

Preliminary Drainage Report
for
The Sanctuary Filing 1
at
Meridian Ranch



EL PASO COUNTY, COLORADO

August 2022

Prepared For:

GTL DEVELOPMENT, INC.
P.O. Box 80036
San Diego, CA 92138

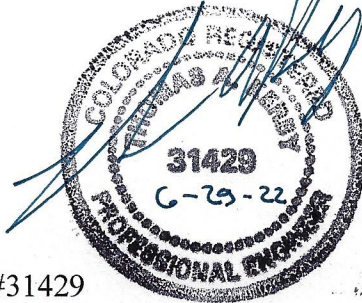
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PCD Project No. PUDSP22-004

CERTIFICATIONS

Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.



Thomas A. Kerby, P.E. #31429

Owner/Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.


Raul Guzman, Vice President
GTL Development, Inc.
P.O. Box 80036
San Diego, CA 92138

6/29/22
Date

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 & 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

APPROVED
Engineering Department

08/17/2022 3:39:53 PM
dsdnijkamp

EPC Planning & Community
Development Department

Joshua Palmer, P.E.
County Engineer / ECM Administrator

Date

The Sanctuary Filing 1 at Meridian Ranch Preliminary Drainage Report

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EXECUTIVE SUMMARY

The purpose of the following Preliminary Drainage Report (PDR) is to present the changes to the drainage patterns as a result the Sanctuary Filing 1 at Meridian Ranch (Sanctuary). Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) (1994 version) and portions of the City of Colorado Springs Drainage Criteria Manual, Volume 1 (DCM-1) ((2014 version) as amended by the El Paso County Engineering Criteria Manual (ECM).

This report based on the current version of the Meridian Ranch Sketch Plan amendment as adopted by the El Paso County Board of Commissioners on March 13, 2018. Hydrologic calculations follow method outlined in Chapter 6 of the 2014 version of the City of Colorado Springs Drainage Criteria Manual (COSDCM) as adopted by the El Paso County Board of County Commissioners by Resolution 15-042. Chapter 6 addresses the hydrologic calculation methods and includes an updated hydrograph to be used with storm drainage runoff. The Board adopted by the same resolution, Section 3.2.1 of Chapter 13 of the COSDCM referencing Full Spectrum Detention; the concept “provides better control of the full range of runoff rates that pass through detention facilities than the convention multi-stage concept. This section of the COSDCM identifies the necessity to provide full spectrum detention but does not prescribe a methodology to reach such the detention requirements. This report includes hydrologic models from HEC-HMS for the historic, interim and future conditions for the 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, and 100-yr design storm frequencies. The interim and the future conditions include the existing detention facilities sized and modeled such that *“frequent and infrequent inflows are released at rates approximating undeveloped conditions”*

The Sanctuary encompasses 74± acres and is located in Section 20, Township 12 South, Range 64 West of the 6th Principal Meridian. It is approximately 12 miles northeast of the city of Colorado Springs, 2.5 miles north of the unincorporated town of Falcon, and immediately north of the Woodmen Hills development.

the Sanctuary Filing 1 is located within Gieck Ranch Drainage Basin. The Gieck Ranch Basin has been studied, but has not received final approval from El Paso County. The developer has agreed to meet the requirements of the studied Gieck Ranch Basin but as yet to be approved Drainage Basin Study.

Based on the aforementioned design parameters the development of the project will not adversely affect downstream properties.

INTRODUCTION

Purpose

The purpose of the following Preliminary Drainage Report (PDR) is to present proposed changes to the drainage patterns as a result of the development of the Sanctuary. The report outlines the proposed drainage mitigation based on calculated developed flows in excess of allowable exiting runoff discharge.

Scope

The scope of this report includes:

- Location and description of the proposed development stating the proposed land use, density, acreage and adjacent features to the site.
- Calculations for design peak flows from all off-site tributary drainage areas.
- Calculations for design peak flows within the proposed project area for all drainage areas.
- Discussion of major drainage facilities required as a result of the development.
- Discussion and analysis of existing and proposed facilities.

Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) (1994 version) and those portions of the City of Colorado Springs Drainage Criteria Manual, Volume 1 (DCM-1) ((2014 version) adopted by Resolution 15-042 of the El Paso County Board of County Commissioners as amended by the El Paso County Engineering Criteria Manual (ECM).

Background

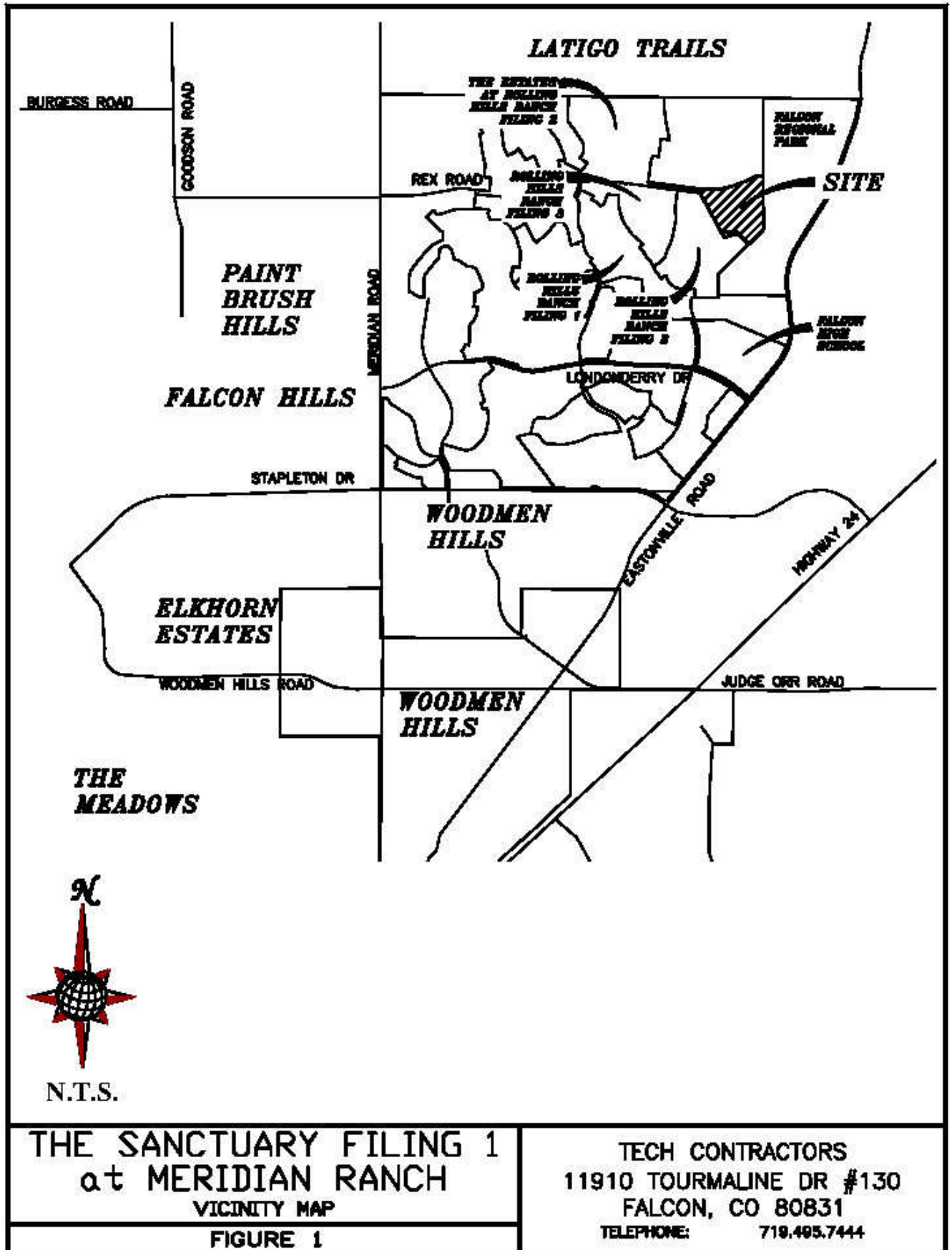
On November 16, 2000 the El Paso County Board of County Commissioners approved the rezoning of the Meridian Ranch project (PUD-00-010) from A-35 to PUD with several conditions. Condition number seven stated in part that “drainage plans shall release and/or retain at approximately eighty percent (80%) of historic rates.” At the time of the initial approvals there were no drainage improvements downstream of the Meridian Ranch project and the existing natural channels were shallow and undefined.

The Sketch Plan Amendment (SKP-17-001) was processed and approved in 2018 by the El Paso County Board of County Commissioners by resolution 18-104 for Meridian Ranch. The resolution eliminated the required restriction of 80% of historic peak flow rates mentioned above. The detention pond proposed with this project will release at historic or less peak flow rates as per the current El Paso County stormwater requirements.

No development has occurred downstream of this project except for portions of the Falcon Regional Park providing ballparks and associated parking. The Meridian Ranch MDDP and this report indicate the Eastonville Road culvert crossing located downstream of this project does not provide enough capacity for the historic flow rates. It is anticipated that this culvert will be upgraded at the time of the Eastonville Road construction.

Current calculations show the future design discharge of the proposed Pond G to the Falcon Regional Park to be below historic flow rates at full buildout for the full spectrum of design storms.

Figure 1: Vicinity Map



EXISTING CONDITIONS

General Location

The Sanctuary project encompasses 74± acres and is located in Section 20, Township 12 South, Range 64 West of the 6th Principal Meridian. It is approximately 12 miles northeast of the city of Colorado Springs, 2.5 miles north of the unincorporated town of Falcon, and immediately north of the Woodmen Hills development.

Land Use

Historically, ranching dominated the area surrounding Meridian Ranch; however, currently urbanization has occurred in the general vicinity. Most notably, urbanization is occurring to the north with Latigo Trails, to the south in the Woodmen Hills Subdivision, to the east in Four Way Ranch, to the west in the Falcon Hills subdivision, and to the northwest in the Paint Brush Hills subdivision.

Climate

Mild summers and winter, light precipitation; high evaporation and moderately high wind velocities characterize the climate of the study area. The average annual monthly temperature is 48.4 F with an average monthly low of 30.3 F in the winter and an average monthly high of 68.1 F in the summer. Two years in ten will have maximum temperature higher than 98 F and a minimum temperature lower than -16 F. Precipitation averages 15.73" annually, with 80% of this occurring during the months of April through September. The average annual Class A pan evaporation is 45 inches. (Soil Survey of El Paso County Area, Colorado).

Topography and Floodplains

The topography of the site is typical of a high desert, short prairie grass with relatively flat slopes generally ranging from 2% to 4%. The project site drains generally from the northwest to southeast and is tributary to the Black Squirrel Creek.

The Flood Insurance Rate Maps (FIRM No. 08041C0552G dated 12/07/2018) indicates that the project is outside of any designated flood plain. Please see Figure 2: The Sanctuary Federal Emergency Management Agency (FEMA) Floodplain Map.

Geology

The National Resources Conservation Service (NRCS) soil survey records indicate that the service area is predominately covered by soils classified in the Columbine (53 ac.) and Stapleton series (21 ac.). These series are categorized in the Hydrological Soil Groups A & B.

The Stapleton (83) sandy loam is a deep, non-calcareous, well-drained soil formed in alluvium derived from arkosic bedrock on uplands. Permeability of this soil is rapid. Available water capacity is moderate, surface runoff is slow, and the hazard of erosion and soil blowing is moderate. The Stapleton series is categorized as a Hydrological Soil Group B.

This soil is used mainly for grazing livestock, for wildlife habitat and for home sites. The main limitation of this soil for urban development is a hazard of flooding in some areas.

Figure 2: FEMA Floodplain Map

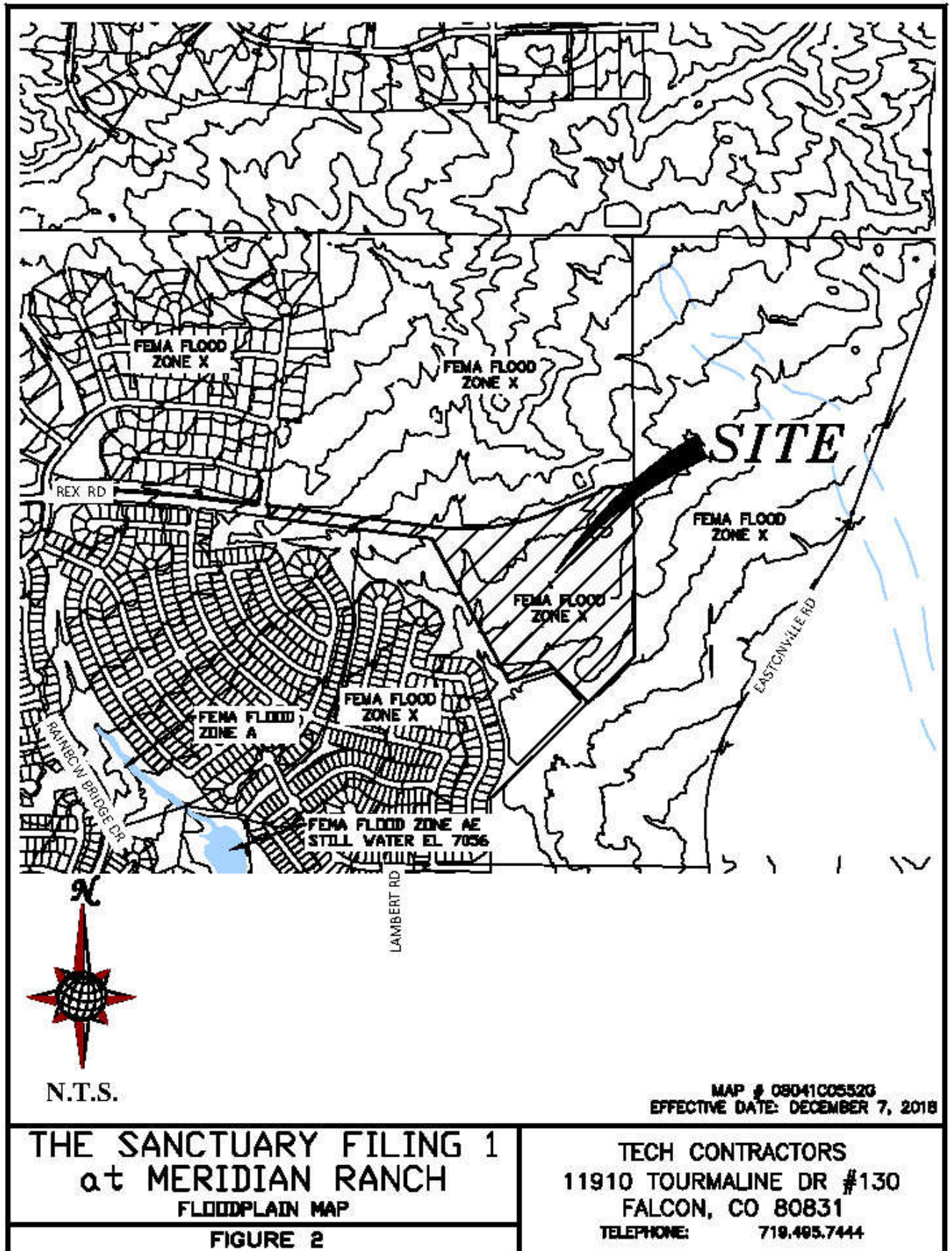
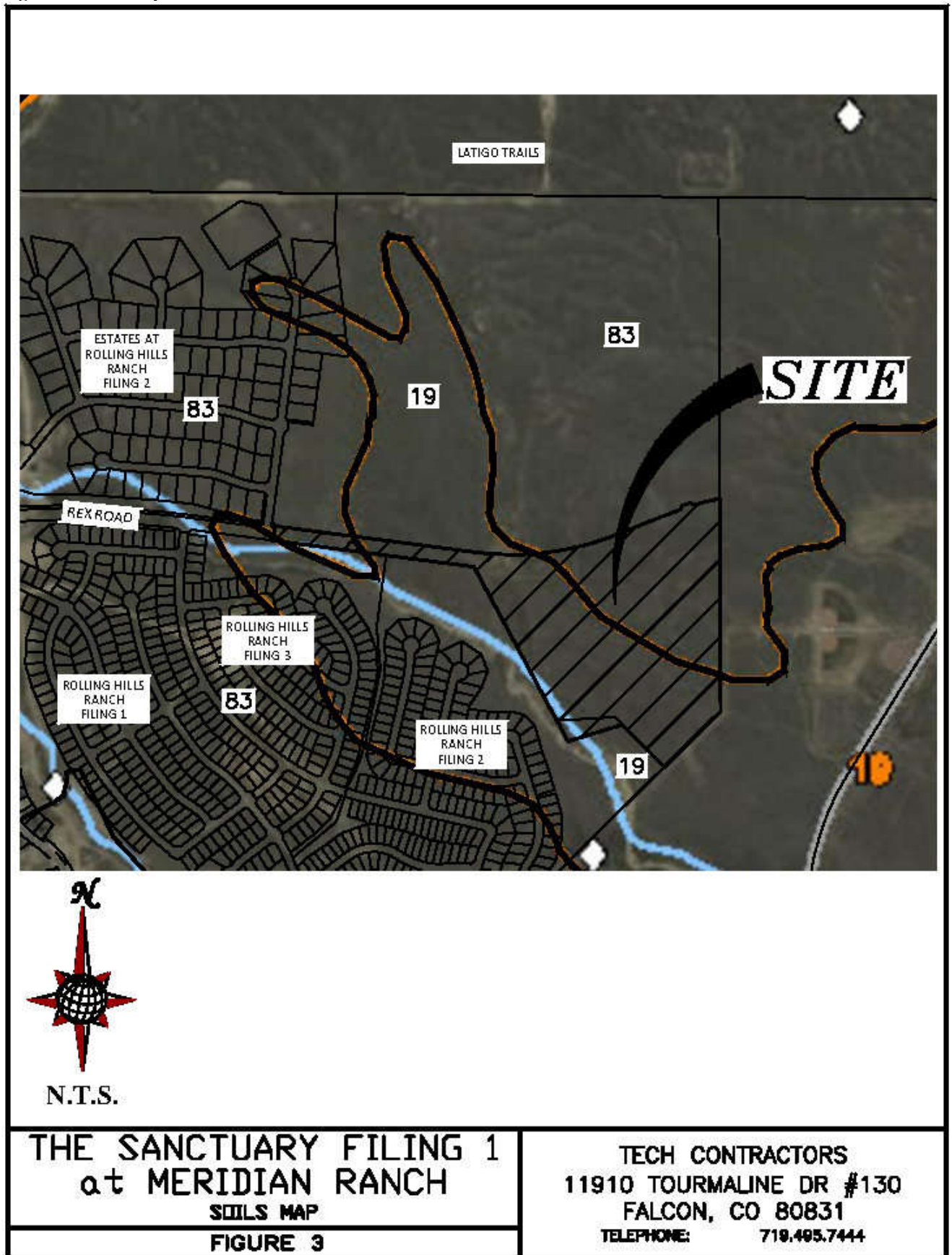


Figure 3: Soils Map



This soil is suited to habitat for open land and rangeland wildlife. The main limitation of this soil for urban development is frost-action potential.

Typically, these soils are well-drained, gravelly sandy loams that form on alluvial terraces and fans and exhibit high permeability and low available water capacity with depth to bedrock greater than 6 feet.

The Columbine (19) gravelly sandy loam is a deep, well-drained to excessively drained soil formed in coarse textured material on alluvial terraces, fans and flood plains. Permeability of this soil is very rapid. Available water capacity is low to moderate, surface runoff is slow, and the hazard of erosion is slight to moderate. The Columbine series is categorized as a Hydrological Soil Group A.

This soil is used mainly for grazing livestock, for wildlife habitat and for home sites. The main limitation of this soil for urban development is a hazard of flooding in some areas.

Note: (#) indicates Soil Conservation Survey soil classification number. See Figure 3 the Sanctuary Filing 1 – Soils Map.

Natural Hazards Analysis

Natural hazards analysis indicates that no unusual surface or subsurface hazards are located near the vicinity. However, because the soils are cohesionless, sloughing of steep banks during drilling and/or excavation could occur. By citing improvements in a manner that provides an opportunity to lay the banks of excavations back at a 1:1 slope during construction, the problems associated with sloughing soils can be minimized.

DRAINAGE BASINS AND SUB-BASINS

The site is near the top of the Gieck Ranch Drainage Basin and accepts flow from areas north of the extension of Rex Road within Meridian Ranch and portions of the Latigo development.

Three different scenarios were analyzed for the drainage conditions for the project.

The first scenario analyzes the historic conditions for Meridian Ranch. This condition has all of Meridian Ranch in the pre-development state; where the entirety of Meridian Ranch is modeled in its undeveloped, undisturbed condition, alternatively called the historic condition.

The second scenario is the interim conditions scenario and it consists of the current existing conditions for all areas whether developed or undeveloped/historic with the addition of the Sanctuary Filing 1 in the proposed developed condition. The current existing conditions assume all approved projects tributary to the Sanctuary Filing 1 are at full buildout. This condition was analyzed to ensure that the historic flow rates at the outlets of the existing Pond G (Design Point G12) located upstream of and adjacent to the Falcon Regional Park are maintained.

The final scenario analyzes the future build out conditions for the entirety of Meridian Ranch to ensure the storm drain and future detention facilities located at the discharge point downstream of this project are able to properly attenuate the full spectrum of developed peak flow rates to historic peak flow rates as the storm water exits the Meridian Ranch project onto the adjacent Falcon Regional Park.

DRAINAGE DESIGN CRITERIA

SCS Hydrograph Procedure

The US Army Corp of Engineers HEC-HMS computer program was used to model the Soil Conservation Service (SCS) Hydrograph procedure to determine final design parameters for the major drainage facilities within the project. Onsite basin areas were calculated using aerial topography of the site and approved final design data. Times of concentration were estimated using the SCS procedures described in the DCM. Based upon the hydrologic soil type, the natural conditions found in the basins and the runoff curve numbers (CN) chart from Table 6-10 of the City of Colorado Springs DCM for Antecedent Runoff Condition II (ARC II), the following CN values were used for the given conditions.

Table 1: SCS Runoff Curve Numbers

| Condition | CN* | | |
|-----------------------------|-----|--------------------|----|
| Residential Lots (5 acre) | 63 | School | 80 |
| Residential Lots (2.5 acre) | 66 | Parks/Open Space | 62 |
| Residential Lots (1 acre) | 68 | Commercial | 85 |
| Residential Lots (1/2 acre) | 70 | Roadways | 98 |
| Residential Lots (1/3 acre) | 72 | Graded | 67 |
| Residential Lots (1/4 acre) | 75 | Golf Course | 62 |
| Residential Lots (1/5 acre) | 78 | Latigo Undeveloped | 65 |
| Residential Lots (1/6 acre) | 80 | Undeveloped | 61 |

*Curve Numbers were interpolated and based on amount of impervious area per lot. The 24 hour storm precipitation values were selected from the NOAA Atlas 14, Volume 8, Version 2 for the Meridian Ranch location (Latitude 38.9783°, Longitude -104.5842°, Elevation 7054 ft). These numbers along with SCS information were used as input to the U.S. Army Corp of Engineers HEC-HMS computer model to determine design runoffs. See the table for all the design storm events in Appendix A. These numbers along with SCS information were used as input to the U.S. Army Corp of Engineers HEC-HMS computer model to determine design runoffs.

Full Spectrum Design

The City of Colorado Springs adopted a new Drainage Criteria Manual (DCM) in 2014 which incorporated the use of *Full Spectrum Design* for storm drainage analysis for projects located within the city limits. El Paso County adopted portions of the City's 2014 DCM by resolution in January 2015; the County resolution adopted Chapter 6 (Hydrology) and Section 3.2.1 of Chapter 13 (Full Spectrum Detention) for projects outside of the City of Colorado Springs establishing a one year review period to analyze the impacts of the Full Spectrum Design on the storm drainage analysis of projects. This report has incorporated the use of full spectrum in the analysis using the SCS Method to determine the size requirements for the detention pond during the interim and future conditions.

The idea behind full spectrum detention is to release the developed runoff flow rates that will approximate those of the pre-developed condition. The existing design of Pond G and the outlet control structure meets or exceeds the intent and spirit of the concept.

Table 2: Detention Pond Summary:

| POND G | | | | |
|--------------------|----------------|-----------------|-----------------|-------------------|
| | PEAK INFLOW | PEAK OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | FT |
| INTERIM CONDITIONS | | | | |
| 2-YEAR STORM | 33 | 5.0 | 5.0 | 7026.7 |
| 5-YEAR STORM | 85 | 19 | 8.7 | 7027.5 |
| 10-YEAR STORM | 156 | 50 | 11.3 | 7027.9 |
| 50-YEAR STORM | 452 | 307 | 20.4 | 7029.5 |
| 100-YEAR STORM | 667 | 466 | 25.7 | 7030.3 |
| FUTURE CONDITIONS | | | | |
| 2-YEAR STORM | 47 | 5.3 | 5.7 | 7026.8 |
| 5-YEAR STORM | 108 | 21 | 8.9 | 7027.5 |
| 10-YEAR STORM | 187 | 52 | 11.5 | 7028.0 |
| 50-YEAR STORM | 477 | 293 | 20.0 | 7029.4 |
| 100-YEAR STORM | 663 | 450 | 24.8 | 7030.1 |

DRAINAGE CALCULATIONS

SCS General Overview

The project is located within the Gieck Ranch Drainage Basin; storm water runoff will be conveyed across the site overland and within proposed storm drain networks to the existing Pond G detention facility.

The Pond G detention facility has been adequately sized such that the developed flows detained and released will approximate the historic flow rates for the various design storm events for both the interim condition and in the future as the storm flow exits Meridian Ranch onto the Falcon Regional Park.

Figure 4: Meridian Ranch SCS Calculations – Historic Conditions Map, Figure 5: Meridian Ranch SCS Calculations – Interim Conditions Map and Figure 6: Meridian Ranch SCS Calculations – Future Conditions Map depict the historic, interim and future general drainage patterns for the Sanctuary Filing 1.

The purpose of this report is to show that the development of the Sanctuary Filing 1 will not adversely impact the existing drainage facilities adjacent to and downstream of the developed area and the existing Pond G is properly sized for the anticipated future development.

SCS Calculations

Historic Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics under Existing Conditions using the SCS calculation method. Please refer to Figure 4 - Meridian Ranch SCS Calculations - Historic Basin Map.

Table 3: Historic Drainage Basins – SCS

| HISTORIC SCS (Full Spectrum) | | | | | | |
|------------------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| OS06 | 0.1313 | 80 | 52 | 12 | 3.8 | 0.52 |
| OS06-G02 | 0.1313 | 77 | 52 | 11 | 3.7 | 0.52 |
| OS05 | 0.0578 | 39 | 26 | 5.6 | 1.8 | 0.23 |
| OS05-G01 | 0.0578 | 38 | 25 | 5.5 | 1.7 | 0.23 |
| HG01 | 0.0547 | 32 | 21 | 4.7 | 1.5 | 0.22 |
| G01 | 0.1125 | 70 | 46 | 10 | 3.2 | 0.45 |
| G01-G02 | 0.1125 | 68 | 46 | 9.9 | 3.2 | 0.45 |
| HG02 | 0.0906 | 45 | 30 | 6.7 | 2.3 | 0.36 |
| G02 | 0.3344 | 191 | 127 | 27 | 9.0 | 1.32 |
| G02-G03 | 0.3344 | 190 | 125 | 27 | 9.0 | 1.32 |
| HG03 | 0.1828 | 77 | 51 | 12 | 4.3 | 0.72 |
| OS07 | 0.0328 | 25 | 17 | 4.5 | 1.7 | 0.26 |
| OS07-G03 | 0.0328 | 24 | 17 | 4.3 | 1.7 | 0.26 |
| G03 | 0.5500 | 291 | 192 | 42 | 15 | 2.25 |
| G03-G04 | 0.5500 | 281 | 189 | 42 | 14 | 2.25 |
| OS09 | 0.1547 | 91 | 63 | 19 | 8.3 | 1.89 |
| OS09-G04 | 0.1547 | 90 | 62 | 18 | 8.3 | 1.88 |
| HG04 | 0.0891 | 40 | 26 | 5.9 | 2.1 | 0.34 |
| HG05 | 0.1125 | 49 | 32 | 7.4 | 2.6 | 0.43 |
| OS08 | 0.0406 | 35 | 25 | 7.7 | 3.4 | 0.72 |
| OS08-G04 | 0.0406 | 34 | 24 | 7.4 | 3.4 | 0.72 |
| G04 | 0.9469 | 493 | 332 | 76 | 28 | 4.71 |
| G04-G05 | 0.9469 | 488 | 318 | 76 | 27 | 4.69 |
| HG06A | 0.1375 | 49 | 32 | 7.6 | 2.9 | 0.51 |
| G05 | 1.0844 | 536 | 350 | 84 | 30 | 5.18 |
| G05-G06 | 1.0844 | 520 | 348 | 83 | 30 | 5.16 |
| HG06B | 0.1031 | 33 | 22 | 5.3 | 2.0 | 0.37 |
| G06 | 1.1875 | 551 | 369 | 88 | 32 | 5.52 |

Interim Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics for the interim conditions using the SCS calculation method. Please refer to Figure 5 - Meridian Ranch SCS Calculations – Interim Basins Map

Table 4: Interim Drainage Basins-SCS

| INTERIM SCS (Full Spectrum) | | | | | | |
|-----------------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| OS06 | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 |
| G1a | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 |
| G1a-G2 | 0.1313 | 79 | 52 | 11 | 3.7 | 0.5 |
| OS05 | 0.0578 | 39 | 26 | 5.6 | 1.8 | 0.2 |
| OS05-G1 | 0.0578 | 39 | 25 | 5.5 | 1.7 | 0.2 |
| FG01 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 |
| FG01-G1 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 |
| G1 | 0.1116 | 61 | 41 | 11 | 4.9 | 1.1 |
| G1-G2 | 0.1116 | 61 | 41 | 11 | 4.8 | 1.1 |
| FG02 | 0.0391 | 32 | 22 | 6.4 | 2.7 | 0.5 |
| G2 | 0.2820 | 167 | 112 | 27 | 10 | 1.9 |
| G2-G3 | 0.2820 | 163 | 108 | 27 | 10 | 1.9 |
| FG03 | 0.0203 | 24 | 17 | 5.9 | 3.0 | 0.8 |
| FG04 | 0.0172 | 22 | 16 | 5.8 | 3.1 | 0.9 |
| G3 | 0.3195 | 185 | 123 | 31 | 12 | 2.4 |
| FG06 | 0.0675 | 56 | 40 | 12 | 5.8 | 1.3 |
| FG05 | 0.0580 | 45 | 33 | 12 | 6.7 | 2.4 |
| OS07ab | 0.0170 | 12 | 7.9 | 1.8 | 0.5 | 0.1 |
| OS07ab-POND F | 0.0170 | 12 | 7.6 | 1.7 | 0.5 | 0.1 |
| POND F IN | 0.4620 | 293 | 200 | 54 | 23 | 5.1 |
| POND F | 0.4620 | 178 | 121 | 16 | 8.0 | 2.1 |
| POND F-G7 | 0.4620 | 177 | 120 | 16 | 8.0 | 2.1 |
| OS07c | 0.0158 | 13 | 8.6 | 1.8 | 0.6 | 0.1 |
| OS07c-G4 | 0.0158 | 13 | 8.2 | 1.8 | 0.5 | 0.1 |
| FG21a | 0.0095 | 5.9 | 4.0 | 1.0 | 0.4 | 0.1 |
| G4 | 0.0253 | 19 | 12 | 2.8 | 0.9 | 0.1 |
| G4-G7 | 0.0253 | 17 | 12 | 2.7 | 0.9 | 0.1 |
| FG21b | 0.0150 | 21 | 16 | 6.5 | 3.9 | 1.7 |
| G7 | 0.5023 | 189 | 127 | 18 | 8.7 | 2.3 |
| G7-G8 | 0.5023 | 188 | 127 | 18 | 8.7 | 2.3 |
| FG22 | 0.1400 | 124 | 90 | 32 | 17 | 5.3 |
| OS08a | 0.0469 | 29 | 19 | 4.4 | 1.5 | 0.2 |
| OS08-G8 | 0.0469 | 29 | 19 | 4.3 | 1.5 | 0.2 |
| FG23a | 0.0216 | 21 | 15 | 5.2 | 2.7 | 0.8 |
| OS07d | 0.0036 | 2.6 | 1.7 | 0.4 | 0.1 | 0.0 |
| OS07d-G8 | 0.0036 | 2.6 | 1.7 | 0.4 | 0.1 | 0.0 |
| G8 | 0.7144 | 283 | 179 | 48 | 25 | 7.6 |
| G8-G10 | 0.7144 | 282 | 179 | 47 | 24 | 7.6 |
| OS08b | 0.1167 | 72 | 49 | 14 | 6.1 | 1.3 |
| OS08b-G9a | 0.1167 | 71 | 49 | 14 | 6.0 | 1.2 |
| FG24b | 0.0589 | 41 | 30 | 10 | 4.9 | 1.4 |
| FG24a | 0.0359 | 23 | 15 | 4.0 | 1.6 | 0.3 |
| OS09a | 0.0279 | 17 | 11 | 2.8 | 1.0 | 0.2 |
| OS09a-G9a | 0.0279 | 17 | 11 | 2.7 | 1.0 | 0.2 |
| G9a | 0.2394 | 148 | 100 | 28 | 12 | 2.6 |

| INTERIM SCS (Full Spectrum) | | | | | | |
|-----------------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| G9a-G9b | 0.2394 | 145 | 100 | 28 | 12 | 2.6 |
| FG24c | 0.0291 | 26 | 18 | 5.8 | 2.9 | 0.8 |
| FG24d | 0.0262 | 30 | 23 | 10 | 5.7 | 2.6 |
| G9b | 0.2947 | 185 | 126 | 36 | 16 | 4.0 |
| REX RD WQCV | 0.2947 | 173 | 126 | 35 | 16 | 3.8 |
| G9b-G10 | 0.2947 | 172 | 125 | 35 | 16 | 3.8 |
| FG23b | 0.0235 | 18 | 12 | 3.0 | 1.1 | 0.2 |
| G10 | 1.0326 | 459 | 286 | 80 | 39 | 11 |
| G10-G11 | 1.0326 | 458 | 285 | 79 | 38 | 11 |
| FG23c | 0.0109 | 11 | 7.7 | 2.3 | 1.0 | 0.2 |
| G11 | 1.0435 | 461 | 287 | 80 | 39 | 11 |
| FG25 | 0.1084 | 111 | 84 | 36 | 22 | 9.9 |
| FG28 | 0.0184 | 15 | 10 | 3.0 | 1.2 | 0.2 |
| POND G IN-W | 1.1703 | 544 | 357 | 112 | 56 | 17 |
| FG27 | 0.0679 | 81 | 64 | 34 | 24 | 14 |
| FG26 | 0.0570 | 45 | 32 | 11 | 5.1 | 1.3 |
| G13 | 0.0570 | 45 | 32 | 11 | 5.1 | 1.3 |
| G13-POND G | 0.0570 | 45 | 32 | 10 | 5.1 | 1.3 |
| POND G IN-E | 0.1249 | 123 | 95 | 44 | 29 | 15 |
| POND G | 1.2952 | 466 | 307 | 50 | 19 | 5.0 |
| G12 | 1.2952 | 466 | 307 | 50 | 19 | 5.0 |
| G12-G06 | 1.2952 | 465 | 307 | 49 | 19 | 5.0 |
| FG29 | 0.0983 | 60 | 39 | 8.9 | 2.9 | 0.4 |
| FG32 | 0.0402 | 21 | 14 | 3.1 | 1.0 | 0.2 |
| FG32-G06 | 0.0402 | 21 | 14 | 3.1 | 1.0 | 0.2 |
| G06 | 1.4337 | 491 | 323 | 52 | 20 | 5.3 |

Future Drainage - SCS Calculation Method

Following is a tabulation of the surface drainage characteristics for the future conditions using the SCS calculation method. Please refer to Figure 6 - Meridian Ranch SCS Calculations – Future Basins Map

Table 5: Future Drainage Basins-SCS

| FUTURE SCS (Full Spectrum) | | | | | | |
|----------------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| OS06 | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 |
| G1a | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 |
| G1a-G2 | 0.1313 | 79 | 52 | 11 | 3.7 | 0.5 |
| OS05 | 0.0578 | 39 | 26 | 5.6 | 1.8 | 0.2 |
| OS05-G1 | 0.0578 | 39 | 25 | 5.5 | 1.7 | 0.2 |
| FG01 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 |
| FG01-G1 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 |
| G1 | 0.1116 | 61 | 41 | 11 | 4.9 | 1.1 |
| G1-G2 | 0.1116 | 61 | 41 | 11 | 4.8 | 1.1 |
| FG02 | 0.0391 | 32 | 22 | 6.4 | 2.7 | 0.5 |
| G2 | 0.2820 | 167 | 112 | 27 | 10 | 1.9 |
| G2-G3 | 0.2820 | 163 | 108 | 27 | 10 | 1.9 |
| FG03 | 0.0203 | 24 | 17 | 5.9 | 3.0 | 0.8 |
| FG04 | 0.0172 | 22 | 16 | 5.8 | 3.1 | 0.9 |
| G3 | 0.3195 | 185 | 123 | 31 | 12 | 2.4 |
| FG06 | 0.0675 | 56 | 40 | 12 | 5.8 | 1.3 |
| FG05 | 0.0580 | 45 | 33 | 12 | 6.7 | 2.4 |
| OS07ab | 0.0170 | 12 | 7.9 | 1.8 | 0.5 | 0.07 |
| OS07ab-POND F | 0.0170 | 12 | 7.6 | 1.7 | 0.5 | 0.07 |
| POND F IN | 0.4620 | 293 | 200 | 54 | 23 | 5.1 |
| POND F | 0.4620 | 178 | 121 | 16 | 8.0 | 2.1 |
| POND F-G7 | 0.4620 | 177 | 120 | 16 | 8.0 | 2.1 |
| OS07c | 0.0296 | 19 | 12 | 2.7 | 0.9 | 0.12 |
| OS07c-G4 | 0.0296 | 19 | 12 | 2.6 | 0.9 | 0.12 |
| FG21a | 0.0095 | 5.9 | 4.0 | 1.0 | 0.4 | 0.06 |
| G4 | 0.0391 | 25 | 16 | 3.6 | 1.2 | 0.2 |
| G4-G7 | 0.0391 | 24 | 16 | 3.5 | 1.2 | 0.2 |
| FG21b | 0.0150 | 21 | 16 | 6.5 | 3.9 | 1.7 |
| G7 | 0.5161 | 194 | 131 | 18 | 8.9 | 2.3 |
| G7-G8 | 0.5161 | 194 | 131 | 18 | 8.9 | 2.3 |
| FG22 | 0.1354 | 121 | 88 | 32 | 17 | 5.4 |
| OS08a | 0.0251 | 16 | 11 | 2.3 | 0.7 | 0.10 |
| OS08-G8 | 0.0251 | 16 | 10 | 2.3 | 0.7 | 0.10 |
| FG23a | 0.0216 | 21 | 15 | 5.2 | 2.7 | 0.8 |
| OS07d | 0.0034 | 2.5 | 1.6 | 0.4 | 0.11 | 0.01 |
| OS07d-G8 | 0.0034 | 2.4 | 1.6 | 0.3 | 0.11 | 0.01 |
| G8 | 0.7016 | 279 | 178 | 46 | 24 | 7.7 |
| G8-G10 | 0.7016 | 278 | 177 | 45 | 24 | 7.6 |
| FG24b | 0.0589 | 76 | 57 | 24 | 15 | 6.5 |
| FG24a | 0.0348 | 24 | 16 | 4.5 | 2.0 | 0.4 |
| OS08b | 0.0165 | 9.5 | 6.3 | 1.4 | 0.5 | 0.07 |
| OS08b-G9a | 0.0165 | 9.4 | 6.0 | 1.4 | 0.5 | 0.07 |
| OS09a | 0.0093 | 5.3 | 3.5 | 0.8 | 0.3 | 0.04 |
| OS09a-G9a | 0.0093 | 5.2 | 3.4 | 0.7 | 0.3 | 0.04 |
| G9a | 0.1195 | 97 | 71 | 28 | 16 | 6.7 |

| FUTURE SCS (Full Spectrum) | | | | | | |
|----------------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| G9a-G9b | 0.1195 | 96 | 70 | 27 | 16 | 6.6 |
| FG24c | 0.0291 | 40 | 30 | 13 | 8.4 | 4.0 |
| FG24d | 0.0262 | 39 | 30 | 14 | 8.7 | 4.4 |
| G9b | 0.1748 | 170 | 127 | 53 | 32 | 14 |
| REX RD WQCV | 0.1748 | 158 | 125 | 51 | 31 | 14 |
| G9b-G10 | 0.1748 | 158 | 123 | 50 | 31 | 13 |
| FG23b | 0.0236 | 17 | 11 | 2.7 | 0.9 | 0.13 |
| G10 | 0.9000 | 390 | 263 | 90 | 46 | 15 |
| G10-G11 | 0.9000 | 389 | 254 | 85 | 44 | 15 |
| FG23c | 0.0109 | 11 | 7.6 | 2.2 | 1.0 | 0.2 |
| G11 | 0.9109 | 393 | 258 | 86 | 44 | 15 |
| FG25 | 0.1084 | 111 | 84 | 36 | 22 | 9.9 |
| FG28 | 0.0184 | 15 | 10 | 3.0 | 1.2 | 0.2 |
| POND G IN-WEST | 1.0377 | 503 | 350 | 122 | 63 | 22 |
| FG27 | 0.0679 | 98 | 79 | 42 | 30 | 18 |
| FG26 | 0.0570 | 65 | 50 | 24 | 16 | 8.2 |
| G13 | 0.0570 | 65 | 50 | 24 | 16 | 8.2 |
| G13-POND G | 0.0570 | 64 | 50 | 24 | 16 | 8.1 |
| POND G IN-EAST | 0.1249 | 160 | 127 | 64 | 44 | 25 |
| POND G | 1.1626 | 450 | 293 | 52 | 21 | 5.3 |
| G12 | 1.1626 | 450 | 293 | 52 | 21 | 5.3 |
| G12-G06 | 1.1626 | 449 | 293 | 52 | 21 | 5.3 |
| FG29 | 0.0983 | 60 | 39 | 8.9 | 2.9 | 0.4 |
| FG32 | 0.0402 | 51 | 40 | 20 | 14 | 7.5 |
| FG32-G06 | 0.0402 | 50 | 40 | 19 | 13 | 7.4 |
| G06 | 1.3011 | 491 | 317 | 57 | 22 | 7.5 |

Rational Calculations

The Rational Hydrologic Calculation Method was used to estimate the total runoff from the 5-year and the 100-year design storm and thus establish the storm drainage system design. Using the rational calculation methodology outlined in the Hydrology Section (Ch 6) of the COSDCM coupled with the El Paso County EPCDCM an effective storm drainage design for the Sanctuary Filing 1 has been designed. The storm drainage facilities have been designed such that the minor storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not overtop the curbs. The storm drainage facility has been designed such that the major storm will be captured by the inlets and conveyed by the storm drain pipes such that the street flow does not exceed the right-of-way widths for residential streets and the hydraulic grade line will be less than one foot below the surface.

The site is located within the Gieck Ranch Drainage Basin. The storm drain runoff will be collected by a series of inlets and storm drain pipe then conveyed through the project and discharge directly into the existing Pond G that is properly sized to safely convey the storm water flows away from the project without damaging adjacent property.

Rational Narrative

The following is a detailed narrative of the storm drainage system located in the Sanctuary Filing 1. These storm drainage systems meet the requirements of as found in the El Paso

County Engineering Criteria Manual I.7.1.C.5. (ECM) for storm water quality and discharge into Waters of the State. The discharge point is located at the existing Pond G, a Regional Detention Facility with WQCV incorporated into the design and construction. Some rear yard drainage will sheet flow off the properties into a proposed grass lined swale that will discharge directly to Pond G.

Offsite Areas

- Basin OS01 (27 acres, $Q_5 = 29$ CFS, $Q_{100} = 60$ CFS) contains off-site area north of Rex Road within the future Rolling Hills Ranch North subdivision entering the project via a proposed 36" RCP at Design Point 1. The surface runoff will be collected by a temporary inlet during the interim phase. In future phases the stormwater runoff will be collected and conveyed to Rex Road via a storm drain network. The stormwater is directed southerly manhole J01 north of Rex Road.
- Basin OS02 (3.0 acres, $Q_5 = 3.6$ CFS, $Q_{100} = 19$ CFS) contains off-site area north of Rex Road and west of Shelter Creek Dr. within the future Rolling Hills Ranch North subdivision entering the project via a proposed 42" RCP across Rex Rd. The surface runoff will sheet flow off of the future lots and be directed street, where the flow will continue downstream to a proposed 15' Type R sump inlet located at I01. All of the flow ($Q_5 = 3.6$ CFS, $Q_{100} = 19$ CFS) is captured and conveyed downstream via an 18" RCP to outlet at Storm Manhole J01.
- Basin OS03 (6.6 acres, $Q_5 = 7.4$ CFS, $Q_{100} = 19$ CFS) contains off-site area north of Rex Road and east of Shelter Creek Dr. within the future Rolling Hills Ranch North subdivision entering the project via a proposed 42" RCP across Rex Rd. The surface runoff will sheet flow off of the future lots and be directed street, where the flow will continue downstream to a proposed 15' Type R sump inlet located at I02. All of the flow ($Q_5 = 7.4$ CFS, $Q_{100} = 19$ CFS) is captured and conveyed downstream via an 18" RCP to outlet at Storm Manhole J01.
- The total pipe flow at Storm Manhole J01 from Basins OS01, OS02, & OS03 is $Q_5 = 38$ CFS, $Q_{100} = 93$ CFS and is conveyed via a 42" RCP to Storm Manhole J02.

