Final Drainage Report

for

# WindingWalk Filing 2

**at**

## Meridian Ranch

EL PASO COUNTY, COLORADO

August 2018

Prepared For:


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



Prepared By:
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11886 Stapleton Drive
Falcon, CO 80831
719.495.7444


PCD Project No. SF-18-022

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.

COLORADO REGISTERED THOMAS A. KERBY 31429 9-19-18 PROFESSIONAL ENGINEER

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.

9/17/2018

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

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
by Elizabeth Nijkamp
El Paso County Planning and Community Development
on behalf of Jennifer Irvine, County Engineer, ECM Administrator
10/29/2018 5:01:03 PM

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Date

# WindingWalk Filing 2 at Meridian Ranch
# Final Drainage Plan

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## ***EXECUTIVE SUMMARY***

The purpose of the following Final Drainage Report (FDR) is to present the changes to the drainage patterns as a result WindingWalk Filing 2 at Meridian Ranch due to development. 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).

This report includes the planning information from the recently approved WindingWalk PDR, WindingWalk Filing 1 FDR and revised Sketch Plan for Meridian Ranch. The revised Sketch Plan was approved by the Board of County Commissioners in March 2018. The WindingWalk PDR and the WindingWalk Filing 1 FDR were approved by the El Paso County Planning and Community Development Department in June 2018.

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.” The recently approved Sketch Plan for Meridian Ranch removed the eighty percent of historic rate condition allowing developed flows to be released downstream of Meridian Ranch at historic flow rates.

Another significant change from previously approved drainage reports submitted to El Paso County concerning development associated within Meridian Ranch is the adopted changes to the drainage criteria. El Paso County by Resolution 15-042 adopted Chapter 6 of the 2014 version of the City of Colorado Springs Drainage Criteria Manual (COSDCM). Chapter 6 addresses the hydrologic calculations and includes an updated hydrograph to be used with storm drainage runoff. The county also adopted 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 conventional multi-stage concept. 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 detention facilities sized and modeled such that *“frequent and infrequent inflows are released at rates approximating undeveloped conditions”*

WindingWalk Filing 2 at Meridian Ranch encompasses 25± acres with 60 single family residential lots located in Section 29, Township 12 South, Range 64 West of the 6$^{th}$ 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.

WindingWalk Filing 2 at Meridian Ranch is located within two separate drainage basins; Gieck Ranch Basin and Haegler Ranch Basin. The Haegler Basin is a studied Basin and received final approval from El Paso County. The Gieck Ranch Basin has been studied, but has not received final approval from El Paso County.

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

## *INTRODUCTION*

### *Purpose*

The purpose of the following Final Drainage Report (FDR) is to present proposed changes to the drainage patterns as a result of the development of WindingWalk Filing 2 at Meridian Ranch. 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.

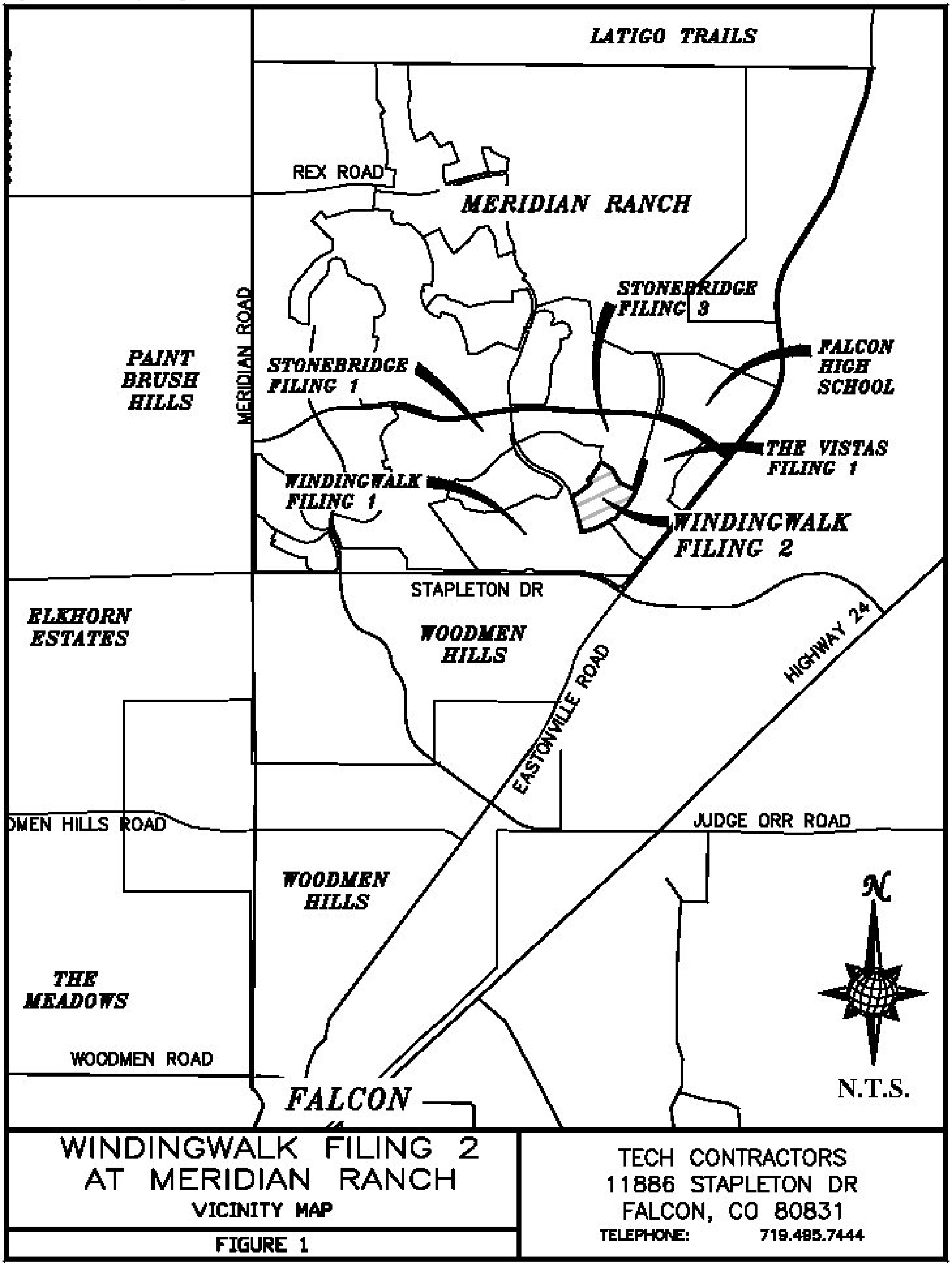
Runoff quantities and proposed facilities have been calculated using the current City of Colorado Springs/El Paso County Drainage Criteria Manual (DCM) (1994 version) and those portions of the City of Colorado Springs Drainage Criteria Manual, Volume 1 (DCM-1) ((2014 version) adopted by Resolution 15-042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

### *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.” The recently approved Sketch Plan for Meridian Ranch removed the eighty percent of historic rate condition allowing developed flows to be released downstream of Meridian Ranch at historic flow rates.

Development has occurred downstream of Meridian Ranch since the time of the original approvals with drainage facilities designed and constructed of sufficient size to safely convey the historic flow rates off of Meridian Ranch further downstream. The 4-Way Ranch development located adjacent and downstream of Meridian Ranch has processed a Letter of Map Revision (LOMR) and constructed storm drainage improvements downstream of the existing Pond E outlets. The LOMR was processed and the improvements constructed assuming historic flow rates from Meridian Ranch using the original El Paso County DCM. Storm drain improvements near the intersection of Stapleton Drive and Eastonville have also been designed and constructed to convey the historic flow rates from Meridian Ranch. The design of these improvements and the downstream system anticipated 87 CFS to be collected

**Figure 1: Vicinity Map**



near outlet of the future Pond H from Meridian Ranch. The design of Pond H has yielded a 100-year flow rate of 60 CFS, well below the anticipated 87 CFS figure.

Current estimates show the design discharge Pond E to 4-Way are near or below 90% of historic flow rates for the 100-year discharge at full buildout and the 5-year discharge at or slightly above historic.

Another significant change from previously approved drainage reports submitted to El Paso County concerning development associated within Meridian Ranch is the adopted changes to the drainage criteria. El Paso County by Resolution 15-042 adopted Chapter 6 of the 2014 version of the City of Colorado Springs Drainage Criteria Manual (COSDCM). Chapter 6 addresses the hydrologic calculations and includes an updated hydrograph to be used with storm drainage runoff. The new hydrograph results in lower historic values for runoff rates and higher developed values given the same input values. The county adopted 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 conventional multi-stage concept. By providing an Excess Urban Runoff Volume (EURV) along with the required Water Quality Capture Volume in the lower portion of the facility storage (WQCV), *frequent and infrequent inflows are released at rates approximating undeveloped conditions*." 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 detention facilities sized and modeled such that *"frequent and infrequent inflows are released at rates approximating undeveloped conditions"*

## ***EXISTING CONDITIONS***

### *General Location*

The WindingWalk Filing 2 at Meridian Ranch project encompasses 25± acres, consists of 60 single family residential lots and is located in Sections 29, 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.

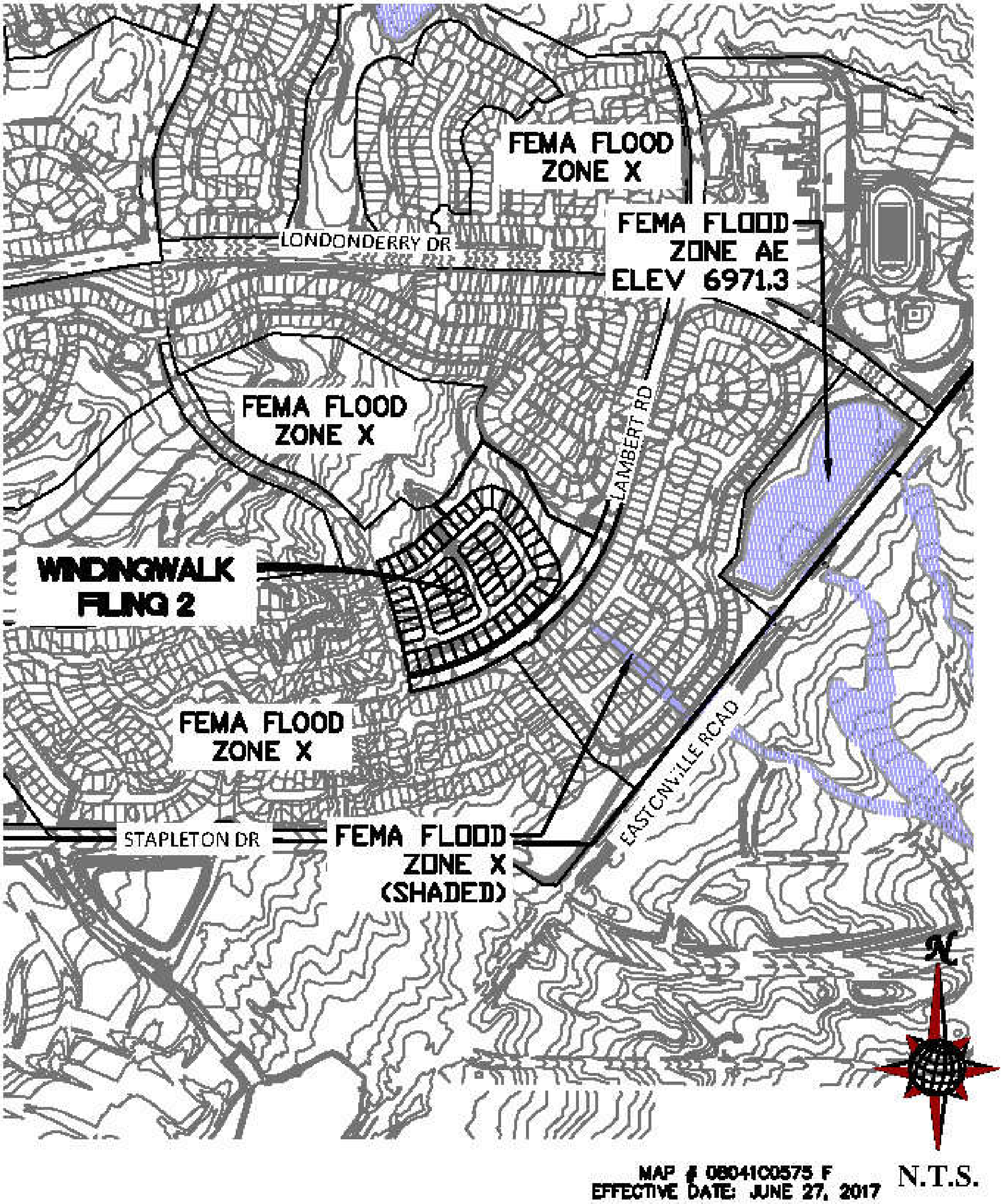
### *Land Use*

Ranching has historically dominated the area surrounding Meridian Ranch; however, urbanization has occurred in the general vicinity. The areas of urbanization include Latigo Trails to the north, to the south is the Woodmen Hills Subdivision, Four Way Ranch to the east, and to the northwest is 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

**Figure 2: FEMA Floodplain Map**




| WINDINGWALK FILING 2 AT MERIDIAN RANCH<br>FLOODPLAIN MAP | TECH CONTRACTORS<br>11886 STAPLETON DR<br>FALCON, CO 80831<br>TELEPHONE: 719.495.7444 |
|---|---|
| FIGURE 2 | |

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. 08041C0575-F dated 3/17/1997) indicates that the project is outside of any designated flood plain. Letter of Map Revision (LOMR), Case No. 14-08-1121P was approved by FEMA on November 6, 2014 with an effective date of March 24, 2015. Please see Figure 2: WindingWalk Filing 2 at Meridian Ranch 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 Stapleton series. This series is categorized in the Hydrological Group 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. 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.

Note: (#) indicates Soil Conservation Survey soil classification number. See Figure 3 WindingWalk Filing 2 at Meridian Ranch – 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 within the Gieck Ranch and the Haegler Ranch Basins and accepts flow from areas north of the project site within portions of Meridian Ranch.

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

**Figure 3: Soils Map**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| WINDINGWALK FILING 2 AT MERIDIAN RANCH<br>SOILS MAP | TECH CONTRACTORS<br>11886 STAPLETON DR<br>FALCON, CO 80831<br>TELEPHONE: 719.495.7444 |
|---|---|
| FIGURE 3 | |

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

The second scenario, the interim conditions scenario is the existing conditions with the addition of WindingWalk Filing 2 in the developed condition. This condition was analyzed to ensure that historic conditions at given design points along Eastonville Road and Stapleton Drive were maintained after WindingWalk Filing 2 are completed.

The final scenario analyzes the future build out conditions for the entirety of Meridian Ranch to ensure the storm drain facilities located at the discharge points of the project are able to properly convey the historic peak flow rates as the storm drainage exits the project.

## ***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 was used 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 |
| Residential Lots (2.5 acre) | 66 |
| Residential Lots (1 acre) | 68 |
| Residential Lots (1/2 acre) | 70 |
| Residential Lots (1/3 acre) | 72 |
| Residential Lots (1/4 acre) | 75 |
| Residential Lots (1/5 acre) | 78 |
| Residential Lots (1/6 acre) | 80 |

| | |
|---|---|
| School | 80 |
| Parks/Open Space | 62 |
| Commercial | 85 |
| Roadways | 98 |
| Graded | 67 |
| Golf Course | 62 |
| Latigo Undeveloped | 65 |
| 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. Full Spectrum analyzes the storm water runoff for the 2-year, 5-year, 10-year, 25-year, 50-year and the 100-year design storms in order ensure the analysis more accurately project the conditions of post development. 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 1 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 of the interim and future conditions.

The idea behind full spectrum detention is to release the developed runoff flows to at or below those of the pre-developed condition. The design of Pond H and control structure meets or exceeds the intent and spirit of the concept.

**Table 2: Detention Pond Summary:**

| POND H | | | | | | |
|---|---|---|---|---|---|---|
| | PEAK INFLOW | PEAK OUTFLOW | TOTAL INFLOW | TOTAL OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | AC-FT | AC-FT | FT |
| INTERIM CONDITIONS | | | | | | |
| 5-YEAR STORM | 21 | 1.9 | 3.6 | 1.9 | 2.4 | 6971.6 |
| 10-YEAR STORM | 35 | 5.1 | 5.6 | 3.6 | 3.2 | 6971.9 |
| 25-YEAR STORM | 61 | 13 | 9.0 | 6.5 | 4.5 | 6972.4 |
| 50-YEAR STORM | 86 | 23 | 12.3 | 9.6 | 5.7 | 6972.8 |
| 100-YEAR STORM | 115 | 42 | 16.1 | 13.3 | 7.0 | 6973.2 |
| FUTURE CONDITIONS | | | | | | |
| 5-YEAR STORM | 34 | 3.0 | 4.5 | 2.6 | 2.8 | 6971.7 |
| 10-YEAR STORM | 53 | 7.8 | 6.7 | 4.6 | 3.6 | 6972.1 |
| 25-YEAR STORM | 87 | 18 | 10.5 | 7.9 | 5.1 | 6972.6 |
| 50-YEAR STORM | 117 | 32 | 13.9 | 11.2 | 6.5 | 6973.1 |
| 100-YEAR STORM | 152 | 57 | 18.0 | 15.2 | 7.7 | 6973.4 |

| POND E | | | | | | |
|---|---|---|---|---|---|---|
| | PEAK INFLOW | PEAK OUTFLOW | TOTAL INFLOW | TOTAL OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | AC-FT | AC-FT | FT |
| INTERIM CONDITIONS | | | | | | |
| 5-YEAR STORM | 107 | 12 | 23.8 | 9.8 | 15.6 | 6971.1 |
| 10-YEAR STORM | 165 | 24 | 37.4 | 19.4 | 21.1 | 6971.7 |
| 25-YEAR STORM | 265 | 58 | 60.5 | 38.6 | 27.5 | 6972.3 |
| 50-YEAR STORM | 361 | 115 | 83.5 | 60.4 | 33.2 | 6972.8 |
| 100-YEAR STORM | 471 | 193 | 111.1 | 87.1 | 39.1 | 6973.3 |
| FUTURE CONDITIONS | | | | | | |
| 5-YEAR STORM | 126 | 16 | 29.0 | 13.1 | 17.9 | 6971.4 |
| 10-YEAR STORM | 198 | 30 | 43.9 | 24.6 | 23.0 | 6971.9 |
| 25-YEAR STORM | 321 | 81 | 69.4 | 47.1 | 30.1 | 6972.5 |
| 50-YEAR STORM | 435 | 151 | 94.1 | 70.8 | 36.2 | 6973.1 |
| 100-YEAR STORM | 609 | 240 | 123.4 | 99.4 | 42.2 | 6973.6 |

## ***DRAINAGE CALCULATIONS***

### *SCS General Overview*

The project is located within portions of the Gieck Ranch and the Haegler Ranch Basins. Storm water runoff will be conveyed across the site overland and within storm drain networks to the detention ponds and existing drainage swales. Temporary sedimentation ponds were constructed during the WindingWalk grading operations within the boundaries of this project and Stonebridge Filing 4. The sedimentation ponds installed within the boundaries of WindingWalk Filing 2 will be removed with this construction. The temporary ponds located within the Stonebridge Filing 4 PUD will be removed during the development of that project.

The facilities have been adequately sized such that the developed flows will be detained and released at or below the historic flow rates for the various design storm events as outlined in the El Paso County DCM and those sections of the City of Colorado Springs DCM-1 adopted by the El Paso County Board of County Commissioners. Existing facilities located downstream of the proposed development have been designed and/or constructed to accept the given release flow rates from Meridian Ranch. Those existing facilities have been reviewed sufficiently to verify the capacity to convey the storm flow rates from Meridian Ranch (see WindingWalk Filing 1 Final Drainage Report).

Those portions of the site tributary to the Haegler Ranch Basin (SCS FH1) will be directed to and released to the existing Pond H detention. Pond H will be utilized as a combination sedimentation/detention pond until such time as the tributary areas establish sufficient ground cover or development in the area is complete.

The portion of the site tributary to the proposed Pond H located within the Haegler Ranch Basin, the pond was sized using the new criteria hydrologic methods and with a release rate approximating the historic peak flow rates for the full spectrum of storm events. Pond H was identified by the Haegler Ranch DBPS as a regional detention facility, the developer has applied for credits as a part of the final plat stage for WindingWalk Filing 1 as a result of constructing the pond. The analysis shows the pond releasing the developed peak flows below the historic flow rates for the full spectrum of design storms and below 90 percent of the 100-year historic flow rate for that location. Additionally, the release rate of the 2-year storm event has been calculated to be 2.5 CFS. The existing storm drain pipe accepting flow from the proposed Pond H is designed to accept a higher flow rate than the Historic rate of flow and the rate of flow that will be discharge from the pond during the 100-yr storm event.

That portion of the site (SCS FG18) located within the Gieck Ranch Basin, tributary to Pond E was designed using the old criteria hydrologic methods and with a release rate approximating 80% of the historic peak flow rates for the 5-year and the 100-year storm events. The analysis shows the pond releasing the developed peak flows below the historic flow rates for the full spectrum of design storms using the newly adopted unit hydrograph from the City DCM-1.

Figure 4: Meridian Ranch SCS Calculations – Historic Conditions Map and Figure 5: Meridian Ranch SCS Calculations – Future Conditions Map depict the historic and future general drainage patterns for WindingWalk and Stonebridge Filing 4 portion of Meridian Ranch.

The purpose of this report is to show that the development of the WindingWalk Filing 2 at Meridian Ranch will not adversely impact the existing drainage facilities adjacent to and downstream of the developed area and the proposed Ponds E & H are properly sized for the anticipated future development of the Stonebridge Filing 4 PUD located within the northern reaches of Basins FH1 and FG18.

