FOUR POINTS SURVEYING ENGINEERING

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

Date: 5/20/2022

REVIEWED FOR CODE COMPLIANCE 06/20/2022

City of Steamboat Springs Planning Department
137 10th Street
Steamboat Springs, CO

RE: SSRC Extended Detention Basin at 1965 Ski Times Square
Final Drainage Letter and Water Quality Plan

Dear Engineering Department:

Introduction

This drainage letter is for stormwater runoff analysis and extended detention basin (EDB) design for the Steamboat Ski & Resort Company (SSRC) at their property located at 1965 Ski Time Square Drive (Site). It presents an analysis of existing stormwater runoff conditions and proposed stormwater management and a permanent stormwater treatment facility for the associated drainage area which encompasses the property. City officials have instructed the Owner to design and implement an EDB to reduce sediment loads and slow flows associated with runoff from the property.

Drainage 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 1.25 year, 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.

Urban Drainage and Flood Control District (UDFCD) design standards were used for the design and engineering of the proposed EDB and outfall structure.

Existing Conditions

See Existing Conditions Drainage Exhibit. The site is partially developed with a paved parking area on the westerly side. The rest of the site is open area and is mostly vacant and used as a storage yard when the ski-resort is closed. The open area consists of sparse vegetation and open bare ground. Existing conditions are estimated to be 35% impervious. Topography is consistent with moderate slopes (5%-10%) comprising most of the site. Stormwater infrastructure consists of a stormwater catch basin and 36-inch diameter storm sewer flowing east to west along the south end of the property which conveys off-site flows into Burgess Creek. It outfalls into a box culvert that conveys Burgess Creek.

The site and drainage basin under consideration outfalls directly into Burgess Creek via a concrete valley pan that crosses the paved access drive located along the easterly property line. This is identified at design point No. 1 on the existing conditions exhibit.

Offsite stormwater runoff entering the site is derived from the bordering northerly, easterly, and southerly neighboring lots. The offsite drainage area is approximately 1.0 acres and consists of asphalt paving from Ski Times Square Drive and T-Bar restaurant parking and open areas associated with the ski resort.

Soils – NRCS USDA Web Soil Survey

A USDA National Resources Conservation Service (NRCS) web soil survey was performed for the site and surrounding areas. The NRCS soil type for the site is classified as Routt Loam, very stony. The soils are classified as a Hydrologic Group C soil.

FEMA Map Review

FEMA map number 08107CO883D effective 2/4/2005 was reviewed for the subject area. A Letter of Map Revision (LOMR) is associated with the area of interest; LOMR 13-08-0214P effective 7/8/2013. The regulatory floodway is contained within the Burgess Creek Easement and does not appear to cross over to the east side of the paved access drive.

Design Point No. 1

Design Point No. 1 receives concentrated runoff flows from Sub-basin SB1 and discharges directly into Burgess Creek via a concrete valley pan across the existing paved access drive. It is the design point of interest because it is the ideal location for the proposed EDB as it is the lowest developable portion of land associated with SSRC's lot.

Proposed Conditions

No development is proposed or was analyzed as part of this drainage study and EDB design. The EDB is intended to treat stormwater runoff from SB1 for the current existing conditions due to the high sediment loads associated with the stormwater runoff from the site. Table 1 summarizes the existing and proposed conditions drainage for SB1.

Table 1: Basin Summary Table of Existing Flows for Minor and Major Rainfall Events

Basin Condition	Area (acres)	Impervious Area (%)	Runoff		
			$Q_{1.25}$ (cfs)	Q_5 (cfs)	Q_{100} (cfs)
SB1	2.75	35%	0.89	2.50	9.74

Detention and Permanent Storm Water Quality Treatment

The EDB will provide both detention and water quality treatment and was designed to meet UDFCD standards for water quality capture volume (WQCV). The EDB's 40-hour drain time for WQCV is able to remove a significant amount of total suspended solids (TSS). The EDB was not designed to detain and treat more than the 1.25-year event with a 40-hour drain time. Including the volume associated with the 1-foot of freeboard, the EDB can contain the 5-year or minor event before overflowing into Burgess Creek. Any peak flow greater than the 5-year event would overtop the EDB and flow over the paved access drive and into Burgess Creek.

Conclusions

In conclusion:

- The site has potential for a high sediment load associated with stormwater runoff and outfalls directly into Burgess Creek.
- The historical discharge point for the site will be maintained at design point No. 1.
- The EDB is capable of effectively treating the 1.25-year or WQCV event with a 40-hour drain time.
- The EDB can contain up to the 5-year or minor event without overflowing.
- Events larger than the 5-year or minor event would overflow the EDB over the existing paved access drive and directly into Burgess Creek.
- The proposed EDB is outside of the FEMA SFHA.

References

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

Urban Drainage and Flood Control District: Latest design standards for extended detention basins.

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 this job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

Certification Statement

I, hereby affirm that this drainage letter and plan for SSRC 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.

Joseph Linus Wiedemeier
Digitally signed by Joseph Linus Wiedemeier
Date: 2022.05.20 15:27:07 -06'00'

Joe Wiedemeier, PE 0054959 State of Colorado
Four Points Surveying and Engineering

Attachments

- Standard Form No. 1 – Drainage Letter Checklist
- Standard Form No. 4 – Water Quality Plan Checklist
- Standard Form No. 5 – Scope Approval Form
- Existing Conditions Drainage Exhibit and Cover Sheet
- Proposed Conditions Drainage Exhibit and EDB Design Details
- EDB O&M Plan
- USDA NRCS Web Soil Survey
- FEMA FIRMette - Annotated
- Basin Drainage Calculations (Rational Method)
- UDFCD Design Calculations for WQCV EDB (UD_Detention_v3.07 design spreadsheet)
- EDB Outfall Pipe Flow Calculations (1.25 year and 5-year rainfall peak flow runoff)
- EDB Forebay Weir Flow Calculation (5-year rainfall peak flow runoff)

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

x A. Typed and legible in 8½ x 11" format.
x 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

x A. Type of Letter.
x B. Project Name, Subdivision, Original Date, Revision Date.
x C. Preparer's name, firm, address, and phone number.
_____ D. Certifications, PE stamp, signature and date from licensed Colorado PE (for FINAL letter).
x E. "DRAFT" for 1st Submittal and revisions; "FINAL" once approved.
x 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

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

IV. Drainage Criteria and Methodology Used

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

V. Existing Conditions (Pre-Development/Historic)

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

VI. Proposed Conditions

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

VII. Conclusions

x A. Provide general summary.
x B. Note if site does or does not comply with criteria and any variances to criteria.
x 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.
x D. Indicate proposed stormwater quality system.

VIII. References

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

IX. Figures

x A. Vicinity Map.
x B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
C. Existing conditions.
x 1. Delineate existing basin boundaries.
x 2. Show existing runoff flow arrows.
x 3. Show existing topography.
x 4. Show existing stormwater features (structures, sizes, materials, etc.).
x 5. Show floodplain limits and information.
x 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
X 1. Delineate proposed basin boundaries.
X 2. Show proposed runoff flow arrows.
X 3. Show existing and proposed topography at an interval of at least 5-ft.
x 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.
X 6. Show floodplain limits and information.
X 7. Show proposed stormwater system (components, sizes, materials, & slopes).
x 8. Show property lines and easements.
X 9. Show any new easements required.

X. Appendices

x A. Runoff Calculations
X B. Culvert Calculations
X C. Pond Calculations.
X D. Other Calculations

Acknowledgements:

Standard Form No. 1 was prepared by: Joe Wiedemeier, PE 5-9-22
Date

Include Attachment A – Scope Approval Form (see Standard Form No. 5)
Include Attachment B – Storm Water Quality Plan (see Standard Form No. 4)

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.
x C. List any project stakeholders and/or requestors.
x 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: Joe Wiedemeier 5-9-22
Date

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

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:	SSRC Detention Basin
Project location:	1965 SKI TIME SQUARE DR
Developer name/contact info:	SSRC - Jim Schneider 970.871.5381
Drainage engineer name/contact info:	Rebecca Lindeman, PE 303.517.8189
Application Type:	Scope Approval
Proposed Land Use:	Commercial

Project Site Parameters	
Total parcel area (acres):	1.59 (93223015, 1333177001), basin is 2.78ac
Disturbed area (acres):	0
Existing impervious area (acres, if applicable):	0.72ac Pavement; 0.12ac Gravel
Proposed new impervious area (acres):	0.84ac, 33%
Proposed total impervious area (acres):	0.84ac, 33%
Proposed number of project outfalls:	1
Number of additional parking spaces:	0
Description and site percentage of existing cover/land use(s):	Parking, laydown areas and associated vegetation Pavement (0.79ac), Gravel (0.12ac), Low quality vegetation (1.94ac)
Description and site percentage of proposed cover/land use(s):	Unchanged
Expected maximum proposed conveyance gradient (%):	Ex. sheet flow 11.5%
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	ski hill access and vegetated areas, 1.19ac

Type of Study Required:

- [x] Drainage Letter
- [ ] Final Drainage Study
- [ ] Conceptual Drainage Study
- [ ] Stormwater Quality Plan

Required

Hydrologic Evaluation:

- [x] Rational Method
- [ ] CUHP/SWMM
- [ ] HEC-HMS
- [ ] Other_____

Project Drainage	
Number of subbasins to be evaluated:	1
Presence of pass through flow (circle):	YES (NO)
Description of proposed stormwater conveyance on site:	Construct stormwater quality feature - detention basin
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:	Storm infrastructure exists N, S and E of basin. South of basin drains via sheet flow to Burgess Creek
Detention expected onsite (circle):	(YES) NO
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:	

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

- [x] 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.:	WQCV used for basin volume calculation of detention basin; replacement of previous basin at the site
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	Forebay with EDB, outlet piped to Burgess Creek existing MH or open flow area
Proposed LID measures to reduce runoff volume:	ESB with forebay accomplishes runoff reduction
Will treatment evaluation include off-site, pass through flow (circle):	YES (NO)