Onsite Areas

- Basin A01 (5.3 acres, $Q_5 = 7.1$ CFS, $Q_{100} = 17$ CFS) contains rear portions of the lots north of Rex Road within the Rolling Hills Ranch North subdivision and runoff from Rex Road entering the project on the north side via the curb and gutter. The surface runoff will sheet flow off the residential lots onto Rex Road and be directed to the street, where the flow will be directed downstream to a proposed 15' Type R flow-by inlet located at I03. Most of the flow is captured ($Q_5 = 4.7$ CFS, $Q_{100} = 8.9$ CFS) with the remaining flow ($Q_5 = 2.4$ CFS, $Q_{100} = 8.1$ CFS) continuing downstream to Inlet I04.

- The total pipe flow at Storm Manhole J02 is $Q_5 = 42$ CFS, $Q_{100} = 99$ CFS and is conveyed via a 42" RCP to Storm Manhole J03.
- Basin A02 (4.3 acres, $Q_5 = 6.5$ CFS, $Q_{100} = 14$ CFS) contains lots along proposed Arriba Dr, the surface runoff will sheet flow off the lots where the flow will be directed downstream to a proposed 20' Type R flow-by inlet located at I04 and combined with flow-by from I03 ($Q_5 = 8.9$ CFS, $Q_{100} = 22$ CFS). Most of the flow ($Q_5 = 6.3$ CFS, $Q_{100} = 14$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J03. The remaining flow ($Q_5 = 2.5$ CFS, $Q_{100} = 8.7$ CFS) continuing downstream to Inlet I05.
- The total pipe flow at Storm Manhole J03 is $Q_5 = 47$ CFS, $Q_{100} = 110$ CFS and is conveyed via a 48" RCP to Storm Manhole J04.
- Basin A03 (5.4 acres, $Q_5 = 8.4$ CFS, $Q_{100} = 18$ CFS) contains lots along proposed Nederland Dr, the surface runoff will sheet flow off the lots where the flow will be directed downstream to a proposed 20' Type R flow-by inlet located at I05 and combined with flow-by from I04 ($Q_5 = 10$ CFS, $Q_{100} = 25$ CFS). Most of the flow ($Q_5 = 7.8$ CFS, $Q_{100} = 17$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J04. The remaining flow ($Q_5 = 2.2$ CFS, $Q_{100} = 8.2$ CFS) continuing downstream to Inlet I06.
- The total pipe flow at Storm Manhole J04 is $Q_5 = 53$ CFS, $Q_{100} = 124$ CFS and is conveyed via a 48" RCP to Storm Manhole J05.
- Basin A04 (4.7 acres, $Q_5 = 7.3$ CFS, $Q_{100} = 16$ CFS) contains lots along proposed Estes Ridge Dr and Rico Ridge Dr, the surface runoff will sheet flow off the lots where the flow will be directed downstream to a proposed 20' Type R flow-by inlet located at I06 and combined with flow-by from I05 ($Q_5 = 8.2$ CFS, $Q_{100} = 21$ CFS). Most of the flow ($Q_5 = 6.6$ CFS, $Q_{100} = 15$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J05. The remaining flow ($Q_5 = 1.6$ CFS, $Q_{100} = 6.6$ CFS) continuing downstream to Inlet I10.
- The total pipe flow at Storm Manhole J05 is $Q_5 = 59$ CFS, $Q_{100} = 136$ CFS and is conveyed via a 54" RCP to Storm Manhole J06 and J07.
- Basin A05 (2.5 acres, $Q_5 = 4.4$ CFS, $Q_{100} = 9.1$ CFS) contains lots fronting along the east side of Shelter Creek Dr. The surface runoff will sheet flow off the residential lots and be directed to the street, where the flow will be directed downstream to a proposed 15' Type R flow-by inlet located at I07. Most of the flow ($Q_5 = 3.7$ CFS, $Q_{100} = 6.7$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J07. The remaining flow ($Q_5 = 0.7$ CFS, $Q_{100} = 2.3$ CFS) continuing downstream to Inlet I11.
- The total pipe flow at Storm Manhole J07 is $Q_5 = 61$ CFS, $Q_{100} = 140$ CFS and is conveyed via a 54" RCP to Storm Manhole J11.

- Basin A06 (4.5 acres, $Q_5 = 8.0$ CFS, $Q_{100} = 18$ CFS) contains lots along Arriba Dr, Nederland Dr, and Estes Ridge Dr, the surface runoff will sheet flow off of the residential lots and be directed to the street, where the flow will be directed downstream to a proposed 20' Type R flow-by inlet located at I08. Most of the flow ($Q_5 = 5.8$ CFS, $Q_{100} = 11$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J08. The remaining flow ($Q_5 = 2.2$ CFS, $Q_{100} = 6.5$ CFS) continuing downstream to Inlet I09.
- The total pipe flow at Storm Manhole J08 is $Q_5 = 5.8$ CFS, $Q_{100} = 11$ CFS and is conveyed via an 18" RCP to Storm Manhole J09.
- Basin A07 (3.6 acres, $Q_5 = 5.7$ CFS, $Q_{100} = 13$ CFS) contains lots along proposed Rico Ridge Dr, the surface runoff will sheet flow off the lots where the flow will be directed downstream to a proposed 15' Type R flow-by inlet located at I09 and combined with flow-by from I08 ($Q_5 = 7.7$ CFS, $Q_{100} = 18$ CFS). Most of the flow ($Q_5 = 5.4$ CFS, $Q_{100} = 11$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J09. The remaining flow ($Q_5 = 2.3$ CFS, $Q_{100} = 7.2$ CFS) continuing downstream to Inlet I10.
- The total pipe flow at Storm Manhole J09 is $Q_5 = 11$ CFS, $Q_{100} = 21$ CFS and is conveyed via a 24" RCP to Storm Manholes J10 and J11.
- Basin A08 (3.3 acres, $Q_5 = 5.3$ CFS, $Q_{100} = 12$ CFS) contains lots along the north side of proposed Manzanola Dr, the surface runoff will sheet flow off the lots where the flow will be directed downstream to a proposed 10' Type R sump inlet located at I10 and combined with flow-by from I06 and I09 ($Q_5 = 6.4$ CFS, $Q_{100} = 18$ CFS). All of the 5-year flow ($Q_5 = 6.4$ CFS) and most of the 100-year flow ($Q_{100} = 14$ CFS) is captured and conveyed downstream via an 18" RCP to Storm Manhole J11. The remaining flow ($Q_{100} = 4.0$ CFS) crosses the street to Inlet I11.
- The total pipe flow at Storm Manhole J11 from J07, J10, & I10 is $Q_5 = 67$ CFS, $Q_{100} = 151$ CFS and is conveyed via a 54" RCP to Inlet I11.
- Basin A09 (5.3 acres, $Q_5 = 7.9$ CFS, $Q_{100} = 18$ CFS) contains lots along the west side of Retreat Peak Dr, the south side of Manzanola Dr and Cuchara Way. The surface runoff will sheet flow off the residential lots and be directed to the street, where the flow will be directed downstream to a proposed 20' Type R sump inlet located at I11 and combined with flow-by from I07 and I10 ($Q_5 = 7.9$ CFS, $Q_{100} = 18$ CFS). All the stormwater flow is captured by this inlet.
- The total pipe flow at I11 is $Q_5 = 75$ CFS, $Q_{100} = 169$ CFS and is conveyed via a 54" RCP to OS3 at existing Pond G.
- Basin A10 (2.0 acres, $Q_5 = 2.5$ CFS, $Q_{100} = 5.8$ CFS) contains the rear portions of lots along the east side of Shelter Creek Dr. The surface runoff will sheet flow off the

residential lots and be directed a swale flowing southerly toward DP3 near existing Pond G.

- Basin A11 (1.8 acres, $Q_5 = 2.1$ CFS, $Q_{100} = 5.2$ CFS) contains rear portions of lots along the south side of Manzanola Dr and the east side of Cuchara Way. The surface runoff will sheet flow off the residential lots and be directed to the swale mentioned above where the flow will be combined with the flow from A10 (total flow $Q_5 = 3.9$ CFS, $Q_{100} = 9.6$ CFS) and directed downstream to the existing Pond G.
- Basin A12 (9.9 acres, $Q_5 = 15$ CFS, $Q_{100} = 34$ CFS) contains the areas along Rex Road. The surface runoff will sheet flow off the surrounding areas and be directed downstream to a proposed 20' Type R sump inlet located at I12. All of the flow is captured by this inlet. The captured flow is conveyed downstream via a 24" RCP to the permanent water quality pond located on the north side of Rex Road at DP2.
- Basin OS04 (102 acres, $Q_5 = 46$ CFS, $Q_{100} = 159$ CFS) contains off-site area north of Rex Road within the future Rolling Hills Ranch North subdivision and portions of Latigo Trail further north. The storm drainage is collected within a drainage swale and directed to a water quality pond located north of Rex Rd west of Retreat Peak Dr. The stormwater runoff will be collected and conveyed under Rex Road via a 54" RCP and discharged into the existing natural dry creek and conveyed to the existing Pond G.
- Basin B01 (0.6 acres, $Q_5 = 0.5$ CFS, $Q_{100} = 1.6$ CFS) contains the area near the proposed park. The surface runoff will sheet flow in a southerly direction and be directed overland to the main channel flowing southerly toward the existing Pond G.
- Basin B02 (1.3 acres, $Q_5 = 0.8$ CFS, $Q_{100} = 3.3$ CFS) contains the rear portions of lots along the south side of Manzanola Dr. and the west side of Cuchara Way. The surface runoff will sheet flow off the residential lots towards the existing Pond G.

DETENTION POND

Existing Pond G Detention Storage Criteria

Existing Detention Pond G was constructed with grading operations associated with the Rough Grading Plans for Rolling Hills Ranch at Meridian Ranch in anticipation of the future development of the Rolling Hills Ranch in accordance with the approved Sketch Plan. The pond is located within the Gieck Ranch Drainage Basin in the eastern portion of Rolling Hills Ranch adjacent to the Falcon Regional Park and is adjacent to and south of the Sanctuary Filing 1. The pond is owned and maintained by the Meridian Service Metropolitan District (MSMD) and a maintenance agreement between the MSMD and El Paso County was recorded with the Rolling Hills Ranch Filing 1 final plat.

Pond G and the existing Pond F work in series such that the peak flow rates from the Meridian Ranch development do not adversely affect the drainage patterns downstream of the Meridian Ranch project. A permanent concrete control structure handles full build out of

the tributary area and reduces the developed flows to approximate the historic peak flow rates for the full spectrum of design storms.

The existing concrete control structure the outlet of Pond G will attenuate the peak developed flow rates to approximately historic peak rates for the full spectrum of design storms as per the requirements set forth in Resolution 15-042 adopted by the Board of County Commissioners, County of El Paso. The control structure consists of a water quality control feature, a rectangular slotted orifice located on the front and a grated top to reduce the developed peak flow rates. Table 6 provides summary data for the various design storms for the completed development for all areas tributary to Pond G including the Sanctuary Filing 1. Pond G was designed and constructed to receive and discharge the interim flows and the anticipated future developed flows and therefore there are no proposed changes to the existing pond or outlet structure.

Table 6: Pond G Summary Data

| POND G | | | | |
|--------------------|----------------|-----------------|-----------------|-------------------|
| | PEAK INFLOW | PEAK OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | FT |
| INTERIM CONDITIONS | | | | |
| 2-YEAR STORM | 33 | 5.0 | 5.0 | 7026.7 |
| 5-YEAR STORM | 85 | 19 | 8.7 | 7027.5 |
| 10-YEAR STORM | 156 | 50 | 11.3 | 7027.9 |
| 50-YEAR STORM | 452 | 307 | 20.4 | 7029.5 |
| 100-YEAR STORM | 667 | 466 | 25.7 | 7030.3 |
| FUTURE CONDITIONS | | | | |
| 2-YEAR STORM | 47 | 5.3 | 5.7 | 7026.8 |
| 5-YEAR STORM | 108 | 21 | 8.9 | 7027.5 |
| 10-YEAR STORM | 187 | 52 | 11.5 | 7028.0 |
| 50-YEAR STORM | 477 | 293 | 20.0 | 7029.4 |
| 100-YEAR STORM | 663 | 450 | 24.8 | 7030.1 |

An existing WQ Pond is located north of Rex Rd was designed to accommodate developed runoff from Rex Rd and offsite areas north this project within the future Rolling Hills Ranch North development. The WQ Pond is located near DP02 north of Rex Rd. It was constructed with the grading operations north of Rex Rd and will remain in place after construction is complete.

Downstream Analysis

The developed flow from this project will discharge at the westerly boundary of the Falcon Regional Park (G12), upstream of Eastonville Rd (DP G06). The discharge at this location during the interim period will be 491 CFS during the 100-yr storm event into an existing natural drainage course that traverses the regional park. The 100-year historical peak flow rate at the western boundary of the regional park is 536 CFS. The calculated 100-year interim flow rate will be 87% of the historic flow rate. See Table 7 for a complete comparative list of

the peak flow rates for the key design points impacted by the development of the Sanctuary Filing 1.

Table 7: Key Design Point Comparison – Interim SCS Model

| MERIDIAN RANCH DISCHARGE KEY DESIGN POINTS (INTERIM) | | | | | | |
|---|---------------|--|---|---|--|--|
| | | PEAK DISCHARGE Q ₁₀₀ (CFS) | PEAK DISCHARGE Q ₅₀ (CFS) | PEAK DISCHARGE Q ₁₀ (CFS) | PEAK DISCHARGE Q ₅ (CFS) | PEAK DISCHARGE Q ₂ (CFS) |
| G12 - DISCHARGE POINT AT REGIONAL PARK (G05 - HISTORIC) | Historic | 536 | 350 | 84 | 30 | 5.2 |
| | Interim | 466 | 307 | 50 | 19 | 5.0 |
| | % of Historic | 87% | 88% | 59% | 62% | 96% |
| G06 - EASTONVILLE ROAD ¹ | Historic | 551 | 369 | 88 | 32 | 5.5 |
| | Interim | 491 | 323 | 52 | 20 | 5.3 |
| | % of Historic | 89% | 87% | 59% | 62% | 96% |

¹ Flow rate at Eastonville Rd. listed for reference only

The outlet (DP G12) for Pond G located west of the Falcon Regional Park, upstream of Eastonville Rd (DP G06). At full buildout the discharge from Pond G will be 450 CFS during the 100-yr storm event into an existing natural drainage course that traverses the regional park. The 100-year historical peak flow rate at the western boundary of the regional park is 536 CFS. The calculated 100-year future developed flow rate will be 84% of the historic flow rate. The developed peak flow rate for the full spectrum of design storms are calculated to be below that of the corresponding historic peak flow rates. See Table 8 for a complete comparative list of the future developed peak flow rates for the key design points impacted by the development of Rolling Hills Ranch.

Table 8: Key Design Point Comparison – Future SCS Model

| MERIDIAN RANCH DISCHARGE KEY DESIGN POINTS (FUTURE) | | | | | | |
|--|---------------|--|---|---|--|--|
| | | PEAK DISCHARGE Q ₁₀₀ (CFS) | PEAK DISCHARGE Q ₅₀ (CFS) | PEAK DISCHARGE Q ₁₀ (CFS) | PEAK DISCHARGE Q ₅ (CFS) | PEAK DISCHARGE Q ₂ (CFS) |
| G12 - POND G OUTLET REGIONAL PARK (G05 - HISTORIC) | Historic | 536 | 350 | 84 | 30 | 5.2 |
| | Future | 450 | 293 | 52 | 21 | 5.3 |
| | % of Historic | 84% | 84% | 62% | 68% | 102% |
| G06 - EASTONVILLE ROAD ¹ | Historic | 551 | 369 | 88 | 32 | 5.5 |
| | Future | 491 | 317 | 57 | 22 | 7.5 |
| | % of Historic | 89% | 86% | 65% | 71% | 136% |

¹ Flow rate at Eastonville Rd. listed for reference only

DRAINAGE FEES

The proposed development falls in the Gieck Ranch Drainage Basin. The entire development occupies 48.90 acres of residential development of which 26.3 acres are residential development and 14.7 acres are designated as right-of-way, the remainder is open space.

The following is the imperviousness calculation:

| | <u>Acres</u> | <u>Assumed Imperviousness</u> | <u>Impervious Acres</u> |
|------------------|--------------|-------------------------------|-------------------------|
| Open Space | 7.84 | 3% | 0.24 |
| Right-of-way | 14.73 | 90% | 13.26 |
| Residential Lots | 26.33 | 65% (343 Lots) | 17.11 |
| Total | 48.90 | | 30.61=62.6% imperv |

GIECK RANCH FEES:

Drainage Fees: There are no drainage fees for this basin.

Bridge Fees: There are no bridge fees for this basin.

CONCLUSION

The rational and SCS based hydrologic calculation methods were used to estimate the historic, interim, and future developed runoff values to determine the impact of this project on surrounding property. The resulting calculations were used to estimate the hydraulic impact on the existing and proposed facilities. Finally, the model storms were analyzed to simulate the impacts of storm events of various return periods on the existing detention pond and downstream facilities. Based on the aforementioned design parameters the development of the project will not adversely affect downstream properties.

EROSION CONTROL DESIGN

General Concept

Historically, erosion on this property has been held to a minimum by a variety of natural features and agricultural practices including:

- Substantial prairie grass growth
- Construction of drainage arresting berms
- Construction of multiple stock ponds along drainage courses

Existing temporary sediment ponds will also help to minimize erosion by reducing both the volume and velocity of the peak runoff.

During construction, best management practices (BMP) for erosion control will be employed based on El Paso county Criteria. BMP's will be utilized as deemed necessary by the contractor and/or engineer and are not limited to the measures shown on the construction drawing set. The contractor shall minimize the amount of area disturbed during all construction activities.

In general the following shall be applied in developing the sequence of major activities:

- Install down-slope and side-slope perimeter BMP's before the land disturbing activity occurs.
- Do not disturb an area until it is necessary for the construction activity to proceed
- Cover or stabilize as soon as possible.
- Time the construction activities to reduce the impacts from seasonal climatic changes or weather events.
- The construction of filtration BMP's should wait until the end of the construction project when upstream drainage areas have been stabilized.
- Do not remove the temporary perimeter controls until after all upstream areas are stabilized.

Four Step Process

The following four step process is recommended for selecting structural BMP's in developing urban areas:

Step 1: Employ Runoff Reduction Practices

Homeowners and builders are encouraged to direct roof drains to the sideyards where the runoff will travel overland to the streets and creating an opportunity to allow the runoff to infiltrate into the ground.

Step 2: Stabilize Drainageways

The drainage swale located adjacent and south of the project was designed to have a wide flat bottom and slope reducing the velocity of the concentrated flow traveling along the drainageway. The construction of the swale also included erosion control along the entire length of the swale.

Step 3: Provide Water Quality Capture Volume (WQCV)

An existing extended detention pond with water quality capture volume is located to the south of the project that was designed to accommodate the runoff from this development.

An existing WQ Pond is located north of Rex Rd was designed to accommodate developed runoff from Rex Rd and offsite areas north this project within the future Rolling Hills Ranch North development.

Step 4: Consider Need for Industrial and Commercial BMP's

This project is neither industrial nor commercial and therefore this section does not apply.

Detention Pond

The detention ponds will act as the primary water quality control for the areas within the project boundaries. Runoff will be collected by the proposed storm drainage system and diverted into the detention pond where practical. The pond will serve a dual purpose: first, by facilitating the settling of sediment in runoff during and after construction (by means of the WQCV) and, second, by maintaining runoff at or below existing levels.

Silt Fence

Silt fence will be place along downstream limits of disturbed areas. This will prevent suspended sediment from leaving the site during infrastructure construction. Silt fencing is to remain in place until vegetation is reestablished.

Erosion Bales

Erosion bales will be placed ten (10) feet from the inlet of all culverts during construction to prevent culverts from filling with sediment. Erosion bales will remain in place until vegetation is reestablished. Erosion bale checks will be used on slopes greater than 1 percent to reduce flow velocities until vegetation is reestablished.

Miscellaneous

Best erosion control practices will be utilized as deemed necessary by the Contractor or Engineer and are not limited to the measures described above.

REFERENCES

1. “City of Colorado Springs/El Paso County Drainage Criteria Manual” September 1987, Revised November 1991, Revised October 1994.
2. Chapter 6, Hydrology and Chapter 11, Storage, Section 3.2.1 of the “City of Colorado Springs Drainage Criteria Manual” May 2014.
3. “Volume 2, El Paso County/City of Colorado Springs Drainage Criteria Manual-Stormwater Quality Policies, Procedures and Best Management Practices” November 1, 2002.
4. Flood Insurance Rate Study for El Paso County, Colorado and Incorporated Areas. Federal Emergency Management Agency, Revised March 17, 1997.
5. Soils Survey of El Paso County area, Natural Resources Conservation Services of Colorado.
6. Master Development Drainage Plan Meridian Ranch. August 2000. Prepared by URS Corp.
7. Revision to Master Development Drainage Plan Meridian Ranch. July 2021. Prepared by Tech Contractors.
8. Master Development Drainage Plan Latigo Trails. October 2001. Prepared by URS Corp.
9. Final Drainage Report for Estates at Rolling Hills Ranch Filing 2. September 2020. Prepared by Tech Contractors.
10. Final Drainage Report for Rolling Hills Ranch Filing 2. November 2020. Prepared by Tech Contractors.
11. Final Drainage Report for Rolling Hills Ranch Filing 3. May 2021. Prepared by Tech Contractors.

Appendices

Appendix A - HEC-HMS Data

Input Data

The Sanctuary PDR-FDR

| BASIN | AREA | | CURVE NO. | LAG TIME (min) |
|----------|--------|--------------------|-----------|----------------|
| | (acre) | (mi ²) | | |
| HISTORIC | | | | |
| OS05 | 37 | 0.0578 | 61.0 | 15.2 |
| OS06 | 84 | 0.1313 | 61.0 | 18.7 |
| OS07 | 21 | 0.0328 | 63.1 | 15.4 |
| OS08 | 26 | 0.0406 | 65.7 | 15.9 |
| OS09 | 98 | 0.1527 | 65.0 | 29.5 |
| HG01 | 35 | 0.0547 | 61.0 | 19.6 |
| HG02 | 58 | 0.0906 | 61.0 | 25.4 |
| HG03 | 117 | 0.1828 | 61.1 | 33.8 |
| HG04 | 57 | 0.0891 | 61.0 | 30.7 |
| HG05 | 72 | 0.1125 | 61.0 | 31.8 |
| HG06A | 88 | 0.1375 | 61.0 | 43.2 |
| HG06B | 66 | 0.1031 | 61.0 | 49.5 |
| HG07 | 63 | 0.0984 | 61.0 | 28.3 |
| HG08 | 85 | 0.1328 | 61.0 | 22.9 |
| HG09 | 114 | 0.1781 | 61.0 | 35.6 |
| HG10 | 88 | 0.1375 | 61.0 | 61.4 |
| HG11 | 131 | 0.2047 | 61.0 | 40.4 |
| HG12 | 83 | 0.1297 | 61.0 | 32.0 |
| HG13 | 67 | 0.1053 | 61.0 | 43.0 |
| HG14 | 147 | 0.2297 | 61.0 | 45.1 |
| HG15 | 164 | 0.2563 | 61.0 | 65.1 |
| HG18 | 21 | 0.0328 | 61.0 | 14.1 |
| HG19 | 3 | 0.0047 | 61.0 | 6.1 |
| HG20 | 1 | 0.0016 | 61.0 | 6.9 |
| HG21 | 14 | 0.0219 | 61.0 | 13.8 |

| BASIN | AREA | | CURVE NO. | LAG TIME (min) |
|---------|--------|--------------------|-----------|----------------|
| | (acre) | (mi ²) | | |
| INTERIM | | | | |
| OS05 | 37 | 0.0578 | 61.0 | 15.2 |
| OS06 | 84 | 0.1313 | 61.0 | 18.7 |
| OS07ab | 11 | 0.0170 | 61.0 | 13.9 |
| OS07c | 10 | 0.0158 | 61.0 | 10.9 |
| OS07d | 2 | 0.0036 | 61.0 | 13.1 |
| OS08a | 30 | 0.0469 | 61.4 | 19.0 |
| OS08b | 75 | 0.1167 | 64.4 | 25.6 |
| OS09a | 18 | 0.0279 | 62.2 | 21.0 |
| OS09b | 46 | 0.0711 | 61.0 | 37.7 |
| FG01 | 34 | 0.0538 | 66.4 | 33.8 |
| FG02 | 25 | 0.0391 | 64.6 | 16.1 |
| FG03 | 13 | 0.0203 | 68.0 | 11.6 |
| FG04 | 11 | 0.0172 | 68.0 | 7.6 |
| FG05 | 37 | 0.0580 | 70.1 | 28.4 |
| FG06 | 43 | 0.0675 | 66.1 | 18.4 |
| FG21a | 6 | 0.0095 | 62.6 | 21.4 |
| FG21b | 10 | 0.0150 | 73.1 | 12.7 |
| FG22 | 90 | 0.1400 | 68.8 | 20.3 |
| FG23a | 14 | 0.0216 | 68.6 | 18.0 |
| FG23b | 15 | 0.0235 | 62.5 | 15.0 |
| FG23c | 7 | 0.0109 | 65.4 | 12.1 |
| FG24a | 23 | 0.0359 | 63.1 | 21.9 |
| FG24b | 38 | 0.0589 | 67.3 | 26.6 |
| FG24c | 19 | 0.0291 | 67.0 | 18.1 |
| FG24d | 17 | 0.0262 | 73.7 | 19.2 |
| FG25 | 69 | 0.1084 | 74.1 | 23.8 |
| FG26 | 36 | 0.0570 | 66.9 | 20.9 |
| FG27 | 43 | 0.0679 | 82.9 | 31.0 |
| FG28 | 12 | 0.0184 | 64.1 | 14.8 |
| FG29 | 63 | 0.0982 | 61.2 | 19.1 |
| FG32 | 26 | 0.0402 | 61.0 | 23.9 |
| FG34 | 18 | 0.0275 | 62.6 | 17.0 |
| FG35 | 18 | 0.0282 | 61.7 | 14.2 |
| FG36 | 18 | 0.0286 | 65.9 | 24.2 |
| FG37 | 51 | 0.0797 | 63.5 | 20.2 |
| | | | | |

| BASIN | AREA | | CURVE NO. | LAG TIME (min) |
|--------|--------|--------------------|-----------|----------------|
| | (acre) | (mi ²) | | |
| FUTURE | | | | |
| OS05 | 37 | 0.0578 | 61.0 | 15.2 |
| OS06 | 84 | 0.1313 | 61.0 | 18.7 |
| OS07ab | 11 | 0.0170 | 61.0 | 13.9 |
| OS07c | 19 | 0.0296 | 61.0 | 17.4 |
| OS07d | 2 | 0.0034 | 61.0 | 13.1 |
| OS08a | 16 | 0.0251 | 61.0 | 16.7 |
| OS08b | 11 | 0.0165 | 61.0 | 20.3 |
| OS09a | 6 | 0.0093 | 61.0 | 20.9 |
| OS09b | 28 | 0.0435 | 61.0 | 24.3 |
| FG01 | 34 | 0.0538 | 66.4 | 33.8 |
| FG02 | 25 | 0.0391 | 64.6 | 16.1 |
| FG03 | 13 | 0.0203 | 68.0 | 11.6 |
| FG04 | 11 | 0.0172 | 68.0 | 7.6 |
| FG05 | 37 | 0.0580 | 70.1 | 28.4 |
| FG06 | 43 | 0.0675 | 66.1 | 18.4 |
| FG21a | 6 | 0.0095 | 62.6 | 21.4 |
| FG21b | 10 | 0.0150 | 73.1 | 12.7 |
| FG22 | 87 | 0.1354 | 69.0 | 20.3 |
| FG23a | 14 | 0.0216 | 68.6 | 18.0 |
| FG23b | 15 | 0.0236 | 61.8 | 15.0 |
| FG23c | 7 | 0.0109 | 65.2 | 12.1 |
| FG24a | 22 | 0.0348 | 64.3 | 21.9 |
| FG24b | 38 | 0.0589 | 73.4 | 14.5 |
| FG24c | 19 | 0.0291 | 75.0 | 14.7 |
| FG24d | 17 | 0.0262 | 76.4 | 13.9 |
| FG25 | 69 | 0.1084 | 74.1 | 23.8 |
| FG26 | 36 | 0.0570 | 78.0 | 25.5 |
| FG27 | 43 | 0.0679 | 83.3 | 22.1 |
| FG28 | 12 | 0.0184 | 64.1 | 14.8 |
| FG29 | 63 | 0.0983 | 61.2 | 19.1 |
| FG32 | 26 | 0.0402 | 80.0 | 23.9 |
| FG34 | 18 | 0.0275 | 62.7 | 17.0 |
| FG35 | 18 | 0.0282 | 65.5 | 14.2 |
| FG36 | 18 | 0.0286 | 65.9 | 24.2 |
| FG37 | 51 | 0.0797 | 63.5 | 20.2 |
| | | | | |



NOAA Atlas 14, Volume 8, Version 2
Location name: Peyton, Colorado, USA*
Latitude: 38,9783°, Longitude: -104,5842°
Elevation: 7054.14 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypseluk,
Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹ | | | | | | | | | | |
|--|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------|
| Duration | Average recurrence interval (years) | | | | | | | | | |
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.239 (0.190-0.301) | 0.291 (0.232-0.367) | 0.381 (0.302-0.482) | 0.460 (0.363-0.585) | 0.576 (0.442-0.764) | 0.670 (0.501-0.899) | 0.770 (0.556-1.06) | 0.875 (0.606-1.23) | 1.02 (0.680-1.48) | 1.14 (0.737-1.66) |
| 10-min | 0.349 (0.278-0.441) | 0.426 (0.339-0.538) | 0.558 (0.443-0.706) | 0.674 (0.532-0.857) | 0.843 (0.647-1.12) | 0.982 (0.734-1.32) | 1.13 (0.814-1.55) | 1.28 (0.888-1.80) | 1.50 (0.996-2.16) | 1.67 (1.08-2.44) |
| 15-min | 0.426 (0.340-0.538) | 0.519 (0.413-0.656) | 0.680 (0.540-0.861) | 0.822 (0.648-1.04) | 1.03 (0.789-1.36) | 1.20 (0.895-1.61) | 1.37 (0.993-1.89) | 1.56 (1.08-2.20) | 1.82 (1.22-2.64) | 2.03 (1.31-2.97) |
| 30-min | 0.608 (0.485-0.768) | 0.741 (0.590-0.936) | 0.969 (0.769-1.23) | 1.17 (0.923-1.49) | 1.46 (1.12-1.94) | 1.70 (1.27-2.28) | 1.95 (1.41-2.68) | 2.21 (1.53-3.12) | 2.58 (1.72-3.73) | 2.87 (1.86-4.20) |
| 60-min | 0.778 (0.620-0.982) | 0.934 (0.744-1.18) | 1.21 (0.962-1.54) | 1.47 (1.16-1.86) | 1.84 (1.42-2.46) | 2.16 (1.62-2.91) | 2.50 (1.81-3.44) | 2.87 (1.99-4.05) | 3.38 (2.26-4.91) | 3.80 (2.46-5.56) |
| 2-hr | 0.948 (0.762-1.19) | 1.13 (0.905-1.41) | 1.46 (1.16-1.83) | 1.76 (1.40-2.22) | 2.23 (1.73-2.96) | 2.62 (1.99-3.51) | 3.05 (2.23-4.18) | 3.52 (2.47-4.95) | 4.19 (2.82-6.04) | 4.73 (3.09-6.87) |
| 3-hr | 1.04 (0.839-1.29) | 1.22 (0.986-1.52) | 1.57 (1.26-1.96) | 1.90 (1.51-2.38) | 2.41 (1.90-3.21) | 2.86 (2.18-3.83) | 3.35 (2.47-4.59) | 3.90 (2.75-5.47) | 4.68 (3.18-6.75) | 5.33 (3.50-7.71) |
| 6-hr | 1.21 (0.980-1.49) | 1.40 (1.14-1.73) | 1.78 (1.44-2.21) | 2.16 (1.74-2.68) | 2.76 (2.19-3.65) | 3.29 (2.53-4.38) | 3.88 (2.88-5.28) | 4.53 (3.23-6.34) | 5.49 (3.76-7.88) | 6.29 (4.17-9.04) |
| 12-hr | 1.39 (1.14-1.70) | 1.62 (1.33-1.98) | 2.06 (1.68-2.53) | 2.48 (2.02-3.06) | 3.16 (2.53-4.14) | 3.76 (2.92-4.96) | 4.42 (3.31-5.97) | 5.15 (3.70-7.14) | 6.22 (4.30-8.85) | 7.10 (4.75-10.1) |
| 24-hr | 1.61 (1.33-1.95) | 1.88 (1.55-2.29) | 2.39 (1.97-2.92) | 2.88 (2.35-3.52) | 3.63 (2.91-4.69) | 4.27 (3.34-5.58) | 4.98 (3.75-6.66) | 5.75 (4.17-7.90) | 6.87 (4.78-9.70) | 7.79 (5.25-11.1) |
| 2-day | 1.86 (1.55-2.24) | 2.19 (1.83-2.64) | 2.79 (2.31-3.36) | 3.33 (2.75-4.04) | 4.15 (3.35-5.30) | 4.85 (3.81-6.25) | 5.59 (4.25-7.39) | 6.40 (4.67-8.70) | 7.55 (5.30-10.6) | 8.49 (5.77-12.0) |
| 3-day | 2.04 (1.71-2.45) | 2.41 (2.01-2.88) | 3.05 (2.54-3.66) | 3.63 (3.01-4.38) | 4.51 (3.65-5.71) | 5.24 (4.14-6.72) | 6.03 (4.59-7.92) | 6.87 (5.03-9.29) | 8.07 (5.69-11.2) | 9.04 (6.18-12.7) |
| 4-day | 2.20 (1.85-2.62) | 2.58 (2.16-3.08) | 3.25 (2.72-3.89) | 3.86 (3.21-4.63) | 4.77 (3.87-6.01) | 5.53 (4.38-7.06) | 6.34 (4.85-8.31) | 7.22 (5.31-9.73) | 8.46 (5.98-11.7) | 9.46 (6.50-13.2) |
| 7-day | 2.60 (2.20-3.08) | 3.00 (2.54-3.56) | 3.71 (3.13-4.41) | 4.36 (3.65-5.20) | 5.33 (4.36-6.67) | 6.14 (4.89-7.78) | 7.00 (5.40-9.11) | 7.93 (5.87-10.6) | 9.26 (6.59-12.8) | 10.3 (7.14-14.4) |
| 10-day | 2.96 (2.51-3.48) | 3.39 (2.88-4.00) | 4.16 (3.52-4.92) | 4.85 (4.08-5.76) | 5.88 (4.82-7.31) | 6.73 (5.38-8.48) | 7.63 (5.91-9.88) | 8.61 (6.39-11.5) | 9.97 (7.13-13.7) | 11.1 (7.70-15.4) |
| 20-day | 3.95 (3.38-4.61) | 4.55 (3.89-5.32) | 5.57 (4.75-6.52) | 6.44 (5.46-7.58) | 7.68 (6.32-9.39) | 8.67 (6.97-10.8) | 9.69 (7.54-12.4) | 10.8 (8.04-14.1) | 12.2 (8.79-16.6) | 13.3 (9.36-18.4) |
| 30-day | 4.75 (4.09-5.51) | 5.49 (4.72-6.38) | 6.70 (5.74-7.81) | 7.72 (6.58-9.04) | 9.12 (7.52-11.1) | 10.2 (8.24-12.6) | 11.3 (8.83-14.3) | 12.4 (9.32-16.2) | 13.9 (10.1-18.7) | 15.0 (10.6-20.6) |
| 45-day | 5.73 (4.96-6.62) | 6.62 (5.72-7.65) | 8.05 (6.93-9.33) | 9.21 (7.89-10.7) | 10.8 (8.91-12.9) | 12.0 (9.68-14.6) | 13.1 (10.3-16.5) | 14.3 (10.7-18.5) | 15.8 (11.4-21.1) | 16.9 (12.0-23.0) |
| 60-day | 6.56 (5.70-7.55) | 7.55 (6.55-8.69) | 9.12 (7.88-10.5) | 10.4 (8.92-12.0) | 12.1 (9.98-14.4) | 13.3 (10.8-16.1) | 14.5 (11.4-18.1) | 15.6 (11.8-20.2) | 17.1 (12.5-22.8) | 18.2 (12.9-24.8) |

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

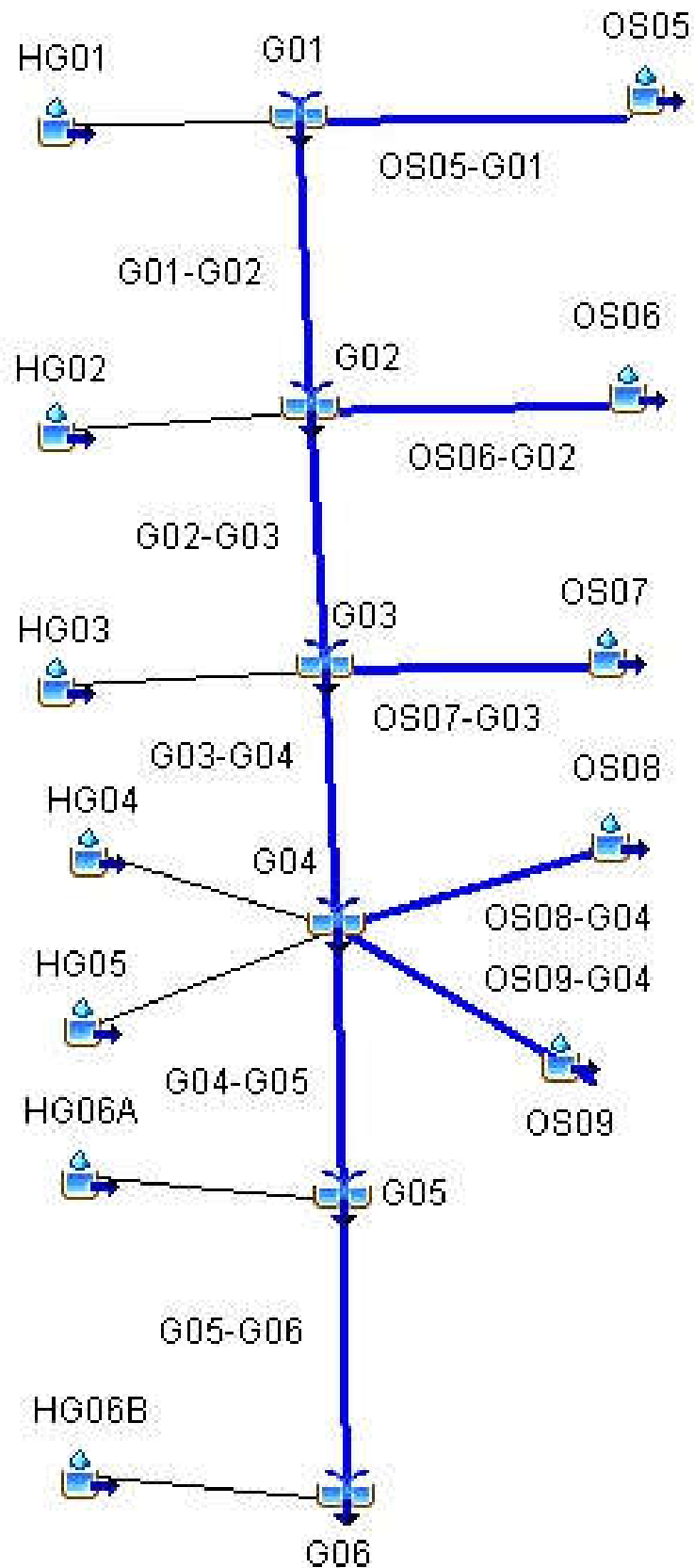
Please refer to NOAA Atlas 14 document for more information.