***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 | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| HG07 | 0.0984 | 47 | 31 | 18 | 7.1 | 2.4 | 0.4 |
| HG07-G11 | 0.0984 | 47 | 31 | 18 | 7.0 | 2.4 | 0.4 |
| HG08 | 0.1328 | 73 | 48 | 28 | 11 | 3.6 | 0.5 |
| G11 | 0.2312 | 115 | 75 | 44 | 17 | 5.7 | 0.9 |
| G11-G12 | 0.2312 | 114 | 75 | 44 | 17 | 5.6 | 0.9 |
| HG09 | 0.1781 | 73 | 48 | 29 | 11 | 4.1 | 0.7 |
| G12 | 0.4093 | 187 | 122 | 72 | 28 | 9.7 | 1.6 |
| G12-H08 | 0.4093 | 183 | 121 | 71 | 28 | 9.7 | 1.6 |
| **HG10** | **0.1375** | **39** | **26** | **16** | **6.5** | **2.6** | **0.5** |
| **H08** | **0.5468** | **216** | **142** | **85** | **34** | **12** | **2.1** |
| **HG11** | **0.2047** | **77** | **51** | **30** | **12** | **4.5** | **0.8** |
| **H09** | **0.2047** | **77** | **51** | **30** | **12** | **4.5** | **0.8** |
| **HH01** | **0.0984** | **65** | **43** | **25** | **9.4** | **3** | **0.4** |
| **H12** | **0.0984** | **65** | **43** | **25** | **9.4** | **3** | **0.4** |
| **HG12** | **0.1297** | **57** | **38** | **22** | **8.7** | **3.1** | **0.5** |
| **H10** | **0.1297** | **57** | **38** | **22** | **8.7** | **3.1** | **0.5** |

See approved Meridian Ranch MDDP (EPC File SKP171) dated January 2018 for complete hydrologic calculations and maps.

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 CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG08A | 0.075 | 117 | 91 | 67 | 42 | 27 | 14 |
| FG08A-G05 | 0.075 | 111 | 86 | 65 | 41 | 27 | 14 |
| FG08B | 0.063 | 87 | 67 | 50 | 31 | 20 | 10 |
| FG08B-G05 | 0.063 | 85 | 66 | 49 | 30 | 20 | 10 |

| INTERIM CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG11 | 0.0625 | 76 | 59 | 45 | 29 | 19 | 10 |
| FG09 | 0.0484 | 49 | 36 | 26 | 15 | 8.4 | 3.3 |
| FG09-G05 | 0.0484 | 48 | 36 | 25 | 14 | 8.2 | 3.3 |
| HG10 | 0.0467 | 29 | 20 | 12 | 5.3 | 2.1 | 0.4 |
| G05 | 0.2956 | 344 | 261 | 190 | 115 | 72 | 36 |
| FG13 | 0.0661 | 44 | 31 | 20 | 10 | 4.9 | 1.4 |
| FG12 | 0.0328 | 51 | 40 | 31 | 20 | 14 | 7.9 |
| POND D | 0.3945 | 107 | 70 | 34 | 15 | 8.6 | 2.7 |
| POND D-G17 | 0.3945 | 107 | 69 | 34 | 15 | 8.6 | 2.7 |
| HG15 | 0.0297 | 13 | 8.8 | 5.4 | 2.2 | 0.9 | 0.2 |
| FG15a | 0.0156 | 28 | 22 | 17 | 11 | 7.3 | 4.0 |
| G17 | 0.4398 | 119 | 77 | 38 | 17 | 9.3 | 4.3 |
| G17-G18 | 0.4398 | 119 | 77 | 38 | 17 | 9.3 | 4.0 |
| FG16 | 0.0773 | 127 | 98 | 74 | 47 | 31 | 16 |
| G18 | 0.5171 | 167 | 126 | 93 | 59 | 38 | 20 |
| G18-POND E | 0.5171 | 161 | 121 | 89 | 56 | 37 | 20 |
| HG30 | 0.1844 | 50 | 33 | 20 | 8.4 | 3.3 | 0.7 |
| FG30-PONDHS | 0.1844 | 50 | 33 | 20 | 8.4 | 3.3 | 0.7 |
| FG31 | 0.0922 | 118 | 92 | 71 | 46 | 31 | 18 |
| POND HS | 0.2766 | 102 | 62 | 40 | 27 | 19 | 10 |
| FG17a | 0.0694 | 108 | 84 | 63 | 40 | 26 | 14 |
| FG17a-POND E | 0.0694 | 106 | 82 | 61 | 39 | 26 | 14 |
| **FG18** | **0.0644** | **56** | **42** | **30** | **17** | **10.4** | **4.6** |
| FG18-POND E | 0.0644 | 56 | 42 | 30 | 17 | 10.4 | 4.5 |
| FG19 | 0.0527 | 85 | 67 | 51 | 33 | 23 | 13.3 |
| FG17c | 0.0313 | 32 | 22 | 15 | 6.7 | 2.9 | 0.5 |
| FG17b | 0.0214 | 40 | 31 | 24 | 16 | 11 | 6.2 |
| **POND E** | **1.0329** | **199** | **119** | **61** | **24** | **12** | **5.5** |
| **H08** | | **173** | **107** | **54** | **19** | **8.3** | **3.3** |
| **H09** | | **25** | **12** | **7.3** | **5.3** | **3.4** | **2.2** |
| **FH01** | **0.1348** | **120** | **91** | **66** | **39** | **24** | **11.0** |
| **POND H** | **0.1348** | **47** | **26** | **15** | **6.0** | **2.3** | **1.1** |
| **FH02** | **0.0091** | **11** | **8.0** | **5.6** | **3.2** | **1.9** | **0.7** |
| FH03 | 0.0081 | 14 | 11 | 8.3 | 5.5 | 3.8 | 2.2 |
| H12 | 0.152 | 50 | 28 | 16 | 9.2 | 6.2 | 3.1 |

See approved Meridian Ranch MDDP (EPC File SKP171) dated January 2018 for complete hydrologic calculations and maps.

## 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 CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG08A | 0.0750 | 117 | 91 | 67 | 42 | 27 | 14 |
| FG08A-G05 | 0.0750 | 111 | 86 | 65 | 41 | 27 | 14 |
| FG10 | 0.0669 | 46 | 34 | 24 | 14 | 8.3 | 3.6 |
| FG08B | 0.0630 | 87 | 67 | 50 | 31 | 20 | 10 |
| FG08B-G05 | 0.0630 | 85 | 66 | 49 | 30 | 20 | 10 |
| FG11 | 0.0625 | 76 | 59 | 45 | 29 | 19 | 10 |
| FG09 | 0.0484 | 49 | 36 | 26 | 15 | 8.4 | 3.3 |
| FG09-G05 | 0.0484 | 48 | 36 | 25 | 14 | 8.2 | 3.3 |
| G05 | 0.3158 | 342 | 262 | 192 | 117 | 75 | 38 |
| FG13 | 0.0661 | 44 | 31 | 20 | 10 | 4.9 | 1.4 |

| FUTURE CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG14 | 0.0331 | 42 | 32 | 24 | 15 | 10 | 5.2 |
| FG12 | 0.0328 | 51 | 40 | 31 | 20 | 14 | 7.9 |
| POND D | 0.4478 | 131 | 89 | 51 | 19 | 12 | 4.5 |
| POND D-G17 | 0.4478 | 131 | 89 | 51 | 19 | 12 | 4.5 |
| FG15 | 0.1017 | 95 | 71 | 51 | 29 | 18 | 7.5 |
| G17a | 0.1017 | 95 | 71 | 51 | 29 | 18 | 7.5 |
| FG15a | 0.0156 | 28 | 22 | 17 | 11 | 7.3 | 4.0 |
| G17 | 0.5651 | 184 | 121 | 72 | 40 | 23 | 11 |
| G17-G18 | 0.5651 | 184 | 121 | 72 | 40 | 23 | 11 |
| FG16 | 0.0773 | 127 | 98 | 74 | 47 | 31 | 16 |
| G18 | 0.6424 | 235 | 177 | 127 | 77 | 49 | 24 |
| G18-POND E | 0.6424 | 233 | 176 | 126 | 77 | 48 | 24 |
| FG31 | 0.0922 | 118 | 92 | 71 | 46 | 31 | 18 |
| FG30 | 0.0400 | 76 | 60 | 46 | 31 | 21 | 12 |
| FG30-PONDHS | 0.0400 | 74 | 59 | 45 | 29 | 20 | 11 |
| POND HS | 0.1322 | 156 | 107 | 60 | 37 | 27 | 15 |
| FG17a | 0.0694 | 102 | 79 | 58 | 36 | 23 | 12 |
| FG17a-POND E | 0.0694 | 100 | 77 | 57 | 36 | 23 | 12 |
| **FG18** | **0.0644** | **57** | **43** | **31** | **18** | **11** | **4.8** |
| FG18-POND E | 0.0644 | 57 | 42 | 30 | 18 | 11 | 4.7 |
| FG19 | 0.0527 | 85 | 67 | 51 | 33 | 23 | 13 |
| FG17c | 0.0313 | 32 | 22 | 15 | 6.7 | 2.9 | 0.5 |
| FG17b | 0.0214 | 40 | 31 | 24 | 16 | 11 | 6.2 |
| **POND E** | **1.0138** | **240** | **151** | **81** | **30** | **16** | **6.6** |
| **H08** | | **204** | **136** | **73** | **24** | **12** | **4.2** |
| **H09** | | **36** | **16** | **8.4** | **6.0** | **4.2** | **2.4** |
| **FH01** | **0.1344** | **152** | **117** | **87** | **53** | **34** | **17** |
| **POND H** | **0.1344** | **57** | **32** | **18** | **7.8** | **3.0** | **1.2** |
| **FH02** | **0.0091** | **11** | **8.0** | **5.6** | **3.2** | **1.9** | **0.7** |
| FH03 | 0.0081 | 14 | 11 | 8.3 | 5.5 | 3.8 | 2.2 |
| H12 | 0.1516 | 62 | 35 | 20 | 10 | 6.3 | 3.5 |

See approved Meridian Ranch MDDP (EPC File SKP171) dated January 2018 for complete hydrologic calculations and maps.

***Rational Calculations***

The Rational Hydrologic Calculation Method was used to estimate the total runoff from the 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 WindingWalk Filing 2 has been designed. The storm drainage facility has 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 more than one foot below the surface.

The eastern portion of WindingWalk Filing 2 is located within the Gieck Ranch Drainage Basin, the western portion  is located within Haegler Ranch Drainage Basin. The project will discharge the collected surface flow from the project into existing downstream facilities properly sized to safely convey the storm water flows away from the project without damaging adjacent property.

Rational hydrologic calculations were performed for the entire PUD area and hydraulic calculations are provided for the storm drain impacted by WindingWalk Filing 2 only. The portion located within the Gieck Basin will be collected by a series of inlets and storm drain pipe then conveyed through an existing storm drain system constructed as a part of the Vistas Filing 1 and discharged into the existing Pond E.

The Haegler Ranch portion consists of an existing backbone storm drain system along Rainbow Bridge Dr ranging in size from 24" to 48" that collects runoff from laterals and inlets, conveying the collected flow southerly and discharging the storm water into Pond H located near northwest of the intersection of Stapleton Drive and Eastonville Road. The storm water (58 CFS) will be released into an existing storm drainage system at rates below the historic flow rates and significantly below the anticipated design flow (87 CFS) when the system was designed and constructed.

Hydraulic analyses were completed on the storm drain systems proposed within WindingWalk Filing 2. The hydraulic calculations can be found at the end of the Rational Calculation Appendix. An analyses showing the existing facilities are sized adequately to accept, convey and discharge the design flow without adversely affecting downstream properties can be found in the Final Drainage Report for WindingWalk Filing 1.

***Rational Narrative***

The following is a detailed narrative of the storm drainage system located within the WindingWalk Filing 2. The description organized by system beginning with the Haegler Ranch portion of WindingWalk and ending with the Gieck Ranch Basin. Note, Basins H01 - H09 are located within the future Stonebridge Filing 4 subdivision (estimated construction Summer 2020).

<u>Haegler Ranch</u>

- Basin H11 (2.0 acres, $Q_5$= 3.8 CFS, $Q_{100}$ = 11 CFS) contains the lots in the future Stonebridge Filing 4 and proposed WindingWalk Filing 2 along with the east side of Rainbow Bridge Dr. The surface runoff will sheet flow off of the residential lots and be conveyed to an existing 10' Type R forced sump inlet located at I25. Most of the flow captured by this inlet ($Q_5$= 3.8 CFS, $Q_{100}$ = 11 CFS) is conveyed via an 18" RCP to J28 where it will combine with the existing pipe flow from I25 and J27. The remaining surface runoff ($Q_{100}$ = 0.3 CFS) continues along the curb and gutter southerly along Rainbow Bridge toward I28.

- The pipe flow conveyed to Manhole J28 from J27, I24 and I25 is combined for a total future flow within the pipe network after the construction of Stonebridge Filing 4 of $Q_5$= 33 CFS, $Q_{100}$ = 89 CFS conveyed via a 42" RCP downstream to manhole J29. The storm drain system located upstream of Manhole J28 within Rainbow Bridge Dr. was constructed with the improvements associated with WindingWalk Filing 1. Stonebridge Filing 4 construction is expected to begin in early 2020.

- The pipe flow ($Q_5$= 7.2 CFS, $Q_{100}$ = 20 CFS) from Basins H12 & H13 located within WindingWalk Filing 1 is conveyed via a 24" RCP to manhole J29 where it will combine with the pipe flow from J28. The combined total flow of $Q_5$= 33 CFS, $Q_{100}$ = 106 CFS is conveyed via a 42" RCP downstream to manhole J30 where it will combine with the pipe flow from I28.

- Basin H14 (1.5 acres, $Q_5$= 2.7 CFS, $Q_{100}$ = 6.2 CFS) contains lots along the south side of proposed WindingWalk Dr., east side of proposed Picket Fence Way and north side of proposed Morning Creek Ln within WindingWalk Filing 2. The surface runoff will sheet flow off of the residential lots and be conveyed via curb and gutter to DP08.

- Basin H15 (1.9 acres, $Q_5$= 3.4 CFS, $Q_{100}$ = 7.9 CFS) contains lots along the west side of proposed Picket Fence Way, south side of proposed WindingWalk Dr., north side of proposed Morning Creek Ln. within WindingWalk Filing 2 and the east side of Rainbow Bridge Dr. The surface runoff will sheet flow off of the residential lots and is combined with the surface flow from DP08, then is conveyed to an existing 15' Type R forced sump inlet located at I28. All of the flow is captured by this inlet ($Q_5$= 5.8 CFS, $Q_{100}$ = 13 CFS) is conveyed via an 18" RCP to J30 where it will combine with the pipe flow from J29 ($Q_5$= 36 CFS, $Q_{100}$ = 116 CFS) and conveyed via a 42" RCP downstream to manhole J31.

- The pipe flow conveyed downstream along Rainbow Bridge and Morning Breeze Way where it will combine with surrounding areas from WindingWalk Filing 1 for a total pipe flow ($Q_5$= 62 CFS, $Q_{100}$ = 193 CFS) is conveyed via a 54" RCP to OS3 located in Pond H.

- Basin H22 (3.0 acres, $Q_5$= 5.7 CFS, $Q_{100}$ = 12 CFS) contains lots along the east side of Rainbow Bridge Dr, the south side of proposed Morning Creek Ln. and the north side of the proposed extention of Lambert Rd within WindingWalk Filing 2. The surface runoff will sheet flow off of the future residential lots and be conveyed to a proposed 5' Type R sump inlet located at I35. All of the flow is captured by this inlet ($Q_5$= 5.7 CFS, $Q_{100}$ = 12 CFS) is conveyed via an 18" RCP to I36.

- Basin H23 (1.0 acres, $Q_5$= 3.0 CFS, $Q_{100}$ = 5.7 CFS) contains street landscape along the south side of the proposed extension Lambert Rd within WindingWalk Filing 2. The surface runoff will sheet flow off of the landscape tract and be conveyed to a proposed 5' Type R sump inlet located at I36. All of the flow is captured by this inlet, combines with the flow from I35 ($Q_5$= 5.7 CFS, $Q_{100}$ = 16 CFS) and is conveyed via a 24" RCP to OS4. The flows from OS4 ($Q_5$= 11 CFS, $Q_{100}$ = 24 CFS) will be conveyed via open channel flow to Pond H.

<u>Gieck Ranch</u>

Note, Basins G01 - G03 are located within the future Stonebridge Filing 4 subdivision (estimated construction Summer 2020).

- During the interim condition, prior to the construction of Stonebridge Filing 4, the surface runoff from Basins G01, G02, and G03 will be directed to a temporary sedimentation pond constructed during the grading operations associated with the WindingWalk Grading Permit. The temporary pond will be removed during the construction of the improvements for Stonebridge Filing 4 and will be replaced with the future 10' Type R sump inlets at I40 and I41.

- The combined flow from G01, G02, G03, E02, and E03 follow the existing swale constructed with Stonebridge Filing 3 to a proposed 42" concrete end section at DP13 for a total flow of $Q_5$= 19 CFS, $Q_{100}$ = 48 CFS for the respective design storms.

- Basin G04 (1.6 acres, $Q_5$= 2.9 CFS, $Q_{100}$ = 6.6 CFS) contains lots fronting along the west side of Quiet Walk Ln within the proposed WindingWalk Filing 2, the surface runoff will sheet flow off of the residential lots and be conveyed via curb and gutter to DP11.

- Basin G05 (3.4 acres, $Q_5$= 8.3 CFS, $Q_{100}$ = 19 CFS) contains lots fronting along the east side of Quiet Walk Ln, south side of WindingWalk Dr, the west side of Winding Bend Ln and the north side of Morning Creek Ln, all within the proposed WindingWalk Filing 2, the surface runoff will sheet flow off of the residential lots and is combined with the surface flow from DP11 then is conveyed to a proposed 10' Type R sump inlet located at I42. Most of the flow is captured by this inlet ($Q_5$= 8.3 CFS, $Q_{100}$ = 18 CFS) is conveyed via a proposed RCP to I43 where it will combine with the pipe flow from I42. The remaining surface runoff ($Q_{100}$ = 1.2 CFS) crosses the centerline toward I43.

- Basin G06 (3.5 acres, $Q_5$= 4.7 CFS, $Q_{100}$ = 11CFS) contains lots fronting along the north side of WindingWalk Dr, the east side of Winding Bend Ln and the south side of Morning Creek Ln, all within the proposed WindingWalk Filing 2, the surface runoff will sheet flow off of the residential lots and is combined with the surface flow from I42 at a proposed 10' Type R sump inlet located at I43. All of the flow captured by this inlet is conveyed via a proposed RCP to a proposed storm drain located within the proposed extension of Lambert Rd where it will combine with flow from the existing swale constructed with Stonebridge Filing 3 at DP13 and surface runoff from I44.

- Basin E04 (3.9 acres, $Q_5$= 8.4 CFS, $Q_{100}$ = 17 CFS) contains rear lots and open space along the west side of the proposed extension of Lambert Rd all within the proposed WindingWalk Filing 2, the surface runoff will sheet flow onto the street and is conveyed to a proposed 10' Type R sump inlet located at I44. All of the flow captured by this inlet is combined with the flow from DP13 and proposed inlets I42 and I43 at J39 and is conveyed via an RCP to I45.

- Basin E05 (1.7 acres, $Q_5$= 3.6 CFS, $Q_{100}$ = 7.5 CFS) contains right-of-way along the east side of the proposed extension of Lambert Rd within WindingWalk Filing 2, the surface runoff will sheet flow onto the street and is conveyed to a proposed 10' Type R sump inlet located at I44. All of the flow captured by this inlet is combined with the flow from J39 for a total flow of $Q_5$= 29 CFS, $Q_{100}$ = 69 CFS where the flow will continue downstream through an existing storm drain system constructed with the Vistas Filing 1 to the existing Pond E.

***DETENTION PONDS***

***Pond H Detention Storage Criteria***

Detention Pond H was constructed as a part of the WindingWalk grading in anticipation of the future development of the WindingWalk Filings 1 & 2 and the Stonebridge Filing 4 Final Plat in accordance with the approved Sketch Plan and no improvements to the pond are necessary as a result of the construction associated with WindingWalk Filing 2. The pond is located within the Haegler Ranch Drainage Basin in the southeastern corner of Meridian Ranch near the intersection of Eastonville Road and Stapleton Drive. The pond is owned and maintained by the Meridian Service Metropolitan District (MSMD). A maintenance agreement between the Meridian Service Metropolitan District and El Paso County will be recorded with the El Paso County Clerk and Recorder with the WindingWalk Filing 1 Final Plat. Pond H is identified in the Haegler Ranch Drainage Basin Planning Study as Sub-Regional Detention pond (SR-01).

The Haegler Ranch DBPS hydrologic analysis shows the historic 100-year flow rate in this area to be at 90 CFS, this report shows the 100-year historic flow rate at the proposed location of the detention pond at 65 CFS. The DBPS estimated the detention pond size to be approximately 10 ac-ft, whereas the WindingWalk Filing 1 FDR report showed the final design of the sub-regional detention pond (SR-01) to be 7.7 ac-ft. Given the parameters set forth in the approved Haegler Ranch Drainage Basin Planning Study and the calculations from this report, the final design of the storm drainage facilities, including Pond H are in substantial conformance with the approved DBPS.

The SCS calculation method was used with the aid of the Army Corp HEC-HMS computer program to determine inflow and outflow from the detention pond to ensure the excess runoff as a result of the grading and the future development will not adversely impact drainage patterns downstream of the project.

The pond is designed to accommodate the developed final inflow from WindingWalk Filings 1 and 2 at Meridian Ranch and Stonebridge Filing 4. Permanent concrete control structures has been designed to handle full build out of the tributary area and reduce the developed flows to at or below the historic full spectrum peak flow rates.

A WQCV analysis for Pond H was also performed based on proposed future development of the proposed tributary area to the pond; this analysis shows that Pond H will require 0.5 ac-ft of storage for first flush water quality for all the areas tributary to the pond. The control structure at DP H12 is proposed to consist of a 6" water quality control riser with a trash grate having a top elevation of 6970.0 to achieve the required 0.5 ac-ft of storage.

The WQCV was calculated by using the equations found in Volume 2, of the Drainage Criteria Manual (DCM). The release rate from the WQCV is generally very small, which helps minimize downstream impacts. Detaining the WQCV also serves to cleanse the "first flush" of runoff from the higher initial concentration of sediment and pollutants by allowing for settlement to occur. This greatly improves the quality of runoff, leaving the facility and reduces the potential for erosion. The positive impact on water quality is expected to be significant, particularly during the construction phase of the development.

A concrete control structure is proposed for the outlet of Pond H. The structure will attenuate the peak developed flow rates to historic peak rates or less 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 will consist of a water quality control standpipe, a rectangular slotted orifice located on the front and a grated top to reduce the developed peak flow rates. Table 7 provides summary data for the various design storms in both the interim condition resulting from the development associated with WindingWalk Filings 1 and 2. The future conditions includes the addition of Stonebridge Filing 4.