Approvals

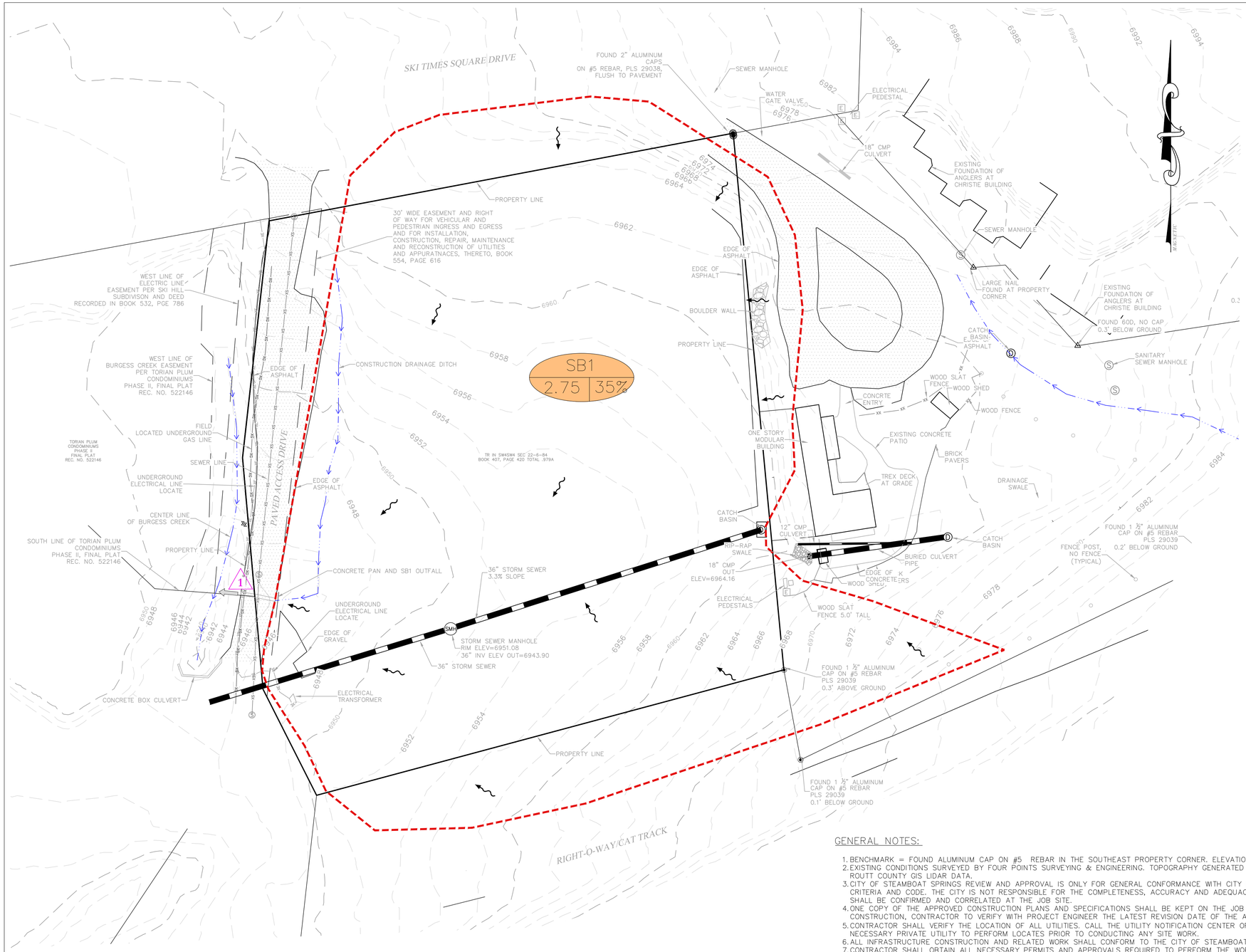
Rebecca Lindeman, PE, Jardon Engineering & Inspections	3/23/22	303.517.8189
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

APPROVED
to be generally in
accordance with
CITY ENGINEERING
STANDARDS
04/21/2022

Printed Name:
City Engineer

Date



DRAINAGE PLAN LEGEND

- 2' CONTOUR
- 10' CONTOUR
- DRAINAGE BASIN BOUNDARY
- FLOW PATH, SHEET FLOW/OVERLAND FLOW
- FLOW PATH, CONCENTRATED
- DITCH/SWALE CENTERLINE
- 1 — DESIGN POINT DESIGNATION
- A: BASIN DESIGNATION
  B: BASIN AREA (ACRES)
  C: % IMPERVIOUS

DESIGN POINTS:

1. SB1 OUTFALLS INTO BURGESS CREEK VIA CONCRETE VALLEY PAN OVER THE PAVED ACCESS DRIVE.

LEGEND	EXISTING	PROPOSED
PROPERTY BOUNDARY		
SECTION LINE		
LOT BOUNDARY		
EASEMENT		
SETBACK		
EDGE OF ASPHALT		
CURB		
CURB FLOWLINE		
1/2 FT CONTOUR	5282	5282
5/10 FT CONTOUR	5280	5280
EDGE OF GRAVEL		
CENTER LINE OF DITCH		
WATER MAIN		
CURB STOP, GV, FH		
SIGN		
LIGHT POLE		
SEWER MAIN		
MANHOLE AND CLEANOUTS		
ELECTRICAL – UNDERGROUND		UGE
ELECTRICAL – OVERHEAD		OHE
ELECTRICAL – OVERHEAD – HIGH VOLTAGE		HVE
ELECTRICAL–PRIMARY		E
FIBER OPTIC		FO
TELEPHONE		T
UNDERGROUND		UGT
UTILITY PEDESTALS		
POWER POLE/ LIGHT POLE		
GAS		GAS
FENCE		
WOODEN FENCE		
PROPOSED EDGE OF CONCRETE		
DECK		
PROPOSED BUILDING		
OVERHANG		
SIDEWALK/ BOARDWALK		
BASE FLOOD CROSS SECTION		
FEMA SFHA BOUNDARY		
WALL		
VEGETATION OUTLINE		
PROPERTY CORNERS		
STORM INLET		
CULVERT		
ASPHALT		
CONCRETE		
GRAVEL/SOFT SURFACE		
ROCK/RIP RAP		
VEGETATION		

GENERAL NOTES:

1. BENCHMARK = FOUND ALUMINUM CAP ON #5 REBAR IN THE SOUTHEAST PROPERTY CORNER. ELEVATION = 6968.59 (SEE EXISTING CONDITIONS PLAN).
2. EXISTING CONDITIONS SURVEYED BY FOUR POINTS SURVEYING & ENGINEERING. TOPOGRAPHY GENERATED FROM A COMBINATION OF FIELD SURVEY DATA AND 2018 ROUTT COUNTY GIS LIDAR DATA.
3. CITY OF STEAMBOAT SPRINGS REVIEW AND APPROVAL IS ONLY FOR GENERAL CONFORMANCE WITH CITY OF STEAMBOAT SPRINGS ENGINEERING AND CDC DESIGN CRITERIA AND CODE. THE CITY IS NOT RESPONSIBLE FOR THE COMPLETENESS, ACCURACY AND ADEQUACY OF THE DRAWINGS. DESIGN, DIMENSIONS, AND ELEVATIONS SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE.
4. ONE COPY OF THE APPROVED CONSTRUCTION PLANS AND SPECIFICATIONS SHALL BE KEPT ON THE JOB SITE AT ALL TIMES. PRIOR TO THE START OF CONSTRUCTION, CONTRACTOR TO VERIFY WITH PROJECT ENGINEER THE LATEST REVISION DATE OF THE APPROVED CONSTRUCTION PLANS.
5. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITIES. CALL THE UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) AT 1-800-922-1987 AND ANY NECESSARY PRIVATE UTILITY TO PERFORM LOCATES PRIOR TO CONDUCTING ANY SITE WORK.
6. ALL INFRASTRUCTURE CONSTRUCTION AND RELATED WORK SHALL CONFORM TO THE CITY OF STEAMBOAT SPRINGS STANDARD SPECIFICATIONS, LATEST REVISION.
7. CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND APPROVALS REQUIRED TO PERFORM THE WORK SUCH AS RIGHT-OF-WAY PERMIT, GRADING AND EXCAVATION PERMIT, CONSTRUCTION DEWATERING PERMIT, STORM WATER QUALITY PERMIT, ARMY CORP OF ENGINEER PERMIT, ETC. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN A COPY OF ALL APPLICABLE CODES, LICENSES, SPECIFICATIONS, AND STANDARDS NECESSARY TO PERFORM THE WORK, AND BE FAMILIAR WITH THEIR CONTENTS PRIOR TO COMMENCING ANY WORK.
8. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL COORDINATE A PRE-CONSTRUCTION MEETING ON SITE WITH THE PROJECT CIVIL ENGINEER.
9. EXISTING ASPHALT PAVEMENT SHALL BE STRAIGHT SAW CUT WHEN ADJOINING WITH NEW ASPHALT PAVEMENT OR WHEN ACCESS TO UNDERGROUND UTILITIES IS REQUIRED. TACK COAT SHALL BE APPLIED TO ALL EXPOSED SURFACES INCLUDING SAW CUTS, POTHOLES, TRENCHES, AND ASPHALT OVERLAY.

GRADING:

1. GRADING SHALL OCCUR WITHIN THE PROPERTY LIMITS. WHERE OFF-SITE WORK IS APPROVED, WRITTEN PERMISSION OF THE ADJACENT PROPERTY OWNER MUST BE OBTAINED PRIOR TO ANY OFF-SITE GRADING OR CONSTRUCTION.
2. VEGETATED SLOPES 2:1 AND GREATER REQUIRE SOIL STABILIZATION WITH STRAW BLANKET AT MINIMUM UPON FINAL GRADING AND SEEDING/REVEGETATION.
3. ALL FINISHED GRADES OF THE EXTENDED DETENTION BASIN NOT RECEIVING A ROCK FINISH SHALL BE RE-VEGETATED WITHIN ONE CONSTRUCTION SEASON.

EROSION CONTROL:

1. CONTRACTOR SHALL WORK IN A MANNER THAT MINIMIZES THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION INTO BURGESS CREEK.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING, INSPECTING, AND MAINTAINING ALL NECESSARY EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION AND REMOVING EROSION CONTROL WHEN PROJECT IS COMPLETE AND VEGETATION IS ESTABLISHED.
3. ANY AREA DISTURBED BY CONSTRUCTION AND NOT PAVED OR NATURAL ROCK SURFACE SHALL BE REVEGETATED WITHIN ONE CONSTRUCTION SEASON.