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| HISTORIC SCS (100-YEAR) | | | | |
|-------------------------|-------------------------|---------------------------|------------------|-----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | TIME OF PEAK | TOTAL VOLUME Q100 (AC. FT.) |
| OS06 | 0.1313 | 80 | 01Jul2015, 12:12 | 9.3 |
| OS06-G02 | 0.1313 | 77 | 01Jul2015, 12:24 | 9.2 |
| OS05 | 0.0578 | 39 | 01Jul2015, 12:12 | 4.1 |
| OS05-G01 | 0.0578 | 38 | 01Jul2015, 12:12 | 4.1 |
| HG01 | 0.0547 | 32 | 01Jul2015, 12:12 | 3.9 |
| G01 | 0.1125 | 70 | 01Jul2015, 12:12 | 7.9 |
| G01-G02 | 0.1125 | 68 | 01Jul2015, 12:24 | 7.8 |
| HG02 | 0.0906 | 45 | 01Jul2015, 12:24 | 6.4 |
| G02 | 0.3344 | 191 | 01Jul2015, 12:24 | 23 |
| G02-G03 | 0.3344 | 190 | 01Jul2015, 12:30 | 23 |
| HG03 | 0.1828 | 77 | 01Jul2015, 12:30 | 13 |
| OS07 | 0.0328 | 25 | 01Jul2015, 12:12 | 2.6 |
| OS07-G03 | 0.0328 | 24 | 01Jul2015, 12:30 | 2.5 |
| G03 | 0.5500 | 291 | 01Jul2015, 12:30 | 38 |
| G03-G04 | 0.5500 | 281 | 01Jul2015, 12:30 | 38 |
| OS09 | 0.1547 | 91 | 01Jul2015, 12:24 | 13 |
| OS09-G04 | 0.1547 | 90 | 01Jul2015, 12:30 | 13 |
| HG04 | 0.0891 | 40 | 01Jul2015, 12:30 | 6.3 |
| HG05 | 0.1125 | 49 | 01Jul2015, 12:30 | 7.9 |
| OS08 | 0.0406 | 35 | 01Jul2015, 12:12 | 3.6 |
| OS08-G04 | 0.0406 | 34 | 01Jul2015, 12:30 | 3.5 |
| G04 | 0.9469 | 493 | 01Jul2015, 12:30 | 69 |
| G04-G05 | 0.9469 | 488 | 01Jul2015, 12:36 | 68 |
| HG06A | 0.1375 | 49 | 01Jul2015, 12:42 | 9.6 |
| G05 | 1.0844 | 536 | 01Jul2015, 12:36 | 78 |
| G05-G06 | 1.0844 | 520 | 01Jul2015, 12:36 | 78 |
| HG06B | 0.1031 | 33 | 01Jul2015, 12:48 | 7.2 |
| G06 | 1.1875 | 551 | 01Jul2015, 12:42 | 85 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

GIECK HISTORIC CONDITIONS



| HISTORIC SCS (50-YEAR) | | | | |
|------------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q50 (CFS) | TIME OF PEAK | TOTAL VOLUME Q50 (AC. FT.) |
| OS06 | 0.1313 | 52 | 01Jul2015, 12:12 | 6.5 |
| OS06-G02 | 0.1313 | 52 | 01Jul2015, 12:24 | 6.4 |
| OS05 | 0.0578 | 26 | 01Jul2015, 12:12 | 2.9 |
| OS05-G01 | 0.0578 | 25 | 01Jul2015, 12:18 | 2.9 |
| HG01 | 0.0547 | 21 | 01Jul2015, 12:18 | 2.7 |
| G01 | 0.1125 | 46 | 01Jul2015, 12:18 | 5.6 |
| G01-G02 | 0.1125 | 46 | 01Jul2015, 12:24 | 5.5 |
| HG02 | 0.0906 | 30 | 01Jul2015, 12:24 | 4.5 |
| G02 | 0.3344 | 127 | 01Jul2015, 12:24 | 16 |
| G02-G03 | 0.3344 | 125 | 01Jul2015, 12:30 | 16 |
| HG03 | 0.1828 | 51 | 01Jul2015, 12:30 | 9.1 |
| OS07 | 0.0328 | 17 | 01Jul2015, 12:12 | 1.9 |
| OS07-G03 | 0.0328 | 17 | 01Jul2015, 12:30 | 1.8 |
| G03 | 0.5500 | 192 | 01Jul2015, 12:30 | 27 |
| G03-G04 | 0.5500 | 189 | 01Jul2015, 12:36 | 27 |
| OS09 | 0.1547 | 63 | 01Jul2015, 12:24 | 9.6 |
| OS09-G04 | 0.1547 | 62 | 01Jul2015, 12:36 | 9.4 |
| HG04 | 0.0891 | 26 | 01Jul2015, 12:30 | 4.4 |
| HG05 | 0.1125 | 32 | 01Jul2015, 12:30 | 5.6 |
| OS08 | 0.0406 | 25 | 01Jul2015, 12:12 | 2.6 |
| OS08-G04 | 0.0406 | 24 | 01Jul2015, 12:36 | 2.5 |
| G04 | 0.9469 | 332 | 01Jul2015, 12:36 | 49 |
| G04-G05 | 0.9469 | 318 | 01Jul2015, 12:42 | 48 |
| HG06A | 0.1375 | 32 | 01Jul2015, 12:42 | 6.7 |
| G05 | 1.0844 | 350 | 01Jul2015, 12:42 | 55 |
| G05-G06 | 1.0844 | 348 | 01Jul2015, 12:42 | 55 |
| HG06B | 0.1031 | 22 | 01Jul2015, 12:54 | 5.0 |
| G06 | 1.1875 | 369 | 01Jul2015, 12:42 | 60 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| HISTORIC SCS (10-YEAR) | | | | |
|------------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q10 (CFS) | TIME OF PEAK | TOTAL VOLUME Q10 (AC. FT.) |
| OS06 | 0.1313 | 12 | 01Jul2015, 12:18 | 2.2 |
| OS06-G02 | 0.1313 | 11 | 01Jul2015, 12:30 | 2.1 |
| OS05 | 0.0578 | 5.6 | 01Jul2015, 12:12 | 1.0 |
| OS05-G01 | 0.0578 | 5.5 | 01Jul2015, 12:24 | 0.9 |
| HG01 | 0.0547 | 4.7 | 01Jul2015, 12:18 | 0.9 |
| G01 | 0.1125 | 10 | 01Jul2015, 12:24 | 1.9 |
| G01-G02 | 0.1125 | 10 | 01Jul2015, 12:36 | 1.8 |
| HG02 | 0.0906 | 6.7 | 01Jul2015, 12:30 | 1.5 |
| G02 | 0.3344 | 27 | 01Jul2015, 12:36 | 5.4 |
| G02-G03 | 0.3344 | 27 | 01Jul2015, 12:48 | 5.3 |
| HG03 | 0.1828 | 12 | 01Jul2015, 12:42 | 3.0 |
| OS07 | 0.0328 | 4.5 | 01Jul2015, 12:12 | 0.7 |
| OS07-G03 | 0.0328 | 4.3 | 01Jul2015, 12:48 | 0.7 |
| G03 | 0.5500 | 42 | 01Jul2015, 12:48 | 8.9 |
| G03-G04 | 0.5500 | 42 | 01Jul2015, 12:54 | 8.8 |
| OS09 | 0.1547 | 19 | 01Jul2015, 12:30 | 3.6 |
| OS09-G04 | 0.1547 | 18 | 01Jul2015, 12:42 | 3.5 |
| HG04 | 0.0891 | 5.9 | 01Jul2015, 12:36 | 1.5 |
| HG05 | 0.1125 | 7.4 | 01Jul2015, 12:36 | 1.8 |
| OS08 | 0.0406 | 7.7 | 01Jul2015, 12:12 | 1.0 |
| OS08-G04 | 0.0406 | 7.4 | 01Jul2015, 12:48 | 1.0 |
| G04 | 0.9469 | 76 | 01Jul2015, 12:54 | 17 |
| G04-G05 | 0.9469 | 76 | 01Jul2015, 12:54 | 16 |
| HG06A | 0.1375 | 7.6 | 01Jul2015, 12:54 | 2.2 |
| G05 | 1.0844 | 84 | 01Jul2015, 12:54 | 19 |
| G05-G06 | 1.0844 | 83 | 01Jul2015, 13:00 | 19 |
| HG06B | 0.1031 | 5.3 | 01Jul2015, 13:00 | 1.7 |
| G06 | 1.1875 | 88 | 01Jul2015, 13:00 | 20 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| HISTORIC SCS (5-YEAR) | | | | |
|-----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q5 (CFS) | TIME OF PEAK | TOTAL VOLUME Q5 (AC. FT.) |
| OS06 | 0.1313 | 3.8 | 01Jul2015, 12:24 | 1.1 |
| OS06-G02 | 0.1313 | 3.7 | 01Jul2015, 12:42 | 1.1 |
| OS05 | 0.0578 | 1.8 | 01Jul2015, 12:18 | 0.5 |
| OS05-G01 | 0.0578 | 1.7 | 01Jul2015, 12:30 | 0.5 |
| HG01 | 0.0547 | 1.5 | 01Jul2015, 12:24 | 0.5 |
| G01 | 0.1125 | 3.2 | 01Jul2015, 12:30 | 1.0 |
| G01-G02 | 0.1125 | 3.2 | 01Jul2015, 12:48 | 0.9 |
| HG02 | 0.0906 | 2.3 | 01Jul2015, 12:36 | 0.8 |
| G02 | 0.3344 | 9.0 | 01Jul2015, 12:42 | 2.8 |
| G02-G03 | 0.3344 | 9.0 | 01Jul2015, 13:00 | 2.7 |
| HG03 | 0.1828 | 4.3 | 01Jul2015, 12:48 | 1.6 |
| OS07 | 0.0328 | 1.7 | 01Jul2015, 12:18 | 0.4 |
| OS07-G03 | 0.0328 | 1.7 | 01Jul2015, 13:00 | 0.4 |
| G03 | 0.5500 | 15 | 01Jul2015, 13:00 | 4.6 |
| G03-G04 | 0.5500 | 14 | 01Jul2015, 13:12 | 4.5 |
| OS09 | 0.1547 | 8.3 | 01Jul2015, 12:36 | 2.1 |
| OS09-G04 | 0.1547 | 8.3 | 01Jul2015, 12:48 | 2.0 |
| HG04 | 0.0891 | 2.1 | 01Jul2015, 12:42 | 0.8 |
| HG05 | 0.1125 | 2.6 | 01Jul2015, 12:42 | 0.9 |
| OS08 | 0.0406 | 3.4 | 01Jul2015, 12:12 | 0.6 |
| OS08-G04 | 0.0406 | 3.4 | 01Jul2015, 13:00 | 0.6 |
| G04 | 0.9469 | 28 | 01Jul2015, 13:12 | 8.7 |
| G04-G05 | 0.9469 | 27 | 01Jul2015, 13:18 | 8.6 |
| HG06A | 0.1375 | 2.9 | 01Jul2015, 13:00 | 1.1 |
| G05 | 1.0844 | 30 | 01Jul2015, 13:18 | 9.8 |
| G05-G06 | 1.0844 | 30 | 01Jul2015, 13:24 | 9.6 |
| HG06B | 0.1031 | 2.0 | 01Jul2015, 13:12 | 0.9 |
| G06 | 1.1875 | 32 | 01Jul2015, 13:24 | 10 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| HISTORIC SCS (2-YEAR) | | | | |
|-----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q2 (CFS) | TIME OF PEAK | TOTAL VOLUME Q2 (AC. FT.) |
| OS06 | 0.1313 | 0.5 | 01Jul2015, 13:30 | 0.3 |
| OS06-G02 | 0.1313 | 0.5 | 01Jul2015, 14:00 | 0.3 |
| OS05 | 0.0578 | 0.2 | 01Jul2015, 13:24 | 0.2 |
| OS05-G01 | 0.0578 | 0.2 | 01Jul2015, 13:42 | 0.2 |
| HG01 | 0.0547 | 0.2 | 01Jul2015, 13:36 | 0.1 |
| G01 | 0.1125 | 0.5 | 01Jul2015, 13:36 | 0.3 |
| G01-G02 | 0.1125 | 0.5 | 01Jul2015, 14:06 | 0.3 |
| HG02 | 0.0906 | 0.4 | 01Jul2015, 13:42 | 0.2 |
| G02 | 0.3344 | 1.3 | 01Jul2015, 14:00 | 0.8 |
| G02-G03 | 0.3344 | 1.3 | 01Jul2015, 14:30 | 0.8 |
| HG03 | 0.1828 | 0.7 | 01Jul2015, 13:54 | 0.5 |
| OS07 | 0.0328 | 0.3 | 01Jul2015, 12:54 | 0.1 |
| OS07-G03 | 0.0328 | 0.3 | 01Jul2015, 14:12 | 0.1 |
| G03 | 0.5500 | 2.3 | 01Jul2015, 14:24 | 1.4 |
| G03-G04 | 0.5500 | 2.3 | 01Jul2015, 14:42 | 1.3 |
| OS09 | 0.1547 | 1.9 | 01Jul2015, 12:54 | 0.8 |
| OS09-G04 | 0.1547 | 1.9 | 01Jul2015, 13:18 | 0.8 |
| HG04 | 0.0891 | 0.3 | 01Jul2015, 13:48 | 0.2 |
| HG05 | 0.1125 | 0.4 | 01Jul2015, 13:54 | 0.3 |
| OS08 | 0.0406 | 0.7 | 01Jul2015, 12:24 | 0.2 |
| OS08-G04 | 0.0406 | 0.7 | 01Jul2015, 13:36 | 0.2 |
| G04 | 0.9469 | 4.7 | 01Jul2015, 14:36 | 2.8 |
| G04-G05 | 0.9469 | 4.7 | 01Jul2015, 14:48 | 2.8 |
| HG06A | 0.1375 | 0.5 | 01Jul2015, 14:12 | 0.3 |
| G05 | 1.0844 | 5.2 | 01Jul2015, 14:48 | 3.1 |
| G05-G06 | 1.0844 | 5.2 | 01Jul2015, 15:00 | 3.0 |
| HG06B | 0.1031 | 0.4 | 01Jul2015, 14:24 | 0.3 |
| G06 | 1.1875 | 5.5 | 01Jul2015, 15:00 | 3.3 |
| | | | | |

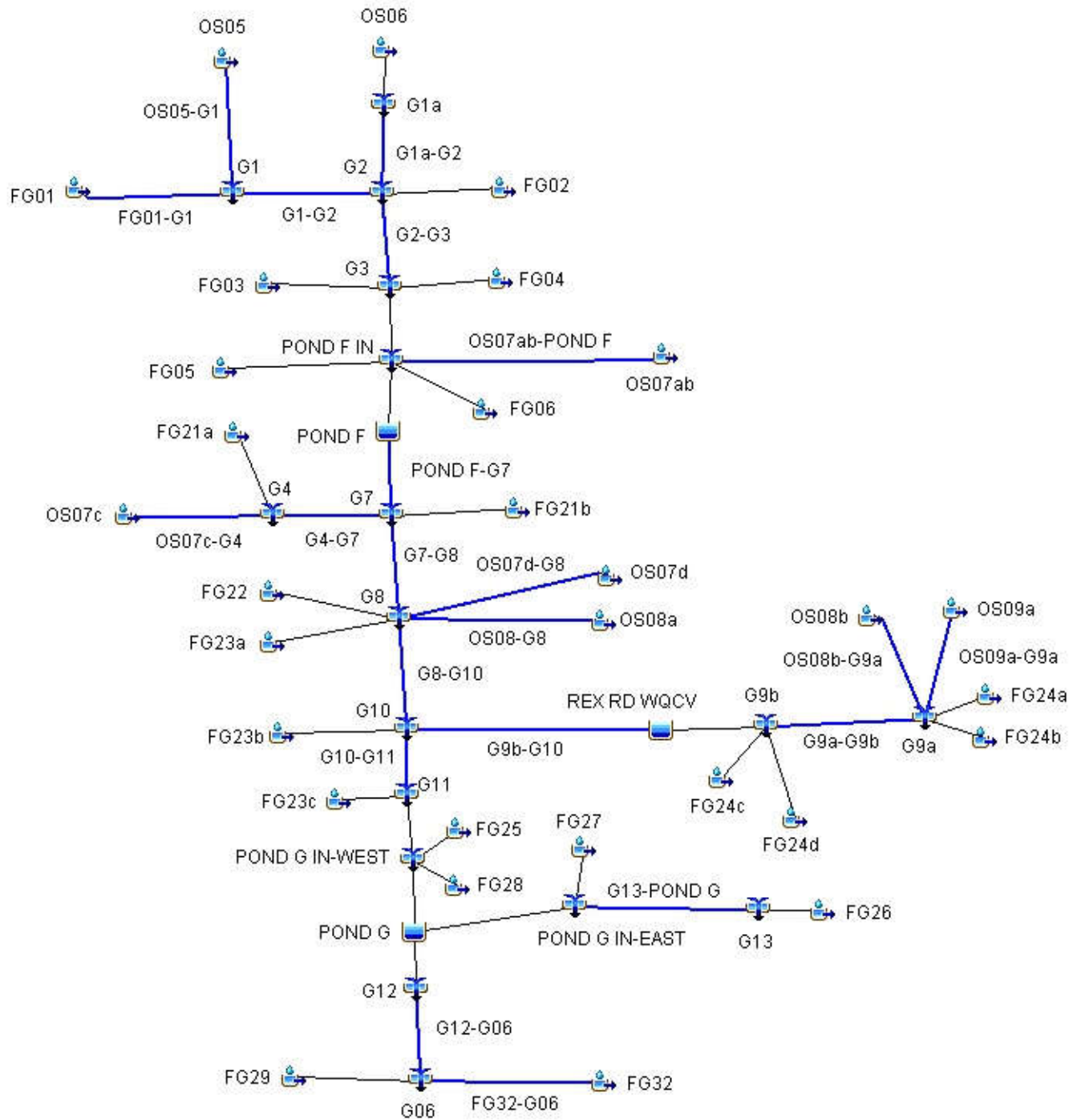
Highlighted green rows reference key design points (Typical all charts this section)

| INTERIM SCS (100-YEAR) | | | | |
|------------------------|-------------------------|---------------------------|------------------|-----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | TIME OF PEAK | TOTAL VOLUME Q100 (AC. FT.) |
| OS06 | 0.1313 | 80 | 01Jul2015, 12:12 | 9.3 |
| G1a | 0.1313 | 80 | 01Jul2015, 12:12 | 9.3 |
| G1a-G2 | 0.1313 | 79 | 01Jul2015, 12:18 | 9.2 |
| OS05 | 0.0578 | 39 | 01Jul2015, 12:12 | 4.1 |
| OS05-G1 | 0.0578 | 39 | 01Jul2015, 12:12 | 4.1 |
| FG01 | 0.0538 | 31 | 01Jul2015, 12:30 | 4.9 |
| FG01-G1 | 0.0538 | 31 | 01Jul2015, 12:30 | 4.9 |
| G1 | 0.1116 | 61 | 01Jul2015, 12:18 | 9.0 |
| G1-G2 | 0.1116 | 61 | 01Jul2015, 12:18 | 9.0 |
| FG02 | 0.0391 | 32 | 01Jul2015, 12:12 | 3.3 |
| G2 | 0.2820 | 167 | 01Jul2015, 12:18 | 21 |
| G2-G3 | 0.2820 | 163 | 01Jul2015, 12:18 | 21 |
| FG03 | 0.0203 | 24 | 01Jul2015, 12:06 | 2.0 |
| FG04 | 0.0172 | 22 | 01Jul2015, 12:00 | 1.7 |
| G3 | 0.3195 | 185 | 01Jul2015, 12:18 | 25 |
| FG06 | 0.0675 | 56 | 01Jul2015, 12:12 | 6.1 |
| FG05 | 0.0580 | 45 | 01Jul2015, 12:24 | 6.1 |
| OS07ab | 0.0170 | 12 | 01Jul2015, 12:06 | 1.2 |
| OS07ab-POND F | 0.0170 | 12 | 01Jul2015, 12:18 | 1.2 |
| POND F IN | 0.4620 | 293 | 01Jul2015, 12:18 | 38 |
| POND F | 0.4620 | 178 | 01Jul2015, 12:42 | 36 |
| POND F-G7 | 0.4620 | 177 | 01Jul2015, 12:42 | 36 |
| OS07c | 0.0158 | 13 | 01Jul2015, 12:06 | 1.1 |
| OS07c-G4 | 0.0158 | 13 | 01Jul2015, 12:12 | 1.1 |
| FG21a | 0.0095 | 5.9 | 01Jul2015, 12:18 | 0.7 |
| G4 | 0.0253 | 19 | 01Jul2015, 12:12 | 1.8 |
| G4-G7 | 0.0253 | 17 | 01Jul2015, 12:18 | 1.8 |
| FG21b | 0.0150 | 21 | 01Jul2015, 12:06 | 1.8 |
| G7 | 0.5023 | 189 | 01Jul2015, 12:42 | 39 |
| G7-G8 | 0.5023 | 188 | 01Jul2015, 12:42 | 39 |
| FG22 | 0.1400 | 124 | 01Jul2015, 12:12 | 14 |
| OS08a | 0.0469 | 29 | 01Jul2015, 12:12 | 3.4 |
| OS08-G8 | 0.0469 | 29 | 01Jul2015, 12:18 | 3.4 |
| FG23a | 0.0216 | 21 | 01Jul2015, 12:12 | 2.2 |
| OS07d | 0.0036 | 2.6 | 01Jul2015, 12:06 | 0.3 |
| OS07d-G8 | 0.0036 | 2.6 | 01Jul2015, 12:12 | 0.3 |
| G8 | 0.7144 | 283 | 01Jul2015, 12:30 | 59 |
| G8-G10 | 0.7144 | 282 | 01Jul2015, 12:36 | 59 |
| OS08b | 0.1167 | 72 | 01Jul2015, 12:18 | 9.7 |
| OS08b-G9a | 0.1167 | 71 | 01Jul2015, 12:30 | 9.6 |
| FG24b | 0.0589 | 41 | 01Jul2015, 12:24 | 5.6 |
| FG24a | 0.0359 | 23 | 01Jul2015, 12:18 | 2.8 |
| OS09a | 0.0279 | 17 | 01Jul2015, 12:18 | 2.1 |
| OS09a-G9a | 0.0279 | 17 | 01Jul2015, 12:24 | 2.1 |
| G9a | 0.2394 | 148 | 01Jul2015, 12:24 | 20 |

| INTERIM SCS (100-YEAR) | | | | |
|------------------------|-------------------------|---------------------------|------------------|-----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | TIME OF PEAK | TOTAL VOLUME Q100 (AC. FT.) |
| G9a-G9b | 0.2394 | 145 | 01Jul2015, 12:30 | 20 |
| FG24c | 0.0291 | 26 | 01Jul2015, 12:12 | 2.7 |
| FG24d | 0.0262 | 30 | 01Jul2015, 12:12 | 3.2 |
| G9b | 0.2947 | 185 | 01Jul2015, 12:24 | 26 |
| REX RD WQCV | 0.2947 | 173 | 01Jul2015, 12:30 | 26 |
| G9b-G10 | 0.2947 | 172 | 01Jul2015, 12:30 | 26 |
| FG23b | 0.0235 | 18 | 01Jul2015, 12:12 | 1.8 |
| G10 | 1.0326 | 459 | 01Jul2015, 12:36 | 86 |
| G10-G11 | 1.0326 | 458 | 01Jul2015, 12:36 | 86 |
| FG23c | 0.0109 | 11 | 01Jul2015, 12:06 | 1.0 |
| G11 | 1.0435 | 461 | 01Jul2015, 12:36 | 87 |
| FG25 | 0.1084 | 111 | 01Jul2015, 12:18 | 13 |
| FG28 | 0.0184 | 15 | 01Jul2015, 12:12 | 1.5 |
| POND G IN-W | 1.1703 | 544 | 01Jul2015, 12:30 | 102 |
| FG27 | 0.0679 | 81 | 01Jul2015, 12:24 | 11.2 |
| FG26 | 0.0570 | 45 | 01Jul2015, 12:18 | 5.3 |
| G13 | 0.0570 | 45 | 01Jul2015, 12:18 | 5.3 |
| G13-POND G | 0.0570 | 45 | 01Jul2015, 12:18 | 5.3 |
| POND G IN-E | 0.1249 | 123 | 01Jul2015, 12:24 | 16.5 |
| POND G | 1.2952 | 466 | 01Jul2015, 12:54 | 108 |
| G12 | 1.2952 | 466 | 01Jul2015, 12:54 | 108 |
| G12-G06 | 1.2952 | 465 | 01Jul2015, 13:00 | 107 |
| FG29 | 0.0983 | 60 | 01Jul2015, 12:12 | 7.0 |
| FG32 | 0.0402 | 21 | 01Jul2015, 12:18 | 2.8 |
| FG32-G06 | 0.0402 | 21 | 01Jul2015, 12:24 | 2.8 |
| G06 | 1.4337 | 491 | 01Jul2015, 12:54 | 117 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

GIECK INTERIM CONDITIONS



| INTERIM SCS (50-YEAR) | | | | |
|-----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q50 (CFS) | TIME OF PEAK | TOTAL VOLUME Q50 (AC. FT.) |
| OS06 | 0.1313 | 52 | 01Jul2015, 12:12 | 6.5 |
| G1a | 0.1313 | 52 | 01Jul2015, 12:12 | 6.5 |
| G1a-G2 | 0.1313 | 52 | 01Jul2015, 12:18 | 6.5 |
| OS05 | 0.0578 | 26 | 01Jul2015, 12:12 | 2.9 |
| OS05-G1 | 0.0578 | 25 | 01Jul2015, 12:12 | 2.9 |
| FG01 | 0.0538 | 22 | 01Jul2015, 12:30 | 3.6 |
| FG01-G1 | 0.0538 | 22 | 01Jul2015, 12:30 | 3.6 |
| G1 | 0.1116 | 41 | 01Jul2015, 12:18 | 6.4 |
| G1-G2 | 0.1116 | 41 | 01Jul2015, 12:18 | 6.4 |
| FG02 | 0.0391 | 22 | 01Jul2015, 12:12 | 2.4 |
| G2 | 0.2820 | 112 | 01Jul2015, 12:18 | 15 |
| G2-G3 | 0.2820 | 108 | 01Jul2015, 12:24 | 15 |
| FG03 | 0.0203 | 17 | 01Jul2015, 12:06 | 1.5 |
| FG04 | 0.0172 | 16 | 01Jul2015, 12:00 | 1.3 |
| G3 | 0.3195 | 123 | 01Jul2015, 12:18 | 18 |
| FG06 | 0.0675 | 40 | 01Jul2015, 12:12 | 4.4 |
| FG05 | 0.0580 | 33 | 01Jul2015, 12:24 | 4.6 |
| OS07ab | 0.0170 | 7.9 | 01Jul2015, 12:12 | 0.9 |
| OS07ab-POND F | 0.0170 | 7.6 | 01Jul2015, 12:18 | 0.8 |
| POND F IN | 0.4620 | 200 | 01Jul2015, 12:18 | 28 |
| POND F | 0.4620 | 121 | 01Jul2015, 12:42 | 26 |
| POND F-G7 | 0.4620 | 120 | 01Jul2015, 12:48 | 26 |
| OS07c | 0.0158 | 8.6 | 01Jul2015, 12:06 | 0.8 |
| OS07c-G4 | 0.0158 | 8.2 | 01Jul2015, 12:12 | 0.8 |
| FG21a | 0.0095 | 4.0 | 01Jul2015, 12:18 | 0.5 |
| G4 | 0.0253 | 12 | 01Jul2015, 12:12 | 1.3 |
| G4-G7 | 0.0253 | 12 | 01Jul2015, 12:18 | 1.3 |
| FG21b | 0.0150 | 16 | 01Jul2015, 12:06 | 1.4 |
| G7 | 0.5023 | 127 | 01Jul2015, 12:48 | 28 |
| G7-G8 | 0.5023 | 127 | 01Jul2015, 12:48 | 28 |
| FG22 | 0.1400 | 90 | 01Jul2015, 12:12 | 11 |
| OS08a | 0.0469 | 19 | 01Jul2015, 12:12 | 2.4 |
| OS08-G8 | 0.0469 | 19 | 01Jul2015, 12:18 | 2.4 |
| FG23a | 0.0216 | 15 | 01Jul2015, 12:12 | 1.6 |
| OS07d | 0.0036 | 1.7 | 01Jul2015, 12:06 | 0.2 |
| OS07d-G8 | 0.0036 | 1.7 | 01Jul2015, 12:18 | 0.2 |
| G8 | 0.7144 | 179 | 01Jul2015, 12:42 | 43 |
| G8-G10 | 0.7144 | 179 | 01Jul2015, 12:48 | 42 |
| OS08b | 0.1167 | 49 | 01Jul2015, 12:24 | 7.0 |
| OS08b-G9a | 0.1167 | 49 | 01Jul2015, 12:30 | 6.9 |
| FG24b | 0.0589 | 30 | 01Jul2015, 12:24 | 4.1 |
| FG24a | 0.0359 | 15 | 01Jul2015, 12:18 | 2.0 |
| OS09a | 0.0279 | 11 | 01Jul2015, 12:18 | 1.5 |
| OS09a-G9a | 0.0279 | 11 | 01Jul2015, 12:30 | 1.5 |
| G9a | 0.2394 | 100 | 01Jul2015, 12:24 | 14 |
| | | | | |

| INTERIM SCS (50-YEAR) | | | | |
|-----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q50 (CFS) | TIME OF PEAK | TOTAL VOLUME Q50 (AC. FT.) |
| G9a-G9b | 0.2394 | 100 | 01Jul2015, 12:30 | 14 |
| FG24c | 0.0291 | 18 | 01Jul2015, 12:12 | 2.0 |
| FG24d | 0.0262 | 23 | 01Jul2015, 12:12 | 2.4 |
| G9b | 0.2947 | 126 | 01Jul2015, 12:24 | 19 |
| REX RD WQCV | 0.2947 | 126 | 01Jul2015, 12:30 | 19 |
| G9b-G10 | 0.2947 | 125 | 01Jul2015, 12:30 | 19 |
| FG23b | 0.0235 | 12 | 01Jul2015, 12:12 | 1.3 |
| G10 | 1.0326 | 286 | 01Jul2015, 12:42 | 62 |
| G10-G11 | 1.0326 | 285 | 01Jul2015, 12:42 | 62 |
| FG23c | 0.0109 | 7.7 | 01Jul2015, 12:06 | 0.7 |
| G11 | 1.0435 | 287 | 01Jul2015, 12:42 | 63 |
| FG25 | 0.1084 | 84 | 01Jul2015, 12:18 | 10 |
| FG28 | 0.0184 | 10 | 01Jul2015, 12:12 | 1.1 |
| POND G IN-WEST | 1.1703 | 357 | 01Jul2015, 12:24 | 74 |
| FG27 | 0.0679 | 64 | 01Jul2015, 12:24 | 8.9 |
| FG26 | 0.0570 | 32 | 01Jul2015, 12:18 | 3.9 |
| G13 | 0.0570 | 32 | 01Jul2015, 12:18 | 3.9 |
| G13-POND G | 0.0570 | 32 | 01Jul2015, 12:18 | 3.9 |
| POND G IN-EAST | 0.1249 | 95 | 01Jul2015, 12:24 | 13 |
| POND G | 1.2952 | 307 | 01Jul2015, 13:00 | 77 |
| G12 | 1.2952 | 307 | 01Jul2015, 13:00 | 77 |
| G12-G06 | 1.2952 | 307 | 01Jul2015, 13:06 | 77 |
| FG29 | 0.0983 | 39 | 01Jul2015, 12:18 | 5.0 |
| FG32 | 0.0402 | 14 | 01Jul2015, 12:18 | 2.0 |
| FG32-G06 | 0.0402 | 14 | 01Jul2015, 12:24 | 2.0 |
| G06 | 1.4337 | 323 | 01Jul2015, 13:06 | 84 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| INTERIM SCS (10-YEAR) | | | | |
|-----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q10 (CFS) | TIME OF PEAK | TOTAL VOLUME Q10 (AC. FT.) |
| OS06 | 0.1313 | 12 | 01Jul2015, 12:18 | 2.2 |
| G1a | 0.1313 | 12 | 01Jul2015, 12:18 | 2.2 |
| G1a-G2 | 0.1313 | 11 | 01Jul2015, 12:24 | 2.1 |
| OS05 | 0.0578 | 5.6 | 01Jul2015, 12:12 | 1.0 |
| OS05-G1 | 0.0578 | 5.5 | 01Jul2015, 12:18 | 1.0 |
| FG01 | 0.0538 | 7.0 | 01Jul2015, 12:36 | 1.4 |
| FG01-G1 | 0.0538 | 7.0 | 01Jul2015, 12:36 | 1.4 |
| G1 | 0.1116 | 11 | 01Jul2015, 12:24 | 2.3 |
| G1-G2 | 0.1116 | 11 | 01Jul2015, 12:30 | 2.3 |
| FG02 | 0.0391 | 6.4 | 01Jul2015, 12:12 | 0.9 |
| G2 | 0.2820 | 27 | 01Jul2015, 12:24 | 5.4 |
| G2-G3 | 0.2820 | 27 | 01Jul2015, 12:30 | 5.3 |
| FG03 | 0.0203 | 5.9 | 01Jul2015, 12:06 | 0.6 |
| FG04 | 0.0172 | 5.8 | 01Jul2015, 12:06 | 0.5 |
| G3 | 0.3195 | 31 | 01Jul2015, 12:30 | 6.4 |
| FG06 | 0.0675 | 12 | 01Jul2015, 12:18 | 1.7 |
| FG05 | 0.0580 | 12 | 01Jul2015, 12:24 | 2.0 |
| OS07ab | 0.0170 | 1.8 | 01Jul2015, 12:12 | 0.3 |
| OS07ab-POND F | 0.0170 | 1.7 | 01Jul2015, 12:30 | 0.3 |
| POND F IN | 0.4620 | 54 | 01Jul2015, 12:24 | 10 |
| POND F | 0.4620 | 16 | 01Jul2015, 13:48 | 9.1 |
| POND F-G7 | 0.4620 | 16 | 01Jul2015, 13:54 | 9.0 |
| OS07c | 0.0158 | 1.8 | 01Jul2015, 12:06 | 0.3 |
| OS07c-G4 | 0.0158 | 1.8 | 01Jul2015, 12:18 | 0.3 |
| FG21a | 0.0095 | 1.0 | 01Jul2015, 12:24 | 0.2 |
| G4 | 0.0253 | 2.8 | 01Jul2015, 12:18 | 0.4 |
| G4-G7 | 0.0253 | 2.7 | 01Jul2015, 12:24 | 0.4 |
| FG21b | 0.0150 | 6.5 | 01Jul2015, 12:06 | 0.6 |
| G7 | 0.5023 | 18 | 01Jul2015, 13:42 | 10 |
| G7-G8 | 0.5023 | 18 | 01Jul2015, 13:42 | 9.9 |
| FG22 | 0.1400 | 32 | 01Jul2015, 12:18 | 4.3 |
| OS08a | 0.0469 | 4.4 | 01Jul2015, 12:18 | 0.8 |
| OS08-G8 | 0.0469 | 4.3 | 01Jul2015, 12:24 | 0.8 |
| FG23a | 0.0216 | 5.2 | 01Jul2015, 12:12 | 0.7 |
| OS07d | 0.0036 | 0.4 | 01Jul2015, 12:12 | 0.1 |
| OS07d-G8 | 0.0036 | 0.4 | 01Jul2015, 12:24 | 0.1 |
| G8 | 0.7144 | 48 | 01Jul2015, 12:18 | 16 |
| G8-G10 | 0.7144 | 47 | 01Jul2015, 12:30 | 15 |
| OS08b | 0.1167 | 14 | 01Jul2015, 12:24 | 2.6 |
| OS08b-G9a | 0.1167 | 14 | 01Jul2015, 12:36 | 2.5 |
| FG24b | 0.0589 | 9.8 | 01Jul2015, 12:24 | 1.6 |
| FG24a | 0.0359 | 4.0 | 01Jul2015, 12:24 | 0.7 |
| OS09a | 0.0279 | 2.8 | 01Jul2015, 12:24 | 0.5 |
| OS09a-G9a | 0.0279 | 2.7 | 01Jul2015, 12:36 | 0.5 |
| G9a | 0.2394 | 28 | 01Jul2015, 12:36 | 5.4 |
| | | | | |

| INTERIM SCS (10-YEAR) | | | | |
|-----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q10 (CFS) | TIME OF PEAK | TOTAL VOLUME Q10 (AC. FT.) |
| G9a-G9b | 0.2394 | 28 | 01Jul2015, 12:36 | 5.3 |
| FG24c | 0.0291 | 5.8 | 01Jul2015, 12:12 | 0.8 |
| FG24d | 0.0262 | 10 | 01Jul2015, 12:12 | 1.1 |
| G9b | 0.2947 | 36 | 01Jul2015, 12:36 | 7.3 |
| REX RD WQCV | 0.2947 | 35 | 01Jul2015, 12:36 | 7.1 |
| G9b-G10 | 0.2947 | 35 | 01Jul2015, 12:42 | 7.1 |
| FG23b | 0.0235 | 3.0 | 01Jul2015, 12:12 | 0.5 |
| G10 | 1.0326 | 80 | 01Jul2015, 12:30 | 23 |
| G10-G11 | 1.0326 | 79 | 01Jul2015, 12:36 | 23 |
| FG23c | 0.0109 | 2.3 | 01Jul2015, 12:06 | 0.3 |
| G11 | 1.0435 | 80 | 01Jul2015, 12:36 | 23 |
| FG25 | 0.1084 | 36 | 01Jul2015, 12:18 | 4.7 |
| FG28 | 0.0184 | 3.0 | 01Jul2015, 12:12 | 0.4 |
| POND G IN-WEST | 1.1703 | 112 | 01Jul2015, 12:30 | 28 |
| FG27 | 0.0679 | 34 | 01Jul2015, 12:24 | 4.8 |
| FG26 | 0.0570 | 11 | 01Jul2015, 12:18 | 1.5 |
| G13 | 0.0570 | 11 | 01Jul2015, 12:18 | 1.5 |
| G13-POND G | 0.0570 | 10 | 01Jul2015, 12:24 | 1.5 |
| POND G IN-EAST | 0.1249 | 44 | 01Jul2015, 12:24 | 6.3 |
| POND G | 1.2952 | 50 | 01Jul2015, 14:06 | 26 |
| G12 | 1.2952 | 50 | 01Jul2015, 14:06 | 26 |
| G12-G06 | 1.2952 | 49 | 01Jul2015, 14:12 | 26 |
| FG29 | 0.0983 | 8.9 | 01Jul2015, 12:18 | 1.7 |
| FG32 | 0.0402 | 3.1 | 01Jul2015, 12:24 | 0.7 |
| FG32-G06 | 0.0402 | 3.1 | 01Jul2015, 12:30 | 0.7 |
| G06 | 1.4337 | 52 | 01Jul2015, 14:12 | 28 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| INTERIM SCS (5-YEAR) | | | | |
|----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q5 (CFS) | TIME OF PEAK | TOTAL VOLUME Q5 (AC. FT.) |
| OS06 | 0.1313 | 3.8 | 01Jul2015, 12:24 | 1.1 |
| G1a | 0.1313 | 3.8 | 01Jul2015, 12:24 | 1.1 |
| G1a-G2 | 0.1313 | 3.7 | 01Jul2015, 12:30 | 1.1 |
| OS05 | 0.0578 | 1.8 | 01Jul2015, 12:18 | 0.5 |
| OS05-G1 | 0.0578 | 1.7 | 01Jul2015, 12:24 | 0.5 |
| FG01 | 0.0538 | 3.4 | 01Jul2015, 12:36 | 0.8 |
| FG01-G1 | 0.0538 | 3.4 | 01Jul2015, 12:36 | 0.8 |
| G1 | 0.1116 | 4.9 | 01Jul2015, 12:36 | 1.3 |
| G1-G2 | 0.1116 | 4.8 | 01Jul2015, 12:36 | 1.3 |
| FG02 | 0.0391 | 2.7 | 01Jul2015, 12:18 | 0.5 |
| G2 | 0.2820 | 10 | 01Jul2015, 12:30 | 2.9 |
| G2-G3 | 0.2820 | 10 | 01Jul2015, 12:42 | 2.9 |
| FG03 | 0.0203 | 3.0 | 01Jul2015, 12:06 | 0.4 |
| FG04 | 0.0172 | 3.1 | 01Jul2015, 12:06 | 0.3 |
| G3 | 0.3195 | 12 | 01Jul2015, 12:36 | 3.5 |
| FG06 | 0.0675 | 5.8 | 01Jul2015, 12:18 | 1.0 |
| FG05 | 0.0580 | 6.7 | 01Jul2015, 12:30 | 1.2 |
| OS07ab | 0.0170 | 0.5 | 01Jul2015, 12:18 | 0.2 |
| OS07ab-POND F | 0.0170 | 0.5 | 01Jul2015, 12:42 | 0.1 |
| POND F IN | 0.4620 | 23 | 01Jul2015, 12:36 | 5.9 |
| POND F | 0.4620 | 8.0 | 01Jul2015, 14:12 | 4.8 |
| POND F-G7 | 0.4620 | 8.0 | 01Jul2015, 14:24 | 4.8 |
| OS07c | 0.0158 | 0.6 | 01Jul2015, 12:12 | 0.1 |
| OS07c-G4 | 0.0158 | 0.5 | 01Jul2015, 12:30 | 0.1 |
| FG21a | 0.0095 | 0.4 | 01Jul2015, 12:24 | 0.1 |
| G4 | 0.0253 | 0.9 | 01Jul2015, 12:24 | 0.2 |
| G4-G7 | 0.0253 | 0.9 | 01Jul2015, 12:30 | 0.2 |
| FG21b | 0.0150 | 3.9 | 01Jul2015, 12:06 | 0.4 |
| G7 | 0.5023 | 8.7 | 01Jul2015, 14:18 | 5.4 |
| G7-G8 | 0.5023 | 8.7 | 01Jul2015, 14:24 | 5.4 |
| FG22 | 0.1400 | 17 | 01Jul2015, 12:18 | 2.7 |
| OS08a | 0.0469 | 1.5 | 01Jul2015, 12:24 | 0.4 |
| OS08-G8 | 0.0469 | 1.5 | 01Jul2015, 12:30 | 0.4 |
| FG23a | 0.0216 | 2.7 | 01Jul2015, 12:18 | 0.4 |
| OS07d | 0.0036 | 0.1 | 01Jul2015, 12:18 | 0.0 |
| OS07d-G8 | 0.0036 | 0.1 | 01Jul2015, 12:30 | 0.0 |
| G8 | 0.7144 | 25 | 01Jul2015, 12:18 | 8.9 |
| G8-G10 | 0.7144 | 24 | 01Jul2015, 12:30 | 8.6 |
| OS08b | 0.1167 | 6.1 | 01Jul2015, 12:30 | 1.5 |
| OS08b-G9a | 0.1167 | 6.0 | 01Jul2015, 12:48 | 1.4 |
| FG24b | 0.0589 | 4.9 | 01Jul2015, 12:30 | 1.0 |
| FG24a | 0.0359 | 1.6 | 01Jul2015, 12:24 | 0.4 |
| OS09a | 0.0279 | 1.0 | 01Jul2015, 12:24 | 0.3 |
| OS09a-G9a | 0.0279 | 1.0 | 01Jul2015, 12:48 | 0.3 |
| G9a | 0.2394 | 12 | 01Jul2015, 12:42 | 3.1 |
| | | | | |

| INTERIM SCS (5-YEAR) | | | | |
|----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q5 (CFS) | TIME OF PEAK | TOTAL VOLUME Q5 (AC. FT.) |
| G9a-G9b | 0.2394 | 12 | 01Jul2015, 12:48 | 3.0 |
| FG24c | 0.0291 | 2.9 | 01Jul2015, 12:18 | 0.5 |
| FG24d | 0.0262 | 5.7 | 01Jul2015, 12:18 | 0.7 |
| G9b | 0.2947 | 16 | 01Jul2015, 12:42 | 4.2 |
| REX RD WQCV | 0.2947 | 16 | 01Jul2015, 12:48 | 4.1 |
| G9b-G10 | 0.2947 | 16 | 01Jul2015, 12:48 | 4.1 |
| FG23b | 0.0235 | 1.1 | 01Jul2015, 12:18 | 0.2 |
| G10 | 1.0326 | 39 | 01Jul2015, 12:30 | 13 |
| G10-G11 | 1.0326 | 38 | 01Jul2015, 12:36 | 13 |
| FG23c | 0.0109 | 1.0 | 01Jul2015, 12:12 | 0.2 |
| G11 | 1.0435 | 39 | 01Jul2015, 12:36 | 13 |
| FG25 | 0.1084 | 22 | 01Jul2015, 12:18 | 3.1 |
| FG28 | 0.0184 | 1.2 | 01Jul2015, 12:12 | 0.2 |
| POND G IN-WEST | 1.1703 | 56 | 01Jul2015, 12:36 | 16 |
| FG27 | 0.0679 | 24 | 01Jul2015, 12:24 | 3.4 |
| FG26 | 0.0570 | 5.1 | 01Jul2015, 12:18 | 0.9 |
| G13 | 0.0570 | 5.1 | 01Jul2015, 12:18 | 0.9 |
| G13-POND G | 0.0570 | 5.1 | 01Jul2015, 12:24 | 0.9 |
| POND G IN-EAST | 0.1249 | 29 | 01Jul2015, 12:24 | 4.3 |
| POND G | 1.2952 | 19 | 01Jul2015, 16:18 | 13 |
| G12 | 1.2952 | 19 | 01Jul2015, 16:18 | 13 |
| G12-G06 | 1.2952 | 19 | 01Jul2015, 16:24 | 13 |
| FG29 | 0.0983 | 2.9 | 01Jul2015, 12:24 | 0.9 |
| FG32 | 0.0402 | 1.0 | 01Jul2015, 12:30 | 0.3 |
| FG32-G06 | 0.0402 | 1.0 | 01Jul2015, 12:36 | 0.3 |
| G06 | 1.4337 | 20 | 01Jul2015, 16:30 | 14 |
| | | | | |

| INTERIM SCS (2-YEAR) | | | | |
|----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q2 (CFS) | TIME OF PEAK | TOTAL VOLUME Q2 (AC. FT.) |
| OS06 | 0.1313 | 0.5 | 01Jul2015, 13:30 | 0.3 |
| G1a | 0.1313 | 0.5 | 01Jul2015, 13:30 | 0.3 |
| G1a-G2 | 0.1313 | 0.5 | 01Jul2015, 13:48 | 0.3 |
| OS05 | 0.0578 | 0.2 | 01Jul2015, 13:24 | 0.2 |
| OS05-G1 | 0.0578 | 0.2 | 01Jul2015, 13:30 | 0.2 |
| FG01 | 0.0538 | 0.9 | 01Jul2015, 12:48 | 0.4 |
| FG01-G1 | 0.0538 | 0.9 | 01Jul2015, 12:48 | 0.4 |
| G1 | 0.1116 | 1.1 | 01Jul2015, 12:54 | 0.5 |
| G1-G2 | 0.1116 | 1.1 | 01Jul2015, 13:00 | 0.5 |
| FG02 | 0.0391 | 0.5 | 01Jul2015, 12:30 | 0.2 |
| G2 | 0.2820 | 1.9 | 01Jul2015, 13:18 | 1.0 |
| G2-G3 | 0.2820 | 1.9 | 01Jul2015, 13:30 | 1.0 |
| FG03 | 0.0203 | 0.8 | 01Jul2015, 12:12 | 0.2 |
| FG04 | 0.0172 | 0.9 | 01Jul2015, 12:06 | 0.1 |
| G3 | 0.3195 | 2.4 | 01Jul2015, 13:24 | 1.3 |
| FG06 | 0.0675 | 1.3 | 01Jul2015, 12:24 | 0.4 |
| FG05 | 0.0580 | 2.4 | 01Jul2015, 12:30 | 0.6 |
| OS07ab | 0.0170 | 0.1 | 01Jul2015, 13:18 | 0.04 |
| OS07ab-POND F | 0.0170 | 0.1 | 01Jul2015, 14:00 | 0.04 |
| POND F IN | 0.4620 | 5.1 | 01Jul2015, 12:42 | 2.4 |
| POND F | 0.4620 | 2.1 | 01Jul2015, 17:54 | 1.6 |
| POND F-G7 | 0.4620 | 2.1 | 01Jul2015, 18:06 | 1.5 |
| OS07c | 0.0158 | 0.1 | 01Jul2015, 13:06 | 0.04 |
| OS07c-G4 | 0.0158 | 0.1 | 01Jul2015, 13:36 | 0.04 |
| FG21a | 0.0095 | 0.1 | 01Jul2015, 13:06 | 0.03 |
| G4 | 0.0253 | 0.1 | 01Jul2015, 13:30 | 0.1 |
| G4-G7 | 0.0253 | 0.1 | 01Jul2015, 13:36 | 0.1 |
| FG21b | 0.0150 | 1.7 | 01Jul2015, 12:12 | 0.2 |
| G7 | 0.5023 | 2.3 | 01Jul2015, 17:48 | 1.8 |
| G7-G8 | 0.5023 | 2.3 | 01Jul2015, 17:54 | 1.8 |
| FG22 | 0.1400 | 5.3 | 01Jul2015, 12:24 | 1.2 |
| OS08a | 0.0469 | 0.2 | 01Jul2015, 13:24 | 0.1 |
| OS08-G8 | 0.0469 | 0.2 | 01Jul2015, 13:30 | 0.1 |
| FG23a | 0.0216 | 0.8 | 01Jul2015, 12:18 | 0.2 |
| OS07d | 0.0036 | 0.0 | 01Jul2015, 13:18 | 0.01 |
| OS07d-G8 | 0.0036 | 0.0 | 01Jul2015, 13:36 | 0.01 |
| G8 | 0.7144 | 7.6 | 01Jul2015, 12:18 | 3.3 |
| G8-G10 | 0.7144 | 7.6 | 01Jul2015, 12:42 | 3.2 |
| OS08b | 0.1167 | 1.3 | 01Jul2015, 12:54 | 0.6 |
| OS08b-G9a | 0.1167 | 1.2 | 01Jul2015, 13:18 | 0.5 |
| FG24b | 0.0589 | 1.4 | 01Jul2015, 12:36 | 0.4 |
| FG24a | 0.0359 | 0.3 | 01Jul2015, 13:00 | 0.1 |
| OS09a | 0.0279 | 0.2 | 01Jul2015, 13:12 | 0.1 |
| OS09a-G9a | 0.0279 | 0.2 | 01Jul2015, 13:42 | 0.1 |
| G9a | 0.2394 | 2.6 | 01Jul2015, 13:12 | 1.2 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| INTERIM SCS (2-YEAR) | | | | |
|----------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q2 (CFS) | TIME OF PEAK | TOTAL VOLUME Q2 (AC. FT.) |
| G9a-G9b | 0.2394 | 2.6 | 01Jul2015, 13:18 | 1.2 |
| FG24c | 0.0291 | 0.8 | 01Jul2015, 12:24 | 0.2 |
| FG24d | 0.0262 | 2.6 | 01Jul2015, 12:18 | 0.4 |
| G9b | 0.2947 | 4.0 | 01Jul2015, 12:24 | 1.8 |
| REX RD WQCV | 0.2947 | 3.8 | 01Jul2015, 13:12 | 1.7 |
| G9b-G10 | 0.2947 | 3.8 | 01Jul2015, 13:18 | 1.7 |
| FG23b | 0.0235 | 0.2 | 01Jul2015, 13:00 | 0.1 |
| G10 | 1.0326 | 11.0 | 01Jul2015, 12:42 | 4.9 |
| G10-G11 | 1.0326 | 10.9 | 01Jul2015, 12:48 | 4.9 |
| FG23c | 0.0109 | 0.2 | 01Jul2015, 12:18 | 0.1 |
| G11 | 1.0435 | 11.1 | 01Jul2015, 12:48 | 4.9 |
| FG25 | 0.1084 | 9.9 | 01Jul2015, 12:24 | 1.7 |
| FG28 | 0.0184 | 0.2 | 01Jul2015, 12:36 | 0.1 |
| POND G IN-WEST | 1.1703 | 17.2 | 01Jul2015, 12:48 | 6.7 |
| FG27 | 0.0679 | 14.2 | 01Jul2015, 12:24 | 2.2 |
| FG26 | 0.0570 | 1.3 | 01Jul2015, 12:30 | 0.4 |
| G13 | 0.0570 | 1.3 | 01Jul2015, 12:30 | 0.4 |
| G13-POND G | 0.0570 | 1.3 | 01Jul2015, 12:36 | 0.4 |
| POND G IN-EAST | 0.1249 | 15.5 | 01Jul2015, 12:30 | 2.6 |
| POND G | 1.2952 | 5.0 | 02Jul2015, 00:00 | 4.2 |
| G12 | 1.2952 | 5.0 | 02Jul2015, 00:00 | 4.2 |
| G12-G06 | 1.2952 | 5.0 | 02Jul2015, 00:00 | 4.1 |
| FG29 | 0.0983 | 0.4 | 01Jul2015, 13:30 | 0.3 |
| FG32 | 0.0402 | 0.2 | 01Jul2015, 13:42 | 0.1 |
| FG32-G06 | 0.0402 | 0.2 | 01Jul2015, 13:48 | 0.1 |
| G06 | 1.4337 | 5.3 | 01Jul2015, 23:48 | 4.4 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