**Table 6: Pond H Summary Data**

| POND H | | | | | | |
|---|---|---|---|---|---|---|
| | PEAK INFLOW | PEAK OUTFLOW | TOTAL INFLOW | TOTAL OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | AC-FT | AC-FT | FT |
| INTERIM CONDITIONS | | | | | | |
| 5-YEAR STORM | 21 | 1.9 | 3.6 | 1.9 | 2.4 | 6971.6 |
| 10-YEAR STORM | 35 | 5.1 | 5.6 | 3.6 | 3.2 | 6971.9 |
| 25-YEAR STORM | 61 | 13 | 9.0 | 6.5 | 4.5 | 6972.4 |
| 50-YEAR STORM | 86 | 23 | 12.3 | 9.6 | 5.7 | 6972.8 |
| 100-YEAR STORM | 115 | 42 | 16.1 | 13.3 | 7.0 | 6973.2 |
| FUTURE CONDITIONS | | | | | | |
| 5-YEAR STORM | 34 | 3.0 | 4.5 | 2.6 | 2.8 | 6971.7 |
| 10-YEAR STORM | 53 | 7.8 | 6.7 | 4.6 | 3.6 | 6972.1 |
| 25-YEAR STORM | 87 | 18 | 10.5 | 7.9 | 5.1 | 6972.6 |
| 50-YEAR STORM | 117 | 32 | 13.9 | 11.2 | 6.5 | 6973.1 |
| 100-YEAR STORM | 152 | 57 | 18.0 | 15.2 | 7.7 | 6973.4 |

### *Existing Pond E Detention Storage Criteria*

Existing Detention Pond E is located south of Londonderry and west of Eastonville, and was constructed as a part of the Meridian Ranch Filing 11 Grading, is owned and maintained by the Meridian Service Metropolitan District (MSMD). It has been in operation since 2013 with no reported issues. A maintenance agreement between the Meridian Service Metropolitan District and El Paso County has been recorded as a part of the Meridian Ranch Filing 11A Final Plat process.

The SCS calculation method was used to determine inflow and outflow from the detention pond to ensure the developed runoff does not overcharge the pond and the discharges do not adversely impact drainage patterns downstream of Eastonville Road. Storm drainage runoff will enter the pond from upstream development via an existing pipe network and overland from existing rear lots of the Vistas Filing 1 at Meridian Ranch. The ultimate future build-out design of the tributary areas was analyzed to insure the sizing of the pond would be adequate after development of Meridian Ranch is complete. This SCS calculation can be found in the appendix.

An analysis of the SCS calculations show that with the proposed permanent concrete control structures, installed with the operations associated with the WindingWalk Grading significantly reduce the developed flow rates to peak rates at or below the historic rates at Eastonville Road. Temporary CMP control structures installed at the time of the original pond construction with the Meridian Ranch Filing 11 grading operations were replaced with the permanent concrete control structures with the grading operations for WindingWalk and Stonebridge Filing 4.

A water quality capture volume (WQCV) was added to the required storage volume for the final build out condition. The purpose of the WQCV is to allow particulates to settle out and accumulate over time to improve water quality and to maintain full volume for detention during the life of the facility for a major storm event. The WQCV of 1.6 ac-ft. was added to the detention of the minor storm and half (0.8 ac-ft.) was added to the detention volume of the major storm. This was accomplished with respect to the HEC-HMS computer run by providing a starting detention volume of 1.6 ft. for the 5-year storm and 0.8 ft. for the 100-year storm. The resulting storage elevations remain well below the emergency spillway elevation. See Appendix B for more information.

**Table 7: Existing Pond E Summary Data**

| POND E | | | | | | |
|---|---|---|---|---|---|---|
| | PEAK INFLOW | PEAK OUTFLOW | TOTAL INFLOW | TOTAL OUTFLOW | PEAK STORAGE | PEAK ELEVATION |
| | CFS | CFS | AC-FT | AC-FT | AC-FT | FT |
| INTERIM CONDITIONS | | | | | | |
| 5-YEAR STORM | 107 | 12 | 23.8 | 9.8 | 15.6 | 6971.1 |
| 10-YEAR STORM | 165 | 24 | 37.4 | 19.4 | 21.1 | 6971.7 |
| 25-YEAR STORM | 265 | 58 | 60.5 | 38.6 | 27.5 | 6972.3 |
| 50-YEAR STORM | 361 | 115 | 83.5 | 60.4 | 33.2 | 6972.8 |
| 100-YEAR STORM | 471 | 193 | 111.1 | 87.1 | 39.1 | 6973.3 |
| FUTURE CONDITIONS | | | | | | |
| 5-YEAR STORM | 126 | 16 | 29.0 | 13.1 | 17.9 | 6971.4 |
| 10-YEAR STORM | 198 | 30 | 43.9 | 24.6 | 23.0 | 6971.9 |
| 25-YEAR STORM | 321 | 81 | 69.4 | 47.1 | 30.1 | 6972.5 |
| 50-YEAR STORM | 435 | 151 | 94.1 | 70.8 | 36.2 | 6973.1 |
| 100-YEAR STORM | 609 | 240 | 123.4 | 99.4 | 42.2 | 6973.6 |

The WQCV was calculated by using the equations found in Volume 2, of the Drainage Criteria Manual (DCM). The release rate from the WQCV is generally very small, which helps minimize downstream impacts. Detaining the WQCV also serves to cleanse the "first flush" of runoff from the higher initial concentration of sediment and pollutants by allowing for settlement to occur. This greatly improves the quality of runoff, leaving the facility and reduces the potential for erosion.

### *Downstream Analysis*

The outlets (DP H08 & H09) for Pond E located along Eastonville Road upstream of 4-Way Ranch Filing 1 were analyzed in detail with the approved 2018 MDDP associated with the most recent Meridian Ranch Sketch Plan Amendment. The information can be found in Appendix D of the approved 2018 Meridian Ranch MDDP. Below you will find a summary table proving release rates of flow for each Pond E outlet.

The outlet (DP H12) for Pond H is located northwest of the intersection of Eastonville Road and Stapleton Drive and upstream of 4-Way Ranch Filing 1. Pond H will discharge 58 CFS during the 100-yr storm event into an existing sedimentation/detention pond constructed with a concrete sedimentation control structure and connected to a 4' x 2' RCB installed with the construction of Stapleton Drive. The plans set, prepared by URS in 2007, indicates the anticipated flow conveyed by the storm drain to be 87 CFS. A quick analysis indicates the 58 CFS will travel through the box culvert at an average velocity of 9 FPS under normal flow.

**Table 8: Key Design Point Comparison - SCS**

| KEY DESIGN POINT FLOW RATES | | | | | |
|---|---|---|---|---|---|
| EVENT | HISTORIC | INTERIM | | FUTURE | |
| | PEAK FLOW (CFS) | PEAK FLOW (CFS) | PERCENT OF HISTORIC | PEAK FLOW (CFS) | PERCENT OF HISTORIC |
| DETENTION POND H (Windingwalk) | | | | | |
| STAPLETON DR/EASTONVILLE ROAD (H12) | | | | | |
| 5-YEAR | 3.0 | 2.3 | 77% | 3.0 | 100% |
| 10-YEAR | 9.4 | 6.0 | 64% | 7.8 | 83% |
| 25-YEAR | 25 | 15 | 58% | 18 | 71% |
| 50-YEAR | 43 | 26 | 60% | 32 | 74% |
| 100-YEAR | 65 | 47 | 72% | 57 | 87% |
| DETENTION POND E (FILING 11A) | | | | | |
| EASTONVILLE ROAD (H08) | | | | | |
| 5-YEAR | 12.1 | 8.3 | 69% | 12 | 97% |
| 10-YEAR | 34 | 19 | 56% | 24 | 72% |
| 25-YEAR | 85 | 54 | 63% | 73 | 86% |
| 50-YEAR | 142 | 107 | 75% | 136 | 95% |
| 100-YEAR | 216 | 173 | 80% | 204 | 95% |
| EASTONVILLE ROAD (H09) | | | | | |
| 5-YEAR | 4.5 | 3.4 | 76% | 4.2 | 93% |
| 10-YEAR | 12 | 5.3 | 44% | 6.0 | 50% |
| 25-YEAR | 30 | 7.3 | 24% | 8.4 | 28% |
| 50-YEAR | 51 | 12 | 23% | 16 | 31% |
| 100-YEAR | 77 | 25 | 32% | 36 | 47% |

The original 4-Way Ranch calculations show the anticipated flow from Meridian Ranch to be approximately 100 CFS, the Stapleton Drive Improvement Plans show an discharge of 110 CFS from the above mentioned RCB storm drain. The calculations show the discharge from Pond H to be 58 CFS and the discharge from the RCB storm drain to be 63 CFS with a discharge velocity of 8 FPS. The storm drain discharges into an existing natural broad bottomed swale and the swale conveys the flow downstream at an average non-erosive velocity of 3.2 FPS for the 100-yr event.

In the event Pond H should overtop the embankment and run through the emergency spillway, the overflow would be conveyed safely down the embankment toward the existing box inlet located north of Stapleton Drive. After a portion of the flow is captured by the inlet the remainder will enter Stapleton Drive and cross both Stapleton Drive and Eastonville Road to the southeast side of the intersection and continue downstream in the existing natural channel.

## ***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**

This development incorporates wider rights-of-way than other developments, thus decreasing the amount area devoted to pavement. The rights-of-way within Meridian Ranch are 20% wider, 60 ft. instead of 50 ft., creating more landscaped area within the development.

The project has over ten acres of open space, accounting for over 20% of the entire project, creating a lower density development.

Home owners 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 mat along the entire length of the swale. At steeper sections of the swale straw logs or rip-rap has been installed to reduce velocities and erosion.

**Step 3: Provide Water Quality Capture Volume (WQCV)**

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

***Temporary Sedimentation Pond***

Temporary sedimentation ponds installed during the overlot grading process will act as the primary water quality control for the areas upstream. Runoff will travel overland toward the existing sedimentation ponds, collected and diverted into the proposed storm drain system and discharged into existing downstream systems. The pond will provide initial sediment control over exposed upstream areas.

***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.

## ***DRAINAGE FEES***

The proposed WindingWalk Filing 2 development is located within two major drainage basins; the Gieck Ranch and the Haegler Ranch Drainage Basins. Of the 25.09 acres of WindingWalk Filing 2, 17.73 acres fall within the Gieck Ranch Basin and 7.36 acres is located within the Haegler Ranch Basin. The Gieck Ranch portion includes 11.40 acres of residential development and 5.18 acres are designated as right-of-way, and 4.41 acres as landscape tract. The portion within the Haegler Ranch includes 4.41 acres of residential development and 2.63 acres designated as right-of-way, and 0.32 acres landscape tract. See the calculation below.

The following is the imperviousness calculation:

GIECK RANCH

| | Acres | Assumed Imperviousness | Impervious Acres |
|---|---|---|---|
| Right-of-way | 5.18 | 85% | 4.4 |
| Residential Lots | 11.40 | 52% (73 Lots) | 5.9 |
| Landscape Tract | 4.41 | 5% | 0.2 |
| Total | 17.73 | | 10.5 = 59.2% imp. |

The Gieck Ranch Drainage Basin is an un-studied basin and has no fees associated with it.

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HAEGLER RANCH

| | Acres | Assumed Imperviousness | Impervious Acres |
|---|---|---|---|
| Right-of-way | 2.63 | 85% | 1.92 |
| Residential Lots | 4.41 | 52% (73 Lots) | 2.29 |
| Landscape Tract | 0.32 | 5% | 0.02 |
| Total | 7.36 | | 4.23 = 57.5% imp. |

Pond H is identified in the approved Haegler Basin Planning Study as Sub-regional Detention Pond SR-01 and is reimbursable to developer after construction. Pond H was constructed as a part of WindingWalk Filing 1 and a final credit amount is yet to be determined at the writing of this report. If any credit is remaining from the construction of Pond H at the time of recordation of WindingWalk Filing 2, that credit will offset the calculated drainage basin fees listed below.

Haegler Ranch

| | | |
|---|---|---|
| Drainage Basin Fees: | 7.36 ac*$ 9,676/Ac*0.575 Imp Area = $ | 40,949.00 |
| Bridge Fees: | 7.36 ac*$ 1,428/Ac*0.575 Imp Area = $ | 6,043.00 |

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## ***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. May 2015. Prepared by Tech Contractors.

8. Master Development Drainage Plan Latigo Trails. October 2001. Prepared by URS Corp.

9. Final Drainage Report for Meridian Ranch Filing 1. November 2001. Prepared by URS Corp.

10. Preliminary Drainage Plan for Meridian Ranch Phase II. September 2003. Prepared by URS.

11. Final Drainage Plan for The Trails Filing No.7. March 2005. Prepared by URS.

12. Final Drainage Report for Meridian Ranch Filing 3. August 2011. Prepared by Tech Contractors.

13. Preliminary and Final Drainage Report for Meridian Ranch Filing 7. June 2012. Prepared by Tech Contractors.

14. Final Drainage Report for Meridian Ranch Estates Filing 2. July 2013. Prepared by Tech Contractors.

15. Final Drainage Report for Meridian Ranch Filing 11A. March 2014. Prepared by Tech Contractors.

16. Preliminary and Final Drainage Report for Meridian Ranch Filing 8. December 2014. Prepared by Tech Contractors.

17. Preliminary and Final Drainage Report for Meridian Ranch Filing 4B. April 2014. Prepared by Tech Contractors.

18. Final Drainage Report for Stonebridge Filing 1 at Meridian Ranch. June 2014. Prepared by Tech Contractors.

19. Final Drainage Report for Meridian Ranch Filing 9. May 2015. Prepared by Tech Contractors.

20. Revision to Master Development Drainage Plan Meridian Ranch. July 2015. Prepared by Tech Contractors.

21. Final Drainage Report for Meridian Ranch Estates Filing 3. October 2015. Prepared by Tech Contractors.

22. Final Drainage Report for the Vistas Filing 1 at Meridian Ranch. July 2016. Prepared by Tech Contractors.

23. Final Drainage Report for Stonebridge Filing 2 at Meridian Ranch. September 2016. Prepared by Tech Contractors.

24. Final Drainage Report for Stonebridge Filing 3 at Meridian Ranch. April 2017. Prepared by Tech Contractors.

25. Revision to Master Development Drainage Plan Meridian Ranch. November 2017. Prepared by Tech Contractors.

26. Final Drainage Report for WindingWalk Filing 1 at Meridian Ranch. May 2018. Prepared by Tech Contractors.

# Appendices

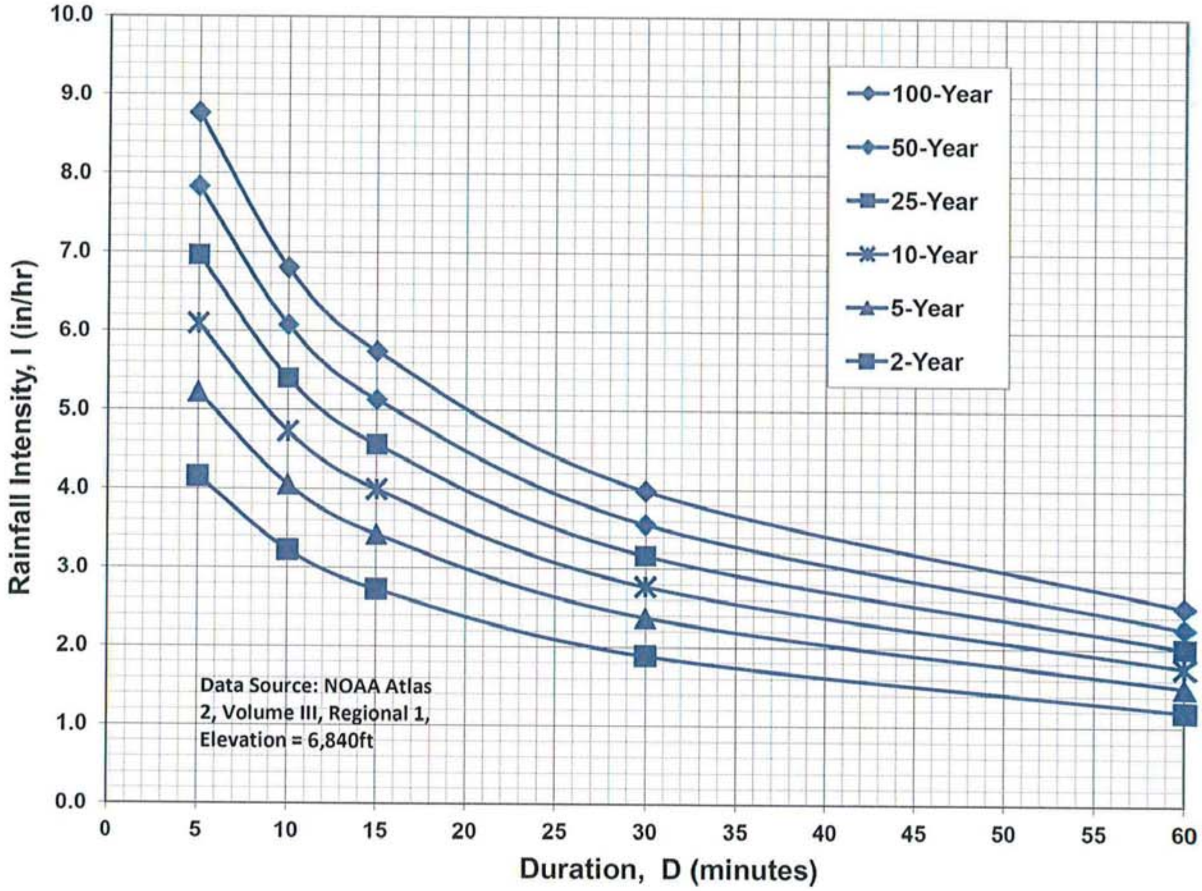
# Appendix A – Rational Calculations

## 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: **Windingwalk Filing 2** 8/24/2018

| BASIN | | AREA (AC.) | | | | | | COMPOSITE FACTOR | | Percent Impervious |
|---|---|---|---|---|---|---|---|---|---|---|
| LABEL | DEV. | UNDEV | 6 DU/AC | STREETS | REC CENTER | OPEN SPACE PARKS/GC | TOTAL | 5-year | 100-year | |
| **H01** | **The Enclave** | | 1.0 | | | | 1.0 | **0.40** | **0.55** | **52.0%** |
| **H02** | | | 1.9 | 0.7 | | 0.9 | 3.5 | **0.45** | **0.59** | **47.9%** |
| **H03** | | | 1.2 | 0.7 | 0.5 | 0.5 | 3.0 | **0.54** | **0.66** | **55.7%** |
| **H04** | | | 1.8 | 0.4 | | 0.2 | 2.4 | **0.46** | **0.60** | **55.3%** |
| **H05** | | | 2.0 | | | | 2.0 | **0.40** | **0.55** | **52.0%** |
| **H06** | | | 2.5 | | | | 2.5 | **0.40** | **0.55** | **52.0%** |
| **H07** | | | 2.4 | 0.5 | | 0.3 | 3.1 | **0.46** | **0.60** | **54.9%** |
| **H08** | | | 1.5 | | | 2.9 | 4.4 | **0.29** | **0.46** | **19.1%** |
| **H09** | | | 1.1 | | | 1.7 | 2.8 | **0.30** | **0.46** | **21.4%** |
| **H10** | **Windingwalk** | | 3.6 | 0.8 | | 0.6 | 5.0 | **0.46** | **0.59** | **53.8%** |
| **H11** | | | 1.4 | 0.4 | | 0.2 | 2.0 | **0.48** | **0.61** | **56.0%** |
| **H12** | | | 4.9 | | | | 4.9 | **0.40** | **0.55** | **52.0%** |
| **H13** | | | 1.3 | | | | 1.3 | **0.40** | **0.55** | **52.0%** |
| **H14** | | | 1.5 | | | | 1.5 | **0.40** | **0.55** | **52.0%** |
| **H15** | | | 1.9 | | | | 1.9 | **0.40** | **0.55** | **52.0%** |
| **H16** | | | 2.3 | 1.1 | | 0.7 | 4.1 | **0.50** | **0.63** | **55.4%** |
| **H17** | | | 2.4 | 0.7 | | 0.4 | 3.4 | **0.48** | **0.61** | **56.0%** |
| **H18** | | | 6.0 | | | | 6.0 | **0.40** | **0.55** | **52.0%** |
| **H19** | | | 3.8 | | | | 3.8 | **0.40** | **0.55** | **52.0%** |
| **H20** | | | 4.6 | | | | 4.6 | **0.40** | **0.55** | **52.0%** |
| **H21** | | | 4.0 | | | | 4.0 | **0.40** | **0.55** | **52.0%** |
| **H22** | | | 1.8 | 0.8 | | 0.4 | 3.0 | **0.51** | **0.64** | **58.5%** |
| **H23** | | | 0.0 | 0.7 | | 0.3 | 1.0 | **0.67** | **0.77** | **66.6%** |
| **H24** | | | 2.0 | | | 1.2 | 3.3 | **0.34** | **0.49** | **33.2%** |
| **H25** | | | 3.7 | | | 7.6 | 11.3 | **0.29** | **0.45** | **18.3%** |
| **H26** | | | 2.7 | | | 0.9 | 3.6 | **0.36** | **0.51** | **39.0%** |
| **H27** | | | 0.3 | | | 1.9 | 2.2 | **0.26** | **0.43** | **9.0%** |
| **H28** | | | | 1.5 | | 0.2 | 1.7 | **0.83** | **0.90** | **89.4%** |
| **G01** | **TE** | | 2.7 | | | | 2.7 | **0.40** | **0.55** | **52.0%** |
| **G02** | | | 4.4 | | | | 4.4 | **0.40** | **0.55** | **52.0%** |
| **G03** | | | 1.2 | | | | 1.2 | **0.40** | **0.55** | **52.0%** |
| **G04** | **WW** | | 1.6 | | | | 1.6 | **0.40** | **0.55** | **52.0%** |
| **G05** | | | 3.4 | | | | 3.4 | **0.40** | **0.55** | **52.0%** |
| **G06** | | | 3.5 | | | | 3.5 | **0.40** | **0.55** | **52.0%** |
| **E02** | **S3** | | 7.2 | | | 10.9 | 18.1 | **0.30** | **0.46** | **21.8%** |
| **E03** | | | 2.1 | | | 4.2 | 6.3 | **0.29** | **0.45** | **18.4%** |
| **E04** | **WW** | | 1.9 | 1.1 | | 0.9 | 3.9 | **0.51** | **0.64** | **55.1%** |
| **E05** | | | | 0.8 | | 1.0 | 1.7 | **0.53** | **0.65** | **45.3%** |
| **E06** | **The Vistas Filing 1** | | 5.1 | 0.3 | | 0.1 | 5.4 | **0.42** | **0.56** | **53.7%** |
| **E07** | | | 4.9 | | | | 4.9 | **0.40** | **0.55** | **52.0%** |
| **E08** | | | 1.2 | | | | 1.2 | **0.40** | **0.55** | **52.0%** |
| **E09** | | | 2.9 | | | | 2.9 | **0.40** | **0.55** | **52.0%** |
| **E10** | | | 4.9 | | | | 4.9 | **0.40** | **0.55** | **52.0%** |
| **E11** | | | 3.0 | | | | 3.0 | **0.40** | **0.55** | **52.0%** |
| **E12** | | | 2.6 | | | | 2.6 | **0.40** | **0.55** | **52.0%** |
| **E13** | | | 3.2 | | | | 3.2 | **0.40** | **0.55** | **52.0%** |
| **E14** | | | 1.9 | | | 2.3 | 4.2 | **0.31** | **0.47** | **24.9%** |
| **E15** | | | | 1.1 | | 0.6 | 1.7 | **0.65** | **0.75** | **62.9%** |
| **E16** | | | 0.6 | 0.9 | | | 1.5 | **0.71** | **0.81** | **82.1%** |
| | | | | | | | | | **Composite:** | **42.9%** |