UTILITY NOTES:

1. EXISTING UTILITY LOCATIONS WERE OBTAINED FROM FIELD LOCATES AND FIELD SURVEYING AND HAVE NOT BEEN VERIFIED WITH ANY ADDITIONAL UNDERGROUND POTHOLING. POTHOLING AND VERIFICATION OF LINE LOCATIONS SHALL BE REQUIRED AT ALL EXISTING UTILITY CROSSINGS.

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

SSRC - TORIAN PLUM EXTENDED DETENTION BASIN

1965 SKI TIME SQUARE DR STEAMBOAT SPRINGS, CO 80487

Horizontal Scale
0 30' 60'
SCALE: 1" = 30'

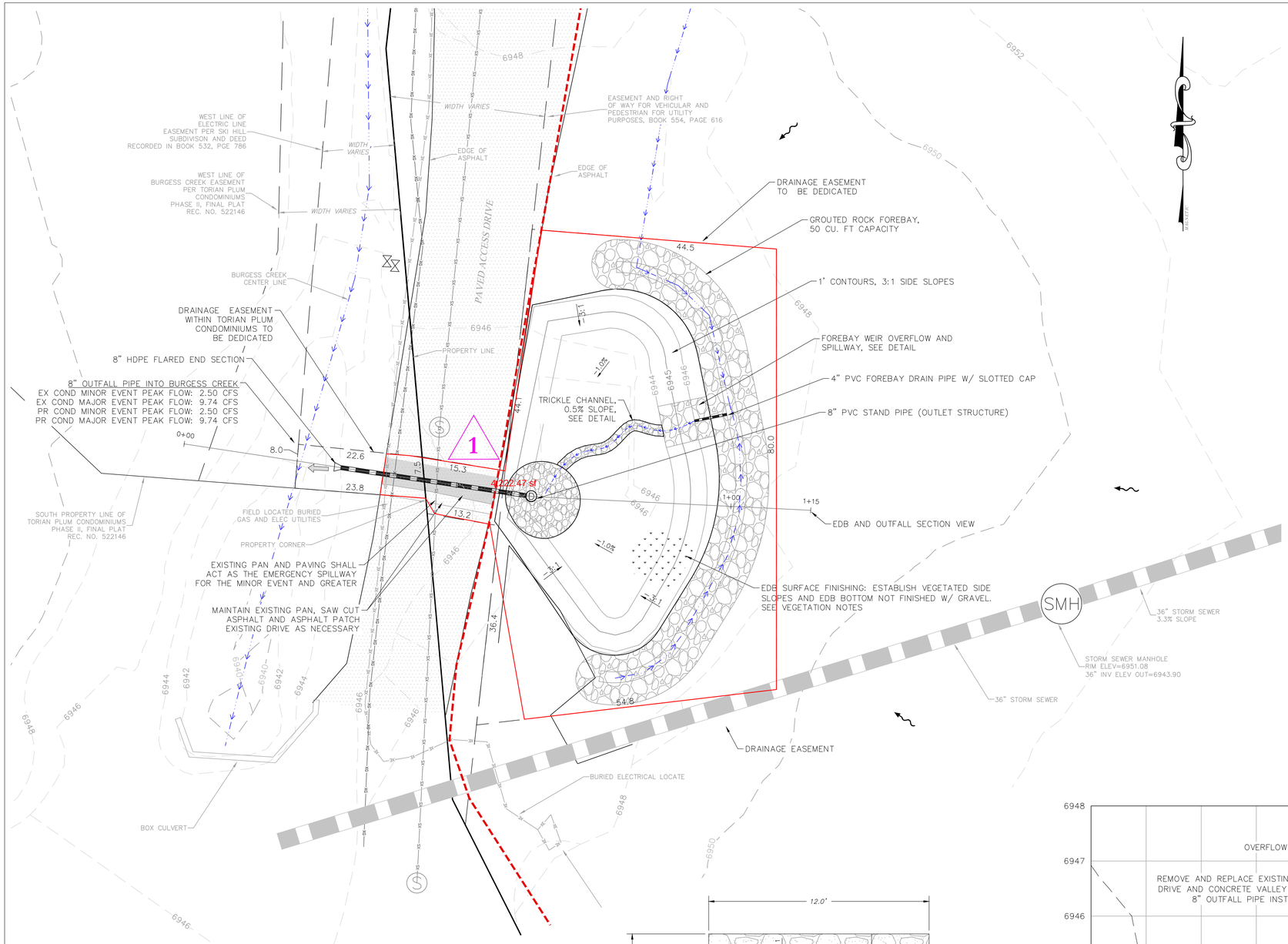
Contour Interval = 2 ft

DATE: 5/20/22
JOB #: 1670-001
DRAWN BY: JLW
DESIGN BY: JLW
REVIEW BY: RL

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

DRAWING: COVER PAGE & EXISTING CONDITIONS DRAINAGE

SHEET #
C1



DRAINAGE PLAN LEGEND

- 2' CONTOUR
- 10' CONTOUR
- DRAINAGE BASIN BOUNDARY
- FLOW PATH, SHEET FLOW/OVERLAND FLOW
- FLOW PATH, CONCENTRATED
- CREEK/DITCH/SWALE CENTERLINE
- 1 — DESIGN POINT DESIGNATION
- A / B C — A: BASIN DESIGNATION; B: BASIN AREA (ACRES); C: % IMPERVIOUS

DESIGN POINTS:

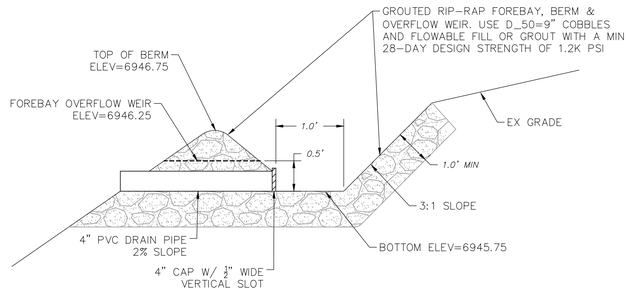
1. EXTENDED DETENTION BASIN AND SB1 OUTFALL INTO BURGESS CREEK.

Basin Runoff Summary Table

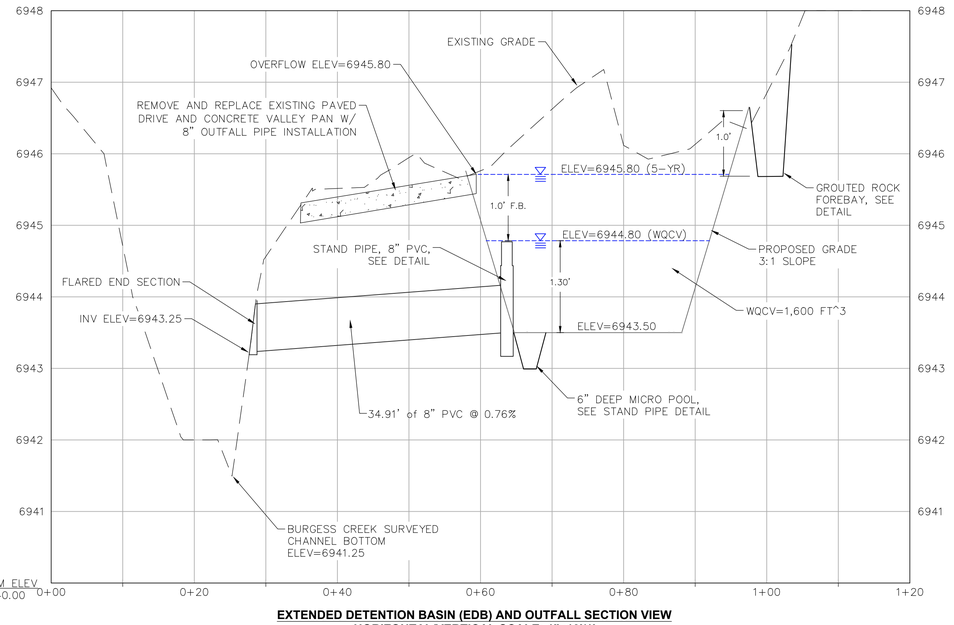
Basin Condition	Area (acres)	Impervious Area (%)	Runoff		
			$Q_{1.25}$ (cfs)	Q_5 (cfs)	Q_{100} (cfs)
SB1	2.75	34%	0.89	2.50	9.74

VEGETATION NOTES:

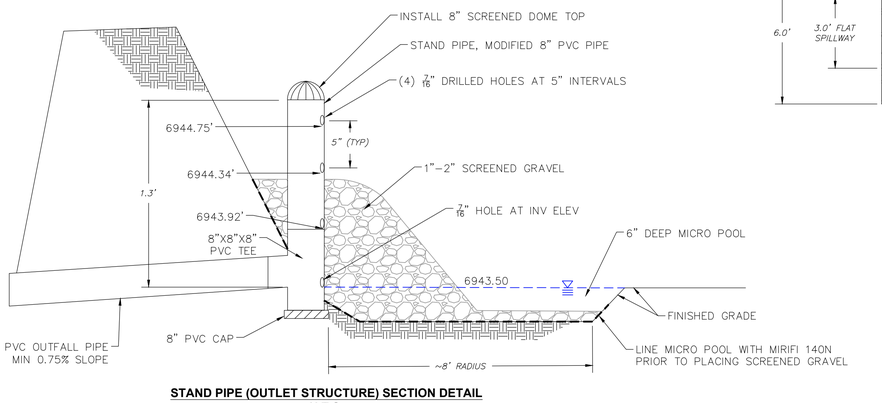
1. FINISH ALL SIDE SLOPES AND THE EDB BOTTOM (AREAS NOT FINISHED WITH GRAVEL) WITH 4" OF SANDY LOAM SOIL, GRASS SEED, AND STRAW BLANKET SECURED WITH STAPLES.
2. XERIC TYPE, DROUGHT TOLERANT GRASSES SHOULD BE PLANTED FOR REDUCED MAINTENANCE REQUIREMENTS. APPLY GRASS SEED AT SUPPLIERS SUGGESTED RATE.
3. FINISHED SURFACES SHOULD BE TEMPORARILY IRRIGATED TO ESTABLISH GROWTH.