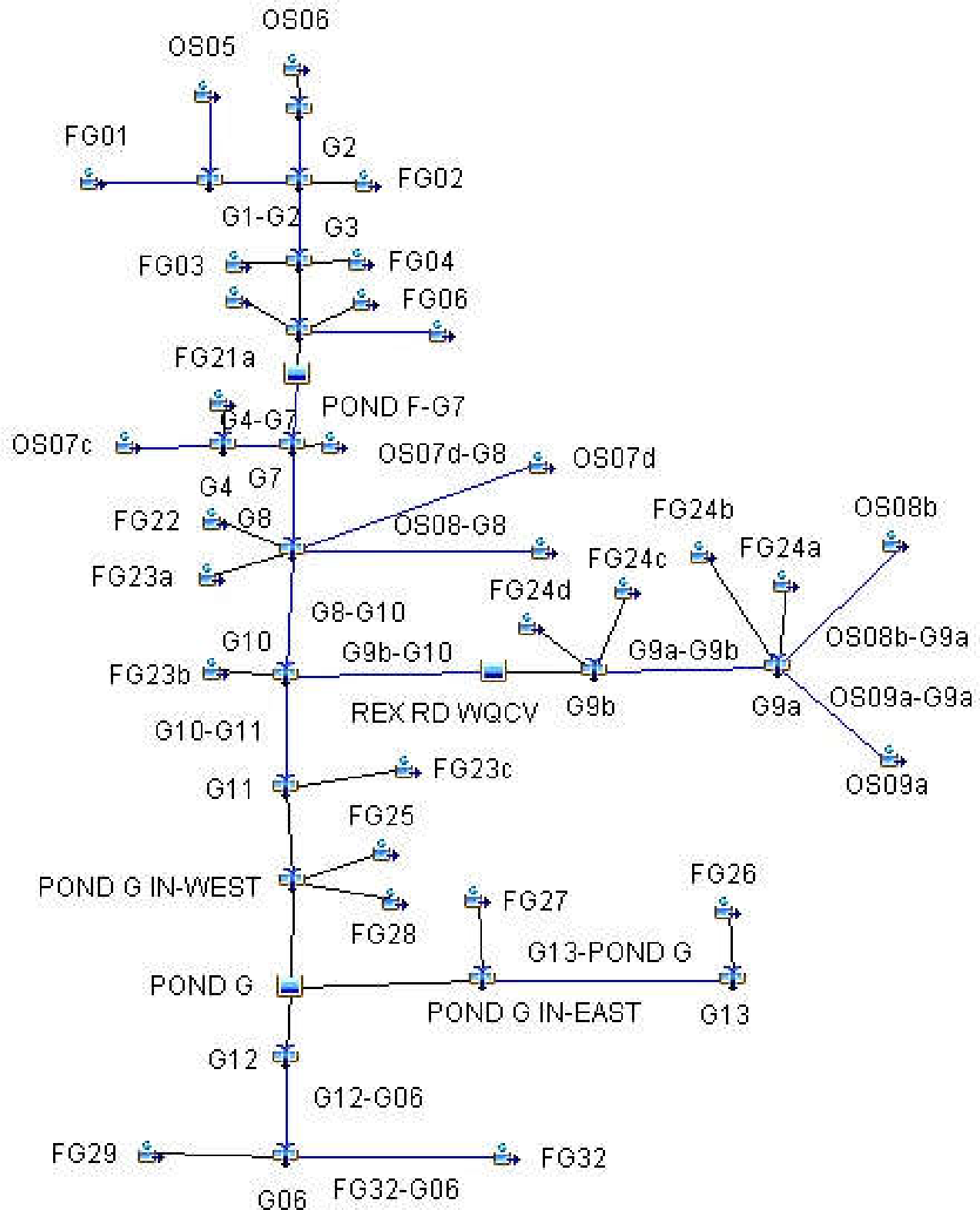
| FUTURE SCS (100-YEAR) | | | | |
|-----------------------|-------------------------|---------------------------|------------------|-----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | TIME OF PEAK | TOTAL VOLUME Q100 (AC. FT.) |
| OS06 | 0.1313 | 80 | 01Jul2015, 12:12 | 9.3 |
| G1a | 0.1313 | 80 | 01Jul2015, 12:12 | 9.3 |
| G1a-G2 | 0.1313 | 79 | 01Jul2015, 12:18 | 9.2 |
| OS05 | 0.0578 | 39 | 01Jul2015, 12:12 | 4.1 |
| OS05-G1 | 0.0578 | 39 | 01Jul2015, 12:12 | 4.1 |
| FG01 | 0.0538 | 31 | 01Jul2015, 12:30 | 4.9 |
| FG01-G1 | 0.0538 | 31 | 01Jul2015, 12:30 | 4.9 |
| G1 | 0.1116 | 61 | 01Jul2015, 12:18 | 9.0 |
| G1-G2 | 0.1116 | 61 | 01Jul2015, 12:18 | 9.0 |
| FG02 | 0.0391 | 32 | 01Jul2015, 12:12 | 3.3 |
| G2 | 0.2820 | 167 | 01Jul2015, 12:18 | 21 |
| G2-G3 | 0.2820 | 163 | 01Jul2015, 12:18 | 21 |
| FG03 | 0.0203 | 24 | 01Jul2015, 12:06 | 2.0 |
| FG04 | 0.0172 | 22 | 01Jul2015, 12:00 | 1.7 |
| G3 | 0.3195 | 185 | 01Jul2015, 12:18 | 25 |
| FG06 | 0.0675 | 56 | 01Jul2015, 12:12 | 6.1 |
| FG05 | 0.0580 | 45 | 01Jul2015, 12:24 | 6.1 |
| OS07ab | 0.0170 | 12 | 01Jul2015, 12:06 | 1.2 |
| OS07ab-POND F | 0.0170 | 12 | 01Jul2015, 12:18 | 1.2 |
| POND F IN | 0.4620 | 293 | 01Jul2015, 12:18 | 38 |
| POND F | 0.4620 | 178 | 01Jul2015, 12:42 | 36 |
| POND F-G7 | 0.4620 | 177 | 01Jul2015, 12:42 | 36 |
| OS07c | 0.0296 | 19 | 01Jul2015, 12:12 | 2.1 |
| OS07c-G4 | 0.0296 | 19 | 01Jul2015, 12:18 | 2.1 |
| FG21a | 0.0095 | 5.9 | 01Jul2015, 12:18 | 0.7 |
| G4 | 0.0391 | 25 | 01Jul2015, 12:18 | 2.8 |
| G4-G7 | 0.0391 | 24 | 01Jul2015, 12:18 | 2.8 |
| FG21b | 0.0150 | 21 | 01Jul2015, 12:06 | 1.8 |
| G7 | 0.5161 | 194 | 01Jul2015, 12:42 | 40 |
| G7-G8 | 0.5161 | 194 | 01Jul2015, 12:42 | 40 |
| FG22 | 0.1354 | 121 | 01Jul2015, 12:12 | 14 |
| OS08a | 0.0251 | 16 | 01Jul2015, 12:12 | 1.8 |
| OS08-G8 | 0.0251 | 16 | 01Jul2015, 12:18 | 1.8 |
| FG23a | 0.0216 | 21 | 01Jul2015, 12:12 | 2.2 |
| OS07d | 0.0034 | 2.5 | 01Jul2015, 12:06 | 0.2 |
| OS07d-G8 | 0.0034 | 2.4 | 01Jul2015, 12:12 | 0.2 |
| G8 | 0.7016 | 279 | 01Jul2015, 12:30 | 58 |
| G8-G10 | 0.7016 | 278 | 01Jul2015, 12:36 | 58 |
| FG24b | 0.0589 | 76 | 01Jul2015, 12:06 | 7.1 |
| FG24a | 0.0348 | 24 | 01Jul2015, 12:18 | 2.9 |
| OS08b | 0.0165 | 9.5 | 01Jul2015, 12:18 | 1.2 |
| OS08b-G9a | 0.0165 | 9.4 | 01Jul2015, 12:30 | 1.1 |
| OS09a | 0.0093 | 5.3 | 01Jul2015, 12:18 | 0.7 |
| OS09a-G9a | 0.0093 | 5.2 | 01Jul2015, 12:30 | 0.6 |
| G9a | 0.1195 | 97 | 01Jul2015, 12:12 | 12 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (100-YEAR) | | | | |
|-----------------------|-------------------------|---------------------------|------------------|-----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | TIME OF PEAK | TOTAL VOLUME Q100 (AC. FT.) |
| G9a-G9b | 0.1195 | 96 | 01Jul2015, 12:12 | 12 |
| FG24c | 0.0291 | 40 | 01Jul2015, 12:06 | 3.7 |
| FG24d | 0.0262 | 39 | 01Jul2015, 12:06 | 3.5 |
| G9b | 0.1748 | 170 | 01Jul2015, 12:12 | 19 |
| REX RD WQCV | 0.1748 | 158 | 01Jul2015, 12:18 | 19 |
| G9b-G10 | 0.1748 | 158 | 01Jul2015, 12:18 | 19 |
| FG23b | 0.0236 | 17 | 01Jul2015, 12:12 | 1.7 |
| G10 | 0.9000 | 390 | 01Jul2015, 12:24 | 78 |
| G10-G11 | 0.9000 | 389 | 01Jul2015, 12:30 | 78 |
| FG23c | 0.0109 | 11 | 01Jul2015, 12:06 | 1.0 |
| G11 | 0.9109 | 393 | 01Jul2015, 12:30 | 79 |
| FG25 | 0.1084 | 111 | 01Jul2015, 12:18 | 13 |
| FG28 | 0.0184 | 15 | 01Jul2015, 12:12 | 1.5 |
| POND G IN-WEST | 1.0377 | 503 | 01Jul2015, 12:24 | 94 |
| FG27 | 0.0679 | 98 | 01Jul2015, 12:12 | 11 |
| FG26 | 0.0570 | 65 | 01Jul2015, 12:18 | 8.0 |
| G13 | 0.0570 | 65 | 01Jul2015, 12:18 | 8.0 |
| G13-POND G | 0.0570 | 64 | 01Jul2015, 12:24 | 8.0 |
| POND G IN-EAST | 0.1249 | 160 | 01Jul2015, 12:18 | 19 |
| POND G | 1.1626 | 450 | 01Jul2015, 12:48 | 103 |
| G12 | 1.1626 | 450 | 01Jul2015, 12:48 | 103 |
| G12-G06 | 1.1626 | 449 | 01Jul2015, 12:54 | 102 |
| FG29 | 0.0983 | 60 | 01Jul2015, 12:12 | 7.0 |
| FG32 | 0.0402 | 51 | 01Jul2015, 12:18 | 6.1 |
| FG32-G06 | 0.0402 | 50 | 01Jul2015, 12:18 | 6.1 |
| G06 | 1.3011 | 491 | 01Jul2015, 12:48 | 115 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

GIECK FUTURE CONDITIONS



| FUTURE SCS (50-YEAR) | | | | |
|----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q50 (CFS) | TIME OF PEAK | TOTAL VOLUME Q50 (AC. FT.) |
| OS06 | 0.1313 | 52 | 01Jul2015, 12:12 | 6.5 |
| G1a | 0.1313 | 52 | 01Jul2015, 12:12 | 6.5 |
| G1a-G2 | 0.1313 | 52 | 01Jul2015, 12:18 | 6.5 |
| OS05 | 0.0578 | 26 | 01Jul2015, 12:12 | 2.9 |
| OS05-G1 | 0.0578 | 25 | 01Jul2015, 12:12 | 2.9 |
| FG01 | 0.0538 | 22 | 01Jul2015, 12:30 | 3.6 |
| FG01-G1 | 0.0538 | 22 | 01Jul2015, 12:30 | 3.6 |
| G1 | 0.1116 | 41 | 01Jul2015, 12:18 | 6.4 |
| G1-G2 | 0.1116 | 41 | 01Jul2015, 12:18 | 6.4 |
| FG02 | 0.0391 | 22 | 01Jul2015, 12:12 | 2.4 |
| G2 | 0.2820 | 112 | 01Jul2015, 12:18 | 15 |
| G2-G3 | 0.2820 | 108 | 01Jul2015, 12:24 | 15 |
| FG03 | 0.0203 | 17 | 01Jul2015, 12:06 | 1.5 |
| FG04 | 0.0172 | 16 | 01Jul2015, 12:00 | 1.3 |
| G3 | 0.3195 | 123 | 01Jul2015, 12:18 | 18 |
| FG06 | 0.0675 | 40 | 01Jul2015, 12:12 | 4.4 |
| FG05 | 0.0580 | 33 | 01Jul2015, 12:24 | 4.6 |
| OS07ab | 0.0170 | 7.9 | 01Jul2015, 12:12 | 0.9 |
| OS07ab-POND F | 0.0170 | 7.6 | 01Jul2015, 12:18 | 0.8 |
| POND F IN | 0.4620 | 200 | 01Jul2015, 12:18 | 28 |
| POND F | 0.4620 | 121 | 01Jul2015, 12:42 | 26 |
| POND F-G7 | 0.4620 | 120 | 01Jul2015, 12:48 | 26 |
| OS07c | 0.0296 | 12 | 01Jul2015, 12:12 | 1.5 |
| OS07c-G4 | 0.0296 | 12 | 01Jul2015, 12:18 | 1.5 |
| FG21a | 0.0095 | 4.0 | 01Jul2015, 12:18 | 0.5 |
| G4 | 0.0391 | 16 | 01Jul2015, 12:18 | 2.0 |
| G4-G7 | 0.0391 | 16 | 01Jul2015, 12:24 | 2.0 |
| FG21b | 0.0150 | 16 | 01Jul2015, 12:06 | 1.4 |
| G7 | 0.5161 | 131 | 01Jul2015, 12:48 | 29 |
| G7-G8 | 0.5161 | 131 | 01Jul2015, 12:48 | 29 |
| FG22 | 0.1354 | 88 | 01Jul2015, 12:12 | 10 |
| OS08a | 0.0251 | 11 | 01Jul2015, 12:12 | 1.3 |
| OS08-G8 | 0.0251 | 10 | 01Jul2015, 12:18 | 1.2 |
| FG23a | 0.0216 | 15 | 01Jul2015, 12:12 | 1.6 |
| OS07d | 0.0034 | 1.6 | 01Jul2015, 12:06 | 0.2 |
| OS07d-G8 | 0.0034 | 1.6 | 01Jul2015, 12:18 | 0.2 |
| G8 | 0.7016 | 178 | 01Jul2015, 12:42 | 42 |
| G8-G10 | 0.7016 | 177 | 01Jul2015, 12:48 | 42 |
| FG24b | 0.0589 | 57 | 01Jul2015, 12:06 | 5.4 |
| FG24a | 0.0348 | 16 | 01Jul2015, 12:18 | 2.1 |
| OS08b | 0.0165 | 6.3 | 01Jul2015, 12:18 | 0.8 |
| OS08b-G9a | 0.0165 | 6.0 | 01Jul2015, 12:36 | 0.8 |
| OS09a | 0.0093 | 3.5 | 01Jul2015, 12:18 | 0.5 |
| OS09a-G9a | 0.0093 | 3.4 | 01Jul2015, 12:30 | 0.5 |
| G9a | 0.1195 | 71 | 01Jul2015, 12:12 | 8.8 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (50-YEAR) | | | | |
|----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q50 (CFS) | TIME OF PEAK | TOTAL VOLUME Q50 (AC. FT.) |
| G9a-G9b | 0.1195 | 70 | 01Jul2015, 12:12 | 8.7 |
| FG24c | 0.0291 | 30 | 01Jul2015, 12:06 | 2.9 |
| FG24d | 0.0262 | 30 | 01Jul2015, 12:06 | 2.7 |
| G9b | 0.1748 | 127 | 01Jul2015, 12:12 | 14 |
| REX RD WQCV | 0.1748 | 125 | 01Jul2015, 12:12 | 14 |
| G9b-G10 | 0.1748 | 123 | 01Jul2015, 12:12 | 14 |
| FG23b | 0.0236 | 11 | 01Jul2015, 12:12 | 1.2 |
| G10 | 0.9000 | 263 | 01Jul2015, 12:18 | 57 |
| G10-G11 | 0.9000 | 254 | 01Jul2015, 12:24 | 57 |
| FG23c | 0.0109 | 7.6 | 01Jul2015, 12:06 | 0.7 |
| G11 | 0.9109 | 258 | 01Jul2015, 12:24 | 57 |
| FG25 | 0.1084 | 84 | 01Jul2015, 12:18 | 10 |
| FG28 | 0.0184 | 10 | 01Jul2015, 12:12 | 1.1 |
| POND G IN-WEST | 1.0377 | 350 | 01Jul2015, 12:18 | 69 |
| FG27 | 0.0679 | 79 | 01Jul2015, 12:12 | 9.1 |
| FG26 | 0.0570 | 50 | 01Jul2015, 12:18 | 6.3 |
| G13 | 0.0570 | 50 | 01Jul2015, 12:18 | 6.3 |
| G13-POND G | 0.0570 | 50 | 01Jul2015, 12:24 | 6.3 |
| POND G IN-EAST | 0.1249 | 127 | 01Jul2015, 12:18 | 15 |
| POND G | 1.1626 | 293 | 01Jul2015, 12:54 | 75 |
| G12 | 1.1626 | 293 | 01Jul2015, 12:54 | 75 |
| G12-G06 | 1.1626 | 293 | 01Jul2015, 13:00 | 74 |
| FG29 | 0.0983 | 39 | 01Jul2015, 12:18 | 5.0 |
| FG32 | 0.0402 | 40 | 01Jul2015, 12:18 | 4.8 |
| FG32-G06 | 0.0402 | 40 | 01Jul2015, 12:18 | 4.8 |
| G06 | 1.3011 | 317 | 01Jul2015, 13:00 | 84 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (10-YEAR) | | | | |
|----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q10 (CFS) | TIME OF PEAK | TOTAL VOLUME Q10 (AC. FT.) |
| OS06 | 0.1313 | 12 | 01Jul2015, 12:18 | 2.2 |
| G1a | 0.1313 | 12 | 01Jul2015, 12:18 | 2.2 |
| G1a-G2 | 0.1313 | 11 | 01Jul2015, 12:24 | 2.1 |
| OS05 | 0.0578 | 5.6 | 01Jul2015, 12:12 | 1.0 |
| OS05-G1 | 0.0578 | 5.5 | 01Jul2015, 12:18 | 1.0 |
| FG01 | 0.0538 | 7.0 | 01Jul2015, 12:36 | 1.4 |
| FG01-G1 | 0.0538 | 7.0 | 01Jul2015, 12:36 | 1.4 |
| G1 | 0.1116 | 11 | 01Jul2015, 12:24 | 2.3 |
| G1-G2 | 0.1116 | 11 | 01Jul2015, 12:30 | 2.3 |
| FG02 | 0.0391 | 6.4 | 01Jul2015, 12:12 | 0.9 |
| G2 | 0.2820 | 27 | 01Jul2015, 12:24 | 5.4 |
| G2-G3 | 0.2820 | 27 | 01Jul2015, 12:30 | 5.3 |
| FG03 | 0.0203 | 5.9 | 01Jul2015, 12:06 | 0.6 |
| FG04 | 0.0172 | 5.8 | 01Jul2015, 12:06 | 0.5 |
| G3 | 0.3195 | 31 | 01Jul2015, 12:30 | 6.4 |
| FG06 | 0.0675 | 12 | 01Jul2015, 12:18 | 1.7 |
| FG05 | 0.0580 | 12 | 01Jul2015, 12:24 | 2.0 |
| OS07ab | 0.0170 | 1.8 | 01Jul2015, 12:12 | 0.3 |
| OS07ab-POND F | 0.0170 | 1.7 | 01Jul2015, 12:30 | 0.3 |
| POND F IN | 0.4620 | 54 | 01Jul2015, 12:24 | 10 |
| POND F | 0.4620 | 16 | 01Jul2015, 13:48 | 9.1 |
| POND F-G7 | 0.4620 | 16 | 01Jul2015, 13:54 | 9.0 |
| OS07c | 0.0296 | 2.7 | 01Jul2015, 12:18 | 0.5 |
| OS07c-G4 | 0.0296 | 2.6 | 01Jul2015, 12:30 | 0.5 |
| FG21a | 0.0095 | 1.0 | 01Jul2015, 12:24 | 0.2 |
| G4 | 0.0391 | 3.6 | 01Jul2015, 12:24 | 0.7 |
| G4-G7 | 0.0391 | 3.5 | 01Jul2015, 12:30 | 0.7 |
| FG21b | 0.0150 | 6.5 | 01Jul2015, 12:06 | 0.6 |
| G7 | 0.5161 | 18 | 01Jul2015, 13:36 | 10 |
| G7-G8 | 0.5161 | 18 | 01Jul2015, 13:42 | 10 |
| FG22 | 0.1354 | 32 | 01Jul2015, 12:18 | 4.3 |
| OS08a | 0.0251 | 2.3 | 01Jul2015, 12:18 | 0.4 |
| OS08-G8 | 0.0251 | 2.3 | 01Jul2015, 12:24 | 0.4 |
| FG23a | 0.0216 | 5.2 | 01Jul2015, 12:12 | 0.7 |
| OS07d | 0.0034 | 0.4 | 01Jul2015, 12:12 | 0.1 |
| OS07d-G8 | 0.0034 | 0.3 | 01Jul2015, 12:24 | 0.1 |
| G8 | 0.7016 | 46 | 01Jul2015, 12:18 | 16 |
| G8-G10 | 0.7016 | 45 | 01Jul2015, 12:24 | 15 |
| FG24b | 0.0589 | 24 | 01Jul2015, 12:12 | 2.5 |
| FG24a | 0.0348 | 4.5 | 01Jul2015, 12:18 | 0.8 |
| OS08b | 0.0165 | 1.4 | 01Jul2015, 12:18 | 0.3 |
| OS08b-G9a | 0.0165 | 1.4 | 01Jul2015, 12:42 | 0.3 |
| OS09a | 0.0093 | 0.8 | 01Jul2015, 12:24 | 0.2 |
| OS09a-G9a | 0.0093 | 0.7 | 01Jul2015, 12:42 | 0.2 |
| G9a | 0.1195 | 28 | 01Jul2015, 12:12 | 3.7 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (10-YEAR) | | | | |
|----------------------|-------------------------|--------------------------|------------------|----------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q10 (CFS) | TIME OF PEAK | TOTAL VOLUME Q10 (AC. FT.) |
| G9a-G9b | 0.1195 | 27 | 01Jul2015, 12:12 | 3.6 |
| FG24c | 0.0291 | 13 | 01Jul2015, 12:12 | 1.3 |
| FG24d | 0.0262 | 14 | 01Jul2015, 12:06 | 1.3 |
| G9b | 0.1748 | 53 | 01Jul2015, 12:12 | 6.3 |
| REX RD WQCV | 0.1748 | 51 | 01Jul2015, 12:12 | 6.1 |
| G9b-G10 | 0.1748 | 50 | 01Jul2015, 12:18 | 6.1 |
| FG23b | 0.0236 | 2.7 | 01Jul2015, 12:12 | 0.4 |
| G10 | 0.9000 | 90 | 01Jul2015, 12:24 | 22 |
| G10-G11 | 0.9000 | 85 | 01Jul2015, 12:30 | 22 |
| FG23c | 0.0109 | 2.2 | 01Jul2015, 12:06 | 0.3 |
| G11 | 0.9109 | 86 | 01Jul2015, 12:30 | 22 |
| FG25 | 0.1084 | 36 | 01Jul2015, 12:18 | 4.7 |
| FG28 | 0.0184 | 3.0 | 01Jul2015, 12:12 | 0.4 |
| POND G IN-WEST | 1.0377 | 122 | 01Jul2015, 12:24 | 27 |
| FG27 | 0.0679 | 42 | 01Jul2015, 12:18 | 4.9 |
| FG26 | 0.0570 | 24 | 01Jul2015, 12:18 | 3.1 |
| G13 | 0.0570 | 24 | 01Jul2015, 12:18 | 3.1 |
| G13-POND G | 0.0570 | 24 | 01Jul2015, 12:24 | 3.1 |
| POND G IN-EAST | 0.1249 | 64 | 01Jul2015, 12:18 | 8.0 |
| POND G | 1.1626 | 52 | 01Jul2015, 13:48 | 27 |
| G12 | 1.1626 | 52 | 01Jul2015, 13:48 | 27 |
| G12-G06 | 1.1626 | 52 | 01Jul2015, 13:54 | 27 |
| FG29 | 0.0983 | 8.9 | 01Jul2015, 12:18 | 1.7 |
| FG32 | 0.0402 | 20 | 01Jul2015, 12:18 | 2.4 |
| FG32-G06 | 0.0402 | 19 | 01Jul2015, 12:18 | 2.4 |
| G06 | 1.3011 | 57 | 01Jul2015, 13:48 | 31 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (5-YEAR) | | | | |
|---------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q5 (CFS) | TIME OF PEAK | TOTAL VOLUME Q5 (AC. FT.) |
| OS06 | 0.1313 | 3.8 | 01Jul2015, 12:24 | 1.1 |
| G1a | 0.1313 | 3.8 | 01Jul2015, 12:24 | 1.1 |
| G1a-G2 | 0.1313 | 3.7 | 01Jul2015, 12:30 | 1.1 |
| OS05 | 0.0578 | 1.8 | 01Jul2015, 12:18 | 0.5 |
| OS05-G1 | 0.0578 | 1.7 | 01Jul2015, 12:24 | 0.5 |
| FG01 | 0.0538 | 3.4 | 01Jul2015, 12:36 | 0.8 |
| FG01-G1 | 0.0538 | 3.4 | 01Jul2015, 12:36 | 0.8 |
| G1 | 0.1116 | 4.9 | 01Jul2015, 12:36 | 1.3 |
| G1-G2 | 0.1116 | 4.8 | 01Jul2015, 12:36 | 1.3 |
| FG02 | 0.0391 | 2.7 | 01Jul2015, 12:18 | 0.5 |
| G2 | 0.2820 | 10 | 01Jul2015, 12:30 | 2.9 |
| G2-G3 | 0.2820 | 10 | 01Jul2015, 12:42 | 2.9 |
| FG03 | 0.0203 | 3.0 | 01Jul2015, 12:06 | 0.4 |
| FG04 | 0.0172 | 3.1 | 01Jul2015, 12:06 | 0.3 |
| G3 | 0.3195 | 12 | 01Jul2015, 12:36 | 3.5 |
| FG06 | 0.0675 | 5.8 | 01Jul2015, 12:18 | 1.0 |
| FG05 | 0.0580 | 6.7 | 01Jul2015, 12:30 | 1.2 |
| OS07ab | 0.0170 | 0.5 | 01Jul2015, 12:18 | 0.2 |
| OS07ab-POND F | 0.0170 | 0.5 | 01Jul2015, 12:42 | 0.1 |
| POND F IN | 0.4620 | 23 | 01Jul2015, 12:36 | 5.9 |
| POND F | 0.4620 | 8.0 | 01Jul2015, 14:12 | 4.8 |
| POND F-G7 | 0.4620 | 8.0 | 01Jul2015, 14:24 | 4.8 |
| OS07c | 0.0296 | 0.9 | 01Jul2015, 12:24 | 0.3 |
| OS07c-G4 | 0.0296 | 0.9 | 01Jul2015, 12:36 | 0.3 |
| FG21a | 0.0095 | 0.4 | 01Jul2015, 12:24 | 0.1 |
| G4 | 0.0391 | 1.2 | 01Jul2015, 12:36 | 0.3 |
| G4-G7 | 0.0391 | 1.2 | 01Jul2015, 12:36 | 0.3 |
| FG21b | 0.0150 | 3.9 | 01Jul2015, 12:06 | 0.4 |
| G7 | 0.5161 | 8.9 | 01Jul2015, 14:12 | 5.5 |
| G7-G8 | 0.5161 | 8.9 | 01Jul2015, 14:18 | 5.5 |
| FG22 | 0.1354 | 17 | 01Jul2015, 12:18 | 2.6 |
| OS08a | 0.0251 | 0.7 | 01Jul2015, 12:24 | 0.2 |
| OS08-G8 | 0.0251 | 0.7 | 01Jul2015, 12:30 | 0.2 |
| FG23a | 0.0216 | 2.7 | 01Jul2015, 12:18 | 0.4 |
| OS07d | 0.0034 | 0.1 | 01Jul2015, 12:18 | 0.0 |
| OS07d-G8 | 0.0034 | 0.1 | 01Jul2015, 12:30 | 0.0 |
| G8 | 0.7016 | 24 | 01Jul2015, 12:18 | 8.7 |
| G8-G10 | 0.7016 | 24 | 01Jul2015, 12:30 | 8.5 |
| FG24b | 0.0589 | 15 | 01Jul2015, 12:12 | 1.6 |
| FG24a | 0.0348 | 2.0 | 01Jul2015, 12:24 | 0.4 |
| OS08b | 0.0165 | 0.5 | 01Jul2015, 12:24 | 0.1 |
| OS08b-G9a | 0.0165 | 0.5 | 01Jul2015, 13:00 | 0.1 |
| OS09a | 0.0093 | 0.3 | 01Jul2015, 12:30 | 0.1 |
| OS09a-G9a | 0.0093 | 0.3 | 01Jul2015, 13:00 | 0.1 |
| G9a | 0.1195 | 16 | 01Jul2015, 12:12 | 2.3 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (5-YEAR) | | | | |
|---------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q5 (CFS) | TIME OF PEAK | TOTAL VOLUME Q5 (AC. FT.) |
| G9a-G9b | 0.1195 | 16 | 01Jul2015, 12:18 | 2.2 |
| FG24c | 0.0291 | 8.4 | 01Jul2015, 12:12 | 0.9 |
| FG24d | 0.0262 | 8.7 | 01Jul2015, 12:06 | 0.9 |
| G9b | 0.1748 | 32 | 01Jul2015, 12:12 | 4.0 |
| REX RD WQCV | 0.1748 | 31 | 01Jul2015, 12:18 | 3.9 |
| G9b-G10 | 0.1748 | 31 | 01Jul2015, 12:18 | 3.9 |
| FG23b | 0.0236 | 0.9 | 01Jul2015, 12:18 | 0.2 |
| G10 | 0.9000 | 46 | 01Jul2015, 12:30 | 13 |
| G10-G11 | 0.9000 | 44 | 01Jul2015, 12:36 | 12 |
| FG23c | 0.0109 | 1.0 | 01Jul2015, 12:12 | 0.2 |
| G11 | 0.9109 | 44 | 01Jul2015, 12:36 | 13 |
| FG25 | 0.1084 | 22 | 01Jul2015, 12:18 | 3.1 |
| FG28 | 0.0184 | 1.2 | 01Jul2015, 12:12 | 0.2 |
| POND G IN-WEST | 1.0377 | 63 | 01Jul2015, 12:30 | 16 |
| FG27 | 0.0679 | 30 | 01Jul2015, 12:18 | 3.5 |
| FG26 | 0.0570 | 16 | 01Jul2015, 12:18 | 2.1 |
| G13 | 0.0570 | 16 | 01Jul2015, 12:18 | 2.1 |
| G13-POND G | 0.0570 | 16 | 01Jul2015, 12:24 | 2.1 |
| POND G IN-EAST | 0.1249 | 44 | 01Jul2015, 12:18 | 5.7 |
| POND G | 1.1626 | 21 | 01Jul2015, 15:24 | 14 |
| G12 | 1.1626 | 21 | 01Jul2015, 15:24 | 14 |
| G12-G06 | 1.1626 | 21 | 01Jul2015, 15:36 | 14 |
| FG29 | 0.0983 | 2.9 | 01Jul2015, 12:24 | 0.9 |
| FG32 | 0.0402 | 14 | 01Jul2015, 12:18 | 1.7 |
| FG32-G06 | 0.0402 | 13 | 01Jul2015, 12:24 | 1.7 |
| G06 | 1.3011 | 22 | 01Jul2015, 15:30 | 17 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (2-YEAR) | | | | |
|---------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q2 (CFS) | TIME OF PEAK | TOTAL VOLUME Q2 (AC. FT.) |
| OS06 | 0.1313 | 0.5 | 01Jul2015, 13:30 | 0.34 |
| G1a | 0.1313 | 0.5 | 01Jul2015, 13:30 | 0.34 |
| G1a-G2 | 0.1313 | 0.5 | 01Jul2015, 13:48 | 0.33 |
| OS05 | 0.0578 | 0.2 | 01Jul2015, 13:24 | 0.15 |
| OS05-G1 | 0.0578 | 0.2 | 01Jul2015, 13:30 | 0.15 |
| FG01 | 0.0538 | 0.9 | 01Jul2015, 12:48 | 0.35 |
| FG01-G1 | 0.0538 | 0.9 | 01Jul2015, 12:48 | 0.35 |
| G1 | 0.1116 | 1.1 | 01Jul2015, 12:54 | 0.50 |
| G1-G2 | 0.1116 | 1.1 | 01Jul2015, 13:00 | 0.49 |
| FG02 | 0.0391 | 0.5 | 01Jul2015, 12:30 | 0.20 |
| G2 | 0.2820 | 1.9 | 01Jul2015, 13:18 | 1.02 |
| G2-G3 | 0.2820 | 1.9 | 01Jul2015, 13:30 | 1.00 |
| FG03 | 0.0203 | 0.8 | 01Jul2015, 12:12 | 0.16 |
| FG04 | 0.0172 | 0.9 | 01Jul2015, 12:06 | 0.14 |
| G3 | 0.3195 | 2.4 | 01Jul2015, 13:24 | 1.30 |
| FG06 | 0.0675 | 1.3 | 01Jul2015, 12:24 | 0.42 |
| FG05 | 0.0580 | 2.4 | 01Jul2015, 12:30 | 0.59 |
| OS07ab | 0.0170 | 0.1 | 01Jul2015, 13:18 | 0.04 |
| OS07ab-POND F | 0.0170 | 0.1 | 01Jul2015, 14:00 | 0.04 |
| POND F IN | 0.4620 | 5.1 | 01Jul2015, 12:42 | 2.36 |
| POND F | 0.4620 | 2.1 | 01Jul2015, 17:54 | 1.55 |
| POND F-G7 | 0.4620 | 2.1 | 01Jul2015, 18:06 | 1.50 |
| OS07c | 0.0296 | 0.1 | 01Jul2015, 13:30 | 0.08 |
| OS07c-G4 | 0.0296 | 0.1 | 01Jul2015, 13:54 | 0.07 |
| FG21a | 0.0095 | 0.1 | 01Jul2015, 13:06 | 0.03 |
| G4 | 0.0391 | 0.2 | 01Jul2015, 13:42 | 0.11 |
| G4-G7 | 0.0391 | 0.2 | 01Jul2015, 13:42 | 0.11 |
| FG21b | 0.0150 | 1.7 | 01Jul2015, 12:12 | 0.21 |
| G7 | 0.5161 | 2.3 | 01Jul2015, 17:48 | 1.82 |
| G7-G8 | 0.5161 | 2.3 | 01Jul2015, 17:54 | 1.79 |
| FG22 | 0.1354 | 5.4 | 01Jul2015, 12:24 | 1.23 |
| OS08a | 0.0251 | 0.1 | 01Jul2015, 13:30 | 0.07 |
| OS08-G8 | 0.0251 | 0.1 | 01Jul2015, 13:36 | 0.06 |
| FG23a | 0.0216 | 0.8 | 01Jul2015, 12:18 | 0.19 |
| OS07d | 0.0034 | 0.01 | 01Jul2015, 13:18 | 0.01 |
| OS07d-G8 | 0.0034 | 0.01 | 01Jul2015, 13:36 | 0.01 |
| G8 | 0.7016 | 7.7 | 01Jul2015, 12:18 | 3.28 |
| G8-G10 | 0.7016 | 7.6 | 01Jul2015, 12:42 | 3.14 |
| FG24b | 0.0589 | 6.5 | 01Jul2015, 12:12 | 0.86 |
| FG24a | 0.0348 | 0.4 | 01Jul2015, 12:48 | 0.17 |
| OS08b | 0.0165 | 0.1 | 01Jul2015, 13:36 | 0.04 |
| OS08b-G9a | 0.0165 | 0.1 | 01Jul2015, 14:30 | 0.04 |
| OS09a | 0.0093 | 0.04 | 01Jul2015, 13:36 | 0.02 |
| OS09a-G9a | 0.0093 | 0.04 | 01Jul2015, 14:24 | 0.02 |
| G9a | 0.1195 | 6.7 | 01Jul2015, 12:12 | 1.08 |
| | | | | |

Highlighted green rows reference key design points (Typical all charts this section)

| FUTURE SCS (2-YEAR) | | | | |
|---------------------|-------------------------|-------------------------|------------------|---------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q2 (CFS) | TIME OF PEAK | TOTAL VOLUME Q2 (AC. FT.) |
| G9a-G9b | 0.1195 | 6.6 | 01Jul2015, 12:18 | 1.1 |
| FG24c | 0.0291 | 4.0 | 01Jul2015, 12:12 | 0.5 |
| FG24d | 0.0262 | 4.4 | 01Jul2015, 12:12 | 0.5 |
| G9b | 0.1748 | 14 | 01Jul2015, 12:12 | 2.1 |
| REX RD WQCV | 0.1748 | 14 | 01Jul2015, 12:18 | 1.9 |
| G9b-G10 | 0.1748 | 13 | 01Jul2015, 12:24 | 1.9 |
| FG23b | 0.0236 | 0.1 | 01Jul2015, 13:06 | 0.1 |
| G10 | 0.9000 | 15 | 01Jul2015, 12:42 | 5.2 |
| G10-G11 | 0.9000 | 15 | 01Jul2015, 12:48 | 5.1 |
| FG23c | 0.0109 | 0.2 | 01Jul2015, 12:18 | 0.1 |
| G11 | 0.9109 | 15 | 01Jul2015, 12:48 | 5.2 |
| FG25 | 0.1084 | 10 | 01Jul2015, 12:24 | 1.7 |
| FG28 | 0.0184 | 0.2 | 01Jul2015, 12:36 | 0.1 |
| POND G IN-WEST | 1.0377 | 22 | 01Jul2015, 12:24 | 6.9 |
| FG27 | 0.0679 | 18 | 01Jul2015, 12:18 | 2.2 |
| FG26 | 0.0570 | 8.2 | 01Jul2015, 12:24 | 1.2 |
| G13 | 0.0570 | 8.2 | 01Jul2015, 12:24 | 1.2 |
| G13-POND G | 0.0570 | 8.1 | 01Jul2015, 12:24 | 1.2 |
| POND G IN-EAST | 0.1249 | 25 | 01Jul2015, 12:18 | 3.5 |
| POND G | 1.1626 | 5.3 | 02Jul2015, 00:00 | 4.7 |
| G12 | 1.1626 | 5.3 | 02Jul2015, 00:00 | 4.7 |
| G12-G06 | 1.1626 | 5.3 | 02Jul2015, 00:00 | 4.5 |
| FG29 | 0.0983 | 0.4 | 01Jul2015, 13:30 | 0.3 |
| FG32 | 0.0402 | 7.5 | 01Jul2015, 12:18 | 1.0 |
| FG32-G06 | 0.0402 | 7.4 | 01Jul2015, 12:24 | 1.0 |
| G06 | 1.3011 | 7.5 | 01Jul2015, 12:24 | 5.8 |
| | | | | |

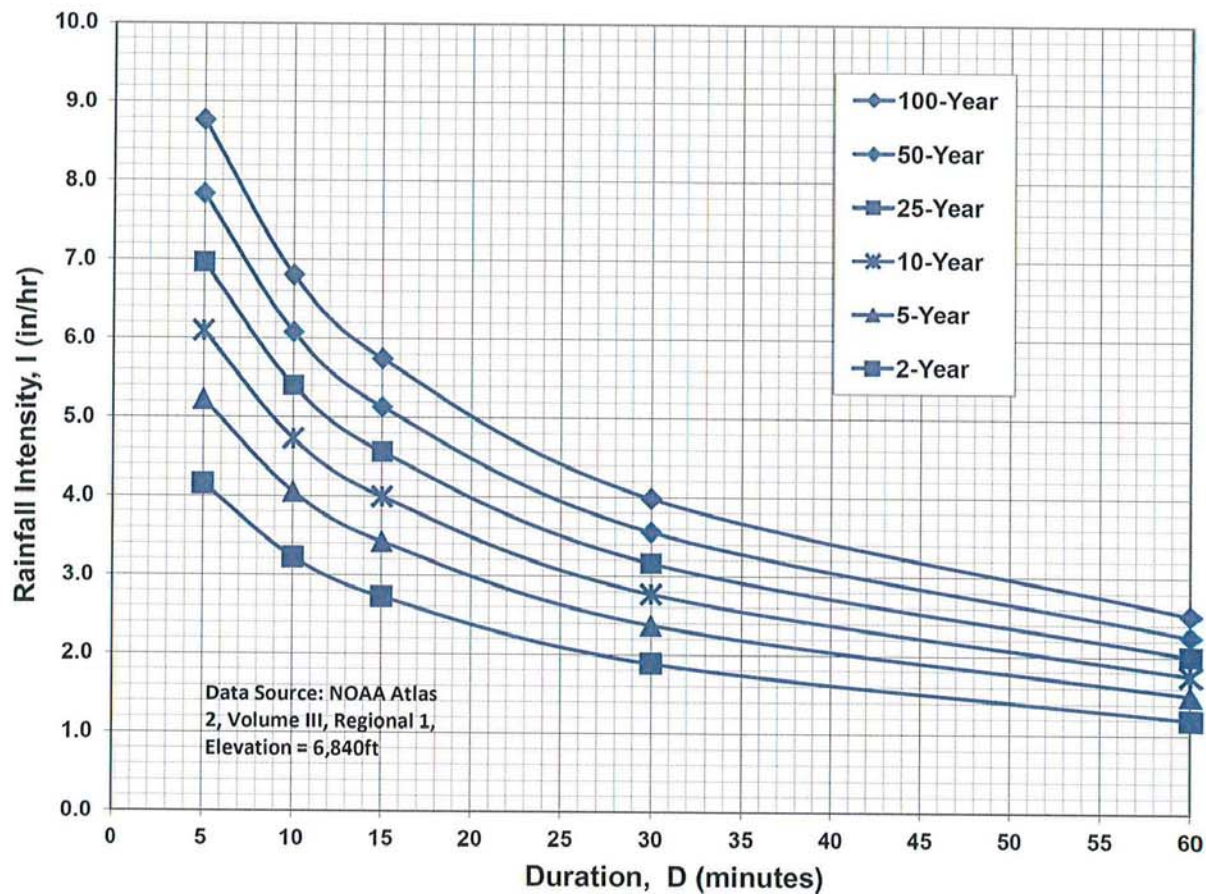
Highlighted green rows reference key design points (Typical all charts this section)