## TIME OF CONCENTRATION

SCS Calculations

PROJECT: **Windingwalk Filing 2** DATE: 8/24/2018

| TIME OF CONCENTRATION | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INIT./OVERLAND TIME ($T_i$) | | | | TRAVEL TIME ($T_t$) | | | | | | | TOTAL | Tc Check (Urbanized Basins) | | FINAL $T_c$ |
| BASIN DESIGNATION | $C_5$ | AREA (AC) | LENGTH (FT) | ΔH | SLOPE % | Ti (Min.)* | LENGTH (FT) | ΔH | SLOPE % | CONVEYANCE TYPE | CONVEYANCE COEF. | VEL. (FPS) | Tt(Min.)** | Ti+Tt(Min.) | L (FT) | Tc = (L/180) + 10 | (min) |
| **H01** | 0.40 | 1.0 | 100 | 2.0 | 2.0% | 10.2 | 370 | 14 | 3.8% | P | 20 | 3.9 | 1.6 | 11.8 | 470.00 | 12.6 | **11.8** |
| **H02** | 0.45 | 3.5 | 100 | 2.0 | 2.0% | 9.4 | 520 | 16 | 3.1% | P | 20 | 3.5 | 2.5 | 11.9 | 620.00 | 13.4 | **11.9** |
| **H03** | 0.54 | 3.0 | 100 | 2.0 | 2.0% | 8.1 | 850 | 13 | 1.5% | P | 20 | 2.5 | 5.7 | 13.9 | 950.00 | 15.3 | **13.9** |
| **H04** | 0.46 | 2.4 | 15 | 0.3 | 2.0% | 5.0 | 707 | 18 | 2.5% | P | 20 | 3.2 | 3.7 | 8.7 | 722.00 | 14.0 | **8.7** |
| **H05** | 0.40 | 2.0 | 15 | 0.3 | 2.0% | 5.0 | 606 | 9 | 1.5% | P | 20 | 2.4 | 4.1 | 9.1 | 621.00 | 13.5 | **9.1** |
| **H06** | 0.40 | 2.5 | 15 | 0.3 | 2.0% | 5.0 | 800 | 23 | 2.9% | P | 20 | 3.4 | 3.9 | 8.9 | 815.00 | 14.5 | **8.9** |
| **H07** | 0.46 | 3.1 | 25 | 0.5 | 2.0% | 5.0 | 764 | 22 | 2.9% | P | 20 | 3.4 | 3.8 | 8.8 | 789.00 | 14.4 | **8.8** |
| **H08** | 0.29 | 4.4 | 100 | 6.0 | 6.0% | 8.1 | 800 | 23 | 2.9% | B | 10 | 1.7 | 7.9 | 16.0 | 900.00 | 15.0 | **15.0** |
| **H09** | 0.30 | 2.8 | 100 | 2.0 | 2.0% | 11.6 | 455 | 8 | 1.8% | B | 10 | 1.3 | 5.7 | 17.3 | 555.00 | 13.1 | **13.1** |
| **H10** | 0.46 | 5.0 | 100 | 2.0 | 2.0% | 9.3 | 840 | 17 | 2.0% | P | 20 | 2.8 | 4.9 | 14.2 | 940.00 | 15.2 | **14.2** |
| **H11** | 0.48 | 2.0 | 40 | 0.8 | 2.0% | 5.7 | 810 | 14 | 1.7% | P | 20 | 2.6 | 5.1 | 10.8 | 850.00 | 14.7 | **10.8** |
| **H12** | 0.40 | 4.9 | 100 | 2.0 | 2.0% | 10.2 | 210 | 4 | 1.9% | L | 7 | 1.0 | 3.6 | | | | |
| | | | | | | | 561 | 18 | 3.2% | P | 20 | 3.6 | 2.6 | 16.4 | 871.00 | 14.8 | **14.8** |
| **H13** | 0.40 | 1.3 | 40 | 0.8 | 2.0% | 6.4 | 703 | 13 | 1.8% | P | 20 | 2.7 | 4.3 | 10.8 | 743.00 | 14.1 | **10.8** |
| **H14** | 0.40 | 1.5 | 30 | 0.6 | 2.0% | 5.6 | 503 | 13 | 2.6% | P | 20 | 3.2 | 2.6 | 8.2 | 533.00 | 13.0 | **8.2** |
| **H15** | 0.40 | 1.9 | 15 | 0.3 | 2.0% | 5.0 | 467 | 11 | 2.4% | P | 20 | 3.1 | 2.5 | 7.5 | 482.00 | 12.7 | **7.5** |
| **H16** | 0.50 | 4.1 | 100 | 2.0 | 2.0% | 8.7 | 720 | 13 | 1.8% | P | 20 | 2.7 | 4.5 | 13.2 | 820.00 | 14.6 | **13.2** |
| **H17** | 0.48 | 3.4 | 100 | 2.0 | 2.0% | 9.0 | 645 | 13 | 2.0% | P | 20 | 2.8 | 3.8 | 12.8 | 745.00 | 14.1 | **12.8** |
| **H18** | 0.40 | 6.0 | 100 | 2.0 | 2.0% | 10.2 | 140 | 3 | 2.1% | L | 7 | 1.0 | 2.3 | | | | |
| | | | | | | | 605 | 11 | 1.8% | P | 20 | 2.7 | 3.7 | 16.2 | 845.00 | 14.7 | **14.7** |
| **H19** | 0.40 | 3.8 | 100 | 2.0 | 2.0% | 10.2 | 830 | 16 | 1.9% | P | 20 | 2.8 | 5.0 | 15.2 | 930.00 | 15.2 | **15.2** |
| **H20** | 0.40 | 4.6 | 100 | 2.0 | 2.0% | 10.2 | 185 | 4 | 2.0% | L | 7 | 1.0 | 3.1 | | | | |
| | | | | | | | 120 | 2 | 1.7% | P | 20 | 2.6 | 0.8 | 14.1 | 405.00 | 12.3 | **12.3** |
| **H21** | 0.40 | 4.0 | 100 | 2.0 | 2.0% | 10.2 | 1730 | 34 | 2.0% | P | 20 | 2.8 | 10.3 | 20.5 | 1830.00 | 20.2 | **20.2** |
| **H22** | 0.51 | 3.0 | 40 | 0.8 | 2.0% | 5.4 | 1093 | 13 | 1.2% | P | 20 | 2.2 | 8.4 | 13.8 | 1133.00 | 16.3 | **13.8** |
| **H23** | 0.67 | 1.0 | 35 | 0.7 | 2.0% | 5.0 | 540 | 8 | 1.5% | P | 20 | 2.4 | 3.7 | 8.7 | 575.00 | 13.2 | **8.7** |
| **H24** | 0.34 | 3.3 | 100 | 2.0 | 2.0% | 11.1 | 765 | 23 | 3.0% | G | 15 | 2.6 | 4.9 | 16.0 | 865.00 | 14.8 | **14.8** |
| **H25** | 0.29 | 11.3 | 100 | 9.0 | 9.0% | 7.1 | 600 | 17 | 2.8% | B | 10 | 1.7 | 5.9 | 13.1 | 700.00 | 13.9 | **13.1** |
| **H26** | 0.36 | 3.6 | 100 | 2.0 | 2.0% | 10.8 | 85 | 4 | 4.7% | L | 7 | 1.5 | 0.9 | | | | |
| | | | | | | | 635 | 15 | 2.4% | P | 20 | 3.1 | 3.4 | 15.2 | 820.00 | 14.6 | **14.6** |
| **H27** | 0.26 | 2.2 | 100 | 8.0 | 8.0% | 7.7 | 1010 | 22 | 2.2% | G | 15 | 2.2 | 7.6 | 15.3 | 1110.00 | 16.2 | **15.3** |
| **H28** | 0.83 | 1.7 | 13 | 0.3 | 2.0% | 5.0 | 909 | 19 | 2.1% | P | 20 | 2.9 | 5.2 | 10.2 | 921.50 | 15.1 | **10.2** |

| | | | INIT./OVERLAND TIME ($T_i$) | | | | TRAVEL TIME ($T_t$) | | | | | | | TOTAL | Tc Check (Urbanized Basins) | | FINAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN DESIGNATION | $C_5$ | AREA (AC) | LENGTH (FT) | ΔH | SLOPE % | Ti (Min.)* | LENGTH (FT) | ΔH | SLOPE % | CONVEYANCE TYPE | CONVEYANCE COEF. | VEL. (FPS) | Tt(Min.)** | Ti+Tt(Min.) | L (FT) | Tc = (L/180) + 10 | (min) |
| **G01** | 0.40 | 2.7 | 15 | 0.3 | 2.0% | 5.0 | 870 | 26 | 3.0% | P | 20 | 3.5 | 4.2 | 9.2 | 885.00 | 14.9 | **9.2** |
| **G02** | 0.40 | 4.4 | 100 | 2.0 | 2.0% | 10.2 | 1115 | 28 | 2.5% | P | 20 | 3.2 | 5.9 | 16.0 | 1215.00 | 16.8 | **16.0** |
| **G03** | 0.40 | 1.2 | 40 | 0.8 | 2.0% | 6.4 | 352 | 5 | 1.4% | P | 20 | 2.4 | 2.5 | 8.9 | 392.00 | 12.2 | **8.9** |
| **G04** | 0.40 | 1.6 | 30 | 0.6 | 2.0% | 5.6 | 556 | 14 | 2.5% | P | 20 | 3.2 | 2.9 | 8.5 | 586.00 | 13.3 | **8.5** |
| **G05** | 0.40 | 3.4 | 25 | 0.5 | 2.0% | 5.1 | 745 | 14 | 1.9% | P | 20 | 2.7 | 4.5 | 9.6 | 770.00 | 14.3 | **9.6** |
| **G06** | 0.40 | 3.5 | 100 | 2.0 | 2.0% | 10.2 | 1100 | 16 | 1.5% | P | 20 | 2.4 | 7.6 | 17.8 | 1200.00 | 16.7 | **16.7** |
| **E02** | 0.30 | 18.1 | 100 | 2.0 | 2.0% | 11.6 | 2242 | 63 | 2.8% | L | 7 | 1.2 | 31.8 | 43.4 | | | **43.4** |
| **E03** | 0.29 | 6.3 | 100 | 2.0 | 2.0% | 11.7 | 710 | 32 | 4.5% | L | 7 | 1.5 | 8.0 | 19.7 | | | **19.7** |
| **E04** | 0.51 | 3.9 | 100 | 8.0 | 8.0% | 5.4 | 695 | 13 | 1.9% | P | 20 | 2.7 | 4.2 | 9.6 | 795.00 | 14.4 | **9.6** |
| **E05** | 0.53 | 1.7 | | | | | | | | | | | | 11.2 | 765.00 | 14.3 | **11.2** |
| **E06** | 0.42 | 5.4 | | | | | | | | | | | | 13.7 | 695.00 | 13.9 | **13.7** |
| **E07** | 0.40 | 4.9 | | | | | | | | | | | | 15.8 | 885.00 | 14.9 | **14.9** |
| **E08** | 0.40 | 1.2 | | | | | | | | | | | | 15.2 | 850.00 | 14.7 | **14.7** |
| **E09** | 0.40 | 2.9 | FROM APPROVED VISTAS FILING 1 FINAL DRAINAGE REPORT | | | | | | | | | | | 16.2 | 680.00 | 13.8 | **13.8** |
| **E10** | 0.40 | 4.9 | | | | | | | | | | | | 20.2 | 1230.00 | 16.8 | **16.8** |
| **E11** | 0.40 | 3.0 | | | | | | | | | | | | 15.0 | 640.00 | 13.6 | **13.6** |
| **E12** | 0.40 | 2.6 | | | | | | | | | | | | 13.9 | 755.00 | 14.2 | **13.9** |
| **E13** | 0.40 | 3.2 | | | | | | | | | | | | 23.1 | 1880.00 | 20.4 | **20.4** |
| **E14** | 0.31 | 4.2 | | | | | | | | | | | | 27.3 | | | **27.3** |
| **E15** | 0.65 | 1.7 | 10 | 0.3 | 2.5% | 5.0 | 530 | 11 | 2.1% | L | 7 | 1.0 | 8.8 | 13.8 | 540.00 | 13.0 | **13.0** |
| **E16** | 0.71 | 1.5 | 25 | 0.5 | 2.0% | 5.0 | 464 | 10 | 2.2% | L | 7 | 1.0 | 7.5 | 12.5 | 489.00 | 12.7 | **12.5** |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Notes:

$$* T_i = \frac{* T_i = 0.395\,(1.1 - C5) L^{0.5}}{S^{0.33}}$$

$V = C_V S_W^{0.5}$

** Tt = 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: **Windingwalk Filing 2** Date: 8/24/2018

| DESIGN POINT | DIRECT RUNOFF | | | | | | | | | | | TOTAL 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)** | | | | | | | |
| DP05 | H01 | 1.0 | 11.8 | 3.88 | 6.52 | 0.40 | 0.55 | 0.40 | 0.54 | 1.5 | 3.5 | | | | | | **1.5** | **3.5** | I20 | P | 20.0 | 1.20% | 2.2 | 140 | 1.1 |
| I20 | H02 | 3.5 | 11.9 | 3.87 | 6.49 | 0.45 | 0.59 | 1.57 | 2.04 | 6.1 | 13 | 12.8 | 3.75 | 6.30 | 1.97 | 2.58 | **7.4** | **16** | I23 | P | 20.0 | 3.10% | 3.5 | 650 | 3.1 |
| DP06 | H03 | 3.0 | 13.9 | 3.64 | 6.11 | 0.54 | 0.66 | 1.60 | 1.96 | 5.8 | 12 | | | | | | **5.8** | **12** | I21 | P | 20.0 | 2.75% | 3.3 | 618 | 3.1 |
| I21 | H04 | 2.4 | 8.7 | 4.34 | 7.29 | 0.46 | 0.60 | 1.10 | 1.42 | 4.8 | 10 | 17.0 | 3.34 | 5.60 | 2.70 | 3.38 | **9.0** | **19** | | | | | | | |
| I22 | H05 | 2.0 | 9.1 | 4.26 | 7.16 | 0.40 | 0.55 | 0.81 | 1.11 | 3.5 | 7.9 | | | | | | **3.5** | **7.9** | | | | | | | |
| DP07 | H06 | 2.5 | 8.9 | 4.30 | 7.22 | 0.40 | 0.55 | 1.01 | 1.37 | 4.3 | 9.9 | | | | | | **4.3** | **9.9** | I23 | P | 20.0 | 1.00% | 2.0 | 152 | 1.3 |
| I23 | H07 | 3.1 | 8.8 | 4.33 | 7.27 | 0.46 | 0.60 | 1.45 | 1.87 | 6.3 | 14 | 15.9 | 3.43 | 5.76 | 2.46 | 3.46 | **8.4** | **20** | I25 | P | 20.0 | 3.30% | 3.6 | 520 | 2.4 |
| CB03 | H08 | 4.4 | 15.0 | 3.52 | 5.91 | 0.29 | 0.46 | 1.30 | 2.01 | 4.6 | 12 | | | | | | **4.6** | **12** | | | | | | | |
| CB04 | H09 | 2.8 | 13.1 | 3.73 | 6.26 | 0.30 | 0.46 | 0.84 | 1.28 | 3.1 | 8.0 | | | | | | **3.1** | **8.0** | | | | | | | |
| I24 | H10 | 5.0 | 14.2 | 3.60 | 6.04 | 0.46 | 0.59 | 2.29 | 2.96 | 8.2 | 18 | | | | | | **8.2** | **18** | I29 | P | 20.0 | 2.50% | 3.2 | 523 | 2.8 |
| I25 | H11 | 2.0 | 10.8 | 4.01 | 6.73 | 0.48 | 0.61 | 0.95 | 1.21 | 3.8 | 8.1 | 18.3 | 3.22 | 5.41 | 0.95 | 2.08 | **3.8** | **11** | | | | | | | |
| I26 | H12 | 4.9 | 14.8 | 3.54 | 5.94 | 0.40 | 0.55 | 1.95 | 2.66 | 6.9 | 16 | | | | | | **6.9** | **16** | I27 | P | 20.0 | 2.00% | 2.8 | 15 | 0.1 |
| I27 | H13 | 1.3 | 10.8 | 4.02 | 6.75 | 0.40 | 0.55 | 0.51 | 0.70 | 2.1 | 4.7 | 14.9 | 3.53 | 5.92 | 0.51 | 1.47 | **2.1** | **8.7** | | | | | | | |
| DP08 | H14 | 1.5 | 8.2 | 4.43 | 7.44 | 0.40 | 0.55 | 0.61 | 0.83 | 2.7 | 6.2 | | | | | | **2.7** | **6.2** | I28 | P | 20.0 | 1.20% | 2.2 | 170 | 1.3 |
| I28 | H15 | 1.9 | 7.5 | 4.55 | 7.65 | 0.40 | 0.55 | 0.75 | 1.03 | 3.4 | 7.9 | 9.5 | 4.21 | 7.07 | 1.37 | 1.86 | **5.8** | **13** | | | | | | | |
| I29 | H16 | 4.1 | 13.2 | 3.71 | 6.23 | 0.50 | 0.63 | 2.07 | 2.60 | 7.7 | 16 | 17.0 | 3.33 | 5.60 | 2.07 | 3.75 | **7.7** | **21** | I35 | P | 20.0 | 1.20% | 2.2 | 600 | 4.6 |
| I30 | H17 | 3.4 | 12.8 | 3.76 | 6.31 | 0.48 | 0.61 | 1.65 | 2.10 | 6.2 | 13 | | | | | | **6.2** | **13** | I31 | P | 20.0 | 2.30% | 3.0 | 300 | 1.6 |
| I31 | H18 | 6.0 | 14.7 | 3.55 | 5.96 | 0.40 | 0.55 | 2.40 | 3.27 | 8.5 | 19 | 14.5 | 3.57 | 6.00 | 2.40 | 3.63 | **8.6** | **22** | I33 | p | 20.0 | 1.00% | 2.0 | 410 | 3.4 |
| I32 | H19 | 3.8 | 15.2 | 3.50 | 5.88 | 0.40 | 0.55 | 1.53 | 2.09 | 5.4 | 12 | | | | | | **5.4** | **12** | I34 | P | 20.0 | 1.00% | 2.0 | 308 | 2.6 |
| I33 | H20 | 4.6 | 12.3 | 3.82 | 6.42 | 0.40 | 0.55 | 1.84 | 2.50 | 7.0 | 16 | 17.9 | 3.26 | 5.47 | 1.84 | 2.98 | **7.0** | **16** | I34 | P | 20.0 | 2.00% | 2.8 | 15 | 0.1 |
| I34 | H21 | 4.0 | 20.2 | 3.08 | 5.16 | 0.40 | 0.55 | 1.60 | 2.19 | 4.9 | 11 | 20.2 | 3.08 | 5.16 | 1.64 | 3.34 | **5.0** | **17** | | | | | | | |
| I35 | H22 | 3.0 | 13.8 | 3.65 | 6.13 | 0.51 | 0.64 | 1.55 | 1.93 | 5.7 | 12 | 21.6 | 2.98 | 5.00 | 1.55 | 2.30 | **5.7** | **12** | | | | | | | |
| I36 | H23 | 1.0 | 8.7 | 4.34 | 7.28 | 0.67 | 0.77 | 0.69 | 0.79 | 3.0 | 5.7 | | | | | | **3.0** | **5.7** | | | | | | | |
| OS4 | H24 | 3.3 | 14.8 | 3.54 | 5.94 | 0.34 | 0.49 | 1.11 | 1.62 | 3.9 | 10 | 21.8 | 2.96 | 4.97 | 3.71 | 4.78 | **11** | **24** | POND | G | 15.0 | 1.20% | 1.6 | 425 | 4.3 |
| POND | H25 | 11.3 | 13.1 | 3.73 | 6.26 | 0.29 | 0.45 | 3.30 | 5.13 | 12 | 32 | | | | | | **12** | **32** | | | | | | | |
| EI37a | H26 | 3.6 | 14.6 | 3.57 | 5.99 | 0.36 | 0.51 | 1.29 | 1.83 | 4.6 | 11 | 18.1 | 3.24 | 5.44 | 1.32 | 2.25 | **4.6** | **12** | EI37b | P | 20.0 | 2.10% | 2.9 | 53 | 0.3 |
| EI37b | | | | | | | | | | | | 18.4 | 3.22 | 5.40 | 0.29 | 0.74 | **0.9** | **4.0** | EI38 | P | 20.0 | 2.10% | 2.9 | 909 | 5.2 |
| DP09 | H27 | 2.2 | 15.3 | 3.49 | 5.86 | 0.26 | 0.43 | 0.58 | 0.95 | 2.0 | 5.6 | 23.6 | 2.84 | 4.77 | 2.01 | 3.06 | **5.7** | **15** | | | | | | | |
| EI38 | H28 | 1.7 | 10.2 | 4.09 | 6.87 | 0.83 | 0.90 | 1.39 | 1.51 | 5.7 | 10 | 23.6 | 2.84 | 4.77 | 1.39 | 1.65 | **5.7** | **10** | EI39 | P | 20.0 | 2.20% | 3.0 | 126 | 0.7 |
| EI39 | | | | | | | | | | | | 24.3 | 2.80 | 4.69 | 0.47 | 0.68 | **1.3** | **3.2** | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| DP10 | G01 | 2.7 | 9.2 | 4.26 | 7.14 | 0.40 | 0.55 | 1.08 | 1.47 | 4.6 | 11 | | | | | | **4.6** | **11** | I40 | P | 20.0 | 0.90% | 1.9 | 143 | 1.3 |
| I40 | G02 | 4.4 | 16.0 | 3.42 | 5.74 | 0.40 | 0.55 | 1.74 | 2.38 | 6.0 | 14 | 16.0 | 3.42 | 5.74 | 2.82 | 3.85 | **9.7** | **22** | I41 | P | 20.0 | 2.00% | 2.8 | 15 | 0.1 |
| I41 | G03 | 1.2 | 8.9 | 4.30 | 7.23 | 0.40 | 0.55 | 0.49 | 0.66 | 2.1 | 4.8 | 16.1 | 3.41 | 5.73 | 0.49 | 1.42 | **2.1** | **8.1** | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| DP11 | G04 | 1.6 | 8.5 | 4.37 | 7.34 | 0.40 | 0.55 | 0.65 | 0.89 | 2.9 | 6.6 | | | | | | **2.9** | **6.6** | I42 | P | 20.0 | 1.00% | 2.0 | 216 | 1.8 |
| I42 | G05 | 3.4 | 9.6 | 4.19 | 7.03 | 0.40 | 0.55 | 1.37 | 1.87 | 5.7 | 13 | 10.3 | 4.08 | 6.86 | 2.02 | 2.76 | **8.3** | **19** | I43 | P | 20.0 | 2.00% | 2.8 | 15 | 0.1 |
| I43 | G06 | 3.5 | 16.7 | 3.36 | 5.65 | 0.40 | 0.55 | 1.41 | 1.92 | 4.7 | 11 | 16.7 | 3.36 | 5.65 | 1.41 | 2.10 | **4.7** | **12** | | | | | | | |
| DP12 | E02 | 18.1 | 43.4 | 1.93 | 3.23 | 0.30 | 0.46 | 5.48 | 8.38 | 11 | 27 | 43.4 | 1.93 | 3.23 | 8.92 | 12.89 | **17** | **42** | DP13 | G | 15.0 | 4.50% | 3.2 | 693 | 3.6 |
| DP13 | E03 | 6.3 | 19.7 | 3.11 | 5.22 | 0.29 | 0.45 | 1.83 | 2.84 | 5.7 | 15 | 47.1 | 1.81 | 3.03 | 10.75 | 15.73 | **19** | **48** | I44 | G | 15.0 | 1.00% | 1.5 | 50 | 0.6 |
| I44 | E04 | 3.9 | 9.6 | 4.18 | 7.03 | 0.51 | 0.64 | 2.00 | 2.49 | 8.4 | 17 | | | | | | **8.4** | **17** | | | | | | | |
| I45 | E05 | 1.7 | 11.2 | 3.96 | 6.64 | 0.53 | 0.65 | 0.91 | 1.12 | 3.6 | 7.5 | 11.2 | 3.96 | 6.64 | 0.91 | 1.12 | **3.6** | **7.5** | | | | | | | |