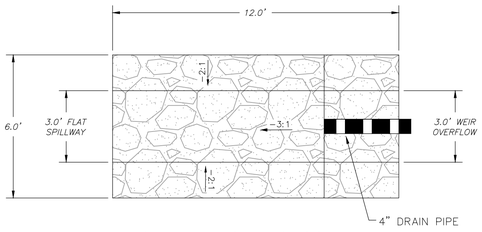
GROUTED ROCK FOREBAY SECTION DETAIL
N.T.S.



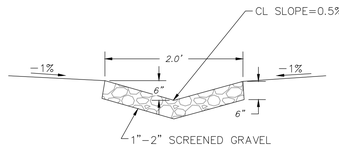
EXTENDED DETENTION BASIN (EDB) AND OUTFALL SECTION VIEW
HORIZONTAL/VERTICAL SCALE: 1"=10'/1'



STAND PIPE (OUTLET STRUCTURE) SECTION DETAIL
N.T.S.



FOREBAY WEIR OVERFLOW & SPILLWAY
N.T.S.



TRICKLE CHANNEL DETAIL
N.T.S.

FOUR POINTS SURVEYING ENGINEERING
440 S. Lincoln Ave, Suite 4A
P.O. Box 775966
Steamboat Springs, CO 80487
(970)-871-5772
www.fourpointsse.com

No.	DATE	REVISIONS
INT		

SSRC - TORIAN PLUM EXTENDED DETENTION BASIN

1965 SKI TIME SQUARE DR STEAMBOAT SPRINGS, CO 80487

Horizontal Scale
0 10' 20'
SCALE: 1" = 10'

Contour Interval = 2 ft

DATE:	5/20/2022
JOB #:	1876-001
DRAWN BY:	JLW
DESIGN BY:	JLW
REVIEW BY:	RL

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

DRAWING: **PROPOSED CONDITIONS DRAINAGE AND EDB DESIGN**

SHEET #

C2

OWNERSHIP AND MAINTENANCE PLAN

for an EXTENDED DETENTION BASIN at SSRC

1. GENERAL PROJECT INFORMATION

A VACANT UNDEVELOPED LOT LOCATED AT THE RESORT BASE AREA AKA SKI TIMES SQUARE. THE PROPERTY HAS THE FOLLOWING LEGAL DESCRIPTION: TR IN SW4SW4 SEC 22-6-84 BOOK 407, PAGE 420 TOTAL .979A.

2. GENERAL FACILITY DESCRIPTION

THIS FACILITY IS AN EXTENDED DETENTION BASIN (EDB) THAT IS CAPABLE OF TREATING RUNOFF FOR WATER QUALITY CAPTURE VOLUME (WQCV) PER URBAN DRAINAGE AND FLOOD CONTROL DISTRICT (UDFCD) REQUIREMENTS. THE FACILITY IS CAPABLE OF EFFECTIVELY REDUCING SEDIMENT LOADS AND OTHER POLLUTANTS ASSOCIATED WITH STORMWATER RUNOFF.

3. INSPECTION & MAINTENANCE FREQUENCY & PROCEDURE

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

Extended Detention Basin Maintenance Considerations

Required Action	Maintenance Objective	Frequency of Action
Mowing	Occasional mowing to limit unwanted Vegetation. Maintain irrigated turf grass As 2 to 4 inches tall and non-irrigated native Turf grasses at 4 to 6 inches.	Routine -Depending on aesthetic requirements.
Debris and litter removal	Remove debris and litter from the entire Pond to minimize outlet clogging and improve aesthetics. Outlet structure Trash racks should be clear of any blockage.	Routine – including just before annual storm seasons (that is, April and May) and Following significant rainfall Events.
Erosion and sediment control	Repair and revegetate eroded areas on slopes.	Nonroutine -Periodic and Repair as necessary based on Inspection.
Structural	Repair pond inlets, outlets, forebays, Low flow channel liners, and energy Dissipators whenever damage is discovered.	Nonroutine- Repair as needed based on regular inspections.
Inspections	Inspect basins to ensure that the basin Continues to function as initially intended. Examine the outlet for clogging, erosion, Slumping, excessive sedimentation Levels, overgrowth, embankment and Spillway integrity, and damage to any Structural element.	Routine -Annual inspection Hydraulic and structural facilities. Also check for obvious problems during routine maintenance visits, especially for plugging of Outlets.
Nuisance control	Address odor, insects, and overgrowth Issues associated with stagnant or Standing water in the bottom zone.	Nonroutine- Handle as necessary per inspection Or local complaints.

4. EQUIPMENT, STAFFING AND VEGETATION MANAGEMENT

GENERAL LANDSCAPING TOOLS SUCH AS LAWNMOWER, WEED WHACKER, SHOVEL, AND RAKE.

A. STAFFING: TBD BY OWNER

B. SEEDING: FOLLOWING COMPLETION OF CONSTRUCTION, A SEED MIX SHALL BE APPLIED TO ALL FINISHED GRADES THAT DO NOT HAVE A ROCK OR PAVEMENT FINISH. ADDITIONAL GRASS SEED SHOULD BE APPLIED TO BARE AREAS AS NEEDED WHILE VEGETATION ESTABLISHES.

C. MOWING: VEGETATION HEALTH SHOULD BE MAINTAINED IN THE EDB AREA WITH REGULAR MOWING AND/OR WEEDEATING. THE REQUIRED MOW AREA POST-CONSTRUCTION WAS ESTIMATED TO BE 0.02 ACRES.

D. UNDESIRABLE VEGETATION, WEEDS, AND DEBRIS: UNDESIRABLE VEGETATION AND NOXIOUS WEEDS SHOULD BE REMOVED REGULARLY BY THE LANDSCAPING STAFF. WEEDS SHOULD BE MOWED OR REMOVED. LEAVES AND OTHER DEBRIS SHOULD BE CLEARED OUT REGULARLY PER THE MAINTENANCE SCHEDULE.

1. SNOW AND ICE CONTROL

THE EDB WILL SERVE AS A SNOW STORAGE AREA DURING THE WINTER MONTHS. SNOW CAN BE PLOWED INTO THE EDB VIA THE PAVED DRIVE. PLOW OPERATORS SHALL TAKE CARE NOT TO DAMAGE THE EDB AND THE OUTLET STRUCTURE. .

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

ACCESS INFORMATION AND DETAILS: ACCESS FROM SKI TIMES SQUARE DRIVE --> PAVED ACCESS DRIVE AND PUBLIC EASEMENT.

A. MAINTENANCE OPERATIONS MAY IMPACT THE PAVED ACCESS DRIVE. TRAFFIC CONES SHOULD BE USED AS NECESSARY TO MARK THE WORKING AND MOBILIZATION AREA AROUND THE ACCESS POINT. THE OWNER IS RESPONSIBLE FOR OBTAINING THE NECESSARY PERMITS SHOULD THEY BE NEEDED FOR ANY MAINTENANCE ACTIONS.

7. HYDRAULIC DESIGN

A. FLOWRATES (CFS)

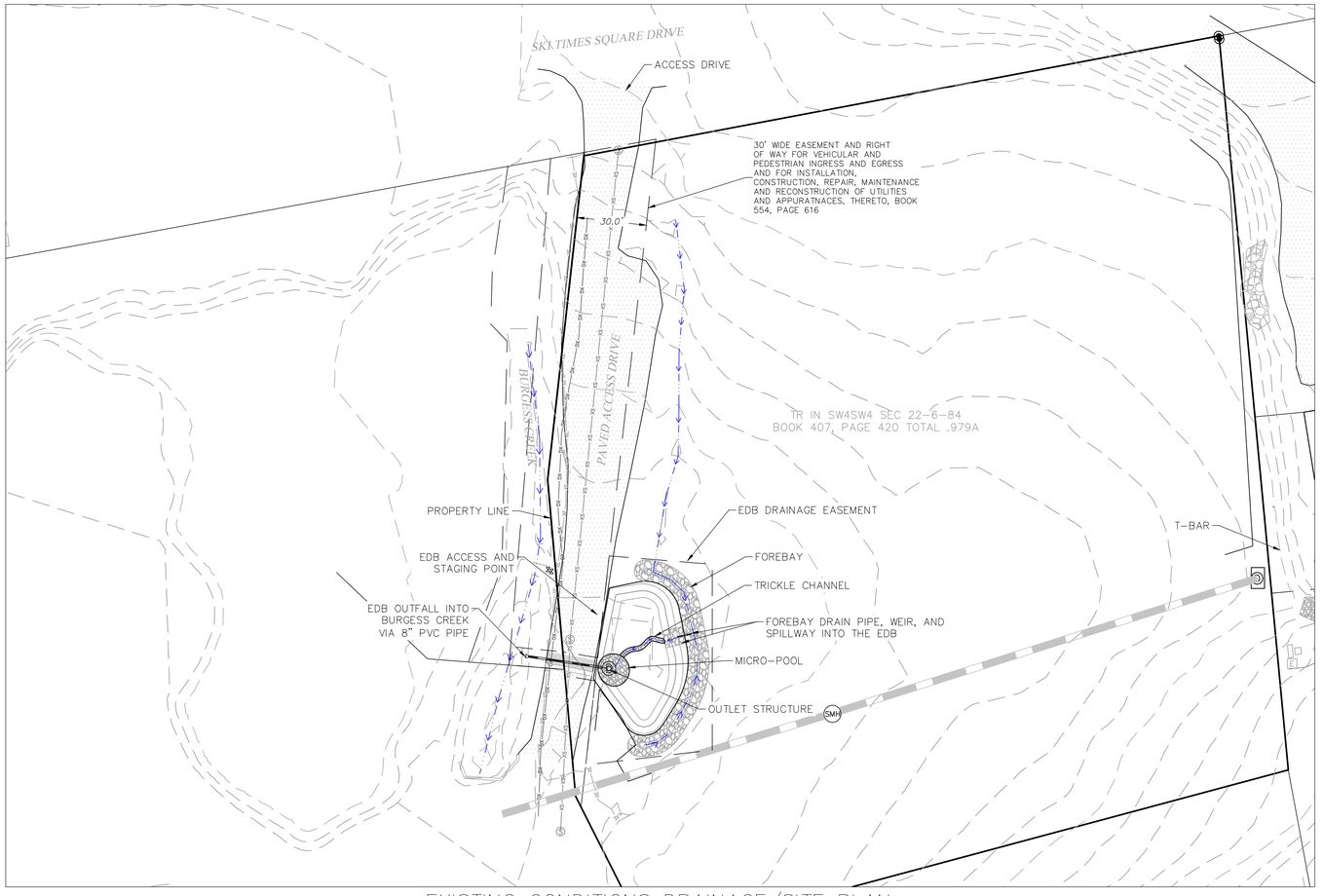
A.A.	DESIGN EVENT (1.25 YEAR)	0.89 CFS
A.B.	MINOR EVENT (5-YEAR)	2.50 CFS
A.C.	MAJOR EVENT (100-YEAR)	9.80 CFS

8. SITE DISCHARGE AND RECEIVING WATERWAYS

THE EDB DISCHARGES INTO BURGESS CREEK AND THE YAMPA RIVER.