Appendix B – Rational Calculations

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

| Land Use or Surface Characteristics | Percent Impervious | Runoff Coefficients | | | | | | | | | | | |
|--|--------------------|---------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| | | 2-year | | 5-year | | 10-year | | 25-year | | 50-year | | 100-year | |
| | | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D |
| Business | | | | | | | | | | | | | |
| Commercial Areas | 95 | 0.79 | 0.80 | 0.81 | 0.82 | 0.83 | 0.84 | 0.85 | 0.87 | 0.87 | 0.88 | 0.88 | 0.89 |
| Neighborhood Areas | 70 | 0.45 | 0.49 | 0.49 | 0.53 | 0.53 | 0.57 | 0.58 | 0.62 | 0.60 | 0.65 | 0.62 | 0.68 |
| Residential | | | | | | | | | | | | | |
| 1/8 Acre or less | 65 | 0.41 | 0.45 | 0.45 | 0.49 | 0.49 | 0.54 | 0.54 | 0.59 | 0.57 | 0.62 | 0.59 | 0.65 |
| 1/4 Acre | 40 | 0.23 | 0.28 | 0.30 | 0.35 | 0.36 | 0.42 | 0.42 | 0.50 | 0.46 | 0.54 | 0.50 | 0.58 |
| 1/3 Acre | 30 | 0.18 | 0.22 | 0.25 | 0.30 | 0.32 | 0.38 | 0.39 | 0.47 | 0.43 | 0.52 | 0.47 | 0.57 |
| 1/2 Acre | 25 | 0.15 | 0.20 | 0.22 | 0.28 | 0.30 | 0.36 | 0.37 | 0.46 | 0.41 | 0.51 | 0.46 | 0.56 |
| 1 Acre | 20 | 0.12 | 0.17 | 0.20 | 0.26 | 0.27 | 0.34 | 0.35 | 0.44 | 0.40 | 0.50 | 0.44 | 0.55 |
| Industrial | | | | | | | | | | | | | |
| Light Areas | 80 | 0.57 | 0.60 | 0.59 | 0.63 | 0.63 | 0.66 | 0.66 | 0.70 | 0.68 | 0.72 | 0.70 | 0.74 |
| Heavy Areas | 90 | 0.71 | 0.73 | 0.73 | 0.75 | 0.75 | 0.77 | 0.78 | 0.80 | 0.80 | 0.82 | 0.81 | 0.83 |
| Parks and Cemeteries | 7 | 0.05 | 0.09 | 0.12 | 0.19 | 0.20 | 0.29 | 0.30 | 0.40 | 0.34 | 0.46 | 0.39 | 0.52 |
| Playgrounds | 13 | 0.07 | 0.13 | 0.16 | 0.23 | 0.24 | 0.31 | 0.32 | 0.42 | 0.37 | 0.48 | 0.41 | 0.54 |
| Railroad Yard Areas | 40 | 0.23 | 0.28 | 0.30 | 0.35 | 0.36 | 0.42 | 0.42 | 0.50 | 0.46 | 0.54 | 0.50 | 0.58 |
| Undeveloped Areas | | | | | | | | | | | | | |
| Historic Flow Analysis-- Greenbelts, Agriculture | 2 | 0.03 | 0.05 | 0.09 | 0.16 | 0.17 | 0.26 | 0.26 | 0.38 | 0.31 | 0.45 | 0.36 | 0.51 |
| Pasture/Meadow | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |
| Forest | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |
| Exposed Rock | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Offsite Flow Analysis (when landuse is undefined) | 45 | 0.26 | 0.31 | 0.32 | 0.37 | 0.38 | 0.44 | 0.44 | 0.51 | 0.48 | 0.55 | 0.51 | 0.59 |
| Streets | | | | | | | | | | | | | |
| Paved | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Gravel | 80 | 0.57 | 0.60 | 0.59 | 0.63 | 0.63 | 0.66 | 0.66 | 0.70 | 0.68 | 0.72 | 0.70 | 0.74 |
| Drive and Walks | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Roofs | 90 | 0.71 | 0.73 | 0.73 | 0.75 | 0.75 | 0.77 | 0.78 | 0.80 | 0.80 | 0.82 | 0.81 | 0.83 |
| Lawns | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

COMPOSITE 'C' FACTORS

PROJECT: **The Sanctuary PDR-FDR**

7/11/2022

| BASIN DESIGNATION | AREA (AC.) | | | | | | | | | COMPOSITE FACTOR | | Percent Impervious |
|----------------------|------------|---------|---------|---------|---------|---------|---------|---------------------------------|-------|-------------------|-------------|-----------------------|
| | UNDEV | 2 DU/AC | 4 DU/AC | 5 DU/AC | 6 DU/AC | 8 DU/AC | STREETS | OPEN SPACE PARKS/GC LAWNS | TOTAL | 5-year | 100-year | |
| | | | | | | | | | | | | |
| OS01 | | | | 27 | | | | | 27 | 0.37 | 0.47 | 43.0% |
| OS02 | | | | 3.0 | | | | | 3.0 | 0.40 | 1.10 | 43.0% |
| OS03 | | | | 6.6 | | | | | 6.6 | 0.35 | 0.53 | 43.0% |
| OS04 | 37.5 | 2.7 | 37.5 | 8.1 | | | 0.8 | 0.1 | 102 | 0.22 | 0.45 | 23.7% |
| A01 | 0.6 | | 1.7 | | | | 1.2 | 1.8 | 5.3 | 0.39 | 0.55 | 35.4% |
| A02 | | | | | | 4.3 | | | 4.3 | 0.45 | 0.59 | 65.0% |
| A03 | | | | | | 5.5 | | | 5.5 | 0.45 | 0.59 | 65.0% |
| A04 | | | | | | 4.7 | | | 4.7 | 0.45 | 0.59 | 65.0% |
| A05 | | | | | | 2.0 | 0.5 | | 2.5 | 0.54 | 0.67 | 72.3% |
| A06 | | | | | | 4.5 | | | 4.5 | 0.45 | 0.59 | 65.0% |
| A07 | | | | | | 3.6 | | | 3.6 | 0.45 | 0.59 | 65.0% |
| A08 | | | | | | 3.3 | | | 3.3 | 0.45 | 0.59 | 65.0% |
| A09 | | | | | | 5.0 | | 0.3 | 5.3 | 0.44 | 0.58 | 61.4% |
| A10 | | | | | | 1.2 | | 0.8 | 2.0 | 0.37 | 0.52 | 39.5% |
| A11 | | | | | | 0.6 | | 1.2 | 1.8 | 0.31 | 0.47 | 23.3% |
| A12 | 2.3 | | 2.8 | | | | 4.0 | 0.8 | 9.9 | 0.49 | 0.65 | 51.9% |
| | | | | | | | | | | | | |
| B01 | 0.2 | | | | | | | 0.4 | 0.6 | 0.20 | 0.40 | 1.4% |
| B02 | 0.8 | | | | | | | 0.5 | 1.3 | 0.15 | 0.38 | 0.8% |
| | | | | | | | | | | | | |
| | | | | | | | | | | Composite: | | 36.3% |
| TOTAL | 41.3 | 2.7 | 42.0 | 44.3 | 0.0 | 34.7 | 6.5 | 5.9 | 192.7 | 0.31 | 0.50 | 36.3% |

TIME OF CONCENTRATION

PROJECT: **The Sanctuary PDR-FDR**

DATE: 7/11/2022

| TIME OF CONCENTRATION | | | | | | | | | | | | | | | | | | |
|-----------------------|----------------|--------------|--|-----|------------|------------------------|-------------------------------|------|------------|------------|-------|---------------|----------------------------|--|--|----------------------------------|-------------------------|------|
| SUBBASIN DATA | | | INIT./OVERLAND TIME (T _i) | | | | TRAVEL TIME (T _t) | | | | | | | TOTAL | T _c Check (Urbanized Basins) | | FINAL | |
| BASIN DESIGNATION | C _s | AREA (AC) | LENGTH (FT) | ΔH | SLOPE % | T _i (Min.)* | LENGTH (FT) | ΔH | SLOPE % | CONVEYANCE | | VEL. (FPS) | T _t (Min.)** | T _i +T _t (Min.) | L (FT) | T _c = (L/180) + 10 | T _c (min) | |
| | | | | | | | | | | TYPE | COEF. | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| OS01 | 0.37 | 27 | FROM ROLLING HILLS RANCH NORTH RATIONAL CALCULATIONS | | | | | | | | | | | | | | | 22.9 |
| OS02 | 0.40 | 3 | FROM ROLLING HILLS RANCH NORTH RATIONAL CALCULATIONS | | | | | | | | | | | | | | | 15.7 |
| OS03 | 0.35 | 7 | FROM ROLLING HILLS RANCH NORTH RATIONAL CALCULATIONS | | | | | | | | | | | | | | | 18.4 |
| OS04 | 0.22 | 102 | FROM SCS CALCULATIONS | | | | | | | | | | | | | | | 39.6 |
| A01 | 0.39 | 5.3 | 100 | 6.0 | 6.0% | 7.2 | 1015 | 11 | 1.1% | P | 20 | 2.1 | 8.1 | 15.329 | 1115.00 | 16.2 | 15.3 | |
| A02 | 0.45 | 4.3 | 95 | 2.0 | 2.1% | 9.1 | 1080 | 10.5 | 1.0% | P | 20 | 2.0 | 9.1 | 18.267 | 1175.00 | 16.5 | 16.5 | |
| A03 | 0.45 | 5.5 | 100 | 5.0 | 5.0% | 7.0 | 1080 | 8.0 | 0.7% | P | 20 | 1.7 | 10.5 | 17.426 | 1180.00 | 16.6 | 16.6 | |
| A04 | 0.45 | 4.7 | 100 | 2.0 | 2.0% | 9.5 | 855 | 10.0 | 1.2% | P | 20 | 2.2 | 6.6 | 16.047 | 955.00 | 15.3 | 15.3 | |
| A05 | 0.54 | 2.5 | 15 | 0.5 | 3.3% | 5.0 | 1605 | 16.0 | 1.0% | P | 20 | 2.0 | 13.4 | 18.396 | 1620.00 | 19.0 | 18.4 | |
| A06 | 0.45 | 4.5 | 100 | 5.0 | 5.0% | 7.0 | 660 | 11.0 | 1.7% | P | 20 | 2.6 | 4.3 | 11.230 | 760.00 | 14.2 | 11.2 | |
| A07 | 0.45 | 3.6 | 100 | 2.0 | 2.0% | 9.5 | 745 | 6.0 | 0.8% | P | 20 | 1.8 | 6.9 | 16.377 | 845.00 | 14.7 | 14.7 | |
| A08 | 0.45 | 3.3 | 100 | 2.0 | 2.0% | 9.5 | 745 | 4.0 | 0.5% | P | 20 | 1.5 | 8.5 | 17.931 | 845.00 | 14.7 | 14.7 | |
| A09 | 0.44 | 5.3 | 100 | 2.0 | 2.0% | 9.6 | 1100 | 22.0 | 2.0% | P | 20 | 2.8 | 6.5 | 16.114 | 1200.00 | 16.7 | 16.1 | |
| A10 | 0.37 | 2.0 | 85 | 6.0 | 7.1% | 6.5 | 1235 | 13.0 | 1.1% | L | 7 | 0.7 | 28.7 | 35.136 | 1320.00 | 17.3 | 17.3 | |
| A11 | 0.31 | 1.8 | 100 | 6.2 | 6.2% | 7.9 | 425 | 4.0 | 0.9% | L | 7 | 0.7 | 10.4 | 18.304 | 525.00 | 12.9 | 12.9 | |
| A12 | 0.49 | 9.9 | 50 | 1.0 | 2.0% | 6.3 | 2070 | 40.0 | 1.9% | P | 20 | 2.8 | 12.4 | 18.7 | 2120.00 | 21.8 | 18.7 | |
| | | | | | | | | | | | | | | | | | | |
| B01 | 0.20 | 0.6 | 100 | 2.0 | 2.0% | 13.1 | 65 | 1.3 | 2.0% | G | 15 | 2.1 | 0.5 | 13.6 | 165.00 | 10.9 | 10.9 | |
| B02 | 0.15 | 1.3 | 45 | 0.9 | 2.0% | 9.3 | 125 | 9.0 | 7.2% | B | 10 | 2.7 | 0.8 | 10.0 | 170.00 | 10.9 | 10.0 | |
| | | | | | | | | | | | | | | | | | | |

| | | |
|--------|---|---------------------------|
| Notes: | * T _i = $\frac{0.395 (1.1 - C_s) L^{0.5}}{S^{0.33}}$ | |
| | V = C _v S _w ^{0.5} | ** T _t = L x V |

| TYPE OF SURFACE | | C _v |
|-------------------------|---|----------------|
| HEAVY MEADOW | H | 2.5 |
| TILLAGE/FIELD | T | 5 |
| RIPRAP (not buried) | R | 6.5 |
| SHORT PASTURE AND LAWNS | L | 7 |
| NEARLY BARE GROUND | B | 10 |
| GRASSED WATERWAY | G | 15 |
| PAVED AREAS | P | 20 |

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)
SURFACE ROUTING

PROJECT: **The Sanctuary PDR-FDR**

Date: 7/11/2022

| DESIGN POINT | DIRECT RUNOFF | | | | | | | | | | | TAL RUNOFF | | | | | | OVERLAND TRAVEL TIME | | | | | | | | |
|-----------------|---------------|-----------|-----------|--------------|----------|----------|----------|--------|----------|--------|----------|---------------|--------------|----------|--------|----------|--------|----------------------|----------------|-----------------|----------------------------|---------|------------|-------------|----------------|-----|
| | BASIN | AREA (AC) | Tc (Min.) | I (in./ hr.) | | COEFF. © | | CA | | Q | | Sum Tc (min.) | I (in./ hr.) | | CA | | Q | | DESTINATION DP | CONVEYANCE TYPE | COEFFICIENT C _v | SLOPE % | VEL. (FPS) | LENGTH (FT) | TRAVEL TIME Tt | |
| | | | | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | | | | | | | | |
| | DEVELOPED | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DP1 | OS01 | 26.6 | 22.9 | 2.89 | 4.85 | 0.37 | 0.47 | 9.92 | 12.38 | 29 | 60 | | | | | | | 29 | 60 | | | | | | | |
| I01 | OS02 | 3.0 | 15.7 | 3.45 | 5.79 | 0.40 | 1.10 | 1.20 | 3.32 | 4.1 | 19 | | | | | | | 3.6 | 19 | | | | | | | |
| I02 | OS03 | 6.6 | 18.4 | 3.21 | 5.39 | 0.35 | 0.53 | 2.31 | 3.50 | 7.4 | 19 | | | | | | | 7.4 | 19 | | | | | | | |
| I03 | A01 | 5.3 | 15.3 | 3.49 | 5.86 | 0.39 | 0.55 | 2.03 | 2.92 | 7.1 | 17 | | | | | | | 7.1 | 17 | I04 | P | 20.0 | 1.00% | 2.0 | 150 | 1.3 |
| I04 | A02 | 4.3 | 16.5 | 3.38 | 5.67 | 0.45 | 0.59 | 1.94 | 2.54 | 6.5 | 14 | 16.6 | 3.37 | 5.66 | 2.63 | 3.93 | | 8.9 | 22 | I05 | P | 20.0 | 1.00% | 2.0 | 395 | 3.3 |
| I05 | A03 | 5.5 | 16.6 | 3.37 | 5.66 | 0.45 | 0.59 | 2.48 | 3.25 | 8.4 | 18 | 19.9 | 3.10 | 5.20 | 3.23 | 4.78 | | 10 | 25 | I06 | P | 20.0 | 1.00% | 2.0 | 315 | 2.6 |
| I06 | A04 | 4.7 | 15.3 | 3.49 | 5.86 | 0.45 | 0.59 | 2.10 | 2.75 | 7.3 | 16 | 22.5 | 2.91 | 4.89 | 2.80 | 4.33 | | 8.2 | 21 | I10 | P | 20.0 | 0.65% | 1.6 | 900 | 9.3 |
| I07 | A05 | 2.5 | 18.4 | 3.21 | 5.40 | 0.54 | 0.67 | 1.37 | 1.68 | 4.4 | 9.1 | | | | | | | 4.4 | 9.1 | I11 | P | 20.0 | 1.20% | 2.2 | 475 | 3.6 |
| I08 | A06 | 4.5 | 11.2 | 3.96 | 6.64 | 0.45 | 0.59 | 2.03 | 2.66 | 8.0 | 18 | | | | | | | 8.0 | 18 | I09 | P | 20.0 | 1.20% | 2.2 | 225 | 1.7 |
| I09 | A07 | 3.6 | 14.7 | 3.55 | 5.96 | 0.45 | 0.59 | 1.61 | 2.12 | 5.7 | 13 | 14.7 | 3.55 | 5.96 | 2.17 | 3.09 | | 7.7 | 18 | I10 | P | 20.0 | 1.00% | 2.0 | 225 | 1.9 |
| I10 | A08 | 3.3 | 14.7 | 3.55 | 5.96 | 0.45 | 0.59 | 1.49 | 1.95 | 5.3 | 12 | 31.8 | 2.39 | 4.02 | 2.67 | 4.52 | | 6.4 | 18 | I11 | P | 20.0 | 2.00% | 2.8 | 17 | 0.1 |
| I11 | A09 | 5.3 | 16.1 | 3.41 | 5.73 | 0.44 | 0.58 | 2.32 | 3.06 | 7.9 | 18 | 31.9 | 2.39 | 4.01 | 2.53 | 4.49 | | 7.9 | 18 | | | | | | | |
| | A10 | 2.0 | 17.3 | 3.30 | 5.55 | 0.37 | 0.52 | 0.74 | 1.05 | 2.5 | 5.8 | | | | | | | 2.5 | 5.8 | | G | 15.0 | 2.00% | 2.1 | 455 | 3.6 |
| DP3 | A11 | 1.8 | 12.9 | 3.75 | 6.29 | 0.31 | 0.47 | 0.55 | 0.83 | 2.1 | 5.2 | 20.9 | 3.02 | 5.07 | 1.29 | 1.88 | | 3.9 | 9.6 | | | | | | | |
| I12 | A12 | 9.9 | 18.7 | 3.19 | 5.35 | 0.49 | 0.65 | 4.82 | 6.37 | 15 | 34 | | | | | | | 15 | 34 | | | | | | | |
| DP2 | OS04 | 102 | 39.63 | 2.06 | 3.46 | 0.22 | 0.45 | 22 | 45.67 | 46 | 158 | | | | | | | 46 | 158 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | B01 | 0.6 | 10.9 | 4.00 | 6.71 | 0.20 | 0.40 | 0.12 | 0.24 | 0.5 | 1.6 | | | | | | | 0.5 | 1.6 | | | | | | | |
| | B02 | 1.3 | 10.0 | 4.12 | 6.92 | 0.15 | 0.38 | 0.19 | 0.48 | 0.8 | 3.3 | | | | | | | 0.8 | 3.3 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |

**STORM DRAINAGE SYSTEM DESIGN
INLET CALCULATIONS**

PROJECT: **The Sanctuary PDR-FDR**

Date: 7/11/2022

| DP | BASIN | Inlet size L(i) | Proposed or Existing | INLET TYPE | CROSS SLOPE | STREET SLOPE | T _c | Q _{Total} | | Q _{Capture} | | | | Q _{Flowby} | | | | DEPTH (max) | | SPREAD | |
|-----|-------|--------------------|-------------------------|---------------|----------------|-----------------|----------------|-------------------------|---------------------------|-------------------------|---------------------------|------------------------------|--------------------------------|-------------------------|---------------------------|------------------------------|--------------------------------|------------------------|--------------------------|------------------------|--------------------------|
| | | | | | | | | Q ₆ (cfs) | Q ₁₀₀ (cfs) | Q ₆ (cfs) | Q ₁₀₀ (cfs) | CA _{eqv.} (5-yr) | CA _{eqv.} (100-yr) | Q ₆ (cfs) | Q ₁₀₀ (cfs) | CA _{eqv.} (5-yr) | CA _{eqv.} (100-yr) | Q ₆ (ft) | Q ₁₀₀ (ft) | Q ₆ (ft) | Q ₁₀₀ (ft) |
| | | | | | | | | | | | | | | | | | | | | | |
| I01 | OS02 | 15 | PROP | SUMP | 2.0% | | 15.7 | 3.6 | 19 | 3.6 | 19 | 1.05 | 3.323 | - | - | - | - | 0.50 | 0.70 | | |
| I02 | OS03 | 15 | PROP | SUMP | 2.0% | | 18.4 | 7.4 | 19 | 7.4 | 19 | 2.31 | 3.500 | - | - | - | - | 0.50 | 0.70 | | |
| I03 | A01 | 15 | PROP | FLOW-BY | 2.0% | 2.0% | 15.3 | 7.1 | 17 | 4.7 | 8.9 | 1.34 | 1.527 | 2.4 | 8.1 | 0.69 | 1.39 | 0.35 | 0.45 | 13.2 | 18.3 |
| I04 | A02 | 20 | PROP | FLOW-BY | 2.0% | 2.0% | 16.6 | 8.9 | 22 | 6.3 | 14 | 1.88 | 2.397 | 2.5 | 8.7 | 0.75 | 1.53 | 0.37 | 0.49 | 14.3 | 20.3 |
| I05 | A03 | 20 | PROP | FLOW-BY | 2.0% | 0.75% | 19.9 | 10 | 25 | 7.8 | 17 | 2.53 | 3.200 | 2.2 | 8.2 | 0.70 | 1.58 | 0.45 | 0.59 | 18.0 | 25.4 |
| I06 | A04 | 20 | PROP | FLOW-BY | 2.0% | 0.75% | 22.5 | 8.2 | 21 | 6.6 | 15 | 2.27 | 2.981 | 1.6 | 6.6 | 0.53 | 1.35 | 0.42 | 0.56 | 16.7 | 23.9 |
| I07 | A05 | 15 | PROP | FLOW-BY | 2.0% | 0.50% | 18.4 | 4.4 | 9.1 | 3.7 | 6.7 | 1.15 | 1.246 | 0.7 | 2.3 | 0.22 | 0.43 | 0.37 | 0.46 | 14.3 | 18.8 |
| I08 | A06 | 20 | PROP | FLOW-BY | 2.0% | 2.0% | 11.2 | 8.0 | 18 | 5.8 | 11 | 1.47 | 1.689 | 2.2 | 6.5 | 0.56 | 0.97 | 0.36 | 0.46 | 13.8 | 18.6 |
| I09 | A07 | 15 | PROP | FLOW-BY | 2.0% | 1.0% | 14.7 | 7.7 | 18 | 5.4 | 11 | 1.53 | 1.878 | 2.3 | 7.2 | 0.64 | 1.21 | 0.40 | 0.51 | 15.5 | 21.5 |
| I10 | A08 | 10 | PROP | SUMP | 2.0% | | 31.8 | 6.4 | 18 | 6.4 | 14 | 2.67 | 3.520 | - | 4.0 | - | 1.00 | 0.50 | 0.60 | | |
| I11 | A09 | 20 | PROP | SUMP | 2.0% | | 31.9 | 7.9 | 18 | 7.9 | 18 | 3.31 | 4.493 | - | - | - | - | 0.50 | 0.60 | | |
| I12 | A12 | 20 | PROP | SUMP | 2.0% | | 18.7 | 15 | 34 | 15 | 34 | 4.82 | 6.371 | - | - | - | - | 0.50 | 1.00 | | |

¹ Forced sump at intersection

**STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)
PIPE ROUTING WORKSHEET**

PROJECT: **The Sanctuary PDR-FDR**

Date: 7/11/2022

| UPSTREAM DESIGN POINT | UPSTREAM BASIN | INLET FLOW | | | | | | | SYSTEM FLOW | | | | | | | TRAVEL TIME | | | | | | |
|--------------------------|-------------------|------------|--------------|----------|--------|----------|--------|----------|---------------|--------------|----------|--------|----------|--------|----------|-------------|---------------|----------------|---------|-------------|---------------------------|----------------|
| | | Tc (Min.) | I (in./ hr.) | | CA | | Q | | Sum Tc (min.) | I (in./ hr.) | | CA | | Q | | PIPE DIA | ROUGHNESS (n) | DESTINATION DP | SLOPE % | LENGTH (FT) | VEL. (FPS) (Estimate)* | TRAVEL TIME Tt |
| | | | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | | | | | | | |
| DP01 | OS01 | | | | | | | | 22.9 | 2.89 | 4.85 | 9.92 | 12.38 | 29 | 60 | 36 | 0.013 | J01 | 1.61% | 165 | 12 | 0.2 |
| I01 | OS02 | 15.7 | 3.45 | 5.79 | 1.05 | 3.32 | 3.6 | 19 | | | | | | 3.6 | 19 | 18 | 0.013 | J01 | 4.28% | 5 | 12 | 0.0 |
| I02 | OS03 | 18.4 | 3.21 | 5.39 | 2.31 | 3.50 | 7.4 | 19 | | | | | | 7.4 | 19 | 18 | 0.013 | J01 | 0.81% | 25 | 5 | 0.1 |
| J01 | | | | | | | | | 23.1 | 2.87 | 4.82 | 13.28 | 19.20 | 38 | 93 | 42 | 0.013 | J02 | 0.79% | 138 | 9 | 0.2 |
| I03 | A01 | 15.3 | 3.49 | 5.86 | 1.34 | 1.53 | 4.7 | 8.9 | | | | | | 4.7 | 8.9 | 18 | 0.013 | J02 | 17.13% | 5 | 25 | 0.0 |
| J02 | | | | | | | | | 23.4 | 2.86 | 4.79 | 14.62 | 20.73 | 42 | 99 | 42 | 0.013 | J03 | 1.78% | 160 | 14 | 0.2 |
| I04 | A02 | 16.6 | 3.37 | 5.66 | 1.88 | 2.40 | 6.3 | 14 | | | | | | 6.3 | 14 | 18 | 0.013 | J03 | 2.14% | 5 | 9 | 0.0 |
| J03 | | | | | | | | | 23.6 | 2.84 | 4.77 | 16.50 | 23.13 | 47 | 110 | 48 | 0.013 | J04 | 1.14% | 404 | 12 | 0.6 |
| I05 | A03 | 19.9 | 3.10 | 5.20 | 2.53 | 3.20 | 7.8 | 17 | | | | | | 7.8 | 17 | 18 | 0.013 | J04 | 2.14% | 5 | 9 | 0.0 |
| J04 | | | | | | | | | 24.1 | 2.81 | 4.72 | 19.02 | 26.33 | 53 | 124 | 48 | 0.013 | J05 | 0.68% | 330 | 9 | 0.6 |
| I06 | A04 | 22.5 | 2.91 | 4.89 | 2.27 | 2.98 | 6.6 | 15 | | | | | | 6.6 | 15 | 18 | 0.013 | J05 | 2.40% | 4 | 9 | 0.0 |
| J05 | | | | | | | | | 24.7 | 2.77 | 4.66 | 21.29 | 29.31 | 59 | 136 | 54 | 0.013 | J06 | 0.79% | 163 | 11 | 0.2 |
| J06 | | | | | | | | | 24.9 | 2.76 | 4.63 | 21.29 | 29.31 | 59 | 136 | 54 | 0.013 | J07 | 0.57% | 265 | 9 | 0.5 |
| I07 | A05 | 18.4 | 3.21 | 5.40 | 1.15 | 1.25 | 3.7 | 6.7 | | | | | | 3.7 | 6.7 | 18 | 0.013 | J07 | 7.74% | 25 | 17 | 0.0 |
| J07 | | | | | | | | | 25.4 | 2.73 | 4.58 | 22.44 | 30.56 | 61 | 140 | 54 | 0.013 | J11 | 0.50% | 486 | 9 | 0.9 |
| I08 | A06 | 11.2 | 3.96 | 6.64 | 1.47 | 1.69 | 5.8 | 11 | | | | | | 5.8 | 11 | 18 | 0.013 | J08 | 4.41% | 6 | 13 | 0.0 |
| J08 | | | | | | | | | 11.2 | 3.96 | 6.64 | 1.47 | 1.69 | 5.8 | 11 | 18 | 0.013 | J09 | 1.48% | 233 | 7 | 0.5 |
| I09 | A07 | 14.7 | 3.55 | 5.96 | 1.53 | 1.88 | 5.4 | 11 | | | | | | 5.4 | 11 | 18 | 0.013 | J09 | 1.76% | 6 | 8 | 0.0 |
| J09 | | | | | | | | | 14.7 | 3.55 | 5.96 | 3.00 | 3.57 | 11 | 21 | 24 | 0.013 | J10 | 0.93% | 156 | 7 | 0.4 |
| J10 | | | | | | | | | 15.1 | 3.51 | 5.90 | 3.00 | 3.57 | 11 | 21 | 24 | 0.013 | J11 | 1.13% | 93 | 8 | 0.2 |
| I10 | A08 | 31.8 | 2.39 | 4.02 | 2.67 | 3.52 | 6.4 | 14 | | | | | | 6.4 | 14 | 18 | 0.013 | J11 | 4.09% | 4 | 12 | 0.0 |
| J11 | | | | | | | | | 31.8 | 2.39 | 4.02 | 28.11 | 37.64 | 67 | 151 | 54 | 0.013 | I11 | 1.90% | 24 | 17 | 0.0 |
| I11 | A09 | 31.9 | 2.39 | 4.01 | 3.31 | 4.49 | 7.9 | 18 | 31.9 | 2.39 | 4.01 | 31.42 | 42.14 | 75 | 169 | 54 | 0.013 | OS1 | 1.73% | 115 | 16 | 0.1 |
| | | | | | | | | | | | | | | | | | | | | | | |
| I12 | A12 | 18.7 | 3.19 | 5.35 | 4.82 | 6.37 | 15 | 34 | 18.7 | 3.19 | 5.35 | 4.82 | 6.37 | 15 | 34 | 24 | 0.013 | OS3 | 3.00% | 118 | 13 | 0.2 |
| | | | | | | | | | | | | | | | | | | | | | | |

Appendix C - Detention Pond Information

STAGE/STORAGE/DISCHARGE CURVES FOR DETENTIOA1:U54N POND ANALYSIS

Meridian Ranch Proposed Detention Pond G - SANCTUARY INTERIM CONDITIONS (G12)

Gieck Basin - El Paso County, Colorado

Data for outlet pipe and grate:

| Type | H or V | Dimensions Width (ft.) X Height (ft.) | Dia.(in) | (sqft) |
|--------------------|---------------|--|----------|-----------------------------------|
| Circular | Orifice 1a: V | | 1.75 | Area = 0.017 Elev to cl = 7023.50 |
| Circular | Orifice 1b: V | | 1.75 | Area = 0.017 Elev to cl = 7024.10 |
| Circular | Orifice 1c: V | | 1.75 | Area = 0.017 Elev to cl = 7024.80 |
| Rectangular | Orifice 2: V | 8.6 | 1.04 | Area = 8.944 Elev to cl = 7027.62 |
| Rectangular | Orifice 3: V | 2 | 0.43 | Area = 0.860 Elev to cl = 7025.44 |
| Rectangular | Orifice 4: V | 4.1 | 0.64 | Area = 2.624 Elev to cl = 7027.82 |
| Rectangular | Orifice 5: V | 8.6 | 1.04 | Area = 8.944 Elev to cl = 7027.62 |

Stand Pipe Dimensions

| | | | | |
|-------------|----|------|---|----------------|
| Rec Grate | 20 | x | 8 | Elev = 7028.14 |
| Circ. Grate | | dia. | | Elev = 7028.14 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | | Dia. (ft.) | Type |
|----------------|-------------|-----|--------------|--|------------|--------------------|
| Outlet Culvert | 10 | x | 4 | | | Rectangular |
| Area | 40.0 | | TOP | | | |
| Outlet I. E. | 7022.5 | | 7027.50 | | | |
| Wall Thick. | 12 | in. | | | | |

| | |
|------------------------|--------|
| 50 year storage vol.= | 20.4 |
| 50 year storage elev.= | 7029.5 |
| 50 year discharge= | 307 |
| 10 year storage vol.= | 11.3 |
| 10 year storage elev.= | 7027.9 |
| 10 year discharge= | 50 |
| 2 year storage vol.= | 5.0 |
| 2 year storage elev.= | 7026.7 |
| 2 year discharge= | 5.0 |

Data for spillway and embankment:

| | |
|-------------------------|--------|
| embankment length = | 500 |
| embankment elev = | 7033.5 |
| spillway length = | 130 |
| spillway elevation = | 7031.5 |
| 100 year storage elev.= | 7030.3 |
| 100 year storage vol.= | 25.7 |
| 100 year discharge= | 466 |
| 5 year storage elev.= | 7027.5 |
| 5 year storage vol.= | 8.7 |
| 5 year discharge= | 19 |
| WQCV storage elev.= | 7025.2 |
| WQCV storage vol.= | 0.9 |
| 1/2 WQCV storage elev.= | 7024.8 |
| 1/2 WQCV storage vol.= | 0.45 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | | | | | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
|--------|--------|---------|------|--------|----------|----------------|----------|--------------------------|------|------|------|------|------|------|------------------------|-----|--|-----|----------|------|--|--------------------------------|---------------|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF BANK | SPILLWAY | ORIFICE (max outflow) | | | | | | | GRATE (max outflow) | | | | | | | | |
| | | sqft | acre | acft | cum acft | | | 1a | 1b | 1c | 2 | 3 | 4 | 5 | Rectangular | | | | | | | | |
| 7023 | 0 | 0 | 0.00 | 0.0 | 0.000 | | | - | - | - | - | - | - | - | - | 10 | | - | - | | | | |
| 7024 | 1 | 2285 | 0.05 | 0.0 | 0.026 | - | - | 0.06 | - | - | - | - | - | - | - | 51 | | 0.1 | 0.06 | | | | |
| 7025 | 2 | 42192 | 0.97 | 0.5 | 0.537 | - | - | 0.10 | 0.08 | 0.04 | - | - | - | - | - | 111 | | 0.2 | 0.21 | | | | |
| 7026 | 3 | 127336 | 2.92 | 1.9 | 2.483 | - | - | 0.13 | 0.11 | 0.09 | - | 3.1 | - | - | - | 184 | | 3.4 | 3.44 | | | | |
| 7026.5 | 3.5 | 169390 | 3.89 | 3.6 | 4.180 | - | - | 0.14 | 0.12 | 0.10 | - | 4.3 | - | - | - | 224 | | 4.6 | 4.64 | | | | |
| 7027 | 4 | 211444 | 4.85 | 2.2 | 6.365 | - | - | 0.15 | 0.14 | 0.12 | - | 5.2 | - | - | - | 268 | | 5.6 | 5.59 | | | | |
| 7027.5 | 4.5 | 234356 | 5.38 | 4.6 | 8.814 | - | - | 0.16 | 0.15 | 0.13 | 6.5 | 6.0 | - | 6.5 | - | 304 | | 19 | 19.45 | | | | |
| 7028 | 5 | 257267 | 5.91 | 5.4 | 11.745 | - | - | 0.17 | 0.16 | 0.14 | 22.0 | 6.6 | 4.3 | 22.0 | - | 337 | | 56 | 55.51 | | | | |
| 7028.5 | 5.5 | 264583 | 6.07 | 5.7 | 14.541 | - | - | 0.18 | 0.17 | 0.15 | 40.4 | 7.2 | 10.4 | 40.4 | 23 | 373 | | 122 | 122.30 | | | | |
| 7029 | 6 | 271899 | 6.24 | 6.1 | 17.819 | - | - | 0.19 | 0.18 | 0.16 | 50.6 | 7.8 | 13.7 | 50.6 | 86 | 406 | | 209 | 209.39 | | | | |
| 7029.5 | 6.5 | 277060 | 6.36 | 11.7 | 20.555 | - | - | 0.21 | 0.19 | 0.17 | 59.0 | 8.3 | 16.4 | 59.0 | 171 | 436 | | 315 | 314.68 | | | | |
| 7030 | 7 | 282220 | 6.48 | 9.4 | 23.956 | - | - | 0.21 | 0.20 | 0.18 | 66.4 | 8.8 | 18.7 | 66.4 | 274 | 464 | | 435 | 434.93 | | | | |
| 7030.5 | 7.5 | 287904 | 6.61 | 6.5 | 27.039 | - | - | 0.21 | 0.20 | 0.19 | 73.1 | 9.3 | 20.7 | 73.1 | 392 | 491 | | 491 | 490.92 | | | | |
| 7031 | 8 | 293587 | 6.74 | 6.6 | 30.565 | - | - | 0.22 | 0.21 | 0.20 | 79.2 | 9.8 | 22.5 | 79.2 | 522 | 516 | | 516 | 516.22 | | | | |
| 7031.5 | 8.5 | 297735 | 6.84 | 6.7 | 33.762 | - | - | 0.23 | 0.22 | 0.21 | 84.8 | 10.2 | 24.2 | 84.8 | 665 | 540 | | 540 | 540.33 | | | | |
| 7032 | 9 | 301883 | 6.93 | 3.4 | 37.203 | 137.9 | 137.9 | 0.23 | 0.23 | 0.22 | 90.1 | 10.6 | 25.8 | 90.1 | 819 | 563 | | 563 | 701.30 | | | | |
| 7032.5 | 9.5 | 309236 | 7.10 | 7.0 | 40.729 | 390.0 | 390.0 | 0.24 | 0.23 | 0.22 | 95.1 | 11.0 | 27.3 | 95.1 | 983 | 586 | | 586 | 975.59 | | | | |
| 7033 | 10 | 316589 | 7.27 | 3.6 | 44.320 | 716.5 | 716.5 | 0.25 | 0.24 | 0.23 | 99.9 | 11.4 | 28.8 | 99.9 | 1,157 | 607 | | 607 | 1,323.43 | | | | |

- Notes:
- 1) Top-of-bank and spillway flows are weir equations from section 11.3.1 in the DCM. $Q=CLH^{1.5}$ (C=3.0)
 - 2) Orifice flows are also from section 11.3.1. $Q=CA(2gH)^{0.5}$ (C=.6)
 - 3) Grate flows are determined from equations 7-2 and 7-3. Weir Flow $Q=(3PH^{1.5})/F$, Orifice Flow $Q=4.815*AH^{0.5}$
 - 4) Pipe flows use the lesser of: 1) Inlet control equations 27 & 28, page 146 of HDS No. 5 - or - 2) Allowable Pipe Flow equation on page 11-9 of the DCM. Use Table 9, page 147-148, HDS No. 5 for formulas 26 & 27.

STAGE/STORAGE/DISCHARGE CURVES FOR DETENTION POND ANALYSIS

Meridian Ranch Proposed Detention Pond G-FUTURE CONDITIONS (G12)

Gieck Basin - El Paso County, Colorado

Data for outlet pipe and grate:

| Type | H or V | Width (ft.) | Height (ft.) | Dia.(in) | (sqft) |
|--------------------|-------------|-------------|--------------|----------|-----------------------------------|
| Circular | Orifice 1a: | V | | 1.75 | Area = 0.017 Elev to cl = 7023.50 |
| Circular | Orifice 1b: | V | | 1.75 | Area = 0.017 Elev to cl = 7024.10 |
| Circular | Orifice 1c: | V | | 1.75 | Area = 0.017 Elev to cl = 7024.80 |
| Rectangular | Orifice 2: | V | 8.6 | 1.04 | Area = 8.944 Elev to cl = 7027.62 |
| Rectangular | Orifice 3: | V | 2 | 0.43 | Area = 0.860 Elev to cl = 7025.44 |
| Rectangular | Orifice 4: | V | 4.1 | 0.64 | Area = 2.624 Elev to cl = 7027.82 |
| Rectangular | Orifice 5: | V | 8.6 | 1.04 | Area = 8.944 Elev to cl = 7027.62 |

Stand Pipe Dimensions

| | | | | |
|-------------|----|------|---|----------------|
| Rec Grate | 20 | x | 8 | Elev = 7028.14 |
| Circ. Grate | | dia. | | Elev = 7028.14 |

Outlet Culvert Dimensions

| | Width (ft.) | Height (ft.) | Dia. (ft.) | Type |
|----------------|-------------|--------------|------------|--------------------|
| Outlet Culvert | 10 | x | 4 | Rectangular |
| Area | 40.0 | TOP | | |
| Outlet I. E. | 7022.5 | 7027.50 | | |
| Wall Thick. | 12 | in. | | |

| | |
|------------------------|--------|
| 50 year storage vol.= | 20.0 |
| 50 year storage elev.= | 7029.4 |
| 50 year discharge= | 293 |
| 10 year storage vol.= | 11.5 |
| 10 year storage elev.= | 7028.0 |
| 10 year discharge= | 52 |
| 2 year storage vol.= | 5.7 |
| 2 year storage elev.= | 7026.8 |
| 2 year discharge= | 5.3 |

Data for spillway and embankment:

| | |
|-------------------------|--------|
| embankment length = | 500 |
| embankment elev = | 7033.5 |
| spillway length = | 130 |
| spillway elevation = | 7031.5 |
| 100 year storage elev.= | 7030.1 |
| 100 year storage vol.= | 24.8 |
| 100 year discharge= | 450 |
| 5 year storage elev.= | 7027.5 |
| 5 year storage vol.= | 8.9 |
| 5 year discharge= | 21 |
| WQCV storage elev.= | 7025.2 |
| WQCV storage vol.= | 0.9 |
| 1/2 WQCV storage elev.= | 7024.8 |
| 1/2 WQCV storage vol.= | 0.45 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | | | PIPE | | REALIZED | TOTAL FLOW |
|--------|--------|---------|------|--------|----------|-----------|----------|---------------|------|------|------|------|------|------|---------------|-----|------|------|--------------------|----------|---------------|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE | | | | | | | GRATE | | PIPE | | CULVERT OUTFLOW | | |
| | | sqft | acre | acft | cum acft | BANK | | (max outflow) | | | | | | | (max outflow) | | 1 | 2 | | | |
| | | | | | | | | 1a | 1b | 1c | 2 | 3 | 4 | 5 | Rectangular | | | | | | |
| 7023 | 0 | 0 | 0.00 | 0.0 | 0.000 | | | - | - | - | - | - | - | - | - | 10 | | - | - | | |
| 7024 | 1 | 2285 | 0.05 | 0.0 | 0.026 | - | - | 0.06 | - | - | - | - | - | - | - | 51 | | 0.1 | 0.06 | | |
| 7025 | 2 | 42192 | 0.97 | 0.5 | 0.537 | - | - | 0.10 | 0.08 | 0.04 | - | - | - | - | - | 111 | | 0.2 | 0.21 | | |
| 7026 | 3 | 127336 | 2.92 | 1.9 | 2.483 | - | - | 0.13 | 0.11 | 0.09 | - | 3.1 | - | - | - | 184 | | 3.4 | 3.44 | | |
| 7026.5 | 3.5 | 169390 | 3.89 | 3.6 | 4.180 | - | - | 0.14 | 0.12 | 0.10 | - | 4.3 | - | - | - | 224 | | 4.6 | 4.64 | | |
| 7027 | 4 | 211444 | 4.85 | 2.2 | 6.365 | - | - | 0.15 | 0.14 | 0.12 | - | 5.2 | - | - | - | 268 | | 5.6 | 5.59 | | |
| 7027.5 | 4.5 | 234356 | 5.38 | 4.6 | 8.814 | - | - | 0.16 | 0.15 | 0.13 | 6.5 | 6.0 | - | 6.5 | - | 304 | | 19 | 19.45 | | |
| 7028 | 5 | 257267 | 5.91 | 5.4 | 11.745 | - | - | 0.17 | 0.16 | 0.14 | 22.0 | 6.6 | 4.3 | 22.0 | - | 337 | | 56 | 55.51 | | |
| 7028.5 | 5.5 | 264583 | 6.07 | 5.7 | 14.541 | - | - | 0.18 | 0.17 | 0.15 | 40.4 | 7.2 | 10.4 | 40.4 | 23 | 373 | | 122 | 122.30 | | |
| 7029 | 6 | 271899 | 6.24 | 6.1 | 17.819 | - | - | 0.19 | 0.18 | 0.16 | 50.6 | 7.8 | 13.7 | 50.6 | 86 | 406 | | 209 | 209.39 | | |
| 7029.5 | 6.5 | 277060 | 6.36 | 11.7 | 20.555 | - | - | 0.21 | 0.19 | 0.17 | 59.0 | 8.3 | 16.4 | 59.0 | 171 | 436 | | 315 | 314.68 | | |
| 7030 | 7 | 282220 | 6.48 | 9.4 | 23.956 | - | - | 0.21 | 0.20 | 0.18 | 66.4 | 8.8 | 18.7 | 66.4 | 274 | 464 | | 435 | 434.93 | | |
| 7030.5 | 7.5 | 287904 | 6.61 | 6.5 | 27.039 | - | - | 0.21 | 0.20 | 0.19 | 73.1 | 9.3 | 20.7 | 73.1 | 392 | 491 | | 491 | 490.92 | | |
| 7031 | 8 | 293587 | 6.74 | 6.6 | 30.565 | - | - | 0.22 | 0.21 | 0.20 | 79.2 | 9.8 | 22.5 | 79.2 | 522 | 516 | | 516 | 516.22 | | |
| 7031.5 | 8.5 | 297735 | 6.84 | 6.7 | 33.762 | - | - | 0.23 | 0.22 | 0.21 | 84.8 | 10.2 | 24.2 | 84.8 | 665 | 540 | | 540 | 540.33 | | |
| 7032 | 9 | 301883 | 6.93 | 3.4 | 37.203 | 137.9 | 137.9 | 0.23 | 0.23 | 0.22 | 90.1 | 10.6 | 25.8 | 90.1 | 819 | 563 | | 563 | 701.30 | | |
| 7032.5 | 9.5 | 309236 | 7.10 | 7.0 | 40.729 | 390.0 | 390.0 | 0.24 | 0.23 | 0.22 | 95.1 | 11.0 | 27.3 | 95.1 | 983 | 586 | | 586 | 975.59 | | |
| 7033 | 10 | 316589 | 7.27 | 3.6 | 44.320 | 716.5 | 716.5 | 0.25 | 0.24 | 0.23 | 99.9 | 11.4 | 28.8 | 99.9 | 1,157 | 607 | | 607 | 1,323.43 | | |

- Notes:
- 1) Top-of-bank and spillway flows are weir equations from section 11.3.1 in the DCM. $Q=CLH^{1.5}$ (C=3.0)
 - 2) Orifice flows are also from section 11.3.1. $Q=CA(2gH)^{0.5}$ (C=.6)
 - 3) Grate flows are determined from equations 7-2 and 7-3. Weir Flow $Q=(3PH^{1.5})/F$, Orifice Flow $Q=4.815*AH^{0.5}$
 - 4) Pipe flows use the lesser of: 1) Inlet control equations 27 & 28, page 146 of HDS No. 5 - or - 2) Allowable Pipe Flow equation on page 11-9 of the DCM. Use Table 9, page 147-148, HDS No. 5 for formulas 26 & 27.

