based on meeting the specified Design Standard and ease of long-term maintenance. Facilities must be designed in accordance with the most current versions of the City's Engineering Standards and Volume 3 of the USDCM and meet the specific requirements for each Design Standard used.

1. Indicate below, which Design Standard(s) will be used for the project, and
2. Complete a separate, corresponding Design Standards checklist for each facility (e.g., WQCV)

Design Standard	*Quantity*	*Tributary Area*	*Location/Identifying information*
WQCV	1	1.05	Porous Landscape Detention Pond
Pollutant Removal			
Runoff Reduction			

Standard Form No. 5 Drainage and Stormwater Treatment Scope Approval Form

Prior to starting a development plan and before the first drainage submittal, a Drainage and Stormwater Treatment Scope Approval Form must be submitted for review and signed by the City Engineer. A signed form shall also be included in every drainage submittal as Attachment A. This Scope Approval Form is for City requirements only. Values may be approximate. The City encourages supporting calculations and figures to be attached.

Project Information	
Project name:	Richey Construction Work/Live
Project location:	Lot 3 Copper Ridge Business Park F4
Developer name/contact info:	Adam Richey, 970-846-1168
Drainage engineer name/contact info:	Matthew McLeod, PE 248-444-3268
Application Type:	Development Plan Administrative
Proposed Land Use:	Two live/work units with associated parking

Project Site Parameters	
Total parcel area (acres):	0.32
Disturbed area (acres):	0.30
Existing impervious area (acres, if applicable):	n/a
Proposed new impervious area (acres):	0.22
Proposed total impervious area (acres):	0.22
Proposed number of project outfalls:	1-west property line
Number of additional parking spaces:	7
Description and site percentage of existing cover/land use(s):	Site is vacant with roadside ditch fronting the property.
Description and site percentage of proposed cover/land use(s):	Two live/work units with paved access and parking ~ 70%
Expected maximum proposed conveyance gradient (%):	4% in the paved area
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	A portion of Lot 4 storage drains onto the site, Cut off ditch was proposed as part of the previous outdoor storage submittal.

Type of Study Required:

☒ Drainage Letter
☐ Final Drainage Study
☐ Conceptual Drainage Study
☐ Stormwater Quality Plan

Hydrologic Evaluation:

☒ Rational Method ☐ CUHP/SWMM ☐ HEC-HMS ☐ Other_____

Project Drainage	
Number of subbasins to be evaluated:	1-2
Presence of pass through flow (circle):	YES (NO)
Description of proposed stormwater conveyance on site:	Sheet flow over the paved area and out into the existing water roadside ditches.
Project includes roadway conveyance as part of design evaluation (circle):	YES (NO)
Description of conveyance of site runoff downstream of site, identify any infrastructure noted in Stormwater Master Plan noted as lacking capacity for minor or major storm event:	Roadside ditches and culverts in the Copper Ridge Subdivision.
Detention expected onsite (circle):	YES (NO) Exists in Copper Ridge Business Park
Presence of Floodway or Floodplain on site (circle):	YES (NO)
Anticipated modification of Floodway or Floodplain proposed (circle):	YES (NO)
Describe culvert or storm sewer conveyance evaluative method:	mannings

Permanent Stormwater Treatment Facility Design Standard (check all that apply with only one standard per tributary basin):

☐ WQCV Standard ☒ TSS Standard ☐ Infiltration Standard

☐ Constrained Redevelopment WQCV Standard

☐ Constrained Redevelopment TSS Standard

☐ Constrained Redevelopment Infiltration Standard

☐ Does not Require Permanent Stormwater Treatment (attach Exclusion Tracking Form)

Project Permanent Stormwater Treatment	
Justification of choice of proposed design standard, including how the site meets the constrained redevelopment standard, infiltration test results, etc.:	Water quality will be handled by grass buffer along west/south property lines.
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	Grass buffer per standards
Proposed LID measures to reduce runoff volume:	None
Will treatment evaluation include off-site, pass through flow (circle):	YES NO N/A

Approvals

Matthew McLeod, PE Four Points Engineering	4-25-2022	248-444-3268
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name: City Engineer	Date

APPROVED
to be generally in
accordance with
CITY ENGINEERING
STANDARDS

05/05/2022