9. MISCELLANEOUS INFORMATION

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



EXISTING CONDITIONS DRAINAGE/SITE PLAN

(SEE SHEET C2 FOR EDB DESIGN DETAILS)

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No.	DATE	REVISIONS	INT

SSRC - TORIAN PLUM EXTENDED DETENTION BASIN

1965 SKI TIMES SQUARE DR STEAMBOAT SPRINGS, CO 80487

Horizontal Scale
0 30' 60'
SCALE: 1" = 30'

Contour Interval = 2 ft

DATE: 5/20/22
JOB #: 1670-001
DRAWN BY: JLW
DESIGN BY: JLW
REVIEW BY: RL

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

DRAWING: OWNERSHIP, OPERATION, AND MAINTENANCE PLAN

SHEET #
OMP

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

April 29, 2022

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,460 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 11, Sep 2, 2021

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 Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50F	Routt loam, 25 to 65 percent slopes, very stony	7.9	100.0%
Totals for Area of Interest		**7.9**	**100.0%**

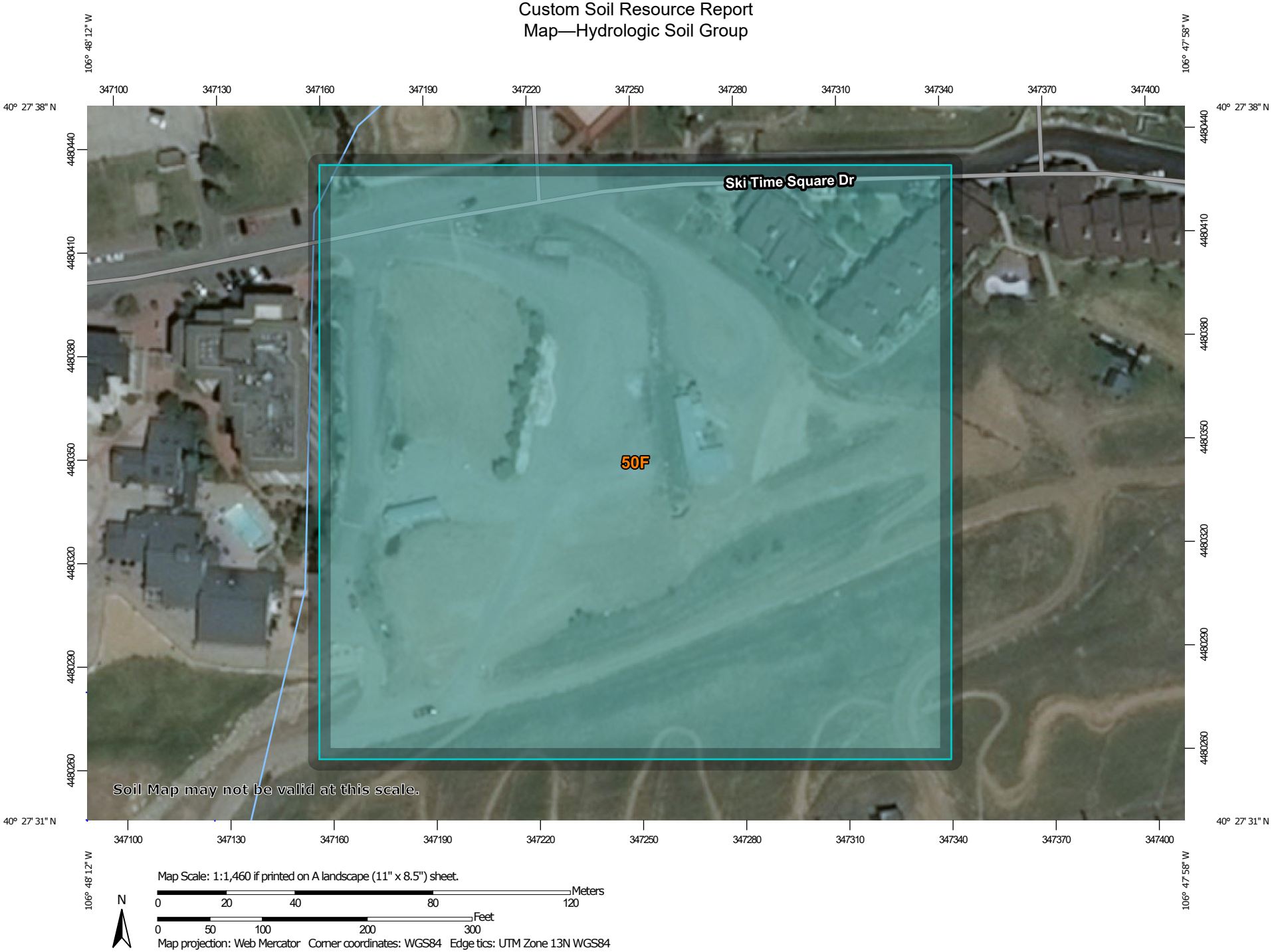
Map Unit Descriptions

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.


106° 48' 12" W
106° 47' 58" W
347100
347130
347160
347190
347220
347250
347280
347310
347340
347370
347400
40° 27' 38" N
40° 27' 31" N
4480440
4480410
4480380
4480350
4480320
4480290
4480260
Ski Time Square Dr
50F
Soil Map may not be valid at this scale.
Map Scale: 1:1,460 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300
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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 11, Sep 2, 2021

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

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
50F	Routt loam, 25 to 65 percent slopes, very stony	C	7.9	100.0%
Totals for Area of Interest			**7.9**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

PIN
- Approximate location based on user input and does not represent an authoritative property location

MAP PANELS
- Selected FloodMap Boundary
- Digital Data Available
- No Digital Data Available
- Unmapped

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D
- Otherwise Protected Area
- Coastal Barrier Resource System Area

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

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

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

RATIONAL METHOD RUNOFF ANALYSIS

Job #	1876-002	Date:	May 2, 2022
Job Name	Torian Plum EDB	Revised:	
Designed by:	JLW		

Sub Basin 1 (SB1)

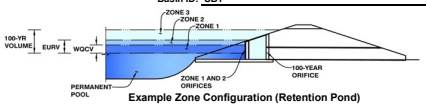
BASIN CHARACTERISTICS				TIME OF CONCENTRATION							RESULTS				
	Area, ac	% imp	Soil Type	Overland Flow - Surface Type 1		Overland Flow - Surface Type 2		Channel Flow		Tc, min	Event	C	*i*, in/hr	A, acres	Q, cfs
Landscape	1.85	2%	C	Surface Imperviousness	0.35	Surface Imperviousness	0.02	Land Surface	Paved Areas and Shallow Swales	Minimum	1.25 YR	0.25	1.3	2.75	0.89
Asphalt Parking & Walkways	0.90	100%		Length, ft	300	Length, ft	0	Length, ft	0	Tc, min	2-YR	0.25	1.9	2.75	1.28
Roof	0.00	90%	P2	Slope, percent	12.0000	Slope, percent	30.0000	Slope, ft/ft	2.0000	5.0	5-YR	0.32	2.8	2.75	2.50
Gravel	0.00	40%	1.4	Runoff Coefficient	0.33	Runoff Coefficient	0.162	Conveyance Coefficient	20	Final	10-YR	0.40	3.6	2.75	3.89
Other	0.00	0%						Velocity, ft/s	28.3	Tc, min	25-YR	0.48	4.6	2.75	6.11
	2.75	34%		Ti, min=	10.5	Ti, min=	0.0	Tt, min=	0.0	**10.5**	**100-YR**	**0.57**	**6.2**	**2.75**	**9.74**

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Ski Core EDB

Basin ID: SB1



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	2.75	acres	
Watershed Length =	400	ft	
Watershed Slope =	0.080	ft/ft	
Watershed Imperviousness =	33.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	0.0%	percent	
Percentage Hydrologic Soil Groups C/D =	100.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.037	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	0.083	acre-feet	
2-yr Runoff Volume (P1 = 0.55 in.) =	0.035	acre-feet	0.55 inches
5-yr Runoff Volume (P1 = 0.82 in.) =	0.068	acre-feet	0.82 inches
10-yr Runoff Volume (P1 = 1.04 in.) =	0.103	acre-feet	1.04 inches
25-yr Runoff Volume (P1 = 1.34 in.) =	0.179	acre-feet	1.34 inches
50-yr Runoff Volume (P1 = 1.57 in.) =	0.232	acre-feet	1.57 inches
100-yr Runoff Volume (P1 = 1.79 in.) =	0.296	acre-feet	1.79 inches
500-yr Runoff Volume (P1 = 2.31 in.) =	0.427	acre-feet	2.31 inches
Approximate 2-yr Detention Volume =	0.033	acre-feet	
Approximate 5-yr Detention Volume =	0.064	acre-feet	
Approximate 10-yr Detention Volume =	0.080	acre-feet	
Approximate 25-yr Detention Volume =	0.101	acre-feet	
Approximate 50-yr Detention Volume =	0.110	acre-feet	
Approximate 100-yr Detention Volume =	0.135	acre-feet	