THE SANCTUARY FILING 1 INTERIM CONDITION

Simulation Run: SANCTUARY PDR-FDR-100 YR Reservoir: POND G

| | | | |
|---------------|------------------|-------------------------|--------------------|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Sanctuary PDR-FDR |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| | | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|----------------|-------------|----------------------------|------------------|
| Peak Inflow: | 658(CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:30 |
| Peak Outflow: | 466 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 12:54 |
| Total Inflow: | 118 (AC-FT) | Peak Storage: | 25.7 (AC-FT) |
| Total Outflow: | 108 (AC-FT) | Peak Elevation: | 7130.3 (FT) |

Simulation Run: SANCTUARY PDR-FDR -005 YR Reservoir: POND G

| | | | |
|---------------|------------------|-------------------------|--------------------|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Sanctuary PDR-FDR |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| | | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|----------------|--------------|----------------------------|------------------|
| Peak Inflow: | 81 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:36 |
| Peak Outflow: | 19 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 16:18 |
| Total Inflow: | 20.7 (AC-FT) | Peak Storage: | 8.7 (AC-FT) |
| Total Outflow: | 13.4 (AC-FT) | Peak Elevation: | 7127.5 (FT) |

Simulation Run: F-100 YR Reservoir: POND G

| | | | |
|---------------|------------------|-------------------------|--------------------|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| | | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|----------------|-------------|----------------------------|------------------|
| Peak Inflow: | 653 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:24 |
| Peak Outflow: | 450 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 12:48 |
| Total Inflow: | 113 (AC-FT) | Peak Storage: | 24.8 (AC-FT) |
| Total Outflow: | 103 (AC-FT) | Peak Elevation: | 7030.1 (FT) |

Simulation Run: F-010 YR Reservoir: POND G

| | | | |
|---------------|------------------|-------------------------|--------------------|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| | | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|----------------|--------------|----------------------------|------------------|
| Peak Inflow: | 101 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:24 |
| Peak Outflow: | 21 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 15:24 |
| Total Inflow: | 21.6 (AC-FT) | Peak Storage: | 8.9 (AC-FT) |
| Total Outflow: | 14.4 (AC-FT) | Peak Elevation: | 7027.5 (FT) |

Appendix D – Outlet Protection Design

Again, enter Figure HS-19a using the smaller d/D (or d/H) ratio to find the A/A_{full} ratio. Then,

$$A = (A/A_{full})A_{full} \quad (\text{HS-16c})$$

Finally,

$$V = Q/A \quad (\text{HS-16d})$$

In which for Equations 16a through 16d above:

A_{full} = cross-sectional area of the pipe (ft^2)

A = area of the design flow in the end of the pipe (ft^2)

n = Manning's n for the pipe full depth

Q_{full} = pipe full discharge at its slope (cfs)

R = hydraulic radius of the pipe flowing full, ft [$R_{full} = D/4$ for circular pipes, $R_{full} = A_{full}/(2H + 2w)$ for rectangular pipes, where D = diameter of a circular conduit, H = height of a rectangular conduit, and w = width of a rectangular conduit (ft)]

S_o = longitudinal slope of the pipe (ft/ft)

V = design flow velocity at the pipe outlet (ft/sec)

V_{full} = flow velocity of the pipe flowing full (ft/sec)

3.4.3.2 Riprap Size

For the design velocity, use [Figure HS-20c](#) to find the size and type of the riprap to use in the scour protection basin downstream of the pipe outlet (i.e., B18, H, M or L). First, calculate the riprap sizing design parameter, P_d , namely,

$$P_d = (V^2 + gd)^{1/2} \quad (\text{HS-16e})$$

in which:

V = design flow velocity at pipe outlet (ft/sec)

g = acceleration due to gravity = 32.2 ft/sec^2

d = design depth of flow at pipe outlet (ft)

necessary when the receiving or downstream channel may have little or no flow or tailwater at time when the pipe or culvert is in operation. Design criteria are provided in Figures HS-19a through HS-20c.

3.4.2 Objective

By providing a low tailwater basin at the end of a storm sewer conduit or culvert, the kinetic energy of the discharge is dissipated under controlled conditions without causing scour at the channel bottom.

[Photograph HS-12](#) shows a fairly large low tailwater basin.

3.4.3 Low Tailwater Basin Design

Low tailwater is defined as being equal to or less than $\frac{1}{3}$ of the height of the storm sewer, that is:

$$y_t \leq \frac{D}{3} \quad \text{or} \quad y_t \leq \frac{H}{3}$$

in which:

y_t = tailwater depth at design

D = diameter of circular pipe (ft)

H = height of rectangular pipe (ft)

3.4.3.1 Finding Flow Depth and Velocity of Storm Sewer Outlet Pipe

The first step in the design of a scour protection basin at the outlet of a storm sewer is to find the depth and velocity of flow at the outlet. Pipe-full flow can be found using Manning's equation.

$$Q_{full} = \frac{1.49}{n} A_{full} (R_{full})^{2/3} S_o^{1/2} \quad (\text{HS-16a})$$

Then and the pipe-full velocity can be found using the continuity equation.

$$V_{full} = Q_{full} / A_{full} \quad (\text{HS-16a})$$

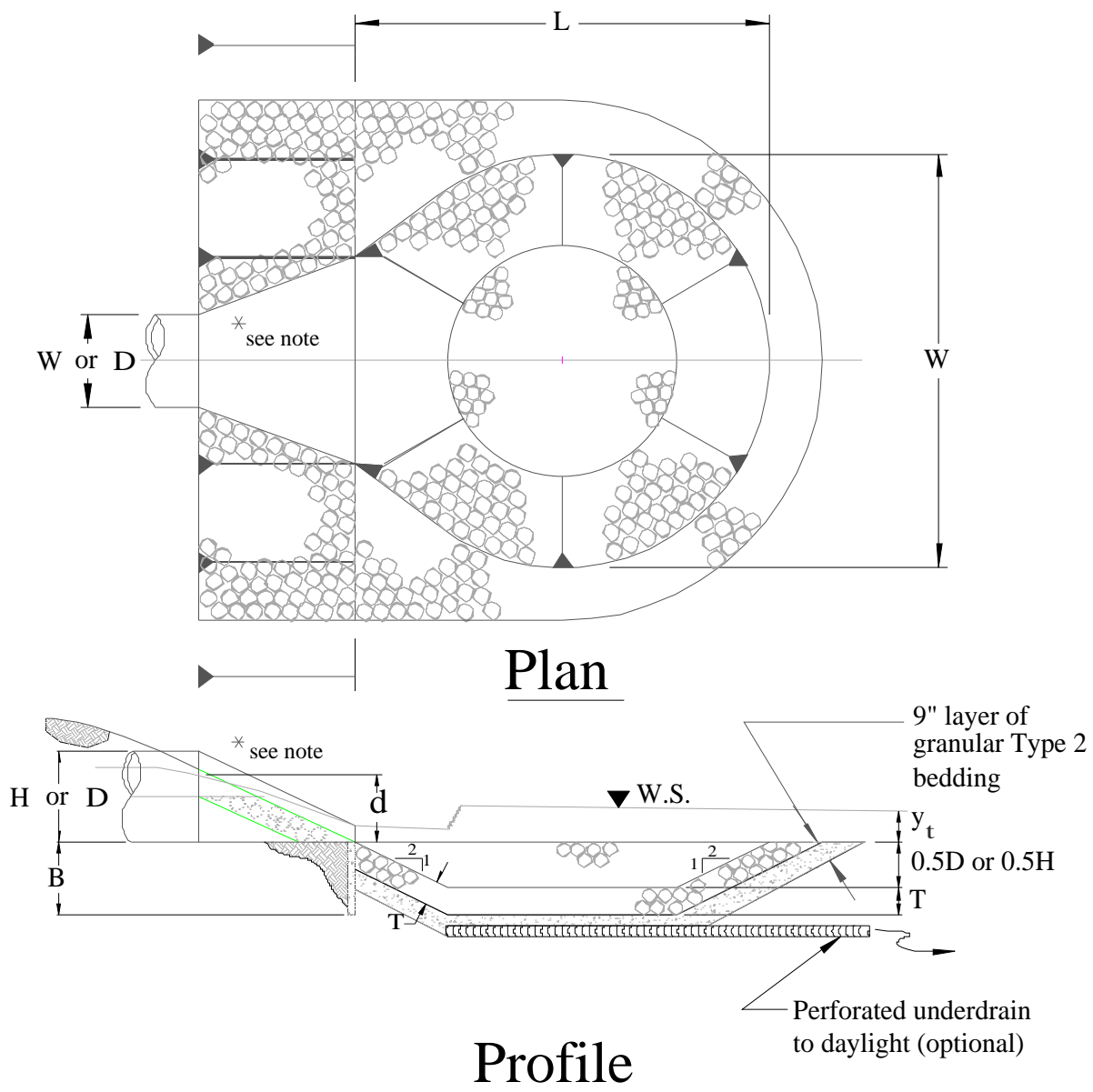
The normal depth of flow, d , and the velocity in a conduit can be found with the aid of [Figure HS-20a](#) and [Figure HS-20b](#). Using the known design discharge, Q , and the calculated pipe-full discharge, Q_{full} , enter Figure HS-20a with the value of Q/Q_{full} and find d/D for a circular pipe or d/H for a rectangular pipe.

Compare the value of d/D (or d/H) with the one obtained from Figure HS-20b using the Froude parameter.

$$Q/D^{2.5} \quad \text{or} \quad Q/(WH^{1/5}) \quad (\text{HS-16a})$$

Choose the smaller of the two (d/D or d/H) ratios to calculate the flow depth at the end of the pipe.

$$d = D(d/D) \quad \text{or} \quad d = H(d/H) \quad (\text{HS-16b})$$



* Note: For rectangular conduits use a standard design for a headwall with wingwalls, paved bottom between the wingwalls, with an end cutoff wall extending to a minimum depth equal to B

**Figure HS-19—Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets—
Low Tailwater Basin at Pipe Outlets
(Stevens and Urbonas 1996)**

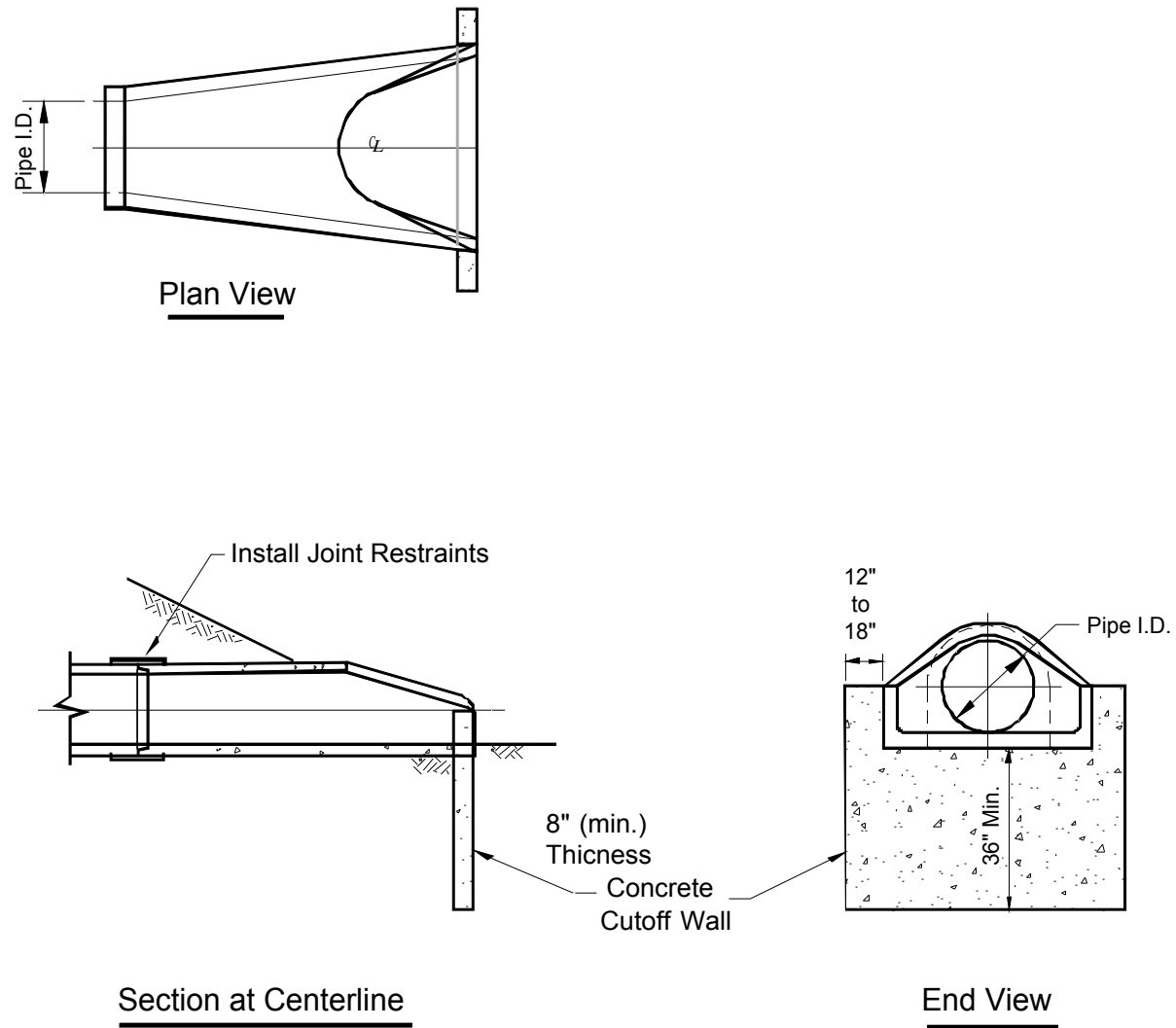


Figure HS-19a—Concrete Flared End Section with Cutoff Wall for all Pipe Outlets



Photograph HS-12—Upstream and downstream views of a low tailwater basin in Douglas County protecting downstream wetland area. Burying and revegetation of the rock would blend the structure better with the adjacent terrain.

When the riprap sizing design parameter indicates conditions that place the design above the Type H riprap line in [Figure HS-20](#), use B18, or larger, grouted boulders. An alternative to a grouted boulder or loose riprap basin is to use the standard USBR Impact Basin VI or one of its modified versions, described earlier in this Chapter of the *Manual*.

After the riprap size has been selected, the minimum thickness of the riprap layer, T , in feet, in the basin is set at:

$$T = 1.75D_{50} \quad (\text{HS-17})$$

in which:

D_{50} = the median size of the riprap (see Table HS-9.)

Table HS-9—Median (i.e., D_{50}) Size of District's Riprap/Boulder

| Riprap Type | D_{50} —Median Rock Size (inches) |
|-------------|--|
| L | 9 |
| M | 12 |
| H | 18 |
| B18 | 18 (minimum dimension of grouted boulders) |

3.4.3.3 Basin Length

The minimum length of the basin, L , in [Figure HS-19](#), is defined as being the greater of the following:

for circular pipe: $L = 4D$ or $L = (D)^{1/2} \left(\frac{V}{2} \right)$ (HS-18)

for rectangular pipe: $L = 4H$ or $L = (H)^{1/2} \left(\frac{V}{2} \right)$ (HS-19)

in which:

L = basin length

H = height of rectangular conduit

V = design flow velocity at outlet

D = diameter of circular conduit

3.4.3.4 Basin Width

The minimum width, W , of the basin downstream of the pipe's flared end section is set as follows:

for circular pipes: $W = 4D$ (HS-20)

for rectangular pipe: $W = w + 4H$ (HS-21)

in which,

W = basin width ([Figure HS-19](#))

D = diameter of circular conduit

w = width of rectangular conduit

3.4.3.5 Other Design Requirements

All slopes in the pre-shaped riprapped basin are 2H to 1V.

Provide pipe joint fasteners and a structural concrete cutoff wall at the end of the flared end section for a circular pipe or a headwall with wingwalls and a paved bottom between the walls, both with a cutoff wall that extends down to a depth of:

$$B = \frac{D}{2} + T \text{ or } B = \frac{H}{2} + T \quad (\text{HS-22})$$

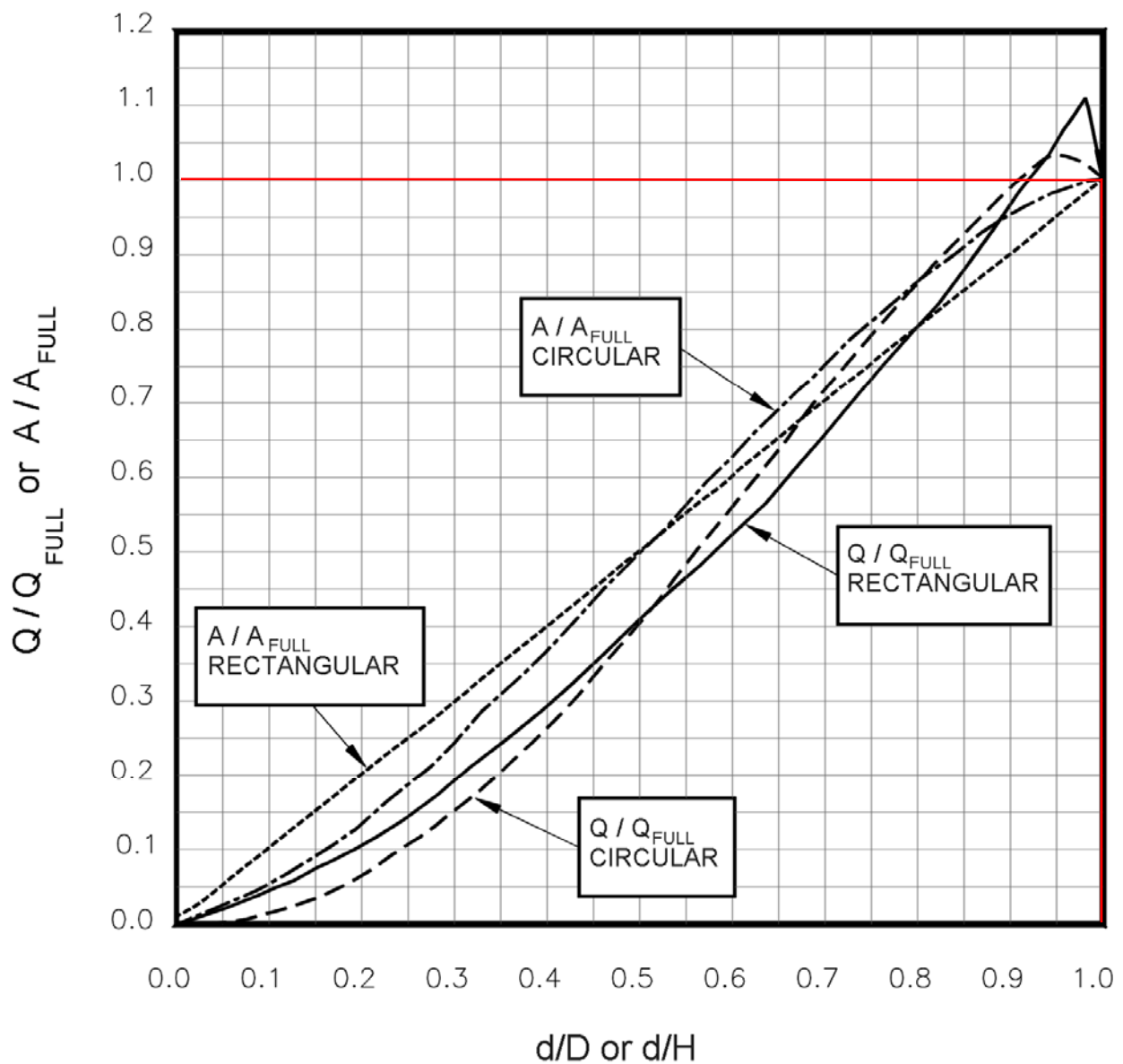
in which,

B = cutoff wall depth

D = diameter of circular conduit

T = Equation HS-17

The riprap must be extended up the outlet embankment's slope to the mid-pipe level.



**Figure HS-20a—Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets—
Discharge and Flow Area Relationships for Circular and Rectangular Pipes**
(Ratios for Flow Based on Manning's n Varying With Depth)
(Stevens and Urbonas 1996)

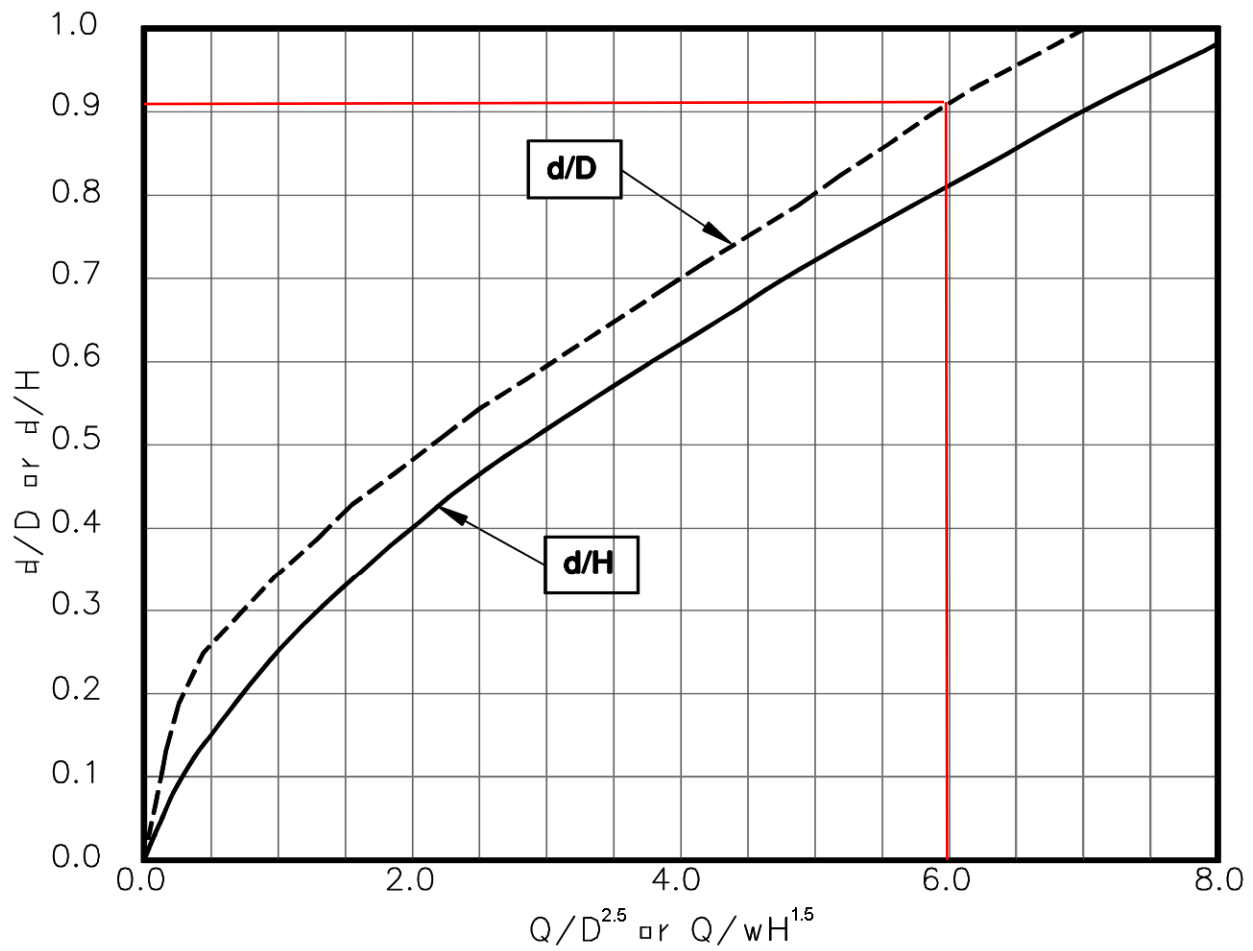


Figure HS-20b—Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets—
Brink Depth for Horizontal Pipe Outlets
 (Stevens and Urbonas 1996)

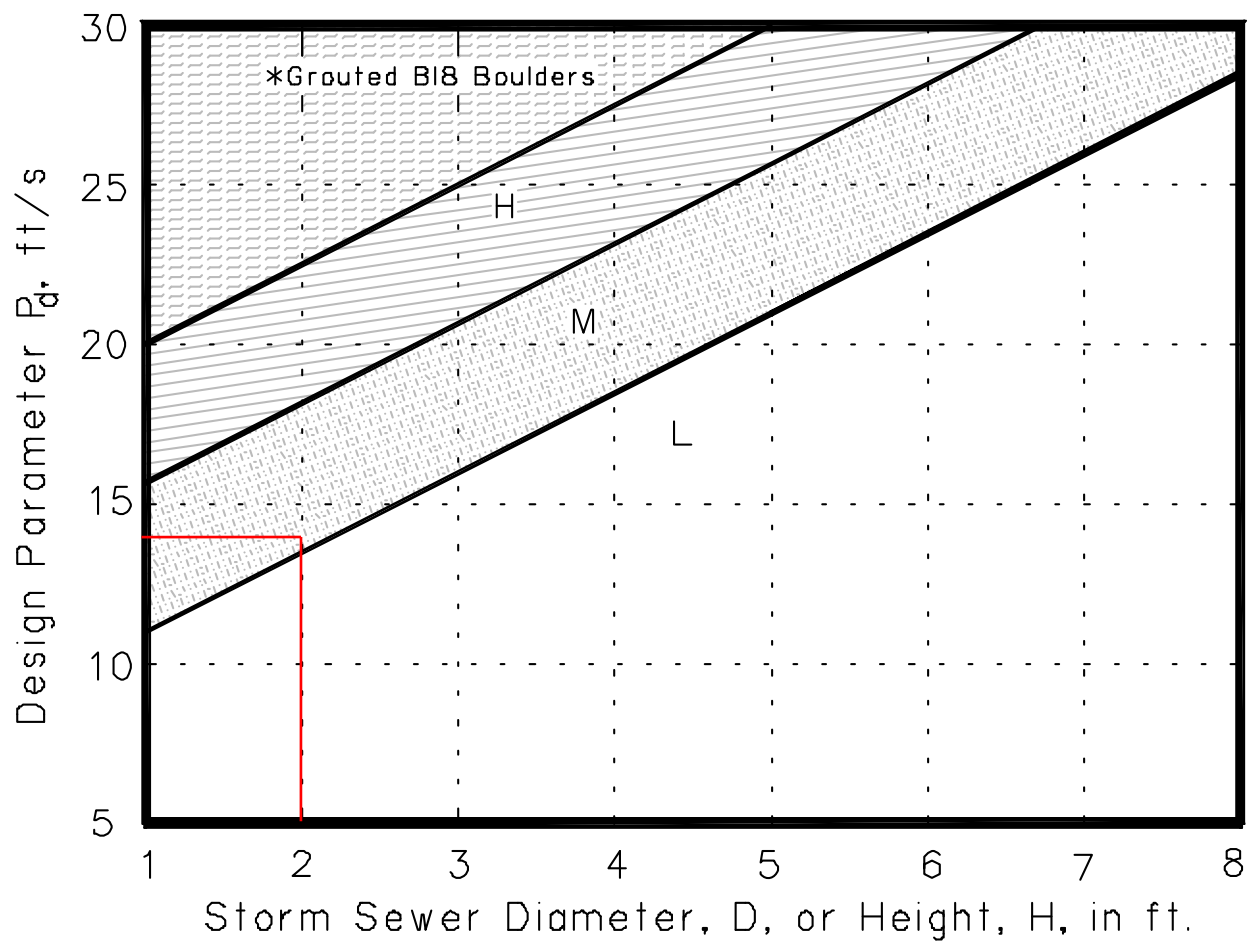


Figure HS-20c—Low Tailwater Riprap Basins for Storm Sewer Pipe Outlets—
Riprap Selection Chart for Low Tailwater Basin at Pipe Outlet
 (Stevens and Urbonas 1996)

RIP RAP PLUNGE POOL

Urban Drainage & Flood Control District Pipe Outlet Design

Low Tailwater Design ($y_t \leq D/3$)

OUTLET # OS3

| | | | | | |
|------------------------------|----|-----|---------------------------------|------|-----|
| Outlet Size (D) : | 24 | in. | Discharge (q): | 34 | CFS |
| Capacity (Q): (full flow) | 23 | CFS | Flow depth (d): (calculated) | 21.8 | in. |

| | | | |
|---------------------|---------|-----------------------|------|
| Q _{full} = | 23 CFS | q/Q _{full} = | 1.48 |
| A _{full} = | 3.1 SF | | |
| V _{full} = | 7.3 FPS | Q/D ^{2.5} = | 6.0 |

| | | |
|-----|------|---------------------------------------|
| d/D | 1.00 | from HS-20a using q/Q _{full} |
| d/D | 0.91 | from HS-20b using Q/D ^{2.5} |

| | | | | | |
|------------------------------|------|---|--|-----|----|
| A' (A/A _{full}) | 0.91 | from HS-20a using smaller d/D from above | Flow Area (a=A' x A _{full}) | 2.9 | SF |
|------------------------------|------|---|--|-----|----|

Outlet Velocity (V = q/a) 11.9 FPS

$P_d = (V^2 + gd)^{1/2} =$ 14

RIP-RAP SIZE: M from HS-20c

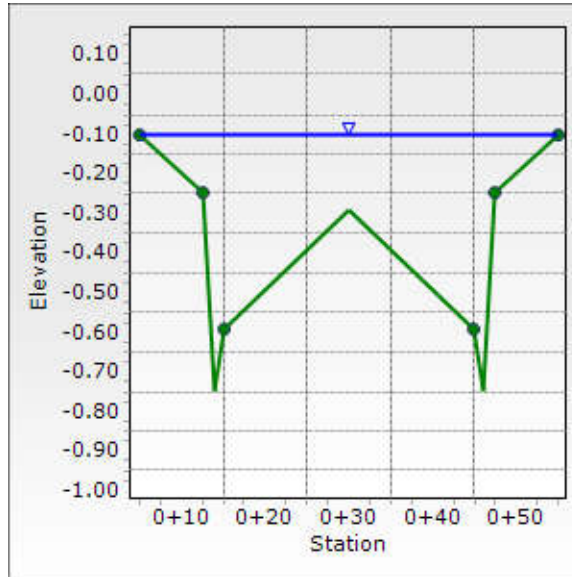
d₅₀ = 12 in T=1.75xd₅₀ 1.75 ft

| | | | |
|------------------|---------|--------------------------------|--------------|
| Basin Length (L) | 8.4 FT. | Cutoff Wall Depth (B=D/2+T) | 2.75 FT |
| Basin Width (W) | 8.0 FT. | | |

Appendix E – Street Flow

Cross Section for Ramp Full Street Section

| | |
|---------------------|----------------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula Discharge |
| Input Data | |
| Channel Slope | 0.0050 ft/ft |
| Normal Depth | 7.8 in |
| Discharge | 29.95 cfs |



Worksheet for Ramp Full Street Section - ROW

| | |
|---------------------|--------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula |
| | Discharge |
| Input Data | |
| Channel Slope | 0.0050 ft/ft |
| Normal Depth | 5.5 in |

Section Definitions

| Station (ft) | Elevation (ft) |
|-----------------|-------------------|
| 0+05.00 | -0.10 |
| 0+12.50 | -0.25 |
| 0+13.83 | -0.75 |
| 0+15.00 | -0.59 |
| 0+30.00 | -0.29 |
| 0+45.00 | -0.59 |
| 0+46.17 | -0.75 |
| 0+47.50 | -0.25 |
| 0+55.00 | -0.10 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|------------------|------------------|-----------------------|
| (0+05.00, -0.10) | (0+12.50, -0.25) | 0.030 |
| (0+12.50, -0.25) | (0+15.00, -0.59) | 0.013 |
| (0+15.00, -0.59) | (0+45.00, -0.59) | 0.015 |
| (0+45.00, -0.59) | (0+47.50, -0.25) | 0.013 |
| (0+47.50, -0.25) | (0+55.00, -0.10) | 0.030 |
| <None> | (0+55.00, -0.10) | 0.030 |

| | |
|-----------------------------------|---------------------|
| Options | |
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

| | |
|-----------------------|---------------------|
| Results | |
| Discharge | 13.41 cfs |
| Roughness Coefficient | 0.015 |
| Elevation Range | -0.75 to -0.10 ft |
| Flow Area | 6.1 ft ² |
| Wetted Perimeter | 34.98 ft |
| Hydraulic Radius | 2.1 in |
| Top Width | 34.79 ft |

Worksheet for Ramp Full Street Section - ROW

Results

| | |
|-----------------|--------------|
| Normal Depth | 5.5 in |
| Critical Depth | 5.4 in |
| Critical Slope | 0.0058 ft/ft |
| Velocity | 2.21 ft/s |
| Velocity Head | 0.08 ft |
| Specific Energy | 0.54 ft |
| Froude Number | 0.936 |
| Flow Type | Subcritical |

GVF Input Data

| | |
|------------------|---------|
| Downstream Depth | 0.0 in |
| Length | 0.00 ft |
| Number Of Steps | 0 |

GVF Output Data

| | |
|---------------------|---------------|
| Upstream Depth | 0.0 in |
| Profile Description | |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 5.5 in |
| Critical Depth | 5.4 in |
| Channel Slope | 0.0050 ft/ft |
| Critical Slope | 0.0058 ft/ft |

50' ROW - RESIDENTIAL STREET SECTION

RAMP CURB

5-Year Storm Event Maximum Allowable Street Flows (Maximum Flow to Top of Curb)

| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|-----------------------|--------------------------------|-----------------|------------------------------|-----------------------|----------------|--------------------------------|-----------------|------------------------------|----------------|
| | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Top Width (ft) |
| 0.0050 | 19 | 2.5 | 7.4 | 35.2 | 35.0 | 9.4 | 2.5 | 3.7 | 17.5 |
| 0.0063 | 21 | 2.8 | 7.4 | 35.2 | 35.0 | 11 | 2.8 | 3.7 | 17.5 |
| 0.0075 | 23 | 3.1 | 7.4 | 35.2 | 35.0 | 12 | 3.1 | 3.7 | 17.5 |
| 0.0088 | 25 | 3.4 | 7.4 | 35.2 | 35.0 | 12 | 3.3 | 3.7 | 17.5 |
| 0.0100 | 27 | 3.6 | 7.4 | 35.2 | 35.0 | 13 | 3.6 | 3.7 | 17.5 |
| 0.0113 | 28 | 3.8 | 7.4 | 35.2 | 35.0 | 14 | 3.8 | 3.7 | 17.5 |
| 0.0125 | 30 | 4.0 | 7.4 | 35.2 | 35.0 | 15 | 4.0 | 3.7 | 17.5 |
| 0.0138 | 31 | 4.2 | 7.4 | 35.2 | 35.0 | 16 | 4.2 | 3.7 | 17.5 |
| 0.0150 | 33 | 4.4 | 7.4 | 35.2 | 35.0 | 16 | 4.4 | 3.7 | 17.5 |
| 0.0163 | 34 | 4.6 | 7.4 | 35.2 | 35.0 | 17 | 4.5 | 3.7 | 17.5 |
| 0.0175 | 35 | 4.7 | 7.4 | 35.2 | 35.0 | 18 | 4.7 | 3.7 | 17.5 |
| 0.0188 | 37 | 4.9 | 7.4 | 35.2 | 35.0 | 18 | 4.9 | 3.7 | 17.5 |
| 0.0200 | 38 | 5.1 | 7.4 | 35.2 | 35.0 | 19 | 5.0 | 3.7 | 17.5 |
| 0.0213 | 39 | 5.2 | 7.4 | 35.2 | 35.0 | 19 | 5.2 | 3.7 | 17.5 |
| 0.0225 | 40 | 5.4 | 7.4 | 35.2 | 35.0 | 20 | 5.4 | 3.7 | 17.5 |
| 0.0238 | 41 | 5.5 | 7.4 | 35.2 | 35.0 | 20 | 5.5 | 3.7 | 17.5 |
| 0.0250 | 42 | 5.7 | 7.4 | 35.2 | 35.0 | 21 | 5.6 | 3.7 | 17.5 |
| 0.0263 | 43 | 5.8 | 7.4 | 35.2 | 35.0 | 22 | 5.8 | 3.7 | 17.5 |
| 0.0275 | 44 | 5.9 | 7.4 | 35.2 | 35.0 | 22 | 5.9 | 3.7 | 17.5 |
| 0.0288 | 45 | 6.1 | 7.4 | 35.2 | 35.0 | 23 | 6.0 | 3.7 | 17.5 |
| 0.0300 | 46 | 6.2 | 7.4 | 35.2 | 35.0 | 23 | 6.2 | 3.7 | 17.5 |
| 0.0313 | 47 | 6.3 | 7.4 | 35.2 | 35.0 | 23 | 6.3 | 3.7 | 17.5 |
| 0.0325 | 48 | 6.5 | 7.4 | 35.2 | 35.0 | 24 | 6.4 | 3.7 | 17.5 |
| 0.0338 | 49 | 6.6 | 7.4 | 35.2 | 35.0 | 24 | 6.6 | 3.7 | 17.5 |
| 0.0350 | 50 | 6.7 | 7.4 | 35.2 | 35.0 | 25 | 6.7 | 3.7 | 17.5 |
| 0.0363 | 51 | 6.8 | 7.4 | 35.2 | 35.0 | 25 | 6.8 | 3.7 | 17.5 |
| 0.0375 | 52 | 6.9 | 7.4 | 35.2 | 35.0 | 26 | 6.9 | 3.7 | 17.5 |
| 0.0388 | 53 | 7.1 | 7.4 | 35.2 | 35.0 | 26 | 7.0 | 3.7 | 17.5 |
| 0.0400 | 53 | 7.2 | 7.4 | 35.2 | 35.0 | 27 | 7.1 | 3.7 | 17.5 |

100-Year Storm Event Maximum Allowable Street Flows
(Maximum Flow to Right of Way)

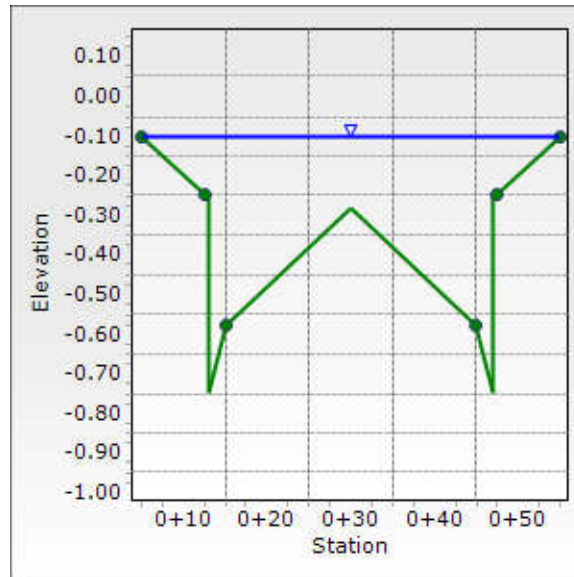
| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|-----------------------|--------------------------------|-----------------|------------------------------|-----------------------|----------------|--------------------------------|-----------------|------------------------------|----------------|
| | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Top Width (ft) |
| 0.0050 | 30 | 2.2 | 13.8 | 50.21 | 50 | 15 | 2.2 | 6.9 | 25 |
| 0.0063 | 34 | 2.4 | 13.8 | 50.21 | 50 | 17 | 2.4 | 6.9 | 25 |
| 0.0075 | 37 | 2.7 | 13.8 | 50.21 | 50 | 18 | 2.6 | 6.9 | 25 |
| 0.0088 | 40 | 2.9 | 13.8 | 50.21 | 50 | 20 | 2.8 | 6.9 | 25 |
| 0.0100 | 42 | 3.1 | 13.8 | 50.21 | 50 | 21 | 3.0 | 6.9 | 25 |
| 0.0113 | 45 | 3.3 | 13.8 | 50.21 | 50 | 22 | 3.2 | 6.9 | 25 |
| 0.0125 | 47 | 3.4 | 13.8 | 50.21 | 50 | 23 | 3.4 | 6.9 | 25 |
| 0.0138 | 50 | 3.6 | 13.8 | 50.21 | 50 | 25 | 3.6 | 6.9 | 25 |
| 0.0150 | 52 | 3.8 | 13.8 | 50.21 | 50 | 26 | 3.7 | 6.9 | 25 |
| 0.0163 | 54 | 3.9 | 13.8 | 50.21 | 50 | 27 | 3.9 | 6.9 | 25 |
| 0.0175 | 56 | 4.1 | 13.8 | 50.21 | 50 | 28 | 4.0 | 6.9 | 25 |
| 0.0188 | 58 | 4.2 | 13.8 | 50.21 | 50 | 29 | 4.2 | 6.9 | 25 |
| 0.0200 | 60 | 4.3 | 13.8 | 50.21 | 50 | 30 | 4.3 | 6.9 | 25 |
| 0.0213 | 62 | 4.5 | 13.8 | 50.21 | 50 | 31 | 4.4 | 6.9 | 25 |
| 0.0225 | 64 | 4.6 | 13.8 | 50.21 | 50 | 31 | 4.6 | 6.9 | 25 |
| 0.0238 | 65 | 4.7 | 13.8 | 50.21 | 50 | 32 | 4.7 | 6.9 | 25 |
| 0.0250 | 67 | 4.9 | 13.8 | 50.21 | 50 | 33 | 4.8 | 6.9 | 25 |
| 0.0263 | 69 | 5.0 | 13.8 | 50.21 | 50 | 34 | 4.9 | 6.9 | 25 |
| 0.0275 | 70 | 5.1 | 13.8 | 50.21 | 50 | 35 | 5.0 | 6.9 | 25 |
| 0.0288 | 72 | 5.2 | 13.8 | 50.21 | 50 | 36 | 5.2 | 6.9 | 25 |
| 0.0300 | 73 | 5.3 | 13.8 | 50.21 | 50 | 36 | 5.3 | 6.9 | 25 |
| 0.0313 | 75 | 5.4 | 13.8 | 50.21 | 50 | 37 | 5.4 | 6.9 | 25 |
| 0.0325 | 76 | 5.5 | 13.8 | 50.21 | 50 | 38 | 5.5 | 6.9 | 25 |
| 0.0338 | 78 | 5.6 | 13.8 | 50.21 | 50 | 39 | 5.6 | 6.9 | 25 |
| 0.0350 | 79 | 5.7 | 13.8 | 50.21 | 50 | 39 | 5.7 | 6.9 | 25 |
| 0.0363 | 81 | 5.8 | 13.8 | 50.21 | 50 | 40 | 5.8 | 6.9 | 25 |
| 0.0375 | 82 | 5.9 | 13.8 | 50.21 | 50 | 41 | 5.9 | 6.9 | 25 |
| 0.0388 | 83 | 6.0 | 13.8 | 50.21 | 50 | 41 | 6.0 | 6.9 | 25 |
| 0.0400 | 85 | 6.1 | 13.8 | 50.21 | 50 | 42 | 6.1 | 6.9 | 25 |

100-Year Storm Event Maximum Allowable Street Flows
(Maximum Flow to Crown of Roadway)

| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|-----------------------|-------------------|-----------------|-----------------|-----------------------|----------------|-------------------|-----------------|-----------------|----------------|
| | Discharge (ft³/s) | Velocity (ft/s) | Flow Area (ft²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft³/s) | Velocity (ft/s) | Flow Area (ft²) | Top Width (ft) |
| 0.0050 | 13 | 2.2 | 6.1 | 35.0 | 34.8 | 6.7 | 2.2 | 3.0 | 17.4 |
| 0.0063 | 15 | 2.5 | 6.1 | 35.0 | 34.8 | 7.5 | 2.5 | 3.0 | 17.4 |
| 0.0075 | 16 | 2.7 | 6.1 | 35.0 | 34.8 | 8.2 | 2.7 | 3.0 | 17.4 |
| 0.0088 | 18 | 2.9 | 6.1 | 35.0 | 34.8 | 8.9 | 2.9 | 3.0 | 17.4 |
| 0.0100 | 19 | 3.1 | 6.1 | 35.0 | 34.8 | 9.5 | 3.1 | 3.0 | 17.4 |
| 0.0113 | 20 | 3.3 | 6.1 | 35.0 | 34.8 | 10 | 3.3 | 3.0 | 17.4 |
| 0.0125 | 21 | 3.5 | 6.1 | 35.0 | 34.8 | 11 | 3.5 | 3.0 | 17.4 |
| 0.0138 | 22 | 3.7 | 6.1 | 35.0 | 34.8 | 11 | 3.7 | 3.0 | 17.4 |
| 0.0150 | 23 | 3.8 | 6.1 | 35.0 | 34.8 | 12 | 3.8 | 3.0 | 17.4 |
| 0.0163 | 24 | 4.0 | 6.1 | 35.0 | 34.8 | 12 | 4.0 | 3.0 | 17.4 |
| 0.0175 | 25 | 4.1 | 6.1 | 35.0 | 34.8 | 13 | 4.1 | 3.0 | 17.4 |
| 0.0188 | 26 | 4.3 | 6.1 | 35.0 | 34.8 | 13 | 4.3 | 3.0 | 17.4 |
| 0.0200 | 27 | 4.4 | 6.1 | 35.0 | 34.8 | 13 | 4.4 | 3.0 | 17.4 |
| 0.0213 | 28 | 4.6 | 6.1 | 35.0 | 34.8 | 14 | 4.6 | 3.0 | 17.4 |
| 0.0225 | 28 | 4.7 | 6.1 | 35.0 | 34.8 | 14 | 4.7 | 3.0 | 17.4 |
| 0.0238 | 29 | 4.8 | 6.1 | 35.0 | 34.8 | 15 | 4.8 | 3.0 | 17.4 |
| 0.0250 | 30 | 5.0 | 6.1 | 35.0 | 34.8 | 15 | 5.0 | 3.0 | 17.4 |
| 0.0263 | 31 | 5.1 | 6.1 | 35.0 | 34.8 | 15 | 5.1 | 3.0 | 17.4 |
| 0.0275 | 31 | 5.2 | 6.1 | 35.0 | 34.8 | 16 | 5.2 | 3.0 | 17.4 |
| 0.0288 | 32 | 5.3 | 6.1 | 35.0 | 34.8 | 16 | 5.3 | 3.0 | 17.4 |
| 0.0300 | 33 | 5.4 | 6.1 | 35.0 | 34.8 | 16 | 5.4 | 3.0 | 17.4 |
| 0.0313 | 34 | 5.5 | 6.1 | 35.0 | 34.8 | 17 | 5.5 | 3.0 | 17.4 |
| 0.0325 | 34 | 5.7 | 6.1 | 35.0 | 34.8 | 17 | 5.6 | 3.0 | 17.4 |
| 0.0338 | 35 | 5.8 | 6.1 | 35.0 | 34.8 | 17 | 5.8 | 3.0 | 17.4 |
| 0.0350 | 35 | 5.9 | 6.1 | 35.0 | 34.8 | 18 | 5.9 | 3.0 | 17.4 |
| 0.0363 | 36 | 6.0 | 6.1 | 35.0 | 34.8 | 18 | 6.0 | 3.0 | 17.4 |
| 0.0375 | 37 | 6.1 | 6.1 | 35.0 | 34.8 | 18 | 6.1 | 3.0 | 17.4 |
| 0.0388 | 37 | 6.2 | 6.1 | 35.0 | 34.8 | 19 | 6.2 | 3.0 | 17.4 |
| 0.0400 | 38 | 6.3 | 6.1 | 35.0 | 34.8 | 19 | 6.3 | 3.0 | 17.4 |