| DESIGN POINT | DIRECT RUNOFF | | | | | | | | | | | TOTAL RUNOFF | | | | | | | OVERLAND TRAVEL TIME | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | I (in./ hr.) | | COEFF. © | | CA | | Q | | | I (in./ hr.) | | CA | | Q | | | | | | | | |
| | BASIN | AREA (AC) | Tc (Min.) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | Sum Tc (min.) | (5 YR) | (100 YR) | (5 YR) | (100 YR) | **(5 YR)** | **(100 YR)** | DESTINATION DP | CONVEYANCE TYPE | COEFFICIENT $C_V$ | SLOPE % | VEL. (FPS) | LENGTH (FT) | TRAVEL TIME Tt |
| EI04 | E06 | 5.4 | 13.7 | 3.66 | 6.14 | 0.42 | 0.56 | 2.29 | 3.05 | 8.4 | 19 | | | | | | **8.4** | **19** | EI05 | P | 20.0 | 0.63% | 1.6 | 315 | 3.3 |
| EI05 | E07 | 4.9 | 14.9 | 3.53 | 5.92 | 0.40 | 0.55 | 1.95 | 2.66 | 6.9 | 16 | 17.0 | 3.33 | 5.59 | 1.95 | 2.82 | **6.9** | **16** | EI07 | P | 20.0 | 0.68% | 1.6 | 294 | 3.0 |
| EI07 | E08 | 1.2 | 14.7 | 3.55 | 5.96 | 0.40 | 0.55 | 0.49 | 0.67 | 1.8 | 4.0 | 25.5 | 2.72 | 4.57 | 0.86 | 1.65 | **2.3** | **7.5** | | | | | | | |
| DP1 | E09 | 2.9 | 13.8 | 3.65 | 6.12 | 0.40 | 0.55 | 1.17 | 1.60 | 4.3 | 9.8 | | | | | | **4.3** | **9.8** | EI06 | P | 20.0 | 0.73% | 1.7 | 1235 | 12.1 |
| EI06 | E10 | 4.9 | 16.8 | 3.35 | 5.62 | 0.40 | 0.55 | 1.95 | 2.66 | 6.5 | 15 | 21.8 | 2.96 | 4.97 | 3.12 | 4.25 | **9.2** | **21** | | | | | | | |
| DP2 | E11 | 3.0 | 13.6 | 3.67 | 6.17 | 0.40 | 0.55 | 1.19 | 1.62 | 4.4 | 10 | | | | | | **4.4** | **10** | EI06 | P | 20.0 | 0.91% | 1.9 | 770 | 6.7 |
| EI06 | E12 | 2.6 | 13.9 | 3.64 | 6.11 | 0.40 | 0.55 | 1.04 | 1.41 | 3.8 | 8.6 | 16.7 | 3.36 | 5.64 | 2.23 | 3.04 | **7.5** | **17** | | | | | | | |
| EI06 | | | | | | | | | | | | 21.8 | 2.96 | 4.97 | 5.35 | 7.29 | **16** | **36** | EI07 | P | 20.0 | 2.00% | 2.8 | 15 | 0.1 |
| EI07 | E13 | 3.2 | 20.4 | 3.06 | 5.13 | 0.40 | 0.55 | 1.27 | 1.73 | 3.9 | 8.9 | 25.5 | 2.72 | 4.57 | 2.13 | 4.47 | **5.8** | **20** | | | | | | | |
| H10 | E14 | 4.2 | 27.3 | 2.62 | 4.40 | 0.31 | 0.47 | 1.31 | 1.97 | 3.4 | 8.7 | | | | | | **3.4** | **8.7** | | | | | | | |

| TYPE OF SURFACE | | $C_V$ |
|---|---|---|
| HEAVY MEADOW | H | 3 |
| TILLAGE/FIELD | T | 5 |
| RIPRAP (not buried) | R | 7 |
| SHORT PASTURE AND LAWNS | L | 7 |
| NEARLY BARE GROUND | B | 10 |
| GRASSED WATERWAY | G | 15 |
| PAVED AREAS | P | 20 |

## STORM DRAINAGE SYSTEM DESIGN
## INLET CALCULATIONS

PROJECT: **Windingwalk Filing 2** Date: 8/24/2018

| | | | | | | | $Q_{Total}$ | | $Q_{Capture}$ | | | | $Q_{Flow\text{-}by}$ | | | | DEPTH (max) | | SPREAD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DP | Inlet size L(i) | Proposed or Existing | INLET TYPE | CROSS SLOPE | STREET SLOPE | $T_c$ | $Q_5$ (cfs) | $Q_{100}$ (cfs) | $Q_5$ (cfs) | $Q_{100}$ (cfs) | CAeqv. (5-yr) | $CA_{eqv.}$ (100-yr) | $Q_5$ (cfs) | $Q_{100}$ (cfs) | CAeqv. (5-yr) | $CA_{eqv.}$ (100-yr) | $Q_5$ (cfs) | $Q_{100}$ (ft) | $Q_5$ (cfs) | $Q_{100}$ (ft) |
| I20 | 15 | PROP | SUMP[1] | 2.0% | | 12.8 | 7.4 | 16 | 7.4 | 15 | 1.97 | 2.37 | - | 1.3 | - | 0.21 | 0.50 | 0.50 | | |
| I21 | 20 | PROP | SUMP[1] | 2.0% | | 17.0 | 9.0 | 19 | 9.0 | 19 | 2.70 | 3.38 | - | - | - | - | 0.50 | 0.50 | | |
| I22 | 10 | PROP | SUMP | 2.0% | | 9.1 | 3.5 | 7.9 | 3.5 | 7.9 | 0.81 | 1.11 | - | - | - | - | 0.50 | 1.00 | | |
| I23 | 15 | PROP | SUMP[1] | 2.0% | | 15.9 | 8.4 | 20 | 8.4 | 15 | 2.46 | 2.59 | - | 5.0 | - | 0.87 | 0.50 | 0.50 | | |
| CB03 | Type C | PROP | SUMP | 2.0% | | 15.0 | 4.6 | 12 | 4.6 | 12 | 1.30 | 2.01 | - | - | - | - | 0.40 | 0.59 | | |
| CB04 | Type C | PROP | SUMP | 2.0% | | 13.1 | 3.1 | 8.0 | 3.1 | 8.0 | 0.84 | 1.28 | - | - | - | - | 0.32 | 0.50 | | |
| I24 | 10 | PROP | SUMP[1] | 2.0% | | 14.2 | 8.2 | 18 | 8.2 | 11 | 2.29 | 1.81 | - | 7.0 | - | 1.15 | 0.50 | 0.50 | | |
| I25 | 10 | PROP | SUMP[1] | 2.0% | | 18.3 | 3.8 | 11 | 3.8 | 11 | 1.18 | 2.02 | - | 0.3 | - | 0.06 | 0.50 | 0.50 | | |
| I26 | 5 | PROP | SUMP | 2.0% | | 14.8 | 6.9 | 16 | 6.9 | 11 | 1.95 | 1.89 | - | 4.6 | - | 0.77 | 0.50 | 0.70 | | |
| I27 | 10 | PROP | SUMP | 2.0% | | 14.9 | 2.1 | 8.7 | 2.1 | 8.7 | 0.58 | 1.47 | - | - | - | - | 0.50 | 0.70 | | |
| I28 | 15 | PROP | SUMP[1] | 2.0% | | 9.5 | 5.8 | 13 | 5.8 | 13 | 1.37 | 1.86 | - | - | - | - | 0.50 | 0.50 | | |
| I29 | 20 | PROP | SUMP[1] | 2.0% | | 17.0 | 7.7 | 21 | 7.7 | 19 | 2.31 | 3.39 | - | 2.1 | - | 0.37 | 0.50 | 0.50 | | |
| I30 | 10 | PROP | SUMP[1] | 2.0% | | 12.8 | 6.2 | 13 | 6.2 | 11 | 1.65 | 1.73 | - | 2.3 | - | 0.37 | 0.50 | 0.50 | | |
| I31 | 20 | PROP | SUMP[1] | 2.0% | | 14.5 | 8.6 | 22 | 8.6 | 19 | 2.40 | 3.16 | - | 2.9 | - | 0.48 | 0.50 | 0.50 | | |
| I32 | 10 | PROP | SUMP | 2.0% | | 15.2 | 5.4 | 12 | 5.4 | 11 | 1.53 | 1.86 | - | 1.3 | - | 0.23 | 0.50 | 0.50 | | |
| I33 | 5 | PROP | SUMP | 2.0% | | 17.9 | 7.0 | 16 | 6.9 | 11 | 2.12 | 2.05 | 0.1 | 5.1 | 0.04 | 0.93 | 0.50 | 0.70 | | |
| I34 | 10 | PROP | SUMP | 2.0% | | 20.2 | 5.0 | 17 | 5.0 | 17 | 1.64 | 3.34 | - | - | - | - | 0.50 | 0.70 | | |
| | | | | | | | | | | | | | | | | | | | | |
| I35 | 5 | PROP | SUMP | 2.0% | | 21.6 | 5.7 | 12 | 5.7 | 12 | 1.90 | 2.37 | - | - | - | - | 0.50 | 1.00 | | |
| I36 | 5 | PROP | SUMP | 2.0% | | 8.7 | 3.0 | 5.7 | 3.0 | 5.7 | 0.69 | 0.79 | - | - | - | - | 0.50 | 1.00 | | |
| | | | | | | | | | | | | | | | | | | | | |
| I40 | 10 | PROP | SUMP | 2.0% | | 16.0 | 9.7 | 22 | 9.7 | 18 | 2.82 | 3.09 | - | 4.3 | - | 0.76 | 0.50 | 0.70 | | |
| I41 | 10 | PROP | SUMP | 2.0% | | 16.1 | 2.1 | 8.1 | 2.1 | 8.1 | 0.61 | 1.42 | - | - | - | - | 0.50 | 0.70 | | |
| | | | | | | | | | | | | | | | | | | | | |
| I42 | 10 | PROP | SUMP | 2.0% | | 10.3 | 8.3 | 19 | 8.3 | 18 | 2.02 | 2.59 | - | 1.2 | - | 0.17 | 0.50 | 0.70 | | |
| I43 | 10 | PROP | SUMP | 2.0% | | 16.7 | 4.7 | 12 | 4.7 | 12 | 1.41 | 2.10 | - | - | - | - | 0.50 | 0.70 | | |
| I44 | 10 | PROP | SUMP | 2.0% | | 9.6 | 8.4 | 17 | 8.4 | 17 | 2.00 | 2.49 | - | - | - | - | 0.50 | 0.70 | | |
| I45 | 10 | PROP | SUMP | 2.0% | | 11.2 | 3.6 | 7.5 | 3.6 | 7.5 | 0.91 | 1.12 | - | - | - | - | 0.50 | 0.70 | | |
| EI04 | 10 | EXIST | SUMP | 2.0% | | 13.7 | 8.4 | 19 | 8.4 | 18 | 2.29 | 2.89 | - | 1.0 | - | 0.16 | 0.50 | 0.70 | | |
| EI05 | 10 | EXIST | SUMP[1] | 2.0% | | 17.0 | 6.9 | 16 | 6.9 | 16 | 2.07 | 2.82 | - | - | - | - | 0.50 | 0.70 | | |
| EI06 | 20 | EXIST | SUMP | 2.0% | | 21.8 | 16 | 36 | 16 | 31 | 4.71 | 6.20 | - | 5.4 | - | 1.09 | 0.50 | 0.70 | | |
| EI07 | 15 | EXIST | SUMP | 2.0% | | 25.5 | 5.8 | 20 | 5.8 | 20 | 2.13 | 4.47 | - | - | - | - | 0.50 | 0.80 | | |
| | | | | | | | | | | | | | | | | | | | | |

[1] Forced sump at intersection

# STORM DRAINAGE SYSTEM DESIGN
## (RATIONAL METHOD PROCEDURE)
## PIPE ROUTING

PROJECT: **Windingwalk Filing 2** Date: 8/24/2018

| UPSTREAM DESIGN POINT | UPSTREAM BASIN | INLET FLOW Tc (Min.) | INLET FLOW I (in./ hr.) (5 YR) | INLET FLOW I (in./ hr.) (100 YR) | INLET FLOW CA (5 YR) | INLET FLOW CA (100 YR) | INLET FLOW Q (5 YR) | INLET FLOW Q (100 YR) | SYSTEM FLOW Sum Tc (min.) | SYSTEM FLOW I (in./ hr.) (5 YR) | SYSTEM FLOW I (in./ hr.) (100 YR) | SYSTEM FLOW CA (5 YR) | SYSTEM FLOW CA (100 YR) | SYSTEM FLOW Q **(5 YR)** | SYSTEM FLOW Q **(100 YR)** | TRAVEL TIME PIPE DIA | ROUGHNESS (n) | DESTINATION DP | SLOPE % | LENGTH (FT) | VEL. (FPS) (Estimate)* | TRAVEL TIME Tt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I20 | H02 | 12.8 | 3.75 | 6.30 | 1.97 | 2.37 | 7.4 | 15 | | | | | | **7.4** | **15** | 18 | 0.013 | J22 | 1.00% | 65 | 6.0 | 0.2 |
| J22 | | | | | | | | | 13.0 | 3.73 | 6.27 | 1.97 | 2.37 | **7.3** | **15** | 18 | 0.013 | J23 | 3.69% | 330 | 11.4 | 0.5 |
| J23 | | | | | | | | | 13.5 | 3.68 | 6.18 | 1.97 | 2.37 | **7.2** | **15** | 18 | 0.013 | J24 | 3.82% | 234 | 11.6 | 0.3 |
| I23 | H07 | 15.9 | 3.43 | 5.76 | 2.46 | 2.59 | 8.4 | 15 | | | | | | **8.4** | **15** | 24 | 0.013 | J24 | 1.08% | 32 | 7.5 | 0.1 |
| J24 | | | | | | | | | 16.0 | 3.43 | 5.75 | 4.43 | 4.96 | **15** | **29** | 24 | 0.013 | J26 | 2.91% | 105 | 12.3 | 0.1 |
| I21 | H04 | 17.0 | 3.34 | 5.60 | 2.70 | 3.38 | 9.0 | 19 | | | | | | **9.0** | **19** | 24 | 0.013 | J25A | 1.03% | 183 | 7.3 | 0.4 |
| J25A | | | | | | | | | 17.4 | 3.30 | 5.54 | 2.70 | 3.38 | **8.9** | **19** | 24 | 0.013 | I22 | 3.32% | 344 | 13.2 | 0.4 |
| I22 | H05 | 9.1 | 4.26 | 7.16 | 0.81 | 1.11 | 3.5 | 7.9 | 17.8 | 3.26 | 5.48 | 3.52 | 4.49 | **11** | **25** | 24 | 0.013 | J25B | 4.97% | 178 | 16 | 0.2 |
| J25B | | | | | | | | | 18.0 | 3.25 | 5.45 | 3.52 | 4.49 | **11** | **24** | 24 | 0.013 | J26 | 1.00% | 100 | 7 | 0.2 |
| J26 | | | | | | | | | 18.2 | 3.23 | 5.42 | 7.94 | 9.45 | **26** | **51** | 30 | 0.013 | J27 | 4.13% | 216 | 17 | 0.2 |
| CB03 | H08 | 15.0 | 3.52 | 5.91 | 1.30 | 2.01 | 4.6 | 12 | | | | | | **4.6** | **12** | 18 | 0.013 | J27 | 0.99% | 71 | 6 | 0.2 |
| CB04 | H09 | 13.1 | 3.73 | 6.26 | 0.84 | 1.28 | 3.1 | 8.0 | | | | | | **3.1** | **8.0** | 18 | 0.013 | J27 | 1.38% | 51 | 7 | 0.1 |
| J27 | | | | | | | | | 18.4 | 3.21 | 5.39 | 10.08 | 12.74 | **32** | **69** | 42 | 0.013 | J28 | 3.10% | 158 | 18 | 0.1 |
| I24 | H10 | 14.2 | 3.60 | 6.04 | 2.29 | 1.81 | 8.2 | 11 | | | | | | **8.2** | **11** | 18 | 0.013 | J28 | 1.04% | 53 | 6 | 0.1 |
| I25 | H11 | 18.3 | 3.22 | 5.41 | 1.18 | 2.02 | 3.8 | 11 | | | | | | **3.8** | **11** | 18 | 0.013 | J28 | 1.68% | 33 | 8 | 0.1 |
| J28 | | | | | | | | | 18.6 | 3.20 | 5.37 | 13.55 | 16.57 | **43** | **89** | 42 | 0.013 | J29 | 3.43% | 264 | 19 | 0.2 |
| I26 | H12 | 14.8 | 3.54 | 5.94 | 1.95 | 1.89 | 6.9 | 11 | | | | | | **6.9** | **11** | 18 | 0.013 | I27 | 4.25% | 35 | 12 | 0.0 |
| I27 | H13 | 14.9 | 3.53 | 5.92 | 0.58 | 1.47 | 2.1 | 8.7 | 14.9 | 3.53 | 5.92 | 2.54 | 3.36 | **8.9** | **20** | 24 | 0.013 | J29 | 3.07% | 192 | 13 | 0.3 |
| J29 | | | | | | | | | 18.8 | 3.18 | 5.34 | 13.55 | 19.93 | **43** | **106** | 42 | 0.013 | J30 | 1.79% | 90 | 14 | 0.1 |
| I28 | H15 | 9.5 | 4.21 | 7.07 | 1.37 | 1.86 | 5.8 | 13 | | | | | | **5.8** | **13** | 18 | 0.013 | J30 | 1.38% | 33 | 7 | 0.1 |
| J30 | | | | | | | | | 18.9 | 3.17 | 5.33 | 14.92 | 21.79 | **47** | **116** | 42 | 0.013 | J31 | 1.95% | 169 | 15 | 0.2 |
| I29 | H16 | 17.0 | 3.33 | 5.60 | 2.31 | 3.39 | 7.7 | 19 | | | | | | **7.7** | **19** | 24 | 0.013 | J31 | 5.91% | 28 | 18 | 0.0 |
| J31 | | | | | | | | | 19.1 | 3.16 | 5.30 | 17.22 | 25.17 | **54** | **133** | 48 | 0.013 | J32 | 1.43% | 249 | 14 | 0.3 |
| I30 | H17 | 12.8 | 3.76 | 6.31 | 1.65 | 1.73 | 6.2 | 11 | | | | | | **6.2** | **11** | 18 | 0.013 | J32 | 2.45% | 45 | 9 | 0.1 |
| J32 | | | | | | | | | 19.4 | 3.13 | 5.26 | 18.87 | 26.90 | **59** | **142** | 48 | 0.013 | J33 | 3.06% | 303 | 20 | 0.3 |
| I31 | H18 | 14.5 | 3.57 | 6.00 | 2.40 | 3.16 | 8.6 | 19 | | | | | | **8.6** | **19** | 24 | 0.013 | J33 | 6.82% | 25 | 19 | 0.0 |
| J33 | | | | | | | | | 19.7 | 3.12 | 5.23 | 21.27 | 30.06 | **66** | **157** | 48 | 0.013 | J34 | 1.04% | 48 | 12 | 0.1 |
| J34 | | | | | | | | | 19.7 | 3.11 | 5.22 | 21.27 | 30.06 | **66** | **157** | 48 | 0.013 | J35 | 2.55% | 387 | 18 | 0.4 |
| I32 | H19 | 15.2 | 3.50 | 5.88 | 1.53 | 1.86 | 5.4 | 11 | | | | | | **5.4** | **11** | 24 | 0.013 | J35 | 1.62% | 312 | 9 | 0.6 |
| I33 | H20 | 17.9 | 3.26 | 5.47 | 2.12 | 2.05 | 6.9 | 11 | | | | | | **6.9** | **11** | 18 | 0.013 | J35 | 9.90% | 24 | 19 | 0.0 |
| J35 | | | | | | | | | 20.1 | 3.08 | 5.18 | 24.92 | 33.97 | **77** | **176** | 48 | 0.013 | I34 | 3.05% | 5 | 20 | 0.0 |
| I34 | H21 | 20.2 | 3.08 | 5.16 | 1.64 | 3.34 | 5.0 | 17 | 20.1 | 3.08 | 5.18 | 26.56 | 37.31 | **82** | **193** | 48 | 0.013 | OS3 | 1.01% | 248 | 12 | 0.4 |
| | | | | | | | | | | | | | | | | | | | | | | |
| I35 | H22 | 21.6 | 2.98 | 5.00 | 1.90 | 2.37 | 5.7 | 12 | | | | | | **5.7** | **12** | 18 | 0.013 | I36 | 1.03% | 53 | 6 | 0.1 |
| I36 | H23 | 8.7 | 4.34 | 7.28 | 0.69 | 0.79 | 3.0 | 5.7 | 21.7 | 2.97 | 4.98 | 2.59 | 3.16 | **7.7** | **16** | 24 | 0.013 | OS4 | 1.06% | 52 | 7 | 0.1 |
| I40 | G02 | 16.0 | 3.42 | 5.74 | 2.82 | 3.09 | 9.7 | 18 | | | | | | **9.7** | **18** | 18 | 0.013 | I41 | 0.99% | 35 | 6 | 0.1 |
| I41 | G03 | 16.1 | 3.41 | 5.73 | 0.61 | 1.42 | 2.1 | 8.1 | 16.1 | 3.41 | 5.73 | 3.44 | 4.51 | **12** | **26** | 24 | 0.013 | J36 | 2.62% | 193 | 12 | 0.3 |
| J33 | | | | | | | | | 16.4 | 3.39 | 5.68 | 3.44 | 4.51 | **12** | **26** | 24 | 0.013 | OS5 | 1.00% | 114 | 7 | 0.3 |
| | | | | | | | | | | | | | | | | | | | | | | |