Stage-Storage Calculation

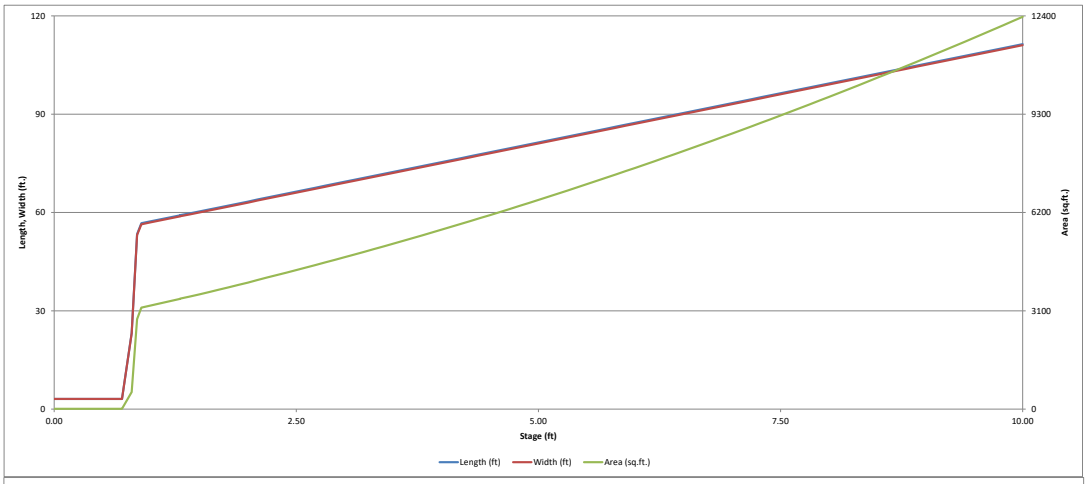
Zone 1 Volume (WQCV) =	0.037	acre-feet	
Select Zone 2 Storage Volume (Optional) =		acre-feet	Total detention volume is less than 100-year volume.
Select Zone 3 Storage Volume (Optional) =		acre-feet	
Total Detention Basin Volume =	0.037	acre-feet	
Initial Surcharge Volume (ISV) =	5	ft^3	
Initial Surcharge Depth (ISD) =	0.50	ft	
Total Available Detention Depth (H_{total}) =	1.30	ft	
Depth of Trickle Channel (H_{TC}) =	0.25	ft	
Slope of Trickle Channel (S_{TC}) =	0.002	ft/ft	
Slopes of Main Basin Sides (S_{main}) =	3	H:V	
Basin Length-to-Width Ratio ($R_{L/W}$) =	1		
Initial Surcharge Area (A_{ISV}) =	10	ft^2	
Surcharge Volume Length (L_{ISV}) =	3.1	ft	
Surcharge Volume Width (W_{ISV}) =	3.1	ft	
Depth of Basin Floor (H_{FLOOR}) =	0.11	ft	
Length of Basin Floor (L_{FLOOR}) =	56.5	ft	
Width of Basin Floor (W_{FLOOR}) =	56.2	ft	
Area of Basin Floor (A_{FLOOR}) =	3,176	ft^2	
Volume of Basin Floor (V_{FLOOR}) =	119	ft^3	
Depth of Main Basin (H_{MAIN}) =	0.44	ft	
Length of Main Basin (L_{MAIN}) =	59.2	ft	
Width of Main Basin (W_{MAIN}) =	58.9	ft	
Area of Main Basin (A_{MAIN}) =	3,484	ft^2	
Volume of Main Basin (V_{MAIN}) =	1,477	ft^3	
Calculated Total Basin Volume (V_{total}) =	**0.037**	acre-feet	

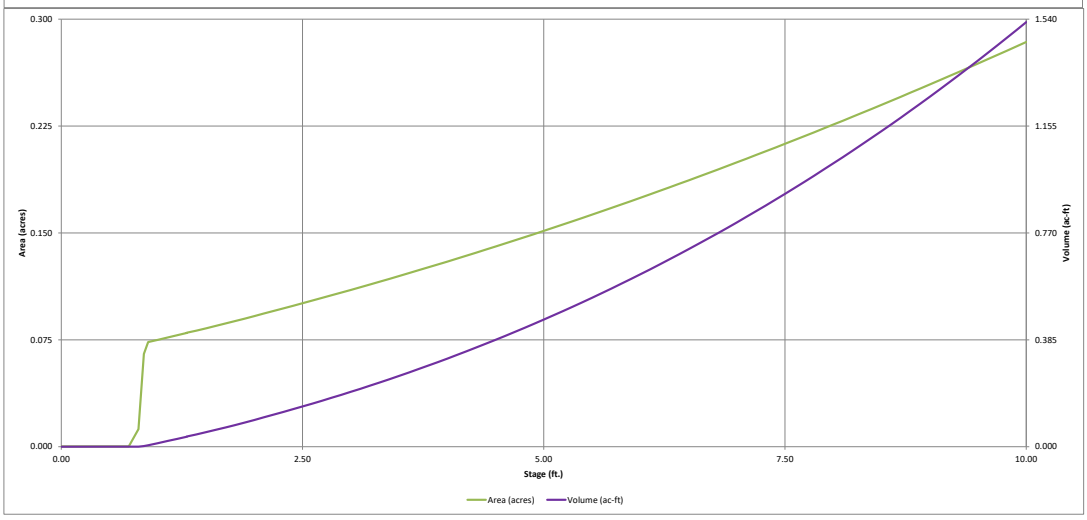
Depth Increment = 0.1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	0.00		3.1	3.1	10		0.000		
ISV	0.50		3.1	3.1	10		0.000	5	0.000
	0.60		3.1	3.1	10		0.000	6	0.000
	0.70		3.1	3.1	10		0.000	7	0.000
	0.80		23.2	23.1	536		0.012	15	0.000
Floor	0.86		53.4	53.1	2,836		0.065	108	0.002
	0.90		56.7	56.4	3,199		0.073	233	0.005
	1.00		57.3	57.0	3,268		0.075	557	0.013
	1.10		57.9	57.6	3,337		0.077	887	0.020
	1.20		58.5	58.2	3,406		0.078	1,224	0.028
	1.30		59.1	58.8	3,477		0.080	1,568	0.036
Zone 1 (WQCV)	1.30		59.2	58.9	3,484		0.080	1,603	0.037
	1.40		59.7	59.4	3,548		0.081	1,919	0.044
	1.50		60.3	60.0	3,620		0.083	2,278	0.052
	1.60		60.9	60.6	3,692		0.085	2,643	0.061
	1.70		61.5	61.2	3,765		0.086	3,016	0.069
	1.80		62.1	61.8	3,839		0.088	3,396	0.078
	1.90		62.7	62.4	3,914		0.090	3,784	0.087
	2.00		63.3	63.0	3,990		0.092	4,179	0.096
	2.10		64.0	63.7	4,073		0.094	4,623	0.106
	2.20		64.6	64.3	4,150		0.095	5,034	0.116
	2.30		65.2	64.9	4,228		0.097	5,453	0.125
	2.40		65.8	65.5	4,306		0.099	5,879	0.135
	2.50		66.4	66.1	4,385		0.101	6,314	0.145
	2.60		67.0	66.7	4,465		0.103	6,756	0.155
	2.70		67.6	67.3	4,546		0.104	7,207	0.165
	2.80		68.2	67.9	4,627		0.106	7,666	0.176
	2.90		68.8	68.5	4,709		0.108	8,132	0.187
	3.00		69.4	69.1	4,792		0.110	8,608	0.198
	3.10		70.0	69.7	4,875		0.112	9,091	0.209
	3.20		70.6	70.3	4,959		0.114	9,583	0.220
	3.30		71.2	70.9	5,044		0.116	10,083	0.231
	3.40		71.8	71.5	5,130		0.118	10,591	0.243
	3.50		72.4	72.1	5,216		0.120	11,109	0.255
	3.60		73.0	72.7	5,303		0.122	11,635	0.267
	3.70		73.6	73.3	5,391		0.124	12,169	0.279
	3.80		74.2	73.9	5,479		0.126	12,713	0.292
	3.90		74.8	74.5	5,569		0.128	13,265	0.305
	4.00		75.4	75.1	5,658		0.130	13,827	0.317
	4.10		76.0	75.7	5,749		0.132	14,397	0.331
	4.20		76.6	76.3	5,840		0.134	14,976	0.344
	4.30		77.2	76.9	5,932		0.136	15,565	0.357
	4.40		77.8	77.5	6,025		0.138	16,163	0.371
	4.50		78.4	78.1	6,119		0.140	16,770	0.385
	4.60		79.0	78.7	6,213		0.143	17,387	0.399
	4.70		79.6	79.3	6,308		0.145	18,013	0.414
	4.80		80.2	79.9	6,404		0.147	18,648	0.428
	4.90		80.8	80.5	6,500		0.149	19,294	0.443
	5.00		81.4	81.1	6,597		0.151	19,948	0.458
	5.10		82.0	81.7	6,695		0.154	20,613	0.473
	5.20		82.6	82.3	6,793		0.156	21,287	0.489
	5.30		83.2	82.9	6,893		0.158	21,972	0.504
	5.40		83.8	83.5	6,993		0.161	22,666	0.520
	5.50		84.4	84.1	7,093		0.163	23,370	0.537
	5.60		85.0	84.7	7,195		0.165	24,085	0.553
	5.70		85.6	85.3	7,297		0.168	24,809	0.570
	5.80		86.2	85.9	7,400		0.170	25,544	0.586
	5.90		86.8	86.5	7,503		0.172	26,289	0.604
	6.00		87.4	87.1	7,608		0.175	27,045	0.621
	6.10		88.0	87.7	7,713		0.177	27,811	0.638
	6.20		88.6	88.3	7,819		0.179	28,587	0.656
	6.30		89.2	88.9	7,925		0.182	29,375	0.674
	6.40		89.8	89.5	8,032		0.184	30,172	0.693
	6.50		90.4	90.1	8,140		0.187	30,981	0.711
	6.60		91.0	90.7	8,249		0.189	31,800	0.730
	6.70		91.6	91.3	8,358		0.192	32,631	0.749
	6.80		92.2	91.9	8,468		0.194	33,472	0.768
	6.90		92.8	92.5	8,579		0.197	34,324	0.788
	7.00		93.4	93.1	8,690		0.200	35,188	0.808
	7.10		94.0	93.7	8,803		0.202	36,063	0.828
	7.20		94.6	94.3	8,916		0.205	36,948	0.848
	7.30		95.2	94.9	9,029		0.207	37,846	0.869
	7.40		95.8	95.5	9,144		0.210	38,754	0.890
	7.50		96.4	96.1	9,259		0.213	39,674	0.911
	7.60		97.0	96.7	9,375		0.215	40,606	0.932
	7.70		97.6	97.3	9,491		0.218	41,549	0.954
	7.80		98.2	97.9	9,608		0.221	42,504	0.976
	7.90		98.8	98.5	9,726		0.223	43,471	0.998
	8.00		99.4	99.1	9,845		0.226	44,450	1.020
	8.10		100.0	99.7	9,965		0.229	45,440	1.043
	8.20		100.6	100.3	10,085		0.232	46,443	1.066
	8.30		101.2	100.9	10,206		0.234	47,457	1.089
	8.40		101.8	101.5	10,327		0.237	48,484	1.113
	8.50		102.4	102.1	10,449		0.240	49,523	1.137
	8.60		103.0	102.7	10,572		0.243	50,574	1.161
	8.70		103.6	103.3	10,696		0.246	51,637	1.185
	8.80		104.2	103.9	10,821		0.248	52,713	1.210
	8.90		104.8	104.5	10,946		0.251	53,801	1.235
	9.00		105.4	105.1	11,072		0.254	54,902	1.260
	9.10		106.0	105.7	11,198		0.257	56,016	1.286
	9.20		106.6	106.3	11,326		0.260	57,142	1.312
	9.30		107.2	106.9	11,454		0.263	58,281	1.338
	9.40		107.8	107.5	11,583		0.266	59,433	1.364
	9.50		108.4	108.1	11,712		0.269	60,597	1.391
	9.60		109.0	108.7	11,842		0.272	61,775	1.418
	9.70		109.6	109.3	11,973		0.275	62,966	1.445
	9.80		110.2	109.9	12,105		0.278	64,170	1.473
	9.90		110.8	110.5	12,237		0.281	65,387	1.501
	10.00		111.4	111.1	12,370		0.284	66,617	1.529