Cross Section for Vertical Full Street Section

| | |
|---------------------|----------------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula Discharge |
| Input Data | |
| Channel Slope | 0.0050 ft/ft |
| Normal Depth | 7.8 in |
| Discharge | 28.77 cfs |



Worksheet for Vertical Full Street Section - ROW

| | |
|---------------------|-------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula |
| | Discharge |
| Input Data | |
| Channel Slope | 0.005 ft/ft |
| Normal Depth | 7.8 in |

Section Definitions

| Station (ft) | Elevation (ft) |
|-----------------|-------------------|
| 0+05.00 | -0.10 |
| 0+12.50 | -0.25 |
| 0+13.00 | -0.25 |
| 0+13.00 | -0.75 |
| 0+15.00 | -0.58 |
| 0+30.00 | -0.28 |
| 0+45.00 | -0.58 |
| 0+47.00 | -0.75 |
| 0+47.00 | -0.25 |
| 0+47.50 | -0.25 |
| 0+55.00 | -0.10 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|------------------|------------------|-----------------------|
| (0+05.00, -0.10) | (0+12.50, -0.25) | 0.030 |
| (0+12.50, -0.25) | (0+15.00, -0.58) | 0.013 |
| (0+15.00, -0.58) | (0+45.00, -0.58) | 0.015 |
| (0+45.00, -0.58) | (0+47.50, -0.25) | 0.013 |
| (0+47.50, -0.25) | (0+55.00, -0.10) | 0.030 |
| <None> | (0+55.00, -0.10) | 0.030 |

Options

| | |
|-----------------------------------|---------------------|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

Results

| | |
|-----------------------|----------------------|
| Discharge | 28.78 cfs |
| Roughness Coefficient | 0.020 |
| Elevation Range | -0.75 to -0.10 ft |
| Flow Area | 13.5 ft ² |
| Wetted Perimeter | 51.02 ft |

Worksheet for Vertical Full Street Section - ROW

Results

| | |
|------------------|-------------|
| Hydraulic Radius | 3.2 in |
| Top Width | 50.00 ft |
| Normal Depth | 7.8 in |
| Critical Depth | 7.0 in |
| Critical Slope | 0.010 ft/ft |
| Velocity | 2.13 ft/s |
| Velocity Head | 0.07 ft |
| Specific Energy | 0.72 ft |
| Froude Number | 0.720 |
| Flow Type | Subcritical |

GVF Input Data

| | |
|------------------|---------|
| Downstream Depth | 0.0 in |
| Length | 0.00 ft |
| Number Of Steps | 0 |

GVF Output Data

| | |
|---------------------|---------------|
| Upstream Depth | 0.0 in |
| Profile Description | |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 7.8 in |
| Critical Depth | 7.0 in |
| Channel Slope | 0.005 ft/ft |
| Critical Slope | 0.010 ft/ft |

50' ROW - RESIDENTIAL STREET SECTION

VERTICAL CURB

5-Year Storm Event Maximum Allowable Street Flows (Maximum Flow to Top of Curb)

| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|-----------------------|--------------------------------|-----------------|------------------------------|-----------------------|----------------|--------------------------------|-----------------|------------------------------|----------------|
| | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Top Width (ft) |
| 0.0050 | 18 | 2.5 | 7.2 | 35 | 34 | 9.0 | 2.5 | 3.6 | 17 |
| 0.0060 | 20 | 2.8 | 7.2 | 35 | 34 | 10.1 | 2.8 | 3.6 | 17 |
| 0.0080 | 22 | 3.0 | 7.2 | 35 | 34 | 11 | 3.1 | 3.6 | 17 |
| 0.0090 | 23 | 3.3 | 7.2 | 35 | 34 | 12 | 3.3 | 3.6 | 17 |
| 0.0100 | 25 | 3.5 | 7.2 | 35 | 34 | 13 | 3.5 | 3.6 | 17 |
| 0.0110 | 27 | 3.7 | 7.2 | 35 | 34 | 14 | 3.7 | 3.6 | 17 |
| 0.0130 | 28 | 3.9 | 7.2 | 35 | 34 | 14 | 3.9 | 3.6 | 17 |
| 0.0140 | 29 | 4.1 | 7.2 | 35 | 34 | 15 | 4.1 | 3.6 | 17 |
| 0.0150 | 31 | 4.3 | 7.2 | 35 | 34 | 16 | 4.3 | 3.6 | 17 |
| 0.0160 | 32 | 4.5 | 7.2 | 35 | 34 | 16 | 4.5 | 3.6 | 17 |
| 0.0180 | 33 | 4.6 | 7.2 | 35 | 34 | 17 | 4.7 | 3.6 | 17 |
| 0.0190 | 34 | 4.8 | 7.2 | 35 | 34 | 18 | 4.8 | 3.6 | 17 |
| 0.0200 | 36 | 5.0 | 7.2 | 35 | 34 | 18 | 5.0 | 3.6 | 17 |
| 0.0210 | 37 | 5.1 | 7.2 | 35 | 34 | 19 | 5.1 | 3.6 | 17 |
| 0.0230 | 38 | 5.3 | 7.2 | 35 | 34 | 19 | 5.3 | 3.6 | 17 |
| 0.0240 | 39 | 5.4 | 7.2 | 35 | 34 | 20 | 5.4 | 3.6 | 17 |
| 0.0250 | 40 | 5.5 | 7.2 | 35 | 34 | 20 | 5.6 | 3.6 | 17 |
| 0.0260 | 41 | 5.7 | 7.2 | 35 | 34 | 21 | 5.7 | 3.6 | 17 |
| 0.0280 | 42 | 5.8 | 7.2 | 35 | 34 | 21 | 5.9 | 3.6 | 17 |
| 0.0290 | 43 | 5.9 | 7.2 | 35 | 34 | 22 | 6.0 | 3.6 | 17 |
| 0.0300 | 43 | 6.1 | 7.2 | 35 | 34 | 22 | 6.1 | 3.6 | 17 |
| 0.0310 | 44 | 6.2 | 7.2 | 35 | 34 | 23 | 6.2 | 3.6 | 17 |
| 0.0330 | 45 | 6.3 | 7.2 | 35 | 34 | 23 | 6.4 | 3.6 | 17 |
| 0.0340 | 46 | 6.4 | 7.2 | 35 | 34 | 23 | 6.5 | 3.6 | 17 |
| 0.0350 | 47 | 6.6 | 7.2 | 35 | 34 | 24 | 6.6 | 3.6 | 17 |
| 0.0360 | 48 | 6.7 | 7.2 | 35 | 34 | 24 | 6.7 | 3.6 | 17 |
| 0.0380 | 49 | 6.8 | 7.2 | 35 | 34 | 25 | 6.8 | 3.6 | 17 |
| 0.0390 | 49 | 6.9 | 7.2 | 35 | 34 | 25 | 6.9 | 3.6 | 17 |
| 0.0400 | 50 | 7.0 | 7.2 | 35 | 34 | 26 | 7.1 | 3.6 | 17 |

100-Year Storm Event Maximum Allowable Street Flows
(Maximum Flow to Right of Way)

| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|--------------------------|-----------------------------------|--------------------|---------------------------------|--------------------------|-------------------|-----------------------------------|--------------------|---------------------------------|-------------------|
| | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Top Width (ft) |
| 0.0050 | 29 | 2.1 | 13.5 | 51 | 50 | 14 | 2.1 | 6.8 | 25 |
| 0.0060 | 32 | 2.4 | 13.5 | 51 | 50 | 16 | 2.4 | 6.8 | 25 |
| 0.0080 | 35 | 2.6 | 13.5 | 51 | 50 | 18 | 2.6 | 6.8 | 25 |
| 0.0090 | 38 | 2.8 | 13.5 | 51 | 50 | 19 | 2.8 | 6.8 | 25 |
| 0.0100 | 41 | 3.0 | 13.5 | 51 | 50 | 20 | 3.0 | 6.8 | 25 |
| 0.0110 | 43 | 3.2 | 13.5 | 51 | 50 | 22 | 3.2 | 6.8 | 25 |
| 0.0130 | 46 | 3.4 | 13.5 | 51 | 50 | 23 | 3.4 | 6.8 | 25 |
| 0.0140 | 48 | 3.5 | 13.5 | 51 | 50 | 24 | 3.5 | 6.8 | 25 |
| 0.0150 | 50 | 3.7 | 13.5 | 51 | 50 | 25 | 3.7 | 6.8 | 25 |
| 0.0160 | 52 | 3.8 | 13.5 | 51 | 50 | 26 | 3.8 | 6.8 | 25 |
| 0.0180 | 54 | 4.0 | 13.5 | 51 | 50 | 27 | 4.0 | 6.8 | 25 |
| 0.0190 | 56 | 4.1 | 13.5 | 51 | 50 | 28 | 4.1 | 6.8 | 25 |
| 0.0200 | 58 | 4.3 | 13.5 | 51 | 50 | 29 | 4.3 | 6.8 | 25 |
| 0.0210 | 59 | 4.4 | 13.5 | 51 | 50 | 30 | 4.4 | 6.8 | 25 |
| 0.0230 | 61 | 4.5 | 13.5 | 51 | 50 | 31 | 4.5 | 6.8 | 25 |
| 0.0240 | 63 | 4.6 | 13.5 | 51 | 50 | 32 | 4.6 | 6.8 | 25 |
| 0.0250 | 64 | 4.8 | 13.5 | 51 | 50 | 32 | 4.8 | 6.8 | 25 |
| 0.0260 | 66 | 4.9 | 13.5 | 51 | 50 | 33 | 4.9 | 6.8 | 25 |
| 0.0280 | 67 | 5.0 | 13.5 | 51 | 50 | 34 | 5.0 | 6.8 | 25 |
| 0.0290 | 69 | 5.1 | 13.5 | 51 | 50 | 35 | 5.1 | 6.8 | 25 |
| 0.0300 | 71 | 5.2 | 13.5 | 51 | 50 | 36 | 5.2 | 6.8 | 25 |
| 0.0310 | 72 | 5.3 | 13.5 | 51 | 50 | 36 | 5.3 | 6.8 | 25 |
| 0.0330 | 73 | 5.4 | 13.5 | 51 | 50 | 37 | 5.4 | 6.8 | 25 |
| 0.0340 | 75 | 5.5 | 13.5 | 51 | 50 | 38 | 5.5 | 6.8 | 25 |
| 0.0350 | 76 | 5.6 | 13.5 | 51 | 50 | 38 | 5.6 | 6.8 | 25 |
| 0.0360 | 77 | 5.7 | 13.5 | 51 | 50 | 39 | 5.7 | 6.8 | 25 |
| 0.0380 | 79 | 5.8 | 13.5 | 51 | 50 | 40 | 5.8 | 6.8 | 25 |
| 0.0390 | 80 | 5.9 | 13.5 | 51 | 50 | 40 | 5.9 | 6.8 | 25 |
| 0.0400 | 81 | 6.0 | 13.5 | 51 | 50 | 41 | 6.0 | 6.8 | 25 |

**100-Year Storm Event Maximum Allowable Street Flows
(Maximum Flow to Crown of Roadway)**

| Channel Slope (ft/ft) | Full Street Width | | | | | Half Street Width | | | |
|-----------------------------|-----------------------------------|--------------------|------------------------------------|-----------------------------|----------------------|-----------------------------------|--------------------|------------------------------------|----------------------|
| | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Top Width (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Flow Area (ft ²) | Top Width (ft) |
| 0.0050 | 13 | 2.2 | 6.0 | 35 | 34 | 6.8 | 2.2 | 3.1 | 17 |
| 0.0060 | 15 | 2.5 | 6.0 | 35 | 34 | 7.6 | 2.5 | 3.1 | 17 |
| 0.0080 | 16 | 2.7 | 6.0 | 35 | 34 | 8.4 | 2.7 | 3.1 | 17 |
| 0.0090 | 18 | 2.9 | 6.0 | 35 | 34 | 9.0 | 3.0 | 3.1 | 17 |
| 0.0100 | 19 | 3.1 | 6.0 | 35 | 34 | 9.7 | 3.2 | 3.1 | 17 |
| 0.0110 | 20 | 3.3 | 6.0 | 35 | 34 | 10.2 | 3.4 | 3.1 | 17 |
| 0.0130 | 21 | 3.5 | 6.0 | 35 | 34 | 11 | 3.5 | 3.1 | 17 |
| 0.0140 | 22 | 3.7 | 6.0 | 35 | 34 | 11 | 3.7 | 3.1 | 17 |
| 0.0150 | 23 | 3.8 | 6.0 | 35 | 34 | 12 | 3.9 | 3.1 | 17 |
| 0.0160 | 24 | 4.0 | 6.0 | 35 | 34 | 12 | 4.0 | 3.1 | 17 |
| 0.0180 | 25 | 4.1 | 6.0 | 35 | 34 | 13 | 4.2 | 3.1 | 17 |
| 0.0190 | 26 | 4.3 | 6.0 | 35 | 34 | 13 | 4.3 | 3.1 | 17 |
| 0.0200 | 27 | 4.4 | 6.0 | 35 | 34 | 14 | 4.5 | 3.1 | 17 |
| 0.0210 | 28 | 4.6 | 6.0 | 35 | 34 | 14 | 4.6 | 3.1 | 17 |
| 0.0230 | 28 | 4.7 | 6.0 | 35 | 34 | 14 | 4.7 | 3.1 | 17 |
| 0.0240 | 29 | 4.8 | 6.0 | 35 | 34 | 15 | 4.9 | 3.1 | 17 |
| 0.0250 | 30 | 4.9 | 6.0 | 35 | 34 | 15 | 5.0 | 3.1 | 17 |
| 0.0260 | 31 | 5.1 | 6.0 | 35 | 34 | 16 | 5.1 | 3.1 | 17 |
| 0.0280 | 31 | 5.2 | 6.0 | 35 | 34 | 16 | 5.2 | 3.1 | 17 |
| 0.0290 | 32 | 5.3 | 6.0 | 35 | 34 | 16 | 5.4 | 3.1 | 17 |
| 0.0300 | 33 | 5.4 | 6.0 | 35 | 34 | 17 | 5.5 | 3.1 | 17 |
| 0.0310 | 33 | 5.5 | 6.0 | 35 | 34 | 17 | 5.6 | 3.1 | 17 |
| 0.0330 | 34 | 5.6 | 6.0 | 35 | 34 | 17 | 5.7 | 3.1 | 17 |
| 0.0340 | 35 | 5.7 | 6.0 | 35 | 34 | 18 | 5.8 | 3.1 | 17 |
| 0.0350 | 35 | 5.9 | 6.0 | 35 | 34 | 18 | 5.9 | 3.1 | 17 |
| 0.0360 | 36 | 6.0 | 6.0 | 35 | 34 | 18 | 6.0 | 3.1 | 17 |
| 0.0380 | 37 | 6.1 | 6.0 | 35 | 34 | 19 | 6.1 | 3.1 | 17 |
| 0.0390 | 37 | 6.2 | 6.0 | 35 | 34 | 19 | 6.2 | 3.1 | 17 |
| 0.0400 | 38 | 6.3 | 6.0 | 35 | 34 | 19 | 6.3 | 3.1 | 17 |

Appendix F – East Grass Swale Analysis

East Swale - Northern Portion

| | |
|-----------------------|---------------------|
| Project Description | |
| Friction Method | Manning |
| | Formula |
| Solve For | Normal Depth |
| Input Data | |
| Roughness Coefficient | 0.030 |
| Channel Slope | 0.008 ft/ft |
| Left Side Slope | 4.000 H:V |
| Right Side Slope | 4.000 H:V |
| Discharge | 5.80 cfs |
| Results | |
| Normal Depth | 9.5 in |
| Flow Area | 2.5 ft ² |
| Wetted Perimeter | 6.5 ft |
| Hydraulic Radius | 4.6 in |
| Top Width | 6.31 ft |
| Critical Depth | 8.0 in |
| Critical Slope | 0.020 ft/ft |
| Velocity | 2.33 ft/s |
| Velocity Head | 0.08 ft |
| Specific Energy | 0.87 ft |
| Froude Number | 0.655 |
| Flow Type | Subcritical |
| GVF Input Data | |
| Downstream Depth | 0.0 in |
| Length | 0.0 ft |
| Number Of Steps | 0 |
| GVF Output Data | |
| Upstream Depth | 0.0 in |
| Profile Description | N/A |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | 0.00 ft/s |
| Upstream Velocity | 0.00 ft/s |
| Normal Depth | 9.5 in |
| Critical Depth | 8.0 in |
| Channel Slope | 0.008 ft/ft |
| Critical Slope | 0.020 ft/ft |

East Swale - Northern Rip-rap Rundown

| | |
|-----------------------|---------------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula |
| | Normal Depth |
| Input Data | |
| Roughness Coefficient | 0.069 |
| Channel Slope | 0.250 ft/ft |
| Left Side Slope | 4.000 H:V |
| Right Side Slope | 4.000 H:V |
| Discharge | 5.80 cfs |
| Results | |
| Normal Depth | 6.8 in |
| Flow Area | 1.3 ft ² |
| Wetted Perimeter | 4.7 ft |
| Hydraulic Radius | 3.3 in |
| Top Width | 4.52 ft |
| Critical Depth | 8.0 in |
| Critical Slope | 0.104 ft/ft |
| Velocity | 4.54 ft/s |
| Velocity Head | 0.32 ft |
| Specific Energy | 0.89 ft |
| Froude Number | 1.507 |
| Flow Type | Supercritical |
| GVF Input Data | |
| Downstream Depth | 0.0 in |
| Length | 0.0 ft |
| Number Of Steps | 0 |
| GVF Output Data | |
| Upstream Depth | 0.0 in |
| Profile Description | N/A |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | Infinity ft/s |
| Upstream Velocity | Infinity ft/s |
| Normal Depth | 6.8 in |
| Critical Depth | 8.0 in |
| Channel Slope | 0.250 ft/ft |
| Critical Slope | 0.104 ft/ft |

East Swale - Southern Portion

| | |
|-----------------------|---------------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula |
| | Normal Depth |
| Input Data | |
| Roughness Coefficient | 0.030 |
| Channel Slope | 0.008 ft/ft |
| Left Side Slope | 4.000 H:V |
| Right Side Slope | 4.000 H:V |
| Discharge | 9.60 cfs |
| Results | |
| Normal Depth | 11.4 in |
| Flow Area | 3.6 ft ² |
| Wetted Perimeter | 7.9 ft |
| Hydraulic Radius | 5.5 in |
| Top Width | 7.62 ft |
| Critical Depth | 9.8 in |
| Critical Slope | 0.018 ft/ft |
| Velocity | 2.65 ft/s |
| Velocity Head | 0.11 ft |
| Specific Energy | 1.06 ft |
| Froude Number | 0.677 |
| Flow Type | Subcritical |
| GVF Input Data | |
| Downstream Depth | 0.0 in |
| Length | 0.0 ft |
| Number Of Steps | 0 |
| GVF Output Data | |
| Upstream Depth | 0.0 in |
| Profile Description | N/A |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | 0.00 ft/s |
| Upstream Velocity | 0.00 ft/s |
| Normal Depth | 11.4 in |
| Critical Depth | 9.8 in |
| Channel Slope | 0.008 ft/ft |
| Critical Slope | 0.018 ft/ft |

East Swale - Southern Rip-rap Rundown

| | |
|-----------------------|---------------------|
| Project Description | |
| Friction Method | Manning |
| Solve For | Formula |
| | Normal Depth |
| Input Data | |
| Roughness Coefficient | 0.078 |
| Channel Slope | 0.100 ft/ft |
| Left Side Slope | 4.000 H:V |
| Right Side Slope | 4.000 H:V |
| Discharge | 9.60 cfs |
| Results | |
| Normal Depth | 10.2 in |
| Flow Area | 2.9 ft ² |
| Wetted Perimeter | 7.0 ft |
| Hydraulic Radius | 4.9 in |
| Top Width | 6.79 ft |
| Critical Depth | 9.8 in |
| Critical Slope | 0.125 ft/ft |
| Velocity | 3.33 ft/s |
| Velocity Head | 0.17 ft |
| Specific Energy | 1.02 ft |
| Froude Number | 0.902 |
| Flow Type | Subcritical |
| GVF Input Data | |
| Downstream Depth | 0.0 in |
| Length | 0.0 ft |
| Number Of Steps | 0 |
| GVF Output Data | |
| Upstream Depth | 0.0 in |
| Profile Description | N/A |
| Profile Headloss | 0.00 ft |
| Downstream Velocity | 0.00 ft/s |
| Upstream Velocity | 0.00 ft/s |
| Normal Depth | 10.2 in |
| Critical Depth | 9.8 in |
| Channel Slope | 0.100 ft/ft |
| Critical Slope | 0.125 ft/ft |

Appendix G – Soil Resource Report



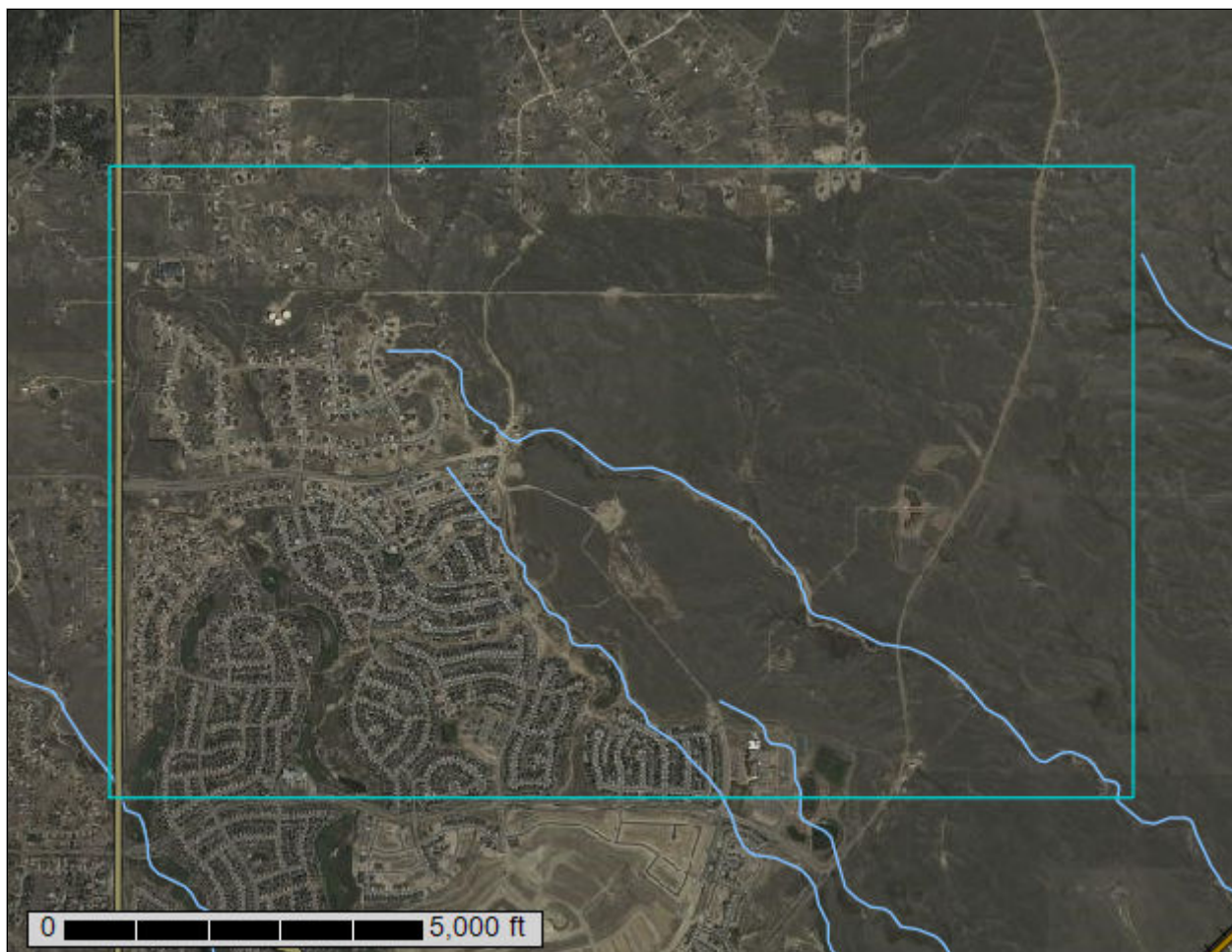
United States
Department of
Agriculture

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 **El Paso County Area, Colorado**



March 10, 2022

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.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

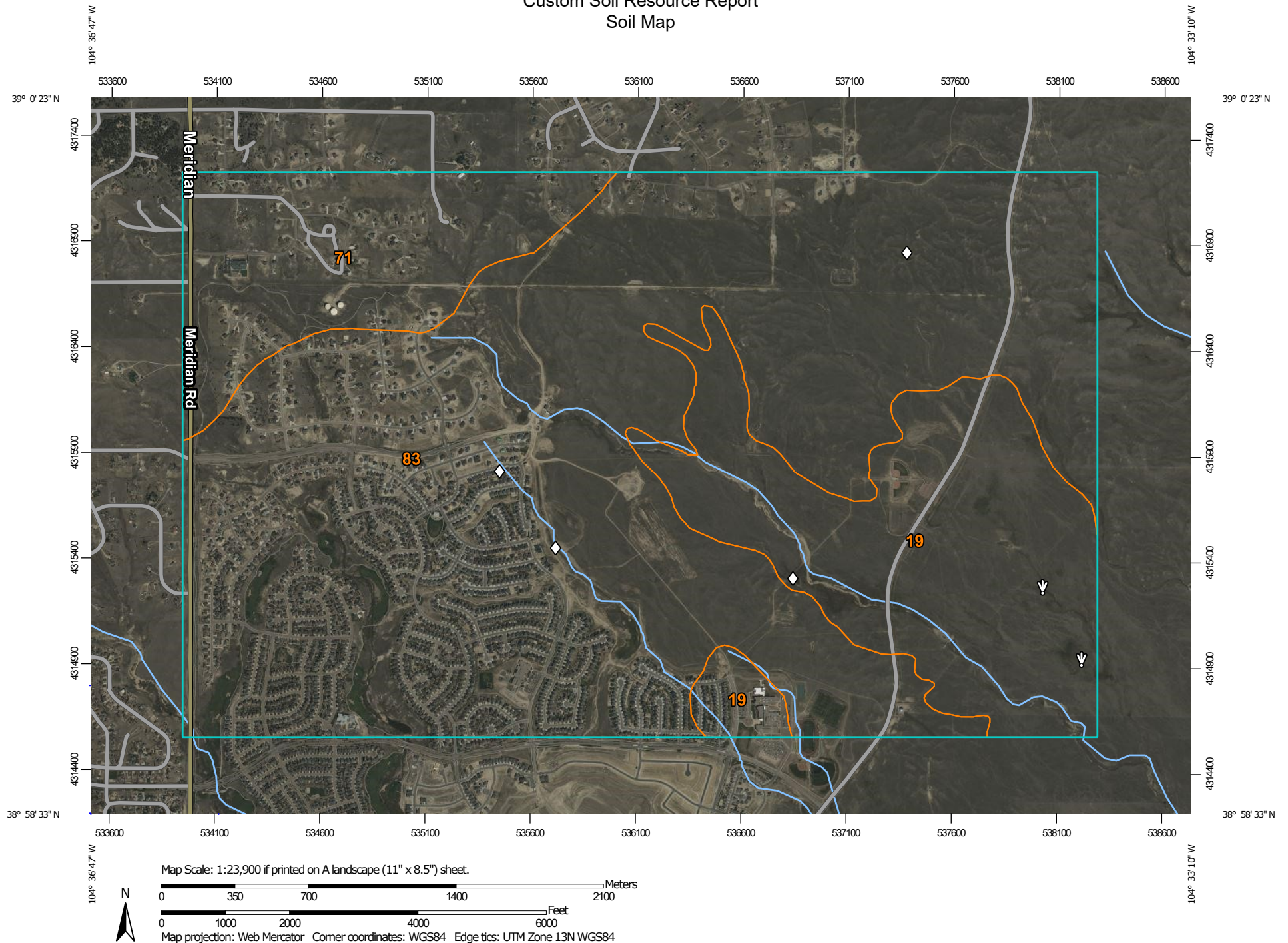
Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

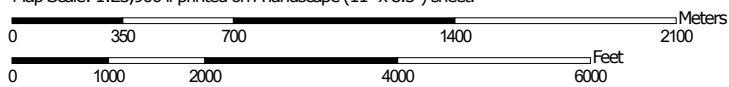
Soil Map

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: 1:23,900 if printed on A landscape (11" x 8.5") sheet.




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

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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.

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: El Paso County Area, Colorado

Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background 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 |
|------------------------------------|--|----------------|----------------|
| 19 | Columbine gravelly sandy loam, 0 to 3 percent slopes | 575.5 | 20.0% |
| 71 | Pring coarse sandy loam, 3 to 8 percent slopes | 339.8 | 11.8% |
| 83 | Stapleton sandy loam, 3 to 8 percent slopes | 1,964.3 | 68.2% |
| Totals for Area of Interest | | 2,879.9 | 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.

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.

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

83—Stapleton sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369z
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Stapleton and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Stapleton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

A - 0 to 11 inches: sandy loam
Bw - 11 to 17 inches: gravelly sandy loam
C - 17 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

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Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R049XY214CO - Gravelly Foothill

Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales

Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

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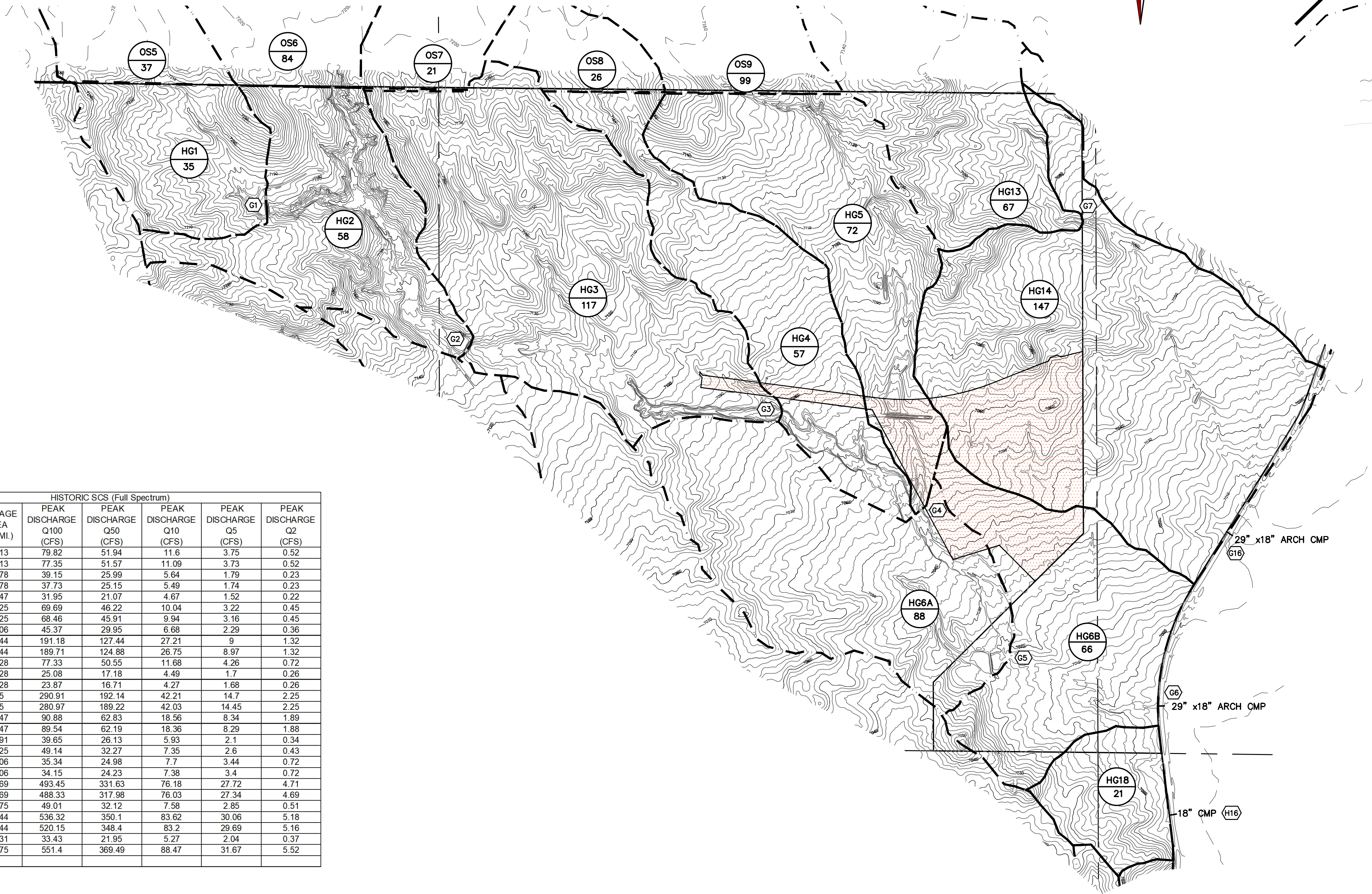
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Appendix H – Drainage Maps


THE SANCTUARY - PDR/FDR

| HISTORIC SCS (Full Spectrum) | | | | | | |
|------------------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| OS06 | 0.1313 | 79.82 | 51.94 | 11.6 | 3.75 | 0.52 |
| OS06-G02 | 0.1313 | 77.35 | 51.57 | 11.09 | 3.73 | 0.52 |
| OS05 | 0.0578 | 39.15 | 25.99 | 5.64 | 1.79 | 0.23 |
| OS05-G01 | 0.0578 | 37.73 | 25.15 | 5.49 | 1.74 | 0.23 |
| HG01 | 0.0547 | 31.95 | 21.07 | 4.67 | 1.52 | 0.22 |
| G01 | 0.1125 | 69.69 | 46.22 | 10.04 | 3.22 | 0.45 |
| G01-G02 | 0.1125 | 68.46 | 45.91 | 9.94 | 3.16 | 0.45 |
| HG02 | 0.0906 | 45.37 | 29.95 | 6.68 | 2.29 | 0.36 |
| G02 | 0.3344 | 191.18 | 127.44 | 27.21 | 9 | 1.32 |
| G02-G03 | 0.3344 | 189.71 | 124.88 | 26.75 | 8.97 | 1.32 |
| HG03 | 0.1828 | 77.33 | 50.55 | 11.68 | 4.26 | 0.72 |
| OS07 | 0.0328 | 25.08 | 17.18 | 4.49 | 1.7 | 0.26 |
| OS07-G03 | 0.0328 | 23.87 | 16.71 | 4.27 | 1.68 | 0.26 |
| G03 | 0.55 | 290.91 | 192.14 | 42.21 | 14.7 | 2.25 |
| G03-G04 | 0.55 | 280.97 | 189.22 | 42.03 | 14.45 | 2.25 |
| OS09 | 0.1547 | 90.88 | 62.83 | 18.56 | 8.34 | 1.89 |
| OS09-G04 | 0.1547 | 89.54 | 62.19 | 18.36 | 8.29 | 1.88 |
| HG04 | 0.0891 | 39.65 | 26.13 | 5.93 | 2.1 | 0.34 |
| HG05 | 0.1125 | 49.14 | 32.27 | 7.35 | 2.6 | 0.43 |
| OS08 | 0.0406 | 35.34 | 24.98 | 7.7 | 3.44 | 0.72 |
| OS08-G04 | 0.0406 | 34.15 | 24.23 | 7.38 | 3.4 | 0.72 |
| G04 | 0.9469 | 493.45 | 331.63 | 76.18 | 27.72 | 4.71 |
| G04-G05 | 0.9469 | 488.33 | 317.98 | 76.03 | 27.34 | 4.69 |
| HG06A | 0.1375 | 49.01 | 32.12 | 7.58 | 2.85 | 0.51 |
| G05 | 1.0844 | 536.32 | 350.1 | 83.62 | 30.06 | 5.18 |
| G05-G06 | 1.0844 | 520.15 | 348.4 | 83.2 | 29.69 | 5.16 |
| HG06B | 0.1031 | 33.43 | 21.95 | 5.27 | 2.04 | 0.37 |
| G06 | 1.1875 | 551.4 | 369.49 | 88.47 | 31.67 | 5.52 |



HISTORIC CONDITIONS - SCS MAP

FIGURE 4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|--|----------|--|-----|--|------------|--|----|--|------|--|-----------|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Scale AS SHOWN | | Drawn by | | TAK | | Checked by | | RD | | Date | | JUNE 2022 | | HISTORIC CONDITIONS - SCS MAP THE SANCTUARY FILING 1 PUD - PDR | |  MERIDIAN RANCH | | TECH CONTRACTORS 11886 STAPLETON DRIVE FALCON, CO 80831 TELEPHONE: 719.495.7444 FAX: 719.495.3349 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|--|----------|--|-----|--|------------|--|----|--|------|--|-----------|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

THE SANCTUARY FILING 1



FIGURE 5

| INTERIM SCS (Full Spectrum) | | | | | | | | | | | | | | |
|-----------------------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------|-------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|--|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) | | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) | |
| OS06 | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 | G8 | 0.7144 | 283 | 179 | 47 | 25 | 7.6 | |
| G1a | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 | G8-G10 | 0.7144 | 282 | 179 | 47 | 24 | 7.6 | |
| G1a-G2 | 0.1313 | 79 | 52 | 11 | 3.7 | 0.5 | OS06b | 0.1167 | 72 | 49 | 14 | 6.1 | 1.3 | |
| OS05 | 0.0578 | 39 | 26 | 5.6 | 1.8 | 0.2 | OS06b-G9a | 0.1167 | 71 | 49 | 14 | 6.0 | 1.2 | |
| OS05-G1 | 0.0578 | 39 | 25 | 5.5 | 1.7 | 0.2 | FG21a | 0.0589 | 41 | 30 | 9.8 | 4.9 | 1.4 | |
| FO01 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 | FG21a | 0.0359 | 23 | 15 | 4.0 | 1.8 | 0.3 | |
| FG01-G1 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 | OS09a | 0.0279 | 17 | 11 | 2.8 | 1.0 | 0.2 | |
| G1 | 0.1116 | 61 | 41 | 11 | 4.9 | 1.1 | OS09a-G9a | 0.0279 | 17 | 11 | 2.7 | 1.0 | 0.2 | |
| G1-G2 | 0.1116 | 61 | 41 | 11 | 4.8 | 1.1 | G9a | 0.2394 | 148 | 100 | 28.2 | 12.2 | 2.6 | |
| FG02 | 0.0391 | 32 | 22 | 6.4 | 2.7 | 0.5 | G9a-G9b | 0.2394 | 145 | 100 | 28.0 | 12.1 | 2.6 | |
| G2 | 0.2820 | 167 | 112 | 27 | 10 | 1.9 | FG24c | 0.0291 | 26 | 18 | 5.8 | 2.9 | 0.8 | |
| G2-G3 | 0.2820 | 163 | 108 | 27 | 10 | 1.9 | FG24d | 0.0262 | 30 | 23 | 5.5 | 2.7 | 0.8 | |
| FG03 | 0.0293 | 24 | 17 | 5.9 | 3.0 | 0.8 | G9b | 0.2947 | 185 | 126 | 36.2 | 16.0 | 4.0 | |
| FG04 | 0.0172 | 22 | 16 | 5.8 | 3.1 | 0.9 | REXRD WQCV | 0.2947 | 173 | 128 | 35.3 | 15.9 | 3.8 | |
| G3 | 0.3195 | 185 | 123 | 31 | 12 | 2.4 | G9b-G10 | 0.2947 | 172 | 125 | 35.2 | 15.8 | 3.8 | |
| FG06 | 0.0675 | 56 | 40 | 12 | 5.8 | 1.3 | FG23b | 0.0235 | 18 | 12 | 3.0 | 1.1 | 0.2 | |
| FG05 | 0.0580 | 45 | 33 | 12 | 6.7 | 2.4 | G10 | 0.0326 | 459 | 286 | 80.1 | 38.6 | 11.0 | |
| OS07ab | 0.0170 | 12 | 7.9 | 1.8 | 0.5 | 0.07 | G10-G11 | 0.0326 | 458 | 285 | 79.3 | 38.3 | 10.9 | |
| OS07ab-POND F | 0.0170 | 12 | 7.6 | 1.7 | 0.5 | 0.07 | G11 | 0.0109 | 11 | 8 | 2.3 | 1.0 | 0.2 | |
| POND F IN | 0.4620 | 293 | 200 | 54 | 23 | 5.1 | G11 | 0.0435 | 461 | 287 | 80.1 | 38.8 | 11.1 | |
| POND F | 0.4620 | 178 | 121 | 16 | 8.0 | 2.1 | FG25 | 0.1084 | 111 | 84 | 36.0 | 21.9 | 9.9 | |
| POND F-G7 | 0.4620 | 177 | 120 | 16 | 8.0 | 2.1 | FG28 | 0.0184 | 15 | 10 | 3.0 | 1.2 | 0.2 | |
| OS07c | 0.0158 | 13 | 8.6 | 1.8 | 0.6 | 0.06 | POND G IN-W | 1.1703 | 544 | 357 | 111.5 | 55.6 | 17.2 | |
| OS07c-G4 | 0.0158 | 13 | 8.2 | 1.8 | 0.5 | 0.06 | FG27 | 0.0679 | 81 | 64 | 33.7 | 23.9 | 14.2 | |
| FG21a | 0.0095 | 5.9 | 4.0 | 1.0 | 0.4 | 0.06 | FG26 | 0.0570 | 45 | 32 | 10.6 | 5.1 | 1.3 | |
| G4 | 0.0253 | 19 | 12 | 2.8 | 0.9 | 0.12 | G13 | 0.0570 | 45 | 32 | 10.6 | 5.1 | 1.3 | |
| G4-G7 | 0.0253 | 17 | 12 | 2.7 | 0.9 | 0.12 | G13-POND G | 0.0570 | 45 | 32 | 10.4 | 5.1 | 1.3 | |
| FG21b | 0.0150 | 21 | 16 | 6.5 | 3.9 | 1.7 | POND G IN-E | 0.1249 | 123 | 95 | 44.0 | 28.9 | 15.5 | |
| G7 | 0.5023 | 189 | 127 | 18 | 8.7 | 2.3 | POND G | 1.2952 | 466 | 307 | 49.5 | 18.5 | 5.0 | |
| G7-G8 | 0.5023 | 188 | 127 | 18 | 8.7 | 2.3 | G12 | 1.2952 | 466 | 307 | 49.5 | 18.5 | 5.0 | |
| FG22 | 0.1400 | 124 | 90 | 32 | 17 | 5.3 | G12-G06 | 1.2952 | 465 | 307 | 49.5 | 18.5 | 5.0 | |
| OS06a | 0.0469 | 29 | 19 | 4.4 | 1.5 | 0.2 | FG29 | 0.0983 | 60 | 39 | 8.9 | 2.9 | 0.4 | |
| OS06a-G8 | 0.0469 | 29 | 19 | 4.3 | 1.5 | 0.2 | FG32 | 0.0402 | 21 | 14 | 3.1 | 1.0 | 0.2 | |
| FG23a | 0.0216 | 21 | 15 | 5.2 | 2.7 | 0.8 | FG32-G06 | 0.0402 | 21 | 14 | 3.1 | 1.0 | 0.2 | |
| OS07d | 0.0036 | 2.6 | 1.7 | 0.4 | 0.1 | 0.01 | G06 | 1.4337 | 491 | 323 | 52.4 | 19.6 | 5.3 | |
| OS07d-G8 | 0.0036 | 2.6 | 1.7 | 0.4 | 0.1 | 0.01 | | | | | | | | |

TECH CONTRACTORS
11886 STAPLETON DRIVE
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.3349

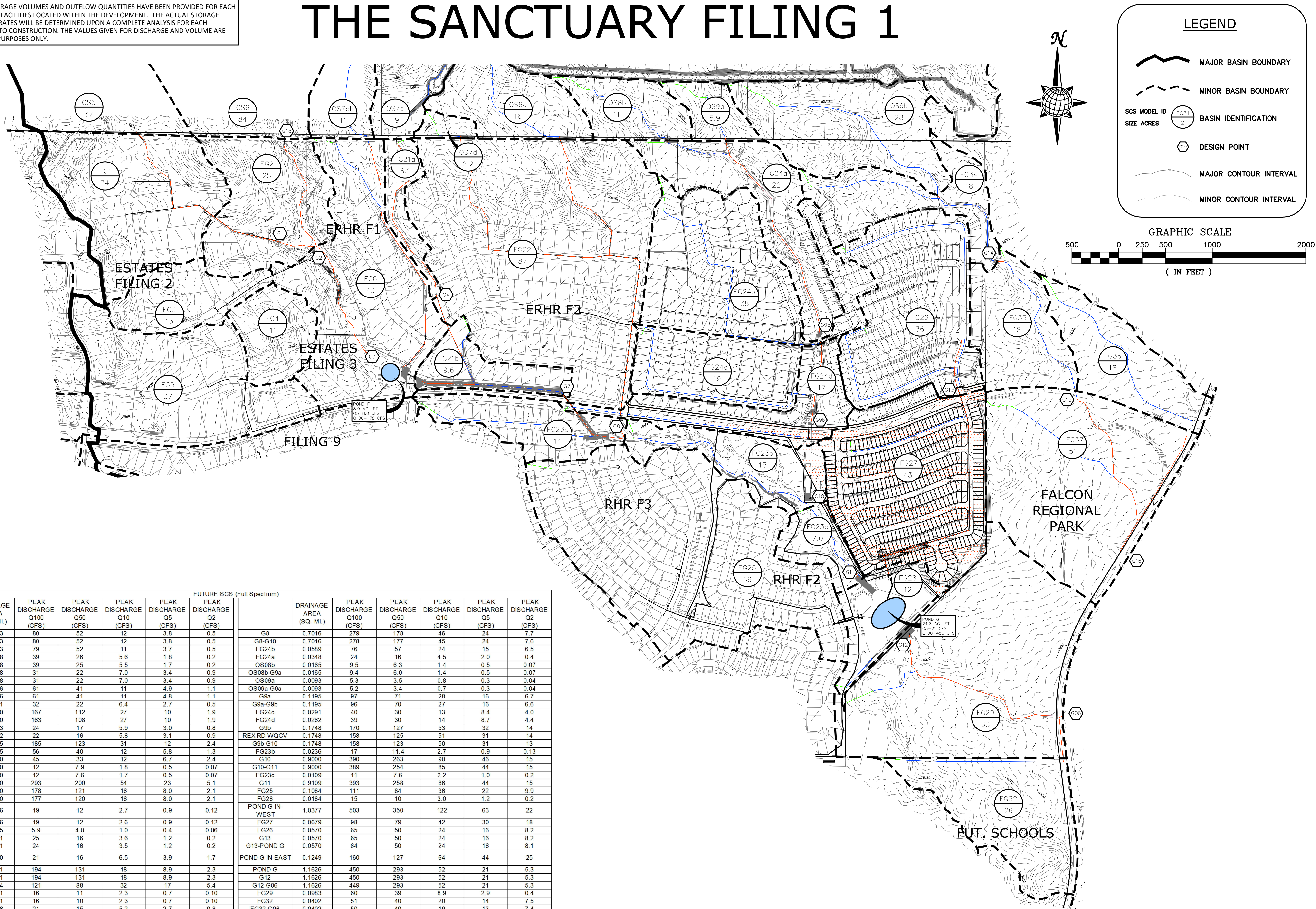

MERIDIAN RANCH

**INTERIM CONDITIONS - SCS MAP
THE SANCTUARY FILING 1
PDR - FDR**

| | |
|----------|------------|
| AS SHOWN | TAK |
| - of - | Checked by |
| | Date |
| | JUNE 2022 |

*NOTE: PRELIMINARY STORAGE VOLUMES AND OUTFLOW QUANTITIES HAVE BEEN PROVIDED FOR EACH OF THE FUTURE DETENTION FACILITIES LOCATED WITHIN THE DEVELOPMENT. THE ACTUAL STORAGE VOLUMES AND DISCHARGE RATES WILL BE DETERMINED UPON A COMPLETE ANALYSIS FOR EACH DETENTION FACILITY PRIOR TO CONSTRUCTION. THE VALUES GIVEN FOR DISCHARGE AND VOLUME ARE ESTIMATES FOR PLANNING PURPOSES ONLY.