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| 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)** | | | | | | | |
| I42 | G05 | 10.3 | 4.08 | 6.86 | 2.02 | 2.59 | 8.3 | 18 | | | | | | **8.3** | **18** | 18 | 0.013 | I43 | 6.65% | 35 | 15 | 0.0 |
| I43 | G06 | 16.7 | 3.36 | 5.65 | 1.41 | 2.10 | 4.7 | 12 | 16.7 | 3.36 | 5.65 | 3.44 | 4.68 | **12** | **26** | 24 | 0.013 | J37 | 2.71% | 188 | 12 | 0.3 |
| J37 | | | | | | | | | 16.9 | 3.34 | 5.61 | 3.44 | 4.68 | **11** | **26** | 30 | 0.013 | J38 | 1.02% | 490 | 8 | 1.0 |
| J38 | | | | | | | | | 17.9 | 3.26 | 5.47 | 3.44 | 4.68 | **11** | **26** | 30 | 0.013 | J39 | 1.38% | 123 | 10 | 0.2 |
| DP13 | E03 | 47.1 | 1.81 | 3.03 | 10.75 | 15.73 | 19 | 48 | 47.1 | 1.81 | 3.03 | 10.75 | 15.73 | **19** | **48** | 42 | 0.013 | I44 | 1.21% | 33 | 12 | 0.0 |
| I44 | E04 | 9.6 | 4.18 | 7.03 | 2.00 | 2.49 | 8.4 | 17 | 47.1 | 1.80 | 3.03 | 12.75 | 18.22 | **23** | **55** | 42 | 0.013 | J39 | 1.07% | 14 | 11 | 0.0 |
| J39 | | | | | | | | | 47.1 | 1.80 | 3.03 | 16.19 | 22.90 | **29** | **69** | 24 | 0.013 | I45 | 1.04% | 34 | 7 | 0.1 |
| I45 | E05 | 11.2 | 3.96 | 6.64 | 0.91 | 1.12 | 3.6 | 7.5 | 47.2 | 1.80 | 3.02 | 17.10 | 24.03 | **31** | **73** | 42 | 0.013 | EI04 | 2.01% | 165 | 15 | 0.2 |
| EI04 | E06 | 13.7 | 3.66 | 6.14 | 2.29 | 2.89 | 8.4 | 18 | 47.4 | 1.80 | 3.01 | 19.39 | 26.92 | **35** | **81** | 42 | 0.013 | EJ04 | 1.00% | 296 | 10 | 0.5 |
| EI05 | E07 | 17.0 | 3.33 | 5.59 | 2.07 | 2.82 | 6.9 | 16 | | | | | | **6.9** | **16** | 18 | 0.013 | EJ04 | 3.70% | 23 | 11 | 0.0 |
| EJ04 | | | | | | | | | 47.9 | 1.78 | 2.99 | 21.46 | 29.74 | **38** | **89** | 42 | 0.013 | EJ06 | 1.10% | 226 | 11 | 0.3 |
| EI06 | E10 & E12 | 21.8 | 2.96 | 4.97 | 4.71 | 6.20 | 14 | 31 | | | | | | **14** | **31** | 24 | 0.013 | EJ05 | 1.00% | 25 | 7 | 0.1 |
| EI07 | E08 & E14 | 25.5 | 2.72 | 4.57 | 2.13 | 4.47 | 5.8 | 20 | | | | | | **5.8** | **20** | 24 | 0.013 | EJ05 | 5.40% | 5 | 17 | 0.0 |
| EJ05 | | | | | | | | | 25.5 | 2.72 | 4.57 | 6.84 | 10.67 | **19** | **49** | 36 | 0.013 | EJ06 | 1.80% | 56 | 13 | 0.1 |
| EJ06 | | | | | | | | | 48.2 | 1.77 | 2.97 | 28.30 | 40.41 | **50** | **120** | 48 | 0.013 | OS2 | 1.50% | 165 | 14 | 0.2 |

* Velocity estimated for calculation of travel time. Refer to Hydraulics for calculated velocity.

# STORM DRAINAGE SYSTEM DESIGN

## HYDRAULICS

PROJECT: **Windingwalk Filing 2** Date: 8/24/2018

| Label | Upstrm Node | Dnstrm Node | Intlet CA (acres) | Inlet Tc (min) | Inlet Flow (ft³/s) | System CA (acres) | System Flow Time (min) | System Intensity (in/hr) | Length (ft) | Section Size (in) | Slope (%) | Capacity (Full Flow) (ft³/s) | System Flow (ft³/s) | Velocity (Ave) (ft/s) | Elevation Ground (Upstrm) (ft) | Hydraulic Grade Line (Upstrm) (ft) | Invert (Upstrm) (ft) | Elevation Ground (Dnstrm) (ft) | Hydraulic Grade Line (Dnstrm) (ft) | Invert (Dnstrm) (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P48 | I20 | J22 | 2.37 | 12.8 | 15 | 2.37 | 12.8 | 6.31 | 65 | 18 | 1.00% | 11 | 15 | 9 | 7057.79 | 7055.9 | 7053.25 | 7057.29 | 7054.6 | 7052.60 |
| P49 | J22 | J23 | | | | 2.37 | 12.9 | 6.29 | 330 | 18 | 3.70% | 20 | 15 | 12.1 | 7057.29 | 7054.0 | 7052.60 | 7044.71 | 7041.9 | 7040.45 |
| P50 | J23 | J24 | | | | 2.37 | 13.4 | 6.20 | 234 | 18 | 3.80% | 21 | 15 | 12 | 7044.71 | 7041.9 | 7040.45 | 7036.79 | 7033.1 | 7031.50 |
| P51 | I23 | J24 | 2.59 | 15.9 | 15 | 2.59 | 15.9 | 5.76 | 32 | 24 | 1.10% | 24 | 15 | 4.8 | 7036.38 | 7033.4 | 7031.35 | 7036.79 | 7033.3 | 7031.00 |
| P52 | J24 | J26 | | | | 4.96 | 16.0 | 5.75 | 105 | 24 | 2.90% | 39 | 29 | 12 | 7036.79 | 7032.8 | 7031.00 | 7034.44 | 7030.1 | 7027.95 |
| P53 | I21 | J25A | 3.38 | 17.0 | 19 | 3.38 | 17.0 | 5.60 | 183 | 24 | 1.00% | 23 | 19 | 8.1 | 7056.10 | 7052.7 | 7051.10 | 7054.38 | 7050.8 | 7049.20 |
| P54 | J25A | I22 | | | | 3.38 | 17.4 | 5.54 | 344 | 24 | 3.30% | 41 | 19 | 12 | 7054.38 | 7050.8 | 7049.20 | 7045.74 | 7039.9 | 7037.80 |
| P55 | I22 | J25B | 1.11 | 9.1 | 8 | 4.49 | 17.9 | 5.47 | 178 | 24 | 5.00% | 50 | 25 | 13.0 | 7045.74 | 7039.6 | 7037.80 | 7035.00 | 7031.9 | 7028.95 |
| P56 | J25B | J26 | | | | 4.49 | 18.1 | 5.44 | 100 | 24 | 1.00% | 23 | 25 | 8 | 7035.00 | 7031.5 | 7028.95 | 7034.44 | 7030.3 | 7027.95 |
| P57 | J26 | J27 | | | | 9.45 | 18.3 | 5.41 | 216 | 30 | 4.10% | 83 | 52 | 16 | 7034.44 | 7029.8 | 7027.45 | 7024.54 | 7020.0 | 7018.55 |
| P58 | CB03 | J27 | 2.01 | 15.0 | 12 | 2.01 | 15.0 | 5.91 | 71 | 18 | 1.00% | 10 | 12 | 6.8 | 7023.00 | 7021.9 | 7020.25 | 7024.54 | 7021.0 | 7019.55 |
| P59 | CB04 | J27 | 1.28 | 13.1 | 8 | 1.28 | 13.1 | 6.25 | 51 | 18 | 1.40% | 12 | 8 | 6 | 7023.00 | 7021.4 | 7020.25 | 7024.54 | 7021.0 | 7019.55 |
| P60 | J27 | J28 | | | | 12.74 | 18.5 | 5.38 | 158 | 42 | 3.10% | 177 | 69 | 14 | 7024.54 | 7020.2 | 7017.55 | 7020.13 | 7015.7 | 7012.65 |
| P61 | I24 | J28 | 1.81 | 14.2 | 11 | 1.81 | 14.2 | 6.05 | 53 | 18 | 1.00% | 11 | 11 | 6.3 | 7019.71 | 7017.3 | 7015.20 | 7020.13 | 7016.7 | 7014.65 |
| P62 | I25 | J28 | 2.02 | 18.3 | 11 | 2.02 | 18.3 | 5.41 | 33 | 18 | 1.70% | 14 | 11 | 6 | 7019.71 | 7017.1 | 7015.20 | 7020.13 | 7016.7 | 7014.65 |
| P63 | J28 | J29 | | | | 16.57 | 18.7 | 5.35 | 264 | 42 | 3.40% | 186 | 89 | 16 | 7020.13 | 7015.6 | 7012.65 | 7011.65 | 7006.9 | 7003.60 |
| P64 | I26 | I27 | 1.89 | 14.8 | 11 | 1.89 | 14.8 | 5.95 | 35 | 18 | 4.20% | 22 | 11 | 9.7 | 7017.49 | 7014.3 | 7013.00 | 7017.49 | 7012.4 | 7011.50 |
| P65 | I27 | J29 | 1.47 | 14.9 | 9 | 3.36 | 14.9 | 5.93 | 192 | 24 | 3.10% | 40 | 20 | 10 | 7017.49 | 7012.6 | 7011.00 | 7011.65 | 7008.3 | 7005.10 |
| P66 | J29 | J30 | | | | 19.93 | 19.0 | 5.32 | 90 | 42 | 1.80% | 134 | 107 | 13 | 7011.65 | 7006.74 | 7003.60 | 7009.38 | 7005.4 | 7002.00 |
| P67 | I28 | J30 | 1.86 | 9.5 | 13 | 1.86 | 9.5 | 7.06 | 33 | 18 | 1.40% | 12 | 13 | 7 | 7008.96 | 7007.5 | 7004.45 | 7009.38 | 7007.0 | 7004.00 |
| P68 | J30 | J31 | | | | 21.79 | 19.1 | 5.30 | 169 | 42 | 2.00% | 141 | 116 | 14.8 | 7009.38 | 7005.2 | 7002.00 | 7006.72 | 7001.2 | 6998.70 |
| P69 | I29 | J31 | 3.39 | 17.0 | 19 | 3.39 | 17.0 | 5.60 | 28 | 24 | 5.90% | 55 | 19 | 7 | 7006.86 | 7003.4 | 7001.85 | 7006.72 | 7003.1 | 7000.20 |
| P70 | J31 | J32 | | | | 25.18 | 19.3 | 5.28 | 249 | 48 | 1.40% | 172 | 134 | 13.9 | 7006.72 | 7001.7 | 6998.20 | 7003.17 | 6998.3 | 6994.65 |
| P71 | I30 | J32 | 1.73 | 12.8 | 11 | 1.73 | 12.8 | 6.31 | 45 | 18 | 2.40% | 16 | 11 | 6.2 | 7002.77 | 7000.2 | 6998.25 | 7003.17 | 6999.7 | 6997.15 |
| P72 | J32 | J33 | | | | 26.91 | 19.6 | 5.24 | 303 | 48 | 3.10% | 251 | 142 | 17 | 7003.17 | 6998.2 | 6994.65 | 6993.93 | 6990.2 | 6985.40 |
| P73 | I31 | J33 | 3.16 | 14.5 | 19 | 3.16 | 14.5 | 6.00 | 25 | 24 | 6.80% | 59 | 19 | 6.1 | 6994.14 | 6992.1 | 6989.10 | 6993.93 | 6992.0 | 6987.40 |
| P74 | J33 | J34 | | | | 30.07 | 19.9 | 5.20 | 48 | 48 | 3.10% | 254 | 158 | 12.5 | 6993.93 | 6990.0 | 6985.40 | 6994.04 | 6989.4 | 6983.90 |
| P75 | J34 | J35 | | | | 30.07 | 19.9 | 5.19 | 387 | 48 | 2.60% | 230 | 157 | 14.9 | 6994.04 | 6987.6 | 6983.90 | 6984.19 | 6980.3 | 6974.00 |
| P76 | I32 | J35 | 1.86 | 15.2 | 11 | 1.86 | 15.2 | 5.88 | 312 | 24 | 1.60% | 29 | 11 | 5.1 | 6986.06 | 6982.2 | 6981.05 | 6984.19 | 6980.3 | 6976.00 |
| P77 | I33 | J35 | 2.05 | 17.9 | 11 | 2.05 | 17.9 | 5.47 | 24 | 18 | 9.90% | 33 | 11 | 8.2 | 6984.42 | 6980.2 | 6978.90 | 6984.19 | 6979.0 | 6976.50 |
| P78 | J35 | I34 | | | | 33.98 | 20.4 | 5.14 | 5 | 54 | 3.00% | 343 | 176 | 11.1 | 6984.19 | 6978.8 | 6973.50 | 6984.42 | 6978.7 | 6973.35 |
| P79 | I34 | OS3 | 3.34 | 20.2 | 17 | 37.32 | 20.4 | 5.14 | 209 | 54 | 0.60% | 158 | 193 | 12.2 | 6984.42 | 6978.5 | 6973.35 | 6977.00 | 6976.5 | 6972.00 |
| P80 | I40 | I41 | 3.09 | 16.0 | 18 | 3.09 | 16.0 | 5.75 | 35 | 18 | 1.00% | 10 | 18 | 10.1 | 7033.44 | 7031.1 | 7028.90 | 7033.44 | 7030.1 | 7028.55 |
| P81 | I41 | J36 | 1.42 | 16.1 | 8 | 4.51 | 16.1 | 5.73 | 193 | 24 | 2.60% | 37 | 26 | 10.1 | 7033.44 | 7029.8 | 7028.05 | 7028.50 | 7026.0 | 7023.00 |
| P82 | J36 | OS5 | | | | 4.51 | 16.4 | 5.68 | 114 | 24 | 1.00% | 23 | 26 | 8.2 | 7028.50 | 7025.3 | 7023.00 | 7025.00 | 7023.8 | 7021.80 |
| P83 | I42 | I43 | 2.59 | 10.3 | 18 | 2.59 | 10.3 | 6.86 | 35 | 18 | 6.70% | 27 | 18 | 12.7 | 7006.70 | 7002.2 | 7000.70 | 7006.70 | 6999.4 | 6998.35 |
| P84 | I43 | J37 | 2.1 | 16.7 | 12 | 4.69 | 16.7 | 5.64 | 188 | 24 | 2.70% | 37 | 27 | 12.0 | 7006.70 | 6999.7 | 6997.85 | 6997.36 | 6994.0 | 6992.75 |
| P85 | J37 | J38 | | | | 4.69 | 17.0 | 5.60 | 490 | 30 | 1.00% | 41 | 26 | 8.9 | 6997.36 | 6994.0 | 6992.25 | 6992.38 | 6989.0 | 6987.25 |
| P86 | J38 | J39 | | | | 4.69 | 17.9 | 5.47 | 124 | 30 | 1.40% | 48 | 26 | 8.1 | 6992.38 | 6989.0 | 6987.25 | 6991.41 | 6988.0 | 6985.55 |
| P87 | DP13 | I44 | 15.73 | 47.1 | 48 | 15.73 | 47.1 | 3.03 | 33 | 42 | 1.20% | 110 | 48 | 8.8 | 6991.80 | 6987.3 | 6985.10 | 6991.47 | 6987.0 | 6984.70 |
| P88 | I44 | J39 | 2.49 | 9.6 | 18 | 18.22 | 47.2 | 3.02 | 14 | 42 | 1.10% | 105 | 56 | 7.4 | 6991.47 | 6987.0 | 6984.70 | 6991.41 | 6987.3 | 6984.55 |
| P89 | J39 | I45 | | | | 22.91 | 47.2 | 3.02 | 34 | 42 | 1.00% | 103 | 70 | 9.8 | 6991.41 | 6987.2 | 6984.55 | 6991.47 | 6987.0 | 6984.20 |
| P90 | I45 | EI04 | 1.12 | 11.2 | 8 | 24.03 | 47.3 | 3.02 | 165 | 42 | 2.00% | 142 | 73 | 12.8 | 6991.47 | 6986.9 | 6984.20 | 6987.67 | 6983.9 | 6980.90 |
| P91 | EI04 | EJ04 | 2.89 | 13.7 | 18 | 26.92 | 47.5 | 3.01 | 296 | 42 | 1.00% | 100 | 82 | 10.8 | 6987.67 | 6983.7 | 6980.90 | 6985.47 | 6981.4 | 6977.95 |
| P92 | EI05 | EJ04 | 2.82 | 17.0 | 16 | 2.82 | 17.0 | 5.60 | 24 | 18 | 3.60% | 20 | 16 | 9.0 | 6985.37 | 6982.5 | 6980.80 | 6985.47 | 6982.0 | 6979.95 |
| P93 | EJ04 | EJ06 | | | | 29.74 | 47.9 | 2.98 | 226 | 42 | 1.10% | 105 | 89 | 10.6 | 6985.47 | 6980.9 | 6977.95 | 6983.66 | 6979.1 | 6975.50 |
| P94 | EI06 | EJ05 | 6.2 | 21.8 | 31 | 6.20 | 21.8 | 4.97 | 25 | 24 | 1.00% | 23 | 31 | 9.9 | 6983.27 | 6980.7 | 6978.25 | 6983.04 | 6980.2 | 6978.00 |
| P95 | EI07 | EJ05 | 4.47 | 25.5 | 21 | 4.47 | 25.5 | 4.57 | 5 | 24 | 5.30% | 52 | 21 | 6.6 | 6983.27 | 6980.2 | 6978.25 | 6983.04 | 6980.2 | 6978.00 |
| P96 | EJ05 | EJ06 | | | | 10.67 | 25.5 | 4.57 | 56 | 36 | 1.80% | 90 | 49 | 7.1 | 6983.04 | 6979.5 | 6977.00 | 6983.66 | 6979.4 | 6976.00 |
| P97 | EJ06 | EOS2 | | | | 40.41 | 48.3 | 2.97 | 165 | 48 | 1.50% | 177 | 121 | 12.6 | 6983.66 | 6978.3 | 6975.00 | 6978.00 | 6976.5 | 6972.50 |
| P98 | I35 | I36 | 2.37 | 21.6 | 12 | 2.37 | 21.6 | 4.99 | 53 | 18 | 1.00% | 11 | 12 | 6.9 | 6998.91 | 6995.9 | 6994.40 | 6998.91 | 6995.2 | 6993.85 |
| P99 | I36 | OS4 | 0.79 | 8.7 | 6 | 3.16 | 21.7 | 4.98 | 52 | 24 | 1.10% | 23 | 16 | 5.5 | 6998.91 | 6994.8 | 6993.35 | 6996.00 | 6994.8 | 6992.80 |
| | | | | | | | | | | | | | | | | | | | | |

# Appendix B – Street Flow Tables

# Worksheet for Ramp Full Street Section

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.00500 | ft/ft |
| Normal Depth | 0.75 | ft |
| Section Definitions | | |

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00 | 0.00 |
| 0+13 | -0.25 |
| 0+14 | -0.75 |
| 0+15 | -0.59 |
| 0+30 | -0.29 |
| 0+45 | -0.59 |
| 0+46 | -0.75 |
| 0+48 | -0.25 |
| 0+60 | 0.00 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00, 0.00) | (0+13, -0.25) | 0.030 |
| (0+13, -0.25) | (0+15, -0.59) | 0.013 |
| (0+15, -0.59) | (0+45, -0.59) | 0.015 |
| (0+45, -0.59) | (0+48, -0.25) | 0.013 |
| (0+48, -0.25) | (0+60, 0.00) | 0.030 |
| <None> | (0+60, 0.00) | 0.030 |

## Options

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

# Worksheet for Ramp Full Street Section

## Results

| | | | |
|---|---|---|---|
| Discharge | | 42.54 | ft³/s |
| Elevation Range | -0.75 to 0.00 ft | | |
| Flow Area | | 19.32 | ft² |
| Wetted Perimeter | | 60.21 | ft |
| Hydraulic Radius | | 0.32 | ft |
| Top Width | | 60.00 | ft |
| Normal Depth | | 0.75 | ft |
| Critical Depth | | 0.66 | ft |
| Critical Slope | | 0.01121 | ft/ft |
| Velocity | | 2.20 | ft/s |
| Velocity Head | | 0.08 | ft |
| Specific Energy | | 0.83 | ft |
| Froude Number | | 0.68 | |
| Flow Type | Subcritical | | |

## GVF Input Data

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

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.75 | ft |
| Critical Depth | 0.66 | ft |
| Channel Slope | 0.00500 | ft/ft |
| Critical Slope | 0.01121 | ft/ft |