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



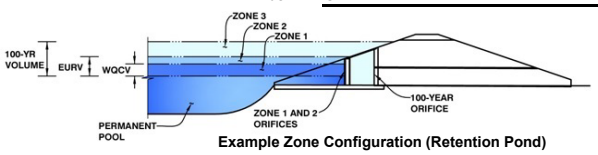


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Ski Core EDB

Basin ID: SB1



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.30	0.037	Orifice Plate
Zone 2			Not Utilized
Zone 3			Not Utilized
		0.037	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	9.722E-04	ft²
Depth at top of Zone using Orifice Plate =	1.31	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	5.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.14	sq. inches (diameter = 7/16 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.40	0.80	1.20				
Orifice Area (sq. inches)	0.14	0.14	0.14	0.14				

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	N/A	N/A	feet
Overflow Weir Front Edge Length =	N/A	N/A	feet	Over Flow Weir Slope Length =	N/A	N/A	feet
Overflow Weir Slope =	N/A	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	N/A	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	N/A	N/A	feet	Overflow Grate Open Area w/o Debris =	N/A	N/A	ft²
Overflow Grate Open Area % =	N/A	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	N/A	N/A	ft²
Debris Clogging % =	N/A	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	N/A	N/A	ft²
Circular Orifice Diameter =	N/A	N/A	inches	Outlet Orifice Centroid =	N/A	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.80	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.48	feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	3.28	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.12	acres
Freeboard above Max Water Surface =	1.00	feet			

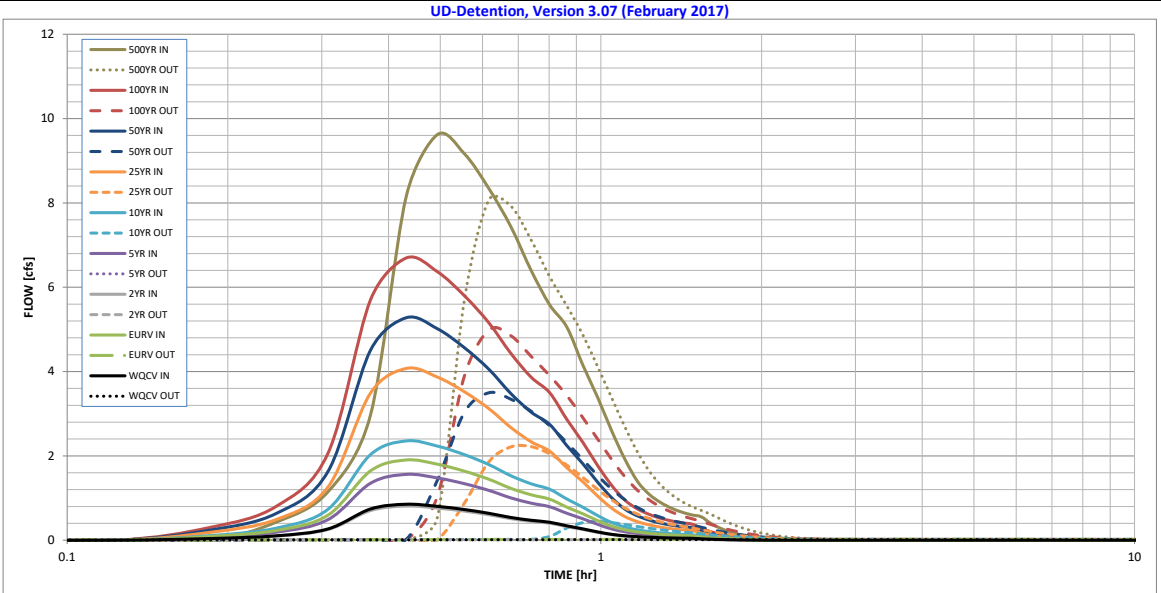
Calculated Parameters for Spillway

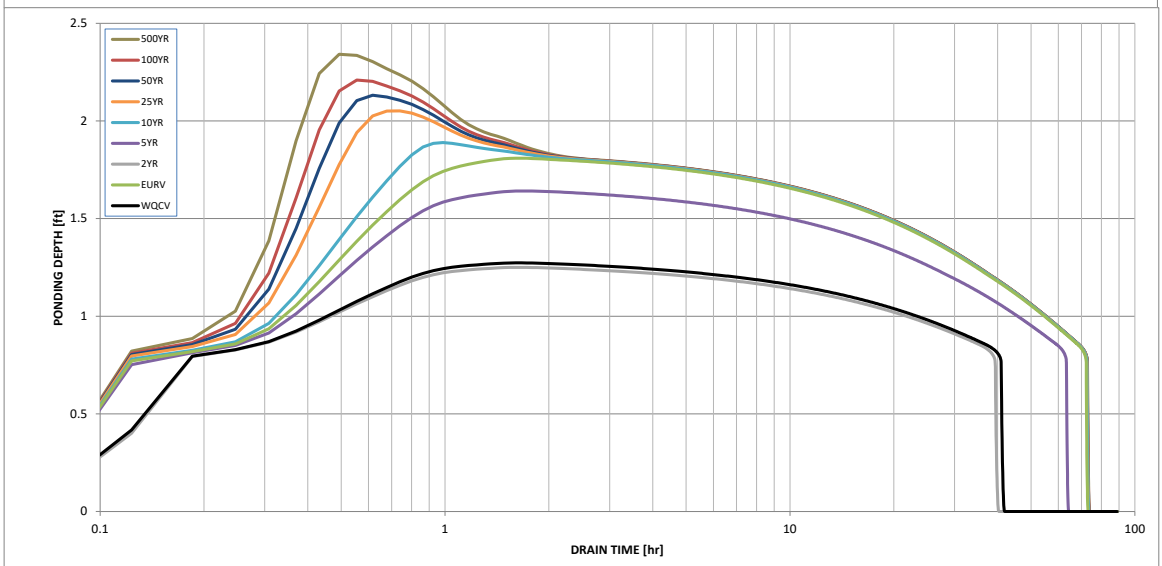
Routed Hydrograph Results

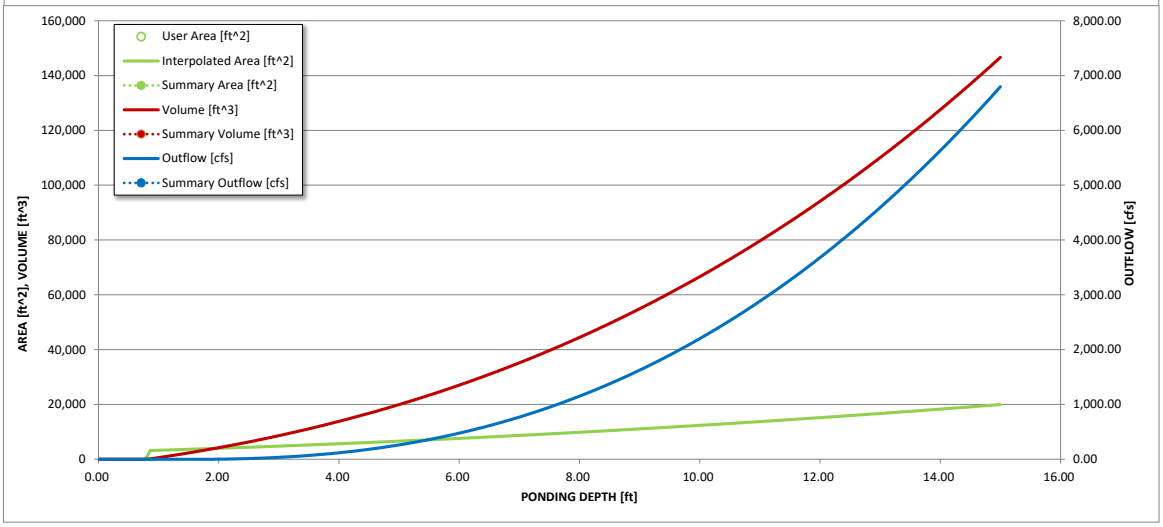
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	0.55	0.82	1.04	1.34	1.57	1.79	2.31
Calculated Runoff Volume (acre-ft) =	0.037	0.083	0.035	0.068	0.103	0.179	0.232	0.296	0.427
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.036	0.082	0.034	0.067	0.102	0.179	0.232	0.295	0.426
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.09	0.27	0.69	0.94	1.24	1.85
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.3	0.7	1.9	2.6	3.4	5.1
Peak Inflow Q (cfs) =	0.9	1.9	0.8	1.6	2.4	4.1	5.3	6.7	9.6
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.4	2.2	3.5	5.0	8.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.6	1.2	1.3	1.5	1.6
Structure Controlling Flow =	Plate	Spillway	Plate	Plate	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	69	38	61	68	65	63	61	56
Time to Drain 99% of Inflow Volume (hours) =	**41**	71	39	63	71	70	70	69	67
Maximum Ponding Depth (ft) =	1.27	1.81	1.25	1.64	1.89	2.05	2.13	2.21	2.34
Area at Maximum Ponding Depth (acres) =	0.08	0.09	0.08	0.09	0.09	0.09	0.09	0.10	0.10
Maximum Volume Stored (acre-ft) =	0.034	0.079	0.033	0.065	0.086	0.101	0.109	0.116	0.129