THE SANCTUARY FILING 1



| FUTURE SCS (Full Spectrum) | | | | | | | | | | | | | |
|----------------------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|-------------------------|----------------|-------------------------|---------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) | | DRAINAGE AREA (SQ. MI.) | PEAK DISCHARGE Q100 (CFS) | PEAK DISCHARGE Q50 (CFS) | PEAK DISCHARGE Q10 (CFS) | PEAK DISCHARGE Q5 (CFS) | PEAK DISCHARGE Q2 (CFS) |
| OS06 | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 | G8 | 0.7016 | 279 | 178 | 46 | 24 | 7.7 |
| G1a | 0.1313 | 80 | 52 | 12 | 3.8 | 0.5 | G8-G10 | 0.7016 | 278 | 177 | 45 | 24 | 7.6 |
| G1a-G2 | 0.1313 | 79 | 52 | 11 | 3.7 | 0.5 | FG24b | 0.0589 | 76 | 57 | 24 | 15 | 6.5 |
| OS05 | 0.0578 | 39 | 26 | 5.6 | 1.8 | 0.2 | FG24a | 0.0348 | 24 | 16 | 4.5 | 2.0 | 0.4 |
| OS05-G1 | 0.0578 | 39 | 25 | 5.5 | 1.7 | 0.2 | OS08b | 0.0165 | 9.5 | 6.3 | 1.4 | 0.5 | 0.07 |
| FG01 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 | OS08b-G9a | 0.0165 | 9.4 | 6.0 | 1.4 | 0.5 | 0.07 |
| FG01-G1 | 0.0538 | 31 | 22 | 7.0 | 3.4 | 0.9 | OS09a | 0.0093 | 5.3 | 3.5 | 0.8 | 0.3 | 0.04 |
| G1 | 0.1116 | 61 | 41 | 11 | 4.9 | 1.1 | OS09a-G9a | 0.0093 | 5.2 | 3.4 | 0.7 | 0.3 | 0.04 |
| G1-G2 | 0.1116 | 61 | 41 | 11 | 4.8 | 1.1 | G9a | 0.1195 | 97 | 71 | 28 | 16 | 6.7 |
| FG02 | 0.0391 | 32 | 22 | 6.4 | 2.7 | 0.5 | G9a-G9b | 0.1195 | 96 | 70 | 27 | 16 | 6.6 |
| G2 | 0.2820 | 167 | 112 | 27 | 10 | 1.9 | FG24c | 0.0291 | 40 | 30 | 13 | 8.4 | 4.0 |
| G2-G3 | 0.2820 | 163 | 108 | 27 | 10 | 1.9 | FG24d | 0.0262 | 39 | 30 | 14 | 8.7 | 4.4 |
| FG03 | 0.0203 | 24 | 17 | 5.9 | 3.0 | 0.8 | G9b | 0.1748 | 170 | 127 | 53 | 32 | 14 |
| FG04 | 0.0172 | 22 | 16 | 5.8 | 3.1 | 0.9 | REX RD WQCV | 0.1748 | 158 | 125 | 51 | 31 | 14 |
| G3 | 0.3195 | 185 | 123 | 31 | 12 | 2.4 | G9b-G10 | 0.1748 | 158 | 123 | 50 | 31 | 13 |
| FG06 | 0.0675 | 56 | 40 | 12 | 5.8 | 1.3 | FG23b | 0.0236 | 17 | 11.4 | 2.7 | 0.9 | 0.13 |
| FG06 | 0.0580 | 45 | 33 | 12 | 6.7 | 2.4 | G10 | 0.9000 | 390 | 263 | 90 | 46 | 15 |
| OS07ab | 0.0170 | 12 | 7.9 | 1.8 | 0.5 | 0.07 | G10-G11 | 0.9000 | 389 | 254 | 85 | 44 | 15 |
| OS07ab-POND F | 0.0170 | 12 | 7.6 | 1.7 | 0.5 | 0.07 | FG23c | 0.0109 | 11 | 7.6 | 2.2 | 1.0 | 0.2 |
| POND F IN | 0.4620 | 293 | 200 | 54 | 23 | 5.1 | G11 | 0.9109 | 393 | 258 | 86 | 44 | 15 |
| POND F | 0.4620 | 178 | 121 | 16 | 8.0 | 2.1 | FG25 | 0.1084 | 111 | 84 | 36 | 22 | 9.9 |
| POND F-G7 | 0.4620 | 177 | 120 | 16 | 8.0 | 2.1 | FG28 | 0.0184 | 15 | 10 | 3.0 | 1.2 | 0.2 |
| OS07c | 0.0296 | 19 | 12 | 2.7 | 0.9 | 0.12 | POND G IN-WEST | 1.0377 | 503 | 350 | 122 | 63 | 22 |
| OS07c-G4 | 0.0296 | 19 | 12 | 2.6 | 0.9 | 0.12 | FG27 | 0.0679 | 98 | 79 | 42 | 30 | 18 |
| FG21a | 0.0095 | 5.9 | 4.0 | 1.0 | 0.4 | 0.06 | FG26 | 0.0570 | 65 | 50 | 24 | 16 | 8.2 |
| G4 | 0.0391 | 25 | 16 | 3.6 | 1.2 | 0.2 | G13 | 0.0570 | 65 | 50 | 24 | 16 | 8.2 |
| G4-G7 | 0.0391 | 24 | 16 | 3.5 | 1.2 | 0.2 | G13-POND G | 0.0570 | 64 | 50 | 24 | 16 | 8.1 |
| FG21b | 0.0150 | 21 | 16 | 6.5 | 3.9 | 1.7 | POND G IN-EAST | 0.1249 | 160 | 127 | 64 | 44 | 25 |
| G7 | 0.5161 | 194 | 131 | 18 | 8.9 | 2.3 | POND G | 1.1626 | 450 | 293 | 52 | 21 | 5.3 |
| G7-G8 | 0.5161 | 194 | 131 | 18 | 8.9 | 2.3 | G12 | 1.1626 | 450 | 293 | 52 | 21 | 5.3 |
| FG22 | 0.1354 | 121 | 88 | 32 | 17 | 5.4 | G12-G06 | 1.1626 | 449 | 293 | 52 | 21 | 5.3 |
| OS08a | 0.0251 | 16 | 11 | 2.3 | 0.7 | 0.10 | FG29 | 0.0983 | 60 | 39 | 8.9 | 2.9 | 0.4 |
| OS08-G8 | 0.0251 | 16 | 10 | 2.3 | 0.7 | 0.10 | FG32 | 0.0402 | 51 | 40 | 20 | 14 | 7.5 |
| FG23a | 0.0216 | 21 | 15 | 5.2 | 2.7 | 0.8 | FG32-G06 | 0.0402 | 50 | 40 | 19 | 13 | 7.4 |
| OS07d | 0.0034 | 2.5 | 1.6 | 0.4 | 0.1 | 0.01 | G06 | 1.3011 | 491 | 317 | 57 | 22 | 7.5 |
| OS07d-G8 | 0.0034 | 2.4 | 1.6 | 0.3 | 0.1 | 0.01 | | | | | | | |

FUTURE CONDITIONS - SCS MAP

FIGURE 6

Scale

AS SHOWN

-

of

-

Drawn by

TAK

Checked by

Date

JUNE 2022

FUTURE CONDITIONS - SCS MAP

THE SANCTUARY FILING 1

FDR - FDR

TECH CONTRACTORS

11910 TOURMALINE DR #130

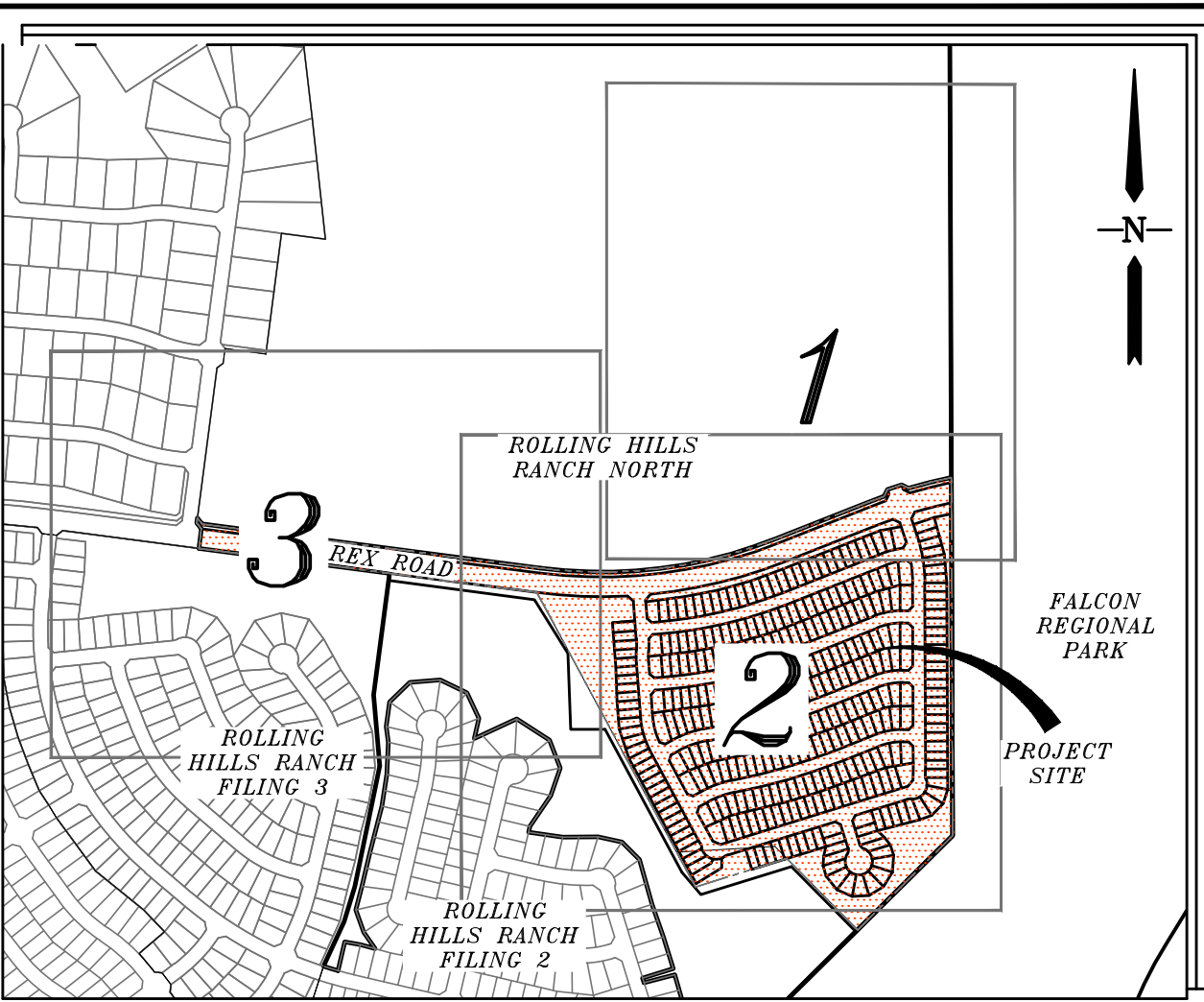
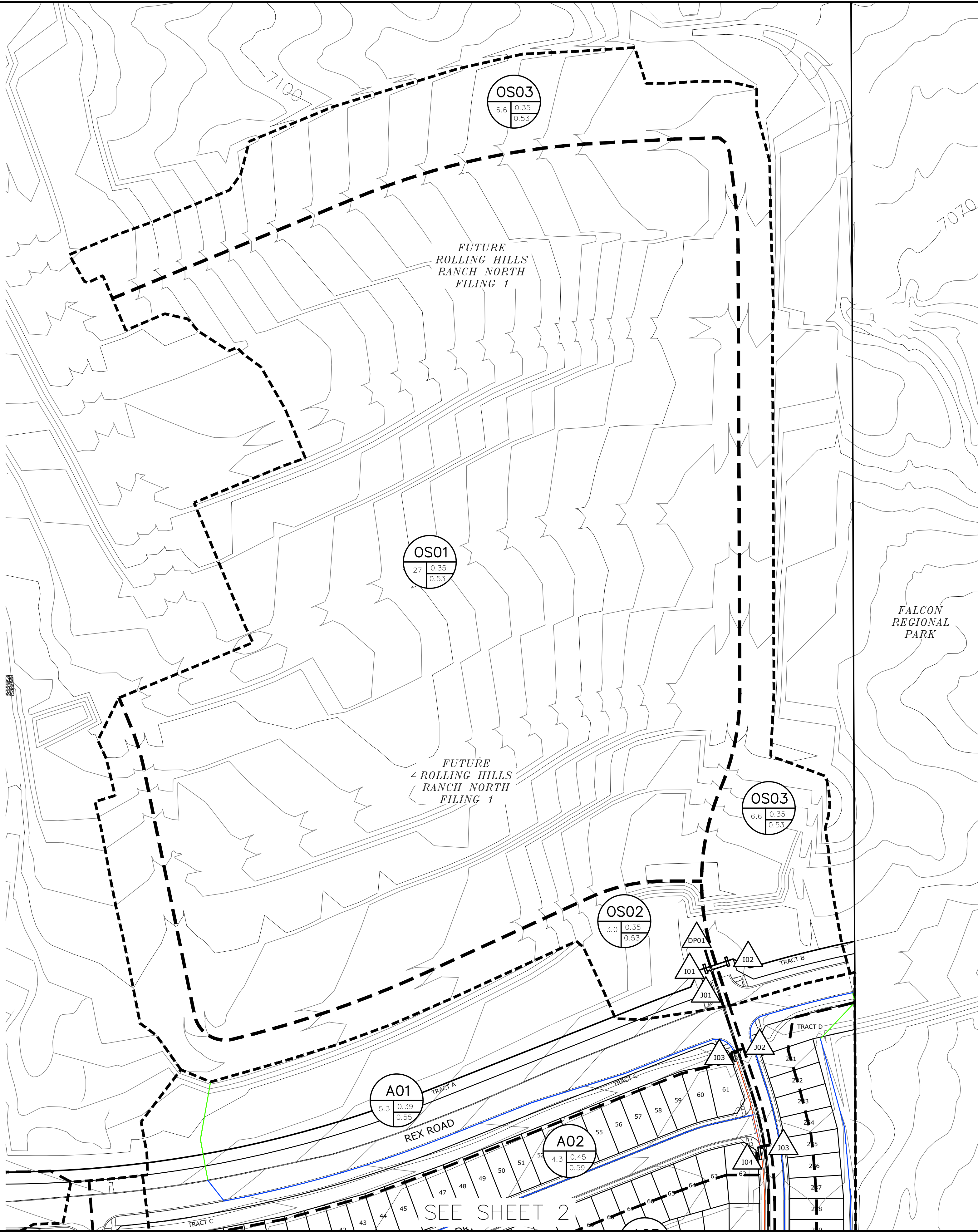
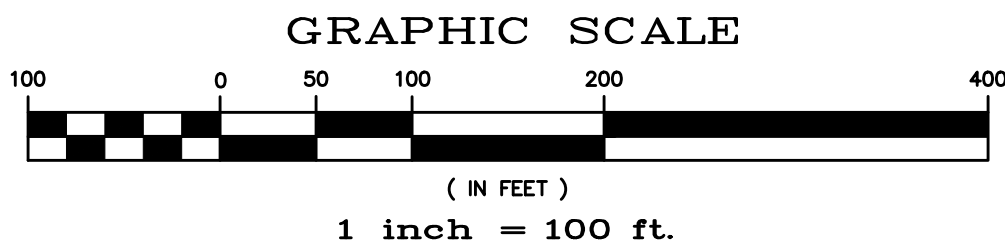
FALCON, CO 80831

TELEPHONE: 719.495.7444

Meridian Ranch

Revisions

| No. | Date | Inst. | Appr. | Date |
|-----|------|-------|-------|------|
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |



INDEX MAP
N.T.S.



- G01** BASIN DESIGNATION
- 2.7 0.40 0.55** SUB-WATERSHED DESIGNATION
- 6.6 0.35 0.53** MINOR/MAJOR STORM COEFFICIENT
- 61** BASIN AREA IN ACRES
- 61** DESIGN POINT DESIGNATION
- MAJOR BASIN BOUNDARY**
- SUB-BASIN BOUNDARY**
- 6130** EXISTING CONTOUR
- 6130** PROPOSED COUNTOUR
- PROPOSED STORM SEWER**
- INITIAL OVERLAND TIME (Ti)**
- TRAVEL TIME (Tt)**
- OVERLAND TIME (To)**

| UPSTREAM DP | BASIN | AREA (AC) | Q(5) (CFS) | Q(100) (CFS) | INLET | Q(5) (CFS) | Q(100) (CFS) | PIPE |
|-------------|-------|-----------|------------|--------------|-----------------|------------|--------------|----------|
| DP1 | OS01 | 27 | 29 | 60 | | 29 | 61 | 36 " RCP |
| I01 | OS02 | 3.0 | 3.6 | 19 | PR 15 ' SUMP | 3.6 | 19 | 18 " RCP |
| I02 | OS03 | 6.6 | 7.4 | 19 | PR 15 ' SUMP | 7.4 | 19 | 18 " RCP |
| J01 | | | | | | 38 | 93 | 42 " RCP |
| I03 | A01 | 5.3 | 6.9 | 17 | PR 15 ' FLOW-BY | 4.6 | 8.9 | 18 " RCP |
| J02 | | | | | | 42 | 100 | 42 " RCP |
| I04 | A02 | 4.3 | 8.6 | 22 | PR 20 ' FLOW-BY | 6.2 | 13 | 18 " RCP |
| J03 | | | | | | 47 | 112 | 48 " RCP |
| I05 | A03 | 5.5 | 9.8 | 24 | PR 20 ' FLOW-BY | 7.7 | 17 | 18 " RCP |
| J04 | | | | | | 53 | 126 | 54 " RCP |
| I06 | A04 | 4.7 | 8.0 | 21 | PR 20 ' FLOW-BY | 6.5 | 14 | 18 " RCP |
| J05 | | | | | | 59 | 138 | 54 " RCP |
| J06 | | | | | | 59 | 137 | 54 " RCP |
| I07 | A05 | 2.5 | 4.4 | 9.1 | PR 15 ' FLOW-BY | 3.7 | 6.8 | 18 " RCP |
| J07 | | | | | | 61 | 141 | 54 " RCP |
| I08 | A06 | 4.5 | 7.8 | 17 | PR 20 ' FLOW-BY | 5.7 | 11 | 18 " RCP |
| J08 | | | | | | 5.7 | 11 | 18 " RCP |
| I09 | A07 | 3.6 | 7.7 | 18 | PR 15 ' FLOW-BY | 5.4 | 11 | 18 " RCP |
| J09 | | | | | | 11 | 22 | 24 " RCP |
| J10 | | | | | | 11 | 21 | 24 " RCP |
| I10 | A08 | 3.3 | 6.2 | 18 | PR 10 ' SUMP | 6.2 | 14 | 18 " RCP |
| J11 | | | | | | 66 | 150 | 54 " RCP |
| I11 | A09 | 5.3 | 7.9 | 18 | PR 20 ' SUMP | 7.4 | 168 | 54 " RCP |
| | A10 | 2.0 | 2.5 | 5.8 | SWALE | 2.5 | 5.8 | |
| DP3 | A11 | 1.8 | 2.1 | 5.2 | SWALE | 3.9 | 9.6 | |
| I12 | A12 | 9.9 | 15 | 34 | PR 20 ' SUMP | 15 | 34 | 24 " RCP |
| DP02 | OS04 | 102 | 46 | 158 | | 46 | 159 | 54 " RCP |
| | B01 | 0.6 | 0.5 | 1.6 | | | | |
| | B02 | 1.3 | 0.8 | 3.3 | | | | |

BENCH MARK:
INTERSECTION OF WOODMEN RD AND MERIDIAN ROAD AT
SW CORNER (BRASS CAP W/ NO. GF-9)
ELEVATION = 6874.00

NOTE:
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FIGURE 7

TECH CONTRACTORS
11886 STAPLETON DRIVE
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.3349

MERIDIAN RANCH

**RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
THE SANCTUARY FILING 1
AT MERIDIAN RANCH**

Drawn by
TAK

Checked by
-

Date
JUNE 2022

Scale
1" = 100'

1 of 3

Revisions

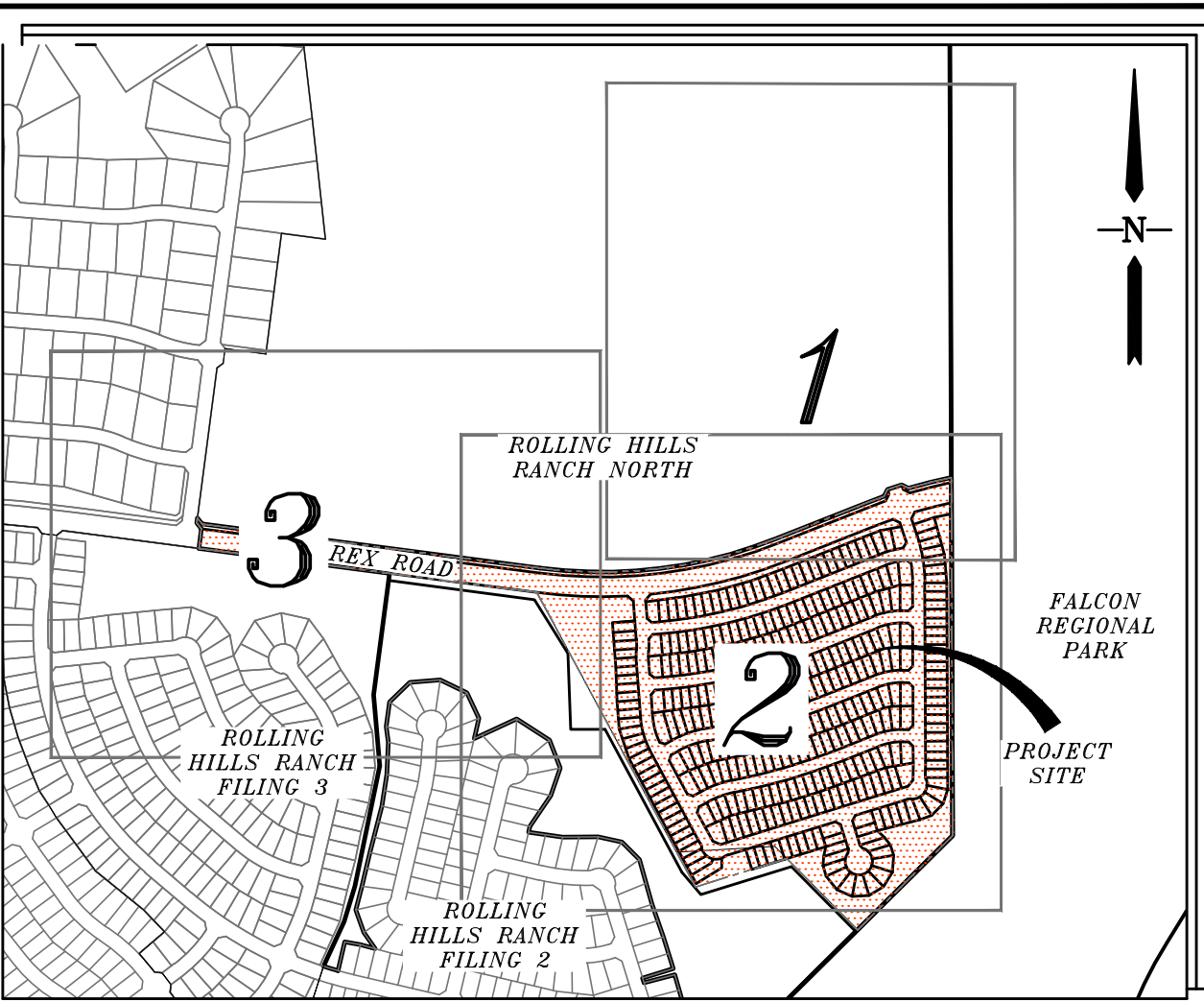
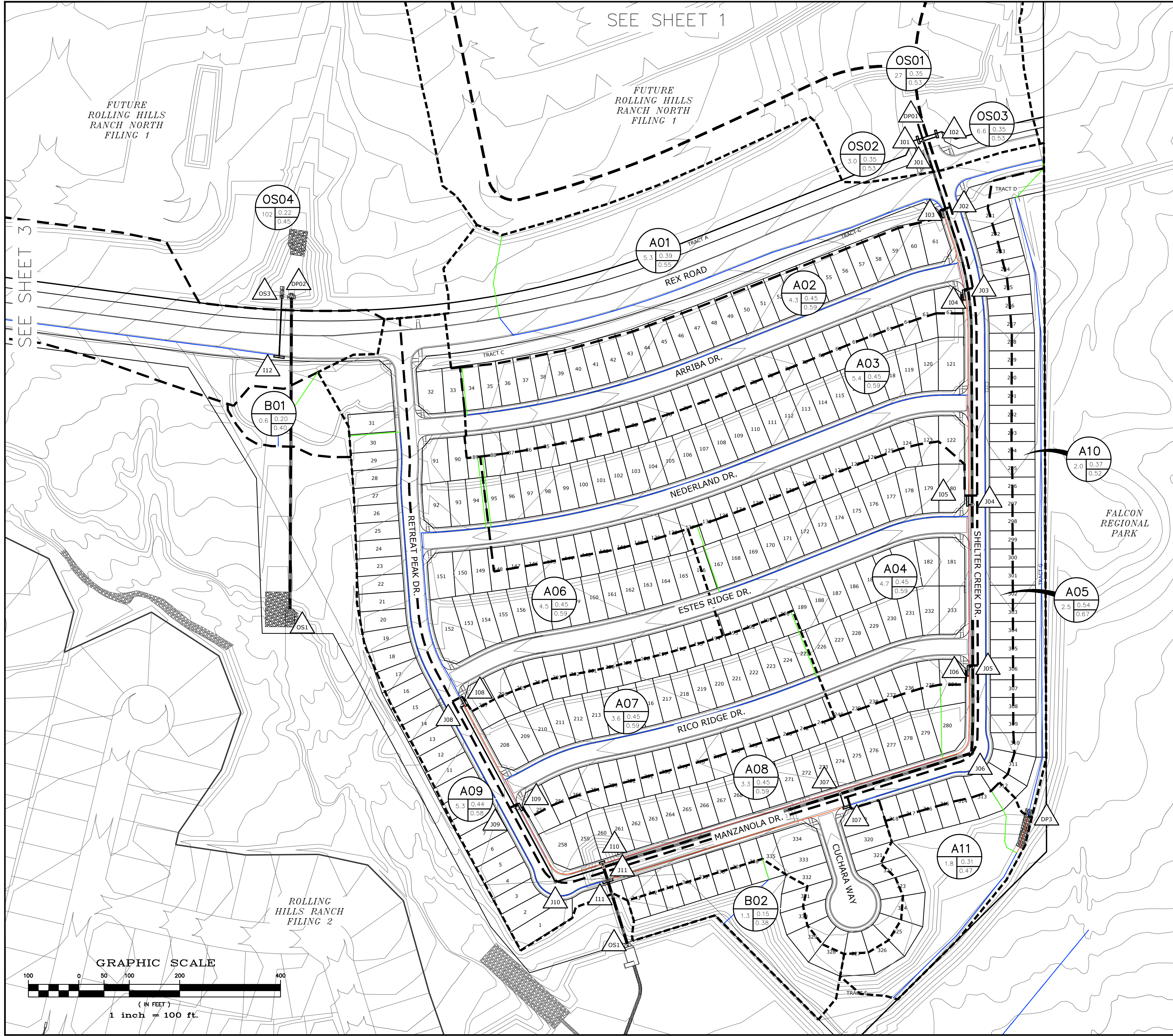
No.

Date

Inst.

Appr.

Date



INDEX MAP
N.T.S.

- LEGEND**
- G01** BASIN DESIGNATION
 - SUB-WATERSHED DESIGNATION**
 - MINOR/MAJOR STORM COEFFICIENT**
 - BASIN AREA IN ACRES**
 - 61** DESIGN POINT DESIGNATION
 - MAJOR BASIN BOUNDARY**
 - SUB-BASIN BOUNDARY**
 - EXISTING CONTOUR**
 - PROPOSED COUNTOUR**
 - PROPOSED STORM SEWER**
 - INITIAL OVERLAND TIME (Ti)**
 - TRAVEL TIME (Tt)**
 - OVERLAND TIME (To)**


| UPSTREAM DP | BASIN | AREA (AC) | Q(5) (CFS) | Q(100) (CFS) | INLET | Q(5) (CFS) | Q(100) (CFS) | PIPE |
|-------------|-------|-----------|------------|--------------|----------------|------------|--------------|---------|
| DP1 | OS01 | 27 | 29 | 60 | | 29 | 61 | 36" RCP |
| I01 | OS02 | 3.0 | 3.6 | 19 | PR 15' SUMP | 3.6 | 19 | 18" RCP |
| I02 | OS03 | 6.6 | 7.4 | 19 | PR 15' SUMP | 7.4 | 19 | 18" RCP |
| J01 | | | | | | 38 | 93 | 42" RCP |
| I03 | A01 | 5.3 | 6.9 | 17 | PR 15' FLOW-BY | 4.6 | 8.9 | 18" RCP |
| J02 | | | | | | 42 | 100 | 42" RCP |
| I04 | A02 | 4.3 | 8.6 | 22 | PR 20' FLOW-BY | 6.2 | 13 | 18" RCP |
| J03 | | | | | | 47 | 112 | 48" RCP |
| I05 | A03 | 5.5 | 9.8 | 24 | PR 20' FLOW-BY | 7.7 | 17 | 18" RCP |
| J04 | | | | | | 53 | 126 | 54" RCP |
| I06 | A04 | 4.7 | 8.0 | 21 | PR 20' FLOW-BY | 6.5 | 14 | 18" RCP |
| J05 | | | | | | 59 | 138 | 54" RCP |
| J06 | | | | | | 59 | 137 | 54" RCP |
| I07 | A05 | 2.5 | 4.4 | 9.1 | PR 15' FLOW-BY | 3.7 | 6.8 | 18" RCP |
| J07 | | | | | | 61 | 141 | 54" RCP |
| I08 | A06 | 4.5 | 7.8 | 17 | PR 20' FLOW-BY | 5.7 | 11 | 18" RCP |
| J08 | | | | | | 5.7 | 11 | 18" RCP |
| I09 | A07 | 3.6 | 7.7 | 18 | PR 15' FLOW-BY | 5.4 | 11 | 18" RCP |
| J09 | | | | | | 11 | 22 | 24" RCP |
| I10 | A08 | 3.3 | 6.2 | 18 | PR 10' SUMP | 6.2 | 14 | 18" RCP |
| J11 | | | | | | 66 | 150 | 54" RCP |
| I11 | A09 | 5.3 | 7.9 | 18 | PR 20' SUMP | 7.4 | 168 | 54" RCP |
| | A10 | 2.0 | 2.5 | 5.8 | SWALE | 2.5 | 5.8 | |
| DP3 | A11 | 1.8 | 2.1 | 5.2 | SWALE | 3.9 | 9.6 | |
| I12 | A12 | 9.9 | 15 | 34 | PR 20' SUMP | 15 | 34 | 24" RCP |
| DP02 | OS04 | 102 | 46 | 158 | | 46 | 159 | 54" RCP |
| | B01 | 0.6 | 0.5 | 1.6 | | | | |
| | B02 | 1.3 | 0.8 | 3.3 | | | | |

BENCH MARK:
INTERSECTION OF WOODMEN RD AND MERIDIAN ROAD AT
SW CORNER (BRASS CAP W/ NO. GF-9)
ELEVATION = 6874.00

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FIGURE 7

TECH CONTRACTORS
11886 STAPLETON DRIVE
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.3349

**MERIDIAN RANCH**

RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
THE SANCTUARY FILING 1
AT MERIDIAN RANCH

Drawn by
TAK

Checked by
-

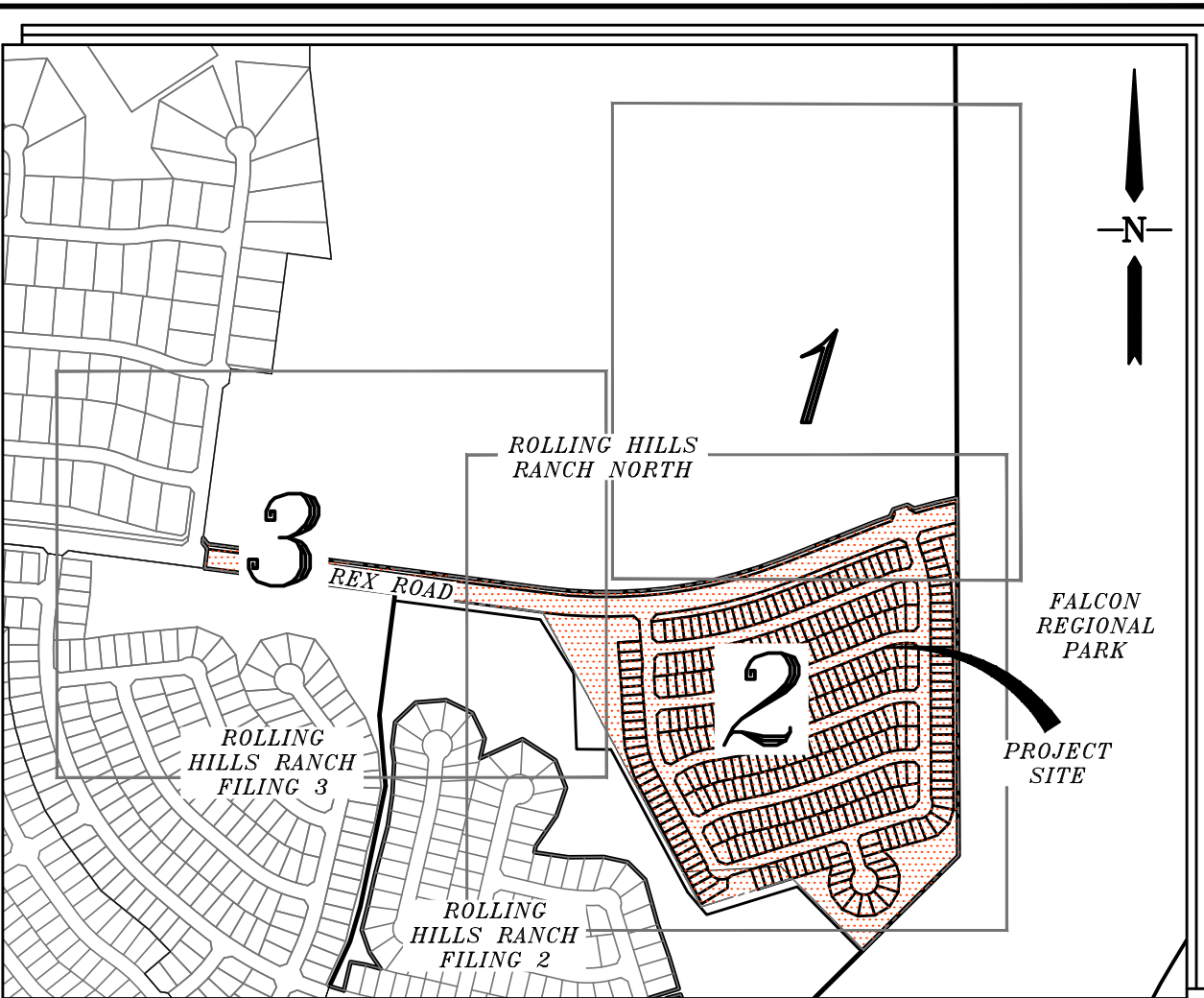
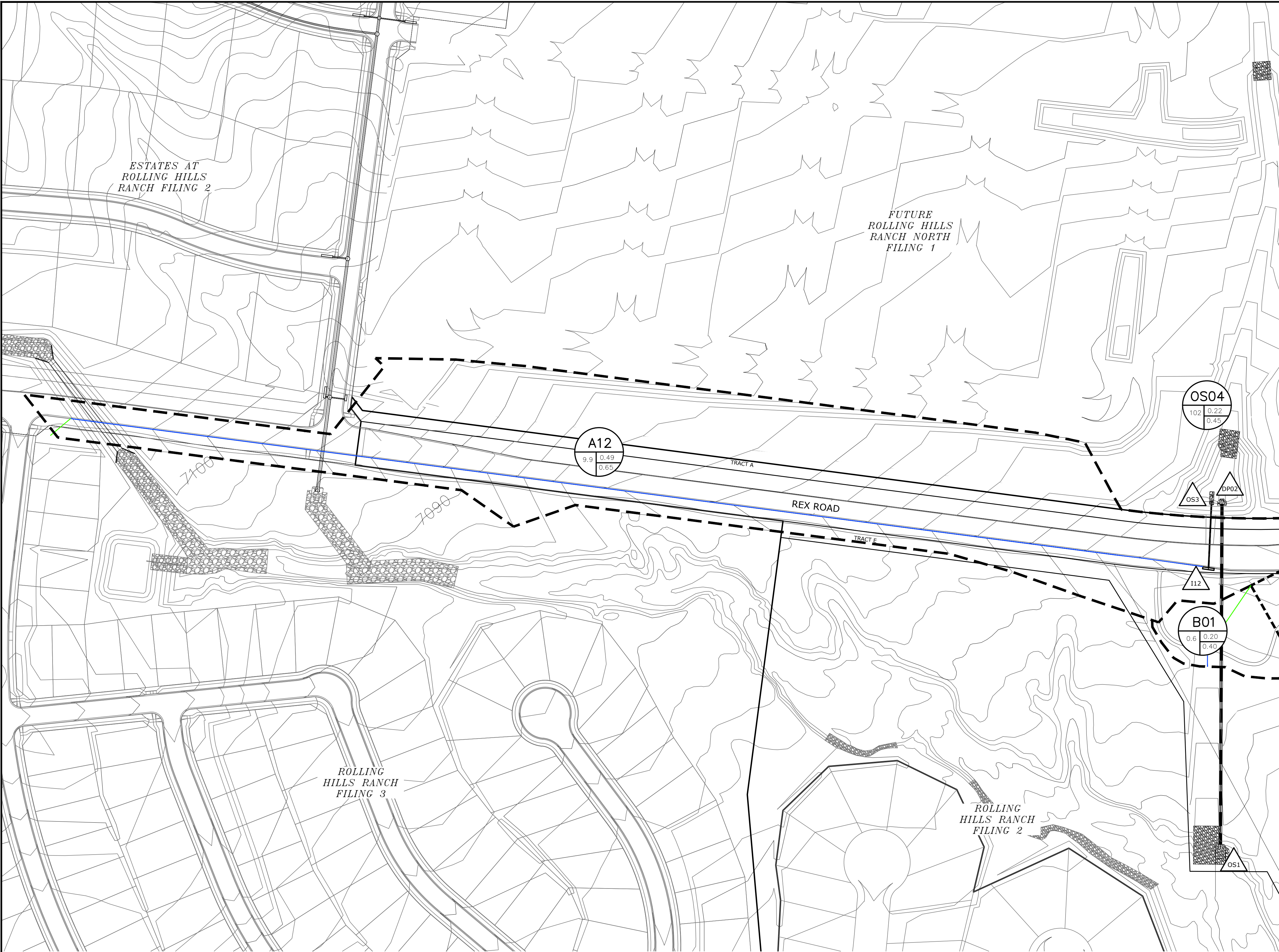
Date
JUNE 2022

Scale
1" = 100'

2 of 3

Revisions
No. Date Inst. Appr. Date

| | | | | | |
|---|--|--|--|--|--|
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |



INDEX MAP
N.T.S.



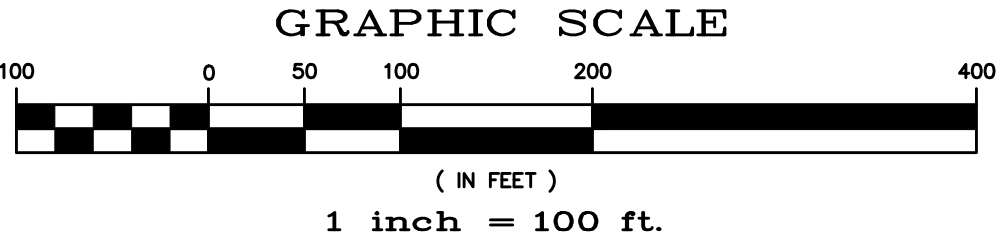
SEE SHEET 2

- BASIN DESIGNATION**
 - G01
- SUB-WATERSHED DESIGNATION**
 - 2.7 0.40 0.55
- BASIN AREA IN ACRES**
 - 61
- DESIGN POINT DESIGNATION**
 - MAJOR BASIN BOUNDARY
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 - 6130
- PROPOSED COUNTOUR**
 - 6130
- PROPOSED STORM SEWER**
 - INITIAL OVERLAND TIME (Ti)
 - TRAVEL TIME (Tt)
 - OVERLAND TIME (To)

| UPSTREAM DP | BASIN | AREA (AC) | Q(5) (CFS) | Q(100) (CFS) | INLET | Q(5) (CFS) | Q(100) (CFS) | PIPE |
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| J07 | | | | | | 61 | 141 | 54 " RCP |
| I08 | A06 | 4.5 | 7.8 | 17 | PR 20 ' FLOW-BY | 5.7 | 11 | 18 " RCP |
| J08 | | | | | | 5.7 | 11 | 18 " RCP |
| I09 | A07 | 3.6 | 7.7 | 18 | PR 15 ' FLOW-BY | 5.4 | 11 | 18 " RCP |
| J09 | | | | | | 11 | 22 | 24 " RCP |
| J10 | | | | | | 11 | 21 | 24 " RCP |
| I10 | A08 | 3.3 | 6.2 | 18 | PR 10 ' SUMP | 6.2 | 14 | 18 " RCP |
| J11 | | | | | | 66 | 150 | 54 " RCP |
| I11 | A09 | 5.3 | 7.9 | 18 | PR 20 ' SUMP | 7.4 | 168 | 54 " RCP |
| | A10 | 2.0 | 2.5 | 5.8 | SWALE | 2.5 | 5.8 | |
| DP3 | A11 | 1.8 | 2.1 | 5.2 | SWALE | 3.9 | 9.6 | |
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Scale

1" = 100'

3 of 3

Drawn by

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Checked by

-

Date

JUNE 2022

TECH CONTRACTORS

11886 STAPLETON DRIVE

FALCON, CO 80831

TELEPHONE: 719.495.7444

FAX: 719.495.3349

MERIDIAN RANCH

RATIONAL DRAINAGE MAP

FINAL DRAINAGE REPORT

THE SANCTUARY FLING 1

AT MERIDIAN RANCH

Revisions

| No. | Date | Inst. | Appr. | Date |
|-----|------|-------|-------|------|
| - | - | - | - | - |

FIGURE 7