# Cross Section for Ramp Full Street Section

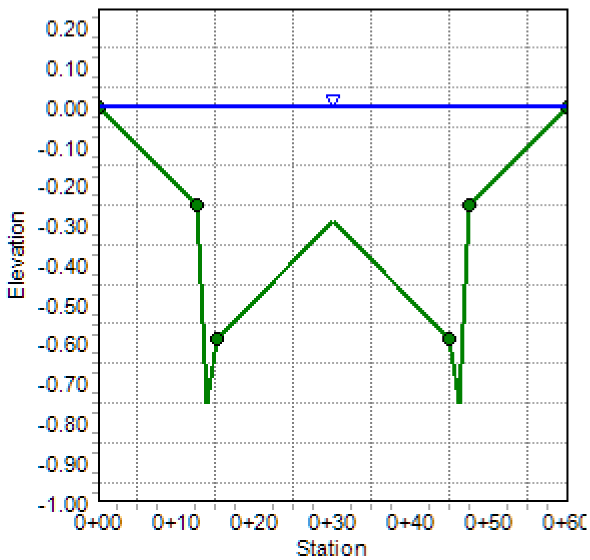
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.00500 | ft/ft |
| Normal Depth | 0.75 | ft |
| Discharge | 42.54 | ft³/s |

## Cross Section Image



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 (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 | 19 | 2.5 | 7.45 | 35.2 | 35.0 | 9.4 | 2.5 | 3.7 | 17.5 |
| 0.0063 | 21 | 2.8 | 7.45 | 35.2 | 35.0 | 11 | 2.8 | 3.7 | 17.5 |
| 0.0075 | 23 | 3.1 | 7.45 | 35.2 | 35.0 | 12 | 3.1 | 3.7 | 17.5 |
| 0.0088 | 25 | 3.4 | 7.45 | 35.2 | 35.0 | 12 | 3.3 | 3.7 | 17.5 |
| 0.0100 | 27 | 3.6 | 7.45 | 35.2 | 35.0 | 13 | 3.6 | 3.7 | 17.5 |
| 0.0113 | 28 | 3.8 | 7.45 | 35.2 | 35.0 | 14 | 3.8 | 3.7 | 17.5 |
| 0.0125 | 30 | 4.0 | 7.45 | 35.2 | 35.0 | 15 | 4.0 | 3.7 | 17.5 |
| 0.0138 | 31 | 4.2 | 7.45 | 35.2 | 35.0 | 16 | 4.2 | 3.7 | 17.5 |
| 0.0150 | 33 | 4.4 | 7.45 | 35.2 | 35.0 | 16 | 4.4 | 3.7 | 17.5 |
| 0.0163 | 34 | 4.6 | 7.45 | 35.2 | 35.0 | 17 | 4.5 | 3.7 | 17.5 |
| 0.0175 | 35 | 4.7 | 7.45 | 35.2 | 35.0 | 18 | 4.7 | 3.7 | 17.5 |
| 0.0188 | 37 | 4.9 | 7.45 | 35.2 | 35.0 | 18 | 4.9 | 3.7 | 17.5 |
| 0.0200 | 38 | 5.1 | 7.45 | 35.2 | 35.0 | 19 | 5.0 | 3.7 | 17.5 |
| 0.0213 | 39 | 5.2 | 7.45 | 35.2 | 35.0 | 19 | 5.2 | 3.7 | 17.5 |
| 0.0225 | 40 | 5.4 | 7.45 | 35.2 | 35.0 | 20 | 5.4 | 3.7 | 17.5 |
| 0.0238 | 41 | 5.5 | 7.45 | 35.2 | 35.0 | 20 | 5.5 | 3.7 | 17.5 |
| 0.0250 | 42 | 5.7 | 7.45 | 35.2 | 35.0 | 21 | 5.6 | 3.7 | 17.5 |
| 0.0263 | 43 | 5.8 | 7.45 | 35.2 | 35.0 | 22 | 5.8 | 3.7 | 17.5 |
| 0.0275 | 44 | 5.9 | 7.45 | 35.2 | 35.0 | 22 | 5.9 | 3.7 | 17.5 |
| 0.0288 | 45 | 6.1 | 7.45 | 35.2 | 35.0 | 23 | 6.0 | 3.7 | 17.5 |
| 0.0300 | 46 | 6.2 | 7.45 | 35.2 | 35.0 | 23 | 6.2 | 3.7 | 17.5 |
| 0.0313 | 47 | 6.3 | 7.45 | 35.2 | 35.0 | 23 | 6.3 | 3.7 | 17.5 |
| 0.0325 | 48 | 6.5 | 7.45 | 35.2 | 35.0 | 24 | 6.4 | 3.7 | 17.5 |
| 0.0338 | 49 | 6.6 | 7.45 | 35.2 | 35.0 | 24 | 6.6 | 3.7 | 17.5 |
| 0.0350 | 50 | 6.7 | 7.45 | 35.2 | 35.0 | 25 | 6.7 | 3.7 | 17.5 |
| 0.0363 | 51 | 6.8 | 7.45 | 35.2 | 35.0 | 25 | 6.8 | 3.7 | 17.5 |
| 0.0375 | 52 | 6.9 | 7.45 | 35.2 | 35.0 | 26 | 6.9 | 3.7 | 17.5 |
| 0.0388 | 53 | 7.1 | 7.45 | 35.2 | 35.0 | 26 | 7.0 | 3.7 | 17.5 |
| 0.0400 | 53 | 7.2 | 7.45 | 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 (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 | 43 | 2.2 | 19.32 | 60.2 | 60.0 | 21 | 2.2 | 9.7 | 30 |
| 0.0063 | 48 | 2.5 | 19.32 | 60.2 | 60.0 | 24 | 2.4 | 9.7 | 30 |
| 0.0075 | 52 | 2.7 | 19.32 | 60.2 | 60.0 | 26 | 2.7 | 9.7 | 30 |
| 0.0088 | 56 | 2.9 | 19.32 | 60.2 | 60.0 | 28 | 2.9 | 9.7 | 30 |
| 0.0100 | 60 | 3.1 | 19.32 | 60.2 | 60.0 | 30 | 3.1 | 9.7 | 30 |
| 0.0113 | 64 | 3.3 | 19.32 | 60.2 | 60.0 | 32 | 3.3 | 9.7 | 30 |
| 0.0125 | 67 | 3.5 | 19.32 | 60.2 | 60.0 | 33 | 3.5 | 9.7 | 30 |
| 0.0138 | 71 | 3.7 | 19.32 | 60.2 | 60.0 | 35 | 3.6 | 9.7 | 30 |
| 0.0150 | 74 | 3.8 | 19.32 | 60.2 | 60.0 | 36 | 3.8 | 9.7 | 30 |
| 0.0163 | 77 | 4.0 | 19.32 | 60.2 | 60.0 | 38 | 3.9 | 9.7 | 30 |
| 0.0175 | 80 | 4.1 | 19.32 | 60.2 | 60.0 | 39 | 4.1 | 9.7 | 30 |
| 0.0188 | 82 | 4.3 | 19.32 | 60.2 | 60.0 | 41 | 4.2 | 9.7 | 30 |
| 0.0200 | 85 | 4.4 | 19.32 | 60.2 | 60.0 | 42 | 4.4 | 9.7 | 30 |
| 0.0213 | 88 | 4.5 | 19.32 | 60.2 | 60.0 | 43 | 4.5 | 9.7 | 30 |
| 0.0225 | 90 | 4.7 | 19.32 | 60.2 | 60.0 | 45 | 4.6 | 9.7 | 30 |
| 0.0238 | 93 | 4.8 | 19.32 | 60.2 | 60.0 | 46 | 4.8 | 9.7 | 30 |
| 0.0250 | 95 | 4.9 | 19.32 | 60.2 | 60.0 | 47 | 4.9 | 9.7 | 30 |
| 0.0263 | 97 | 5.0 | 19.32 | 60.2 | 60.0 | 48 | 5.0 | 9.7 | 30 |
| 0.0275 | 100 | 5.2 | 19.32 | 60.2 | 60.0 | 49 | 5.1 | 9.7 | 30 |
| 0.0288 | 102 | 5.3 | 19.32 | 60.2 | 60.0 | 50 | 5.2 | 9.7 | 30 |
| 0.0300 | 104 | 5.4 | 19.32 | 60.2 | 60.0 | 52 | 5.3 | 9.7 | 30 |
| 0.0313 | 106 | 5.5 | 19.32 | 60.2 | 60.0 | 53 | 5.5 | 9.7 | 30 |
| 0.0325 | 108 | 5.6 | 19.32 | 60.2 | 60.0 | 54 | 5.6 | 9.7 | 30 |
| 0.0338 | 111 | 5.7 | 19.32 | 60.2 | 60.0 | 55 | 5.7 | 9.7 | 30 |
| 0.0350 | 113 | 5.8 | 19.32 | 60.2 | 60.0 | 56 | 5.8 | 9.7 | 30 |
| 0.0363 | 115 | 5.9 | 19.32 | 60.2 | 60.0 | 57 | 5.9 | 9.7 | 30 |
| 0.0375 | 117 | 6.0 | 19.32 | 60.2 | 60.0 | 58 | 6.0 | 9.7 | 30 |
| 0.0388 | 118 | 6.1 | 19.32 | 60.2 | 60.0 | 59 | 6.1 | 9.7 | 30 |
| 0.0400 | 120 | 6.2 | 19.32 | 60.2 | 60.0 | 60 | 6.2 | 9.7 | 30 |

| Street Flows Ramp Curb (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 | 6.05 | 35.0 | 34.8 | 6.7 | 2.2 | 3.0 | 17.4 |
| 0.0063 | 15 | 2.5 | 6.05 | 35.0 | 34.8 | 7.5 | 2.5 | 3.0 | 17.4 |
| 0.0075 | 16 | 2.7 | 6.05 | 35.0 | 34.8 | 8.2 | 2.7 | 3.0 | 17.4 |
| 0.0088 | 18 | 2.9 | 6.05 | 35.0 | 34.8 | 8.9 | 2.9 | 3.0 | 17.4 |
| 0.0100 | 19 | 3.1 | 6.05 | 35.0 | 34.8 | 9.5 | 3.1 | 3.0 | 17.4 |
| 0.0113 | 20 | 3.3 | 6.05 | 35.0 | 34.8 | 10 | 3.3 | 3.0 | 17.4 |
| 0.0125 | 21 | 3.5 | 6.05 | 35.0 | 34.8 | 11 | 3.5 | 3.0 | 17.4 |
| 0.0138 | 22 | 3.7 | 6.05 | 35.0 | 34.8 | 11 | 3.7 | 3.0 | 17.4 |
| 0.0150 | 23 | 3.8 | 6.05 | 35.0 | 34.8 | 12 | 3.8 | 3.0 | 17.4 |
| 0.0163 | 24 | 4.0 | 6.05 | 35.0 | 34.8 | 12 | 4.0 | 3.0 | 17.4 |
| 0.0175 | 25 | 4.1 | 6.05 | 35.0 | 34.8 | 13 | 4.1 | 3.0 | 17.4 |
| 0.0188 | 26 | 4.3 | 6.05 | 35.0 | 34.8 | 13 | 4.3 | 3.0 | 17.4 |
| 0.0200 | 27 | 4.4 | 6.05 | 35.0 | 34.8 | 13 | 4.4 | 3.0 | 17.4 |
| 0.0213 | 28 | 4.6 | 6.05 | 35.0 | 34.8 | 14 | 4.6 | 3.0 | 17.4 |
| 0.0225 | 28 | 4.7 | 6.05 | 35.0 | 34.8 | 14 | 4.7 | 3.0 | 17.4 |
| 0.0238 | 29 | 4.8 | 6.05 | 35.0 | 34.8 | 15 | 4.8 | 3.0 | 17.4 |
| 0.0250 | 30 | 5.0 | 6.05 | 35.0 | 34.8 | 15 | 5.0 | 3.0 | 17.4 |
| 0.0263 | 31 | 5.1 | 6.05 | 35.0 | 34.8 | 15 | 5.1 | 3.0 | 17.4 |
| 0.0275 | 31 | 5.2 | 6.05 | 35.0 | 34.8 | 16 | 5.2 | 3.0 | 17.4 |
| 0.0288 | 32 | 5.3 | 6.05 | 35.0 | 34.8 | 16 | 5.3 | 3.0 | 17.4 |
| 0.0300 | 33 | 5.4 | 6.05 | 35.0 | 34.8 | 16 | 5.4 | 3.0 | 17.4 |
| 0.0313 | 34 | 5.5 | 6.05 | 35.0 | 34.8 | 17 | 5.5 | 3.0 | 17.4 |
| 0.0325 | 34 | 5.7 | 6.05 | 35.0 | 34.8 | 17 | 5.6 | 3.0 | 17.4 |
| 0.0338 | 35 | 5.8 | 6.05 | 35.0 | 34.8 | 17 | 5.8 | 3.0 | 17.4 |
| 0.0350 | 35 | 5.9 | 6.05 | 35.0 | 34.8 | 18 | 5.9 | 3.0 | 17.4 |
| 0.0363 | 36 | 6.0 | 6.05 | 35.0 | 34.8 | 18 | 6.0 | 3.0 | 17.4 |
| 0.0375 | 37 | 6.1 | 6.05 | 35.0 | 34.8 | 18 | 6.1 | 3.0 | 17.4 |
| 0.0388 | 37 | 6.2 | 6.05 | 35.0 | 34.8 | 19 | 6.2 | 3.0 | 17.4 |
| 0.0400 | 38 | 6.3 | 6.05 | 35.0 | 34.8 | 19 | 6.3 | 3.0 | 17.4 |

# Worksheet for Vertical Full Street Section

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.00500 | ft/ft |
| Normal Depth | 0.75 | ft |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00 | 0.00 |
| 0+13 | -0.25 |
| 0+13 | -0.25 |
| 0+13 | -0.75 |
| 0+15 | -0.58 |
| 0+30 | -0.28 |
| 0+45 | -0.58 |
| 0+47 | -0.75 |
| 0+47 | -0.25 |
| 0+48 | -0.25 |
| 0+60 | 0.00 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00, 0.00) | (0+13, -0.25) | 0.030 |
| (0+13, -0.25) | (0+15, -0.58) | 0.013 |
| (0+15, -0.58) | (0+45, -0.58) | 0.015 |
| (0+45, -0.58) | (0+48, -0.25) | 0.013 |
| (0+48, -0.25) | (0+60, 0.00) | 0.030 |
| <None> | (0+60, 0.00) | 0.030 |

## Options

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

# Worksheet for Vertical Full Street Section

## Options

| | |
|---|---|
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | | |
|---|---|---|---|
| Discharge | | 41.33 | ft³/s |
| Elevation Range | -0.75 to 0.00 ft | | |
| Flow Area | | 19.04 | ft² |
| Wetted Perimeter | | 61.02 | ft |
| Hydraulic Radius | | 0.31 | ft |
| Top Width | | 60.00 | ft |
| Normal Depth | | 0.75 | ft |
| Critical Depth | | 0.66 | ft |
| Critical Slope | | 0.01143 | ft/ft |
| Velocity | | 2.17 | ft/s |
| Velocity Head | | 0.07 | ft |
| Specific Energy | | 0.82 | ft |
| Froude Number | | 0.68 | |
| Flow Type | Subcritical | | |

## GVF Input Data

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

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.75 | ft |
| Critical Depth | 0.66 | ft |
| Channel Slope | 0.00500 | ft/ft |
| Critical Slope | 0.01143 | ft/ft |

# Cross Section for Vertical Full Street Section

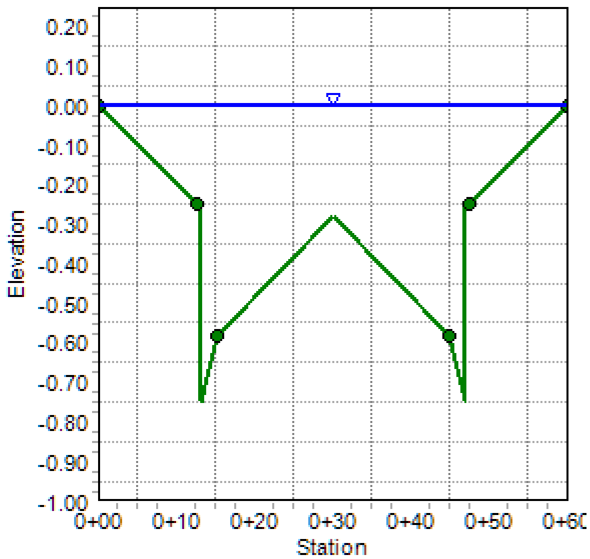
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.00500 | ft/ft |
| Normal Depth | 0.75 | ft |
| Discharge | 41.33 | ft³/s |

## Cross Section Image



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 Discharge ($ft^3/s$) | Full Street Width Velocity (ft/s) | Full Street Width Flow Area ($ft^2$) | Full Street Width Wetted Perimeter (ft) | Full Street Width Top Width (ft) | Half Street Width Discharge ($ft^3/s$) | Half Street Width Velocity (ft/s) | Half Street Width Flow Area ($ft^2$) | Half Street Width Top Width (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.0050 | 18 | 2.5 | 7.17 | 35.0 | 34.0 | 8.9 | 2.5 | 3.6 | 17 |
| 0.0063 | 20 | 2.8 | 7.17 | 35.0 | 34.0 | 9.9 | 2.8 | 3.6 | 17 |
| 0.0075 | 22 | 3.0 | 7.17 | 35.0 | 34.0 | 11 | 3.0 | 3.6 | 17 |
| 0.0088 | 23 | 3.3 | 7.17 | 35.0 | 34.0 | 12 | 3.3 | 3.6 | 17 |
| 0.0100 | 25 | 3.5 | 7.17 | 35.0 | 34.0 | 13 | 3.5 | 3.6 | 17 |
| 0.0113 | 27 | 3.7 | 7.17 | 35.0 | 34.0 | 13 | 3.7 | 3.6 | 17 |
| 0.0125 | 28 | 3.9 | 7.17 | 35.0 | 34.0 | 14 | 3.9 | 3.6 | 17 |
| 0.0138 | 29 | 4.1 | 7.17 | 35.0 | 34.0 | 15 | 4.1 | 3.6 | 17 |
| 0.0150 | 31 | 4.3 | 7.17 | 35.0 | 34.0 | 15 | 4.3 | 3.6 | 17 |
| 0.0163 | 32 | 4.5 | 7.17 | 35.0 | 34.0 | 16 | 4.5 | 3.6 | 17 |
| 0.0175 | 33 | 4.6 | 7.17 | 35.0 | 34.0 | 17 | 4.6 | 3.6 | 17 |
| 0.0188 | 34 | 4.8 | 7.17 | 35.0 | 34.0 | 17 | 4.8 | 3.6 | 17 |
| 0.0200 | 36 | 5.0 | 7.17 | 35.0 | 34.0 | 18 | 5.0 | 3.6 | 17 |
| 0.0213 | 37 | 5.1 | 7.17 | 35.0 | 34.0 | 18 | 5.1 | 3.6 | 17 |
| 0.0225 | 38 | 5.3 | 7.17 | 35.0 | 34.0 | 19 | 5.3 | 3.6 | 17 |
| 0.0238 | 39 | 5.4 | 7.17 | 35.0 | 34.0 | 19 | 5.4 | 3.6 | 17 |
| 0.0250 | 40 | 5.5 | 7.17 | 35.0 | 34.0 | 20 | 5.5 | 3.6 | 17 |
| 0.0263 | 41 | 5.7 | 7.17 | 35.0 | 34.0 | 20 | 5.7 | 3.6 | 17 |
| 0.0275 | 42 | 5.8 | 7.17 | 35.0 | 34.0 | 21 | 5.8 | 3.6 | 17 |
| 0.0288 | 43 | 5.9 | 7.17 | 35.0 | 34.0 | 21 | 5.9 | 3.6 | 17 |
| 0.0300 | 43 | 6.1 | 7.17 | 35.0 | 34.0 | 22 | 6.1 | 3.6 | 17 |
| 0.0313 | 44 | 6.2 | 7.17 | 35.0 | 34.0 | 22 | 6.2 | 3.6 | 17 |
| 0.0325 | 45 | 6.3 | 7.17 | 35.0 | 34.0 | 23 | 6.3 | 3.6 | 17 |
| 0.0338 | 46 | 6.4 | 7.17 | 35.0 | 34.0 | 23 | 6.4 | 3.6 | 17 |
| 0.0350 | 47 | 6.6 | 7.17 | 35.0 | 34.0 | 23 | 6.6 | 3.6 | 17 |
| 0.0363 | 48 | 6.7 | 7.17 | 35.0 | 34.0 | 24 | 6.7 | 3.6 | 17 |
| 0.0375 | 49 | 6.8 | 7.17 | 35.0 | 34.0 | 24 | 6.8 | 3.6 | 17 |
| 0.0388 | 49 | 6.9 | 7.17 | 35.0 | 34.0 | 25 | 6.9 | 3.6 | 17 |
| 0.0400 | 50 | 7.0 | 7.17 | 35.0 | 34.0 | 25 | 7.0 | 3.6 | 17 |