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.70 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph Constant	0:07:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:11:06	0.04	0.09	0.04	0.07	0.11	0.19	0.24	0.30	0.43
1.351	0:14:48	0.10	0.23	0.10	0.19	0.29	0.49	0.64	0.81	1.15
	0:18:30	0.27	0.60	0.26	0.49	0.74	1.27	1.64	2.07	2.96
	0:22:12	0.74	1.64	0.70	1.35	2.03	3.49	4.50	5.70	8.15
	0:25:54	0.85	1.90	0.81	1.56	2.35	4.07	5.28	6.69	9.62
	0:29:36	0.80	1.80	0.76	1.48	2.23	3.87	5.02	6.37	9.17
	0:33:18	0.73	1.64	0.69	1.34	2.03	3.52	4.57	5.80	8.34
	0:37:00	0.64	1.45	0.61	1.18	1.79	3.12	4.06	5.16	7.43
	0:40:42	0.54	1.23	0.51	1.00	1.53	2.67	3.48	4.43	6.40
	0:44:24	0.47	1.08	0.45	0.88	1.34	2.34	3.04	3.87	5.58
	0:48:06	0.43	0.97	0.40	0.79	1.21	2.11	2.75	3.50	5.06
	0:51:48	0.34	0.78	0.32	0.64	0.98	1.72	2.24	2.87	4.16
	0:55:30	0.27	0.63	0.25	0.51	0.78	1.39	1.81	2.32	3.38
	0:59:12	0.20	0.46	0.19	0.38	0.58	1.04	1.37	1.77	2.59
	1:02:54	0.14	0.33	0.13	0.27	0.42	0.76	1.00	1.30	1.91
	1:06:36	0.10	0.25	0.10	0.20	0.31	0.56	0.74	0.95	1.39
	1:10:18	0.08	0.20	0.08	0.16	0.25	0.44	0.58	0.74	1.08
	1:14:00	0.07	0.16	0.07	0.13	0.20	0.36	0.48	0.61	0.89
	1:17:42	0.06	0.14	0.06	0.11	0.17	0.31	0.41	0.52	0.76
	1:21:24	0.05	0.12	0.05	0.10	0.15	0.27	0.36	0.46	0.67
	1:25:06	0.05	0.11	0.05	0.09	0.14	0.25	0.32	0.41	0.60
	1:28:48	0.05	0.10	0.04	0.08	0.13	0.23	0.30	0.38	0.56
	1:32:30	0.03	0.08	0.03	0.06	0.10	0.17	0.22	0.28	0.41
	1:36:12	0.02	0.06	0.02	0.05	0.07	0.12	0.16	0.21	0.30
	1:39:54	0.02	0.04	0.02	0.03	0.05	0.09	0.12	0.15	0.22
	1:43:36	0.01	0.03	0.01	0.02	0.04	0.06	0.09	0.11	0.16
	1:47:18	0.01	0.02	0.01	0.02	0.03	0.05	0.06	0.08	0.11
	1:51:00	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.08
	1:54:42	0.00	0.01	0.00	0.01	0.01	0.02	0.03	0.04	0.06
	1:58:24	0.00	0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.04
	2:02:06	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02
	2:05:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	2:09:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:13:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:16:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:20:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:24:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:28:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:31:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:39:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:42:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:46:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:53:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:57:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:01:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:08:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:12:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:16:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:34:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:38:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:49:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:56:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:04:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:07:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:19:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:26:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 5 2022

8-INCH OUTFALL PIPE - 1.25-YEAR

Invert Elev Dn (ft)	=	6943.25
Pipe Length (ft)	=	35.00
Slope (%)	=	0.74
Invert Elev Up (ft)	=	6943.51
Rise (in)	=	8.0
Shape	=	Circular
Span (in)	=	8.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

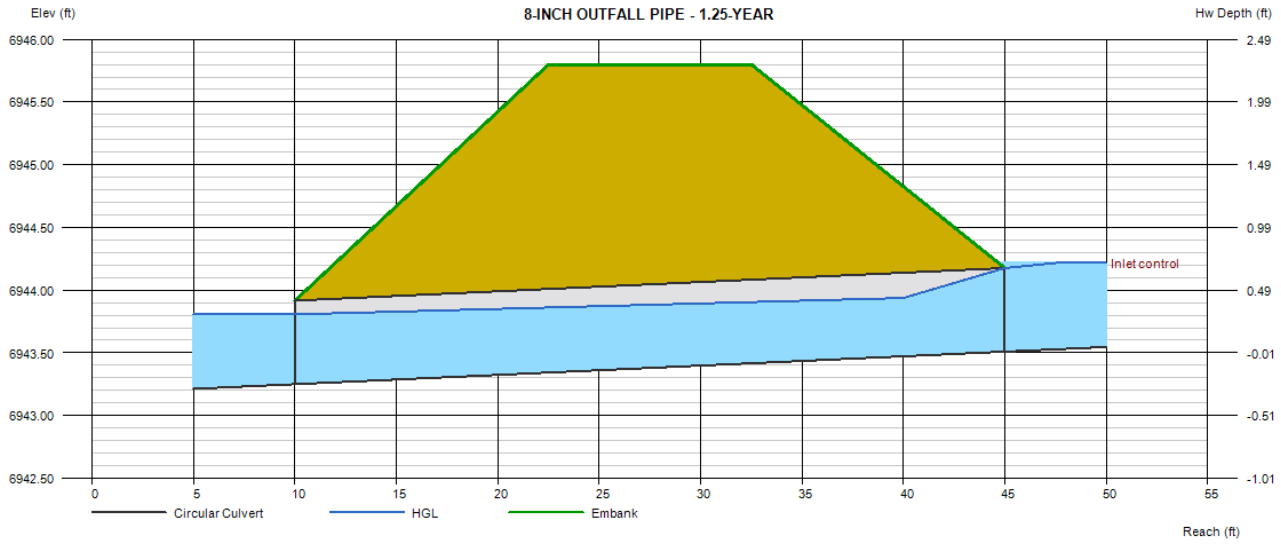
Top Elevation (ft)	=	6945.80
Top Width (ft)	=	10.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	0.89
Qmax (cfs)	=	0.89
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.89
Qpipe (cfs)	=	0.89
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.86
Veloc Up (ft/s)	=	3.55
HGL Dn (ft)	=	6943.81
HGL Up (ft)	=	6943.96
Hw Elev (ft)	=	6944.22
Hw/D (ft)	=	1.06
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, May 5 2022

8-INCH OUTFALL PIPE - 5-YEAR (MAX CAPACITY)

Invert Elev Dn (ft)	=	6943.25
Pipe Length (ft)	=	35.00
Slope (%)	=	0.74
Invert Elev Up (ft)	=	6943.51
Rise (in)	=	8.0
Shape	=	Circular
Span (in)	=	8.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

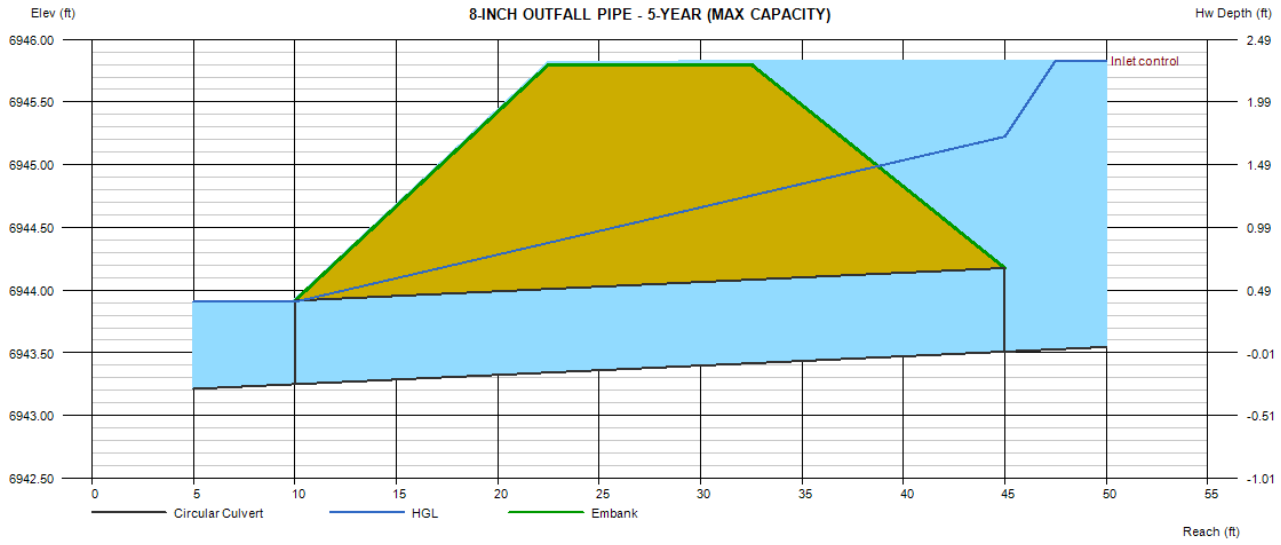
Top Elevation (ft)	=	6945.80
Top Width (ft)	=	10.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	2.50
Qmax (cfs)	=	2.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.50
Qpipe (cfs)	=	2.40
Qovertop (cfs)	=	0.10
Veloc Dn (ft/s)	=	6.89
Veloc Up (ft/s)	=	6.87
HGL Dn (ft)	=	6943.91
HGL Up (ft)	=	6945.23
Hw Elev (ft)	=	6945.83
Hw/D (ft)	=	3.48
Flow Regime	=	Inlet Control



Weir Report

Forebay Overflow Weir - Minor Event Peak Flow

Rectangular Weir

Crest	= Broad
Bottom Length (ft)	= 3.00
Total Depth (ft)	= 0.50

Calculations

Weir Coeff. Cw	= 2.60
Compute by:	Known Q
Known Q (cfs)	= 2.50

Highlighted

Depth (ft)	= 0.47
Q (cfs)	= 2.500
Area (sqft)	= 1.40
Velocity (ft/s)	= 1.78
Top Width (ft)	= 3.00