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

| Channel Slope (ft/ft) | Full Street Width Discharge ($ft^3/s$) | Full Street Width Velocity (ft/s) | Full Street Width Flow Area ($ft^2$) | Full Street Width Wetted Perimeter (ft) | Full Street Width Top Width (ft) | Half Street Width Discharge ($ft^3/s$) | Half Street Width Velocity (ft/s) | Half Street Width Flow Area ($ft^2$) | Half Street Width Top Width (ft) |
|---|---|---|---|---|---|---|---|---|---|
| 0.0050 | 41 | 2.2 | 19.04 | 61.0 | 60.0 | 21 | 2.2 | 9.5 | 30 |
| 0.0063 | 46 | 2.4 | 19.04 | 61.0 | 60.0 | 23 | 2.4 | 9.5 | 30 |
| 0.0075 | 51 | 2.7 | 19.04 | 61.0 | 60.0 | 25 | 2.7 | 9.5 | 30 |
| 0.0088 | 55 | 2.9 | 19.04 | 61.0 | 60.0 | 27 | 2.9 | 9.5 | 30 |
| 0.0100 | 58 | 3.1 | 19.04 | 61.0 | 60.0 | 29 | 3.1 | 9.5 | 30 |
| 0.0113 | 62 | 3.3 | 19.04 | 61.0 | 60.0 | 31 | 3.2 | 9.5 | 30 |
| 0.0125 | 65 | 3.4 | 19.04 | 61.0 | 60.0 | 33 | 3.4 | 9.5 | 30 |
| 0.0138 | 69 | 3.6 | 19.04 | 61.0 | 60.0 | 34 | 3.6 | 9.5 | 30 |
| 0.0150 | 72 | 3.8 | 19.04 | 61.0 | 60.0 | 36 | 3.8 | 9.5 | 30 |
| 0.0163 | 75 | 3.9 | 19.04 | 61.0 | 60.0 | 37 | 3.9 | 9.5 | 30 |
| 0.0175 | 77 | 4.1 | 19.04 | 61.0 | 60.0 | 39 | 4.1 | 9.5 | 30 |
| 0.0188 | 80 | 4.2 | 19.04 | 61.0 | 60.0 | 40 | 4.2 | 9.5 | 30 |
| 0.0200 | 83 | 4.3 | 19.04 | 61.0 | 60.0 | 41 | 4.3 | 9.5 | 30 |
| 0.0213 | 85 | 4.5 | 19.04 | 61.0 | 60.0 | 42 | 4.5 | 9.5 | 30 |
| 0.0225 | 88 | 4.6 | 19.04 | 61.0 | 60.0 | 44 | 4.6 | 9.5 | 30 |
| 0.0238 | 90 | 4.7 | 19.04 | 61.0 | 60.0 | 45 | 4.7 | 9.5 | 30 |
| 0.0250 | 92 | 4.9 | 19.04 | 61.0 | 60.0 | 46 | 4.8 | 9.5 | 30 |
| 0.0263 | 95 | 5.0 | 19.04 | 61.0 | 60.0 | 47 | 5.0 | 9.5 | 30 |
| 0.0275 | 97 | 5.1 | 19.04 | 61.0 | 60.0 | 48 | 5.1 | 9.5 | 30 |
| 0.0288 | 99 | 5.2 | 19.04 | 61.0 | 60.0 | 49 | 5.2 | 9.5 | 30 |
| 0.0300 | 101 | 5.3 | 19.04 | 61.0 | 60.0 | 50 | 5.3 | 9.5 | 30 |
| 0.0313 | 103 | 5.4 | 19.04 | 61.0 | 60.0 | 51 | 5.4 | 9.5 | 30 |
| 0.0325 | 105 | 5.5 | 19.04 | 61.0 | 60.0 | 52 | 5.5 | 9.5 | 30 |
| 0.0338 | 107 | 5.6 | 19.04 | 61.0 | 60.0 | 53 | 5.6 | 9.5 | 30 |
| 0.0350 | 109 | 5.7 | 19.04 | 61.0 | 60.0 | 54 | 5.7 | 9.5 | 30 |
| 0.0363 | 111 | 5.8 | 19.04 | 61.0 | 60.0 | 55 | 5.8 | 9.5 | 30 |
| 0.0375 | 113 | 5.9 | 19.04 | 61.0 | 60.0 | 56 | 5.9 | 9.5 | 30 |
| 0.0388 | 115 | 6.0 | 19.04 | 61.0 | 60.0 | 57 | 6.0 | 9.5 | 30 |
| 0.0400 | 117 | 6.1 | 19.04 | 61.0 | 60.0 | 58 | 6.1 | 9.5 | 30 |

| Street Flows Veritcal Curb<br>(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 | 14 | 2.2 | 6.15 | 35.0 | 34.0 | 6.7 | 2.2 | 3.0 | 17 |
| 0.0063 | 15 | 2.5 | 6.15 | 35.0 | 34.0 | 7.5 | 2.5 | 3.0 | 17 |
| 0.0075 | 17 | 2.7 | 6.15 | 35.0 | 34.0 | 8.2 | 2.7 | 3.0 | 17 |
| 0.0088 | 18 | 3.0 | 6.15 | 35.0 | 34.0 | 8.8 | 2.9 | 3.0 | 17 |
| 0.0100 | 19 | 3.2 | 6.15 | 35.0 | 34.0 | 9.4 | 3.1 | 3.0 | 17 |
| 0.0113 | 21 | 3.4 | 6.15 | 35.0 | 34.0 | 10 | 3.3 | 3.0 | 17 |
| 0.0125 | 22 | 3.5 | 6.15 | 35.0 | 34.0 | 11 | 3.5 | 3.0 | 17 |
| 0.0138 | 23 | 3.7 | 6.15 | 35.0 | 34.0 | 11 | 3.7 | 3.0 | 17 |
| 0.0150 | 24 | 3.9 | 6.15 | 35.0 | 34.0 | 12 | 3.8 | 3.0 | 17 |
| 0.0163 | 25 | 4.0 | 6.15 | 35.0 | 34.0 | 12 | 4.0 | 3.0 | 17 |
| 0.0175 | 26 | 4.2 | 6.15 | 35.0 | 34.0 | 12 | 4.1 | 3.0 | 17 |
| 0.0188 | 27 | 4.3 | 6.15 | 35.0 | 34.0 | 13 | 4.3 | 3.0 | 17 |
| 0.0200 | 28 | 4.5 | 6.15 | 35.0 | 34.0 | 13 | 4.4 | 3.0 | 17 |
| 0.0213 | 28 | 4.6 | 6.15 | 35.0 | 34.0 | 14 | 4.6 | 3.0 | 17 |
| 0.0225 | 29 | 4.8 | 6.15 | 35.0 | 34.0 | 14 | 4.7 | 3.0 | 17 |
| 0.0238 | 30 | 4.9 | 6.15 | 35.0 | 34.0 | 15 | 4.8 | 3.0 | 17 |
| 0.0250 | 31 | 5.0 | 6.15 | 35.0 | 34.0 | 15 | 4.9 | 3.0 | 17 |
| 0.0263 | 32 | 5.1 | 6.15 | 35.0 | 34.0 | 15 | 5.1 | 3.0 | 17 |
| 0.0275 | 32 | 5.3 | 6.15 | 35.0 | 34.0 | 16 | 5.2 | 3.0 | 17 |
| 0.0288 | 33 | 5.4 | 6.15 | 35.0 | 34.0 | 16 | 5.3 | 3.0 | 17 |
| 0.0300 | 34 | 5.5 | 6.15 | 35.0 | 34.0 | 16 | 5.4 | 3.0 | 17 |
| 0.0313 | 34 | 5.6 | 6.15 | 35.0 | 34.0 | 17 | 5.5 | 3.0 | 17 |
| 0.0325 | 35 | 5.7 | 6.15 | 35.0 | 34.0 | 17 | 5.6 | 3.0 | 17 |
| 0.0338 | 36 | 5.8 | 6.15 | 35.0 | 34.0 | 17 | 5.7 | 3.0 | 17 |
| 0.0350 | 36 | 5.9 | 6.15 | 35.0 | 34.0 | 18 | 5.9 | 3.0 | 17 |
| 0.0363 | 37 | 6.0 | 6.15 | 35.0 | 34.0 | 18 | 6.0 | 3.0 | 17 |
| 0.0375 | 38 | 6.1 | 6.15 | 35.0 | 34.0 | 18 | 6.1 | 3.0 | 17 |
| 0.0388 | 38 | 6.2 | 6.15 | 35.0 | 34.0 | 19 | 6.2 | 3.0 | 17 |
| 0.0400 | 39 | 6.3 | 6.15 | 35.0 | 34.0 | 19 | 6.3 | 3.0 | 17 |

# Appendix C - HEC-HMS Data

# Input Data

## Windingwalk Filing 2

| BASIN | AREA (acre) | AREA (mi²) | CURVE NO. | PERCENT IMPERV. | LAG TIME (min) | |
|---|---|---|---|---|---|---|
| HISTORIC | | | | | | |
| HG07 | 63 | 0.0984 | 61.0 | 0% | 28.3 | ◆◆ |
| HG08 | 85 | 0.1328 | 61.0 | 0% | 22.9 | ◆◆ |
| HG09 | 114 | 0.1781 | 61.0 | 0% | 35.6 | ◆◆ |
| HG10 | 88 | 0.1375 | 61.0 | 0% | 61.4 | ◆◆ |
| HG11 | 131 | 0.2047 | 61.0 | 0% | 40.4 | ◆◆ |
| HG12 | 83 | 0.1297 | 61.0 | 0% | 32.0 | ◆◆ |
| HG13 | 54 | 0.0844 | 63.1 | 7% | 21.2 | ◆◆ |
| HG14 | 147 | 0.2297 | 61.0 | 0% | 45.1 | ◆◆ |
| HG15 | 164 | 0.2563 | 61.0 | 0% | 65.1 | ◆◆ |
| HG17 | 85 | 0.1328 | 61.9 | 2% | 29.9 | ◆◆ |
| HG18 | 21 | 0.0328 | 61.0 | 0% | 14.1 | ◆◆ |
| HG19 | 3 | 0.0047 | 61.0 | 0% | 6.1 | ◆◆ |
| HG20 | 1 | 0.0016 | 61.0 | 0% | 6.9 | ◆◆ |
| HG21 | 14 | 0.0219 | 61.0 | 0% | 13.8 | ◆◆ |
| HH01 | 63 | 0.0984 | 61.0 | 0% | 16.6 | ◆◆ |

| BASIN | AREA (acre) | AREA (mi²) | CURVE NO. | PERCENT IMPERV. | LAG TIME (min) | |
|---|---|---|---|---|---|---|
| INTERIM | | | | | | |
| FG08A | 48 | 0.075 | 76.8 | 43% | 13.3 | ✓ |
| FG08B | 40 | 0.063 | 76.7 | 40% | 16.6 | ✓ |
| FG09 | 31 | 0.048 | 71.7 | 27% | 20.8 | ●● |
| HG10 | 30 | 0.047 | 63.2 | 6% | 23.1 | |
| FG11 | 40 | 0.063 | 78.2 | 44% | 23.2 | ● |
| FG12 | 21 | 0.033 | 80.0 | 47% | 16.1 | ❖❖ |
| FG13 | 42 | 0.066 | 66.9 | 14% | 29.6 | |
| HG15 | 19 | 0.030 | 62.1 | 3% | 35.0 | |
| FG15a | 10 | 0.016 | 78.7 | 44% | 11.2 | ❖ |
| FG16 | 50 | 0.077 | 78.8 | 45% | 13.0 | ❖ |
| FG17a | 44 | 0.069 | 76.5 | 39% | 14.4 | ✓✓ |
| FG17b | 14 | 0.021 | 79.9 | 47% | 11.4 | ✓✓ |
| FG17c | 20 | 0.031 | 65.2 | 10% | 11.8 | ✓✓ |
| **FG18** | **41** | **0.064** | **73.2** | **28%** | **29.9** | ✧ |
| **FG19** | **34** | **0.053** | **80.3** | **48%** | **15.3** | ✓✓ |
| FG19a | 5 | 0.008 | 75.2 | 36% | 16.4 | |
| FG20 | 7 | 0.011 | 92.9 | 86% | 10.1 | |
| **FH01** | **86** | **0.135** | **74.3** | **31%** | **30.9** | |
| FH02 | 6 | 0.009 | 71.3 | 25% | 14.6 | |
| FH03 | 5 | 0.008 | 80.7 | 52% | 14.4 | |

| | |
|---|---|
| ✧ | From Meridian Ranch Drainage Reports (Windingwalk Rational Calcs., September 2017) |
| ◆ | From Retrofit Drainage Analysis For Bennett Regional Detention Pond, Jun 2014) |
| ◆◆ | From Approved Meridian Ranch MDDP, Aug 2015 |
| ✧✧ | From Approved Meridian Ranch Final Drainage Reports (Stonebridge Filing 2, Oct 2016) |
| ■ | From Estates Filing 2 Final Drainage Report, July 2013 |
| ■■ | From Estates Filing 3 Final Drainage Report, Nov 2015 |
| ❖ | From Meridian Ranch Filing 11b Approved Final Drainage Report, Nov 2014 |
| ❖❖ | From Meridian Ranch Filing 3 Approved Final Drainage Report, Aug 2012 |
| ● | From Meridian Ranch Filing 7 Approved Final Drainage Report, Aug 2012 |
| ●● | From Meridian Ranch Filing 8 Approved Final Drainage Report, Feb 2015 |
| ✓ | From Meridian Ranch Filing 9 Approved Final Drainage Report, July 2015 |
| ✓✓ | From Stonebridge Filing 3 Approved Final Drainage Report, April 2017 |
| ◆◆◆ | From Approved Meridian Ranch MDDP, Dec 2017 |

| BASIN | AREA (acre) | AREA (mi²) | CURVE NO. | PERCENT IMPERV. | LAG TIME (min) | |
|---|---|---|---|---|---|---|
| FUTURE | | | | | | |
| FG08A | 48 | 0.075 | 76.8 | 43% | 13.3 | ✓ |
| FG08B | 40 | 0.063 | 76.7 | 40% | 16.6 | ✓ |
| FG09 | 31 | 0.048 | 71.7 | 27% | 20.8 | ●● |
| FG10 | 43 | 0.067 | 72.7 | 29% | 41.8 | ◆◆◆ |
| FG11 | 40 | 0.063 | 78.2 | 44% | 23.2 | ● |
| FG12 | 21 | 0.033 | 80.0 | 47% | 16.1 | ❖❖ |
| FG13 | 42 | 0.066 | 66.9 | 14% | 29.6 | |
| FG14 | 21 | 0.033 | 77.5 | 42% | 20.9 | |
| FG15 | 65 | 0.102 | 72.9 | 30% | 25.9 | ◆◆◆ |
| FG15a | 10 | 0.016 | 78.7 | 44% | 11.2 | ❖ |
| FG16 | 50 | 0.077 | 78.8 | 45% | 13.0 | ❖ |
| FG17a | 44 | 0.069 | 76.5 | 39% | 14.4 | ✓✓ |
| FG17b | 14 | 0.021 | 79.9 | 47% | 11.4 | ✓✓ |
| FG17c | 20 | 0.031 | 65.2 | 10% | 11.8 | ✓✓ |
| **FG18** | **41** | **0.064** | **73.5** | **31%** | **29.9** | ✧ |
| **FG19** | **34** | **0.053** | **80.3** | **48%** | **15.3** | ✓✓ |
| FG19a | 4 | 0.007 | 71.4 | 26% | 0.0 | |
| FG20 | 7 | 0.011 | 92.9 | 86% | 10.1 | |
| **FH01** | **86** | **0.134** | **76.2** | **38%** | **23.4** | ◆◆◆ |
| FH02 | 6 | 0.009 | 71.3 | 25% | 14.6 | ◆◆◆ |
| FH03 | 5 | 0.008 | 80.7 | 52% | 14.4 | |

Highlighted green rows reference Drainage Elements associated with WindingWalk Filing 2

**NOAA Atlas 14, Volume 8, Version 2**
**Location name: Peyton, Colorado, USA***
**Latitude: 38.9783°, Longitude: -104.6842°**
**Elevation: 7084.14 ft****
* source: ESRI Maps
** source: USGS

## POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery 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) | 0.878 (0.606-1.23) | 1.02 (0.680-1.45) | 1.14 (0.737-1.65) |
| 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 | 0.606 (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 (1.85-4.20) |
| 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 (2.46-5.58) |
| 2-hr | 0.948 (0.762-1.18) | 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 (1.98-3.51) | 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 (2.16-3.83) | 3.35 (2.47-4.59) | 3.90 (2.75-5.47) | 4.68 (3.16-6.75) | 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) | 2.75 (2.19-3.65) | 3.29 (2.58-4.38) | 3.88 (2.86-5.28) | 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 (2.92-4.98) | 4.42 (3.31-5.97) | 5.15 (3.70-7.14) | 6.22 (4.30-8.86) | 7.10 (4.75-10.1) |
| 24-hr | 1.61 (1.33-1.95) | 1.88 (1.56-2.29) | 2.39 (1.97-2.92) | 2.88 (2.35-3.52) | 3.63 (2.91-4.69) | 4.27 (3.34-5.56) | 4.98 (3.75-6.66) | 5.75 (4.17-7.90) | 6.87 (4.76-9.70) | 7.79 (5.26-11.1) |

| HISTORIC 100-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| HG07 | 0.0984 | 47 | 01Jul2015, 12:24 | 7 |
| HG07-G11 | 0.0984 | 47 | 01Jul2015, 12:30 | 7 |
| HG08 | 0.1328 | 73 | 01Jul2015, 12:18 | 10 |
| G11 | 0.2312 | 115 | 01Jul2015, 12:24 | 17 |
| G11-G12 | 0.2312 | 114 | 01Jul2015, 12:30 | 16 |
| HG09 | 0.1781 | 73 | 01Jul2015, 12:30 | 13 |
| G12 | 0.4093 | 187 | 01Jul2015, 12:30 | 29 |
| G12-H08 | 0.4093 | 183 | 01Jul2015, 12:36 | 28 |
| **HG10** | **0.1375** | **39** | **01Jul2015, 13:06** | **10** |
| **H08** | **0.5468** | **216** | **01Jul2015, 12:42** | **38** |
| **HG11** | **0.2047** | **77** | **01Jul2015, 12:36** | **15** |
| **H09** | **0.2047** | **77** | **01Jul2015, 12:36** | **15** |
| **HH01** | **0.0984** | **65** | **01Jul2015, 12:12** | **7** |
| **H12** | **0.0984** | **65** | **01Jul2015, 12:12** | **7** |
| **HG12** | **0.1297** | **57** | **01Jul2015, 12:30** | **9** |
| **H10** | **0.1297** | **57** | **01Jul2015, 12:30** | **9** |

| HISTORIC 50-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{50}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{50}$ (AC. FT.) |
| HG07 | 0.0984 | 31 | 01Jul2015, 12:24 | 5 |
| HG07-G11 | 0.0984 | 31 | 01Jul2015, 12:30 | 5 |
| HG08 | 0.1328 | 48 | 01Jul2015, 12:18 | 7 |
| G11 | 0.2312 | 75 | 01Jul2015, 12:24 | 12 |
| G11-G12 | 0.2312 | 75 | 01Jul2015, 12:30 | 11 |
| HG09 | 0.1781 | 48 | 01Jul2015, 12:36 | 9 |
| G12 | 0.4093 | 122 | 01Jul2015, 12:30 | 20 |
| G12-H08 | 0.4093 | 121 | 01Jul2015, 12:42 | 20 |
| **HG10** | **0.1375** | **26** | **01Jul2015, 13:06** | **7** |
| **H08** | **0.5468** | **142** | **01Jul2015, 12:42** | **27** |
| **HG11** | **0.2047** | **51** | **01Jul2015, 12:42** | **10** |
| **H09** | **0.2047** | **51** | **01Jul2015, 12:42** | **10** |
| **HH01** | **0.0984** | **43** | **01Jul2015, 12:12** | **5** |
| **H12** | **0.0984** | **43** | **01Jul2015, 12:12** | **5** |
| **HG12** | **0.1297** | **38** | **01Jul2015, 12:30** | **7** |
| **H10** | **0.1297** | **38** | **01Jul2015, 12:30** | **7** |

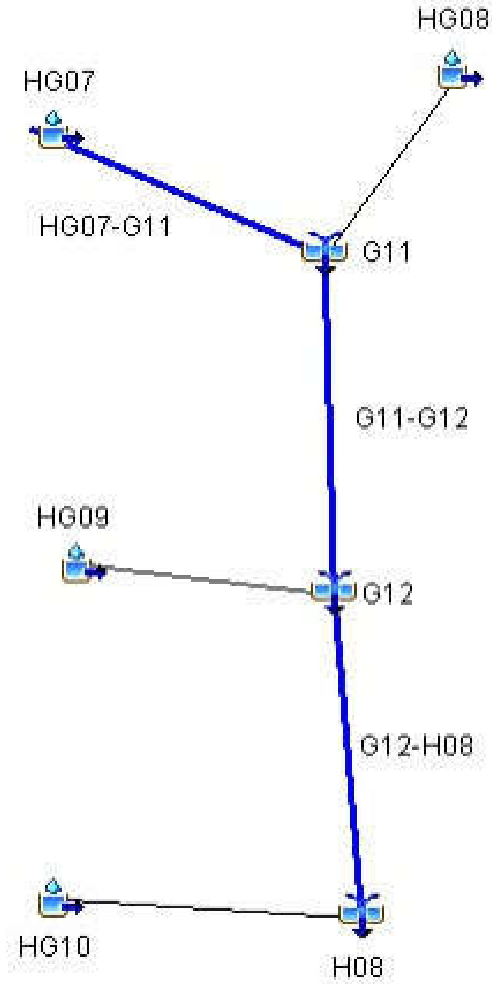
Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| HISTORIC 25-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{25}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{25}$ (AC. FT.) |
| HG07 | 0.0984 | 18 | 01Jul2015, 12:30 | 3.3 |
| HG07-G11 | 0.0984 | 18 | 01Jul2015, 12:30 | 3.2 |
| HG08 | 0.1328 | 28 | 01Jul2015, 12:18 | 4.4 |
| G11 | 0.2312 | 44 | 01Jul2015, 12:24 | 7.6 |
| G11-G12 | 0.2312 | 44 | 01Jul2015, 12:30 | 7.5 |
| HG09 | 0.1781 | 29 | 01Jul2015, 12:36 | 5.9 |
| G12 | 0.4093 | 72 | 01Jul2015, 12:36 | 13.4 |
| G12-H08 | 0.4093 | 71 | 01Jul2015, 12:48 | 13.0 |
| **HG10** | **0.1375** | **16** | **01Jul2015, 13:06** | **4.5** |
| **H08** | **0.5468** | **85** | **01Jul2015, 12:48** | **17.5** |
| **HG11** | **0.2047** | **30** | **01Jul2015, 12:42** | **6.7** |
| **H09** | **0.2047** | **30** | **01Jul2015, 12:42** | **6.7** |
| **HH01** | **0.0984** | **25** | **01Jul2015, 12:12** | **3.3** |
| **H12** | **0.0984** | **25** | **01Jul2015, 12:12** | **3.3** |
| **HG12** | **0.1297** | **22** | **01Jul2015, 12:30** | **4.3** |
| **H10** | **0.1297** | **22** | **01Jul2015, 12:30** | **4.3** |

| HISTORIC 10-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{10}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{10}$ (AC. FT.) |
| HG07 | 0.0984 | 7 | 01Jul2015, 12:30 | 1.6 |
| HG07-G11 | 0.0984 | 7 | 01Jul2015, 12:36 | 1.6 |
| HG08 | 0.1328 | 11 | 01Jul2015, 12:24 | 2.2 |
| G11 | 0.2312 | 17 | 01Jul2015, 12:30 | 3.9 |
| G11-G12 | 0.2312 | 17 | 01Jul2015, 12:42 | 3.8 |
| HG09 | 0.1781 | 11 | 01Jul2015, 12:42 | 3.0 |
| G12 | 0.4093 | 28 | 01Jul2015, 12:42 | 6.8 |
| G12-H08 | 0.4093 | 28 | 01Jul2015, 13:00 | 6.5 |
| **HG10** | **0.1375** | **7** | **01Jul2015, 13:18** | **2.2** |
| **H08** | **0.5468** | **34** | **01Jul2015, 13:00** | **8.8** |
| **HG11** | **0.2047** | **12** | **01Jul2015, 12:48** | **3.4** |
| **H09** | **0.2047** | **12** | **01Jul2015, 12:48** | **3.4** |
| **HH01** | **0.0984** | **9** | **01Jul2015, 12:18** | **1.7** |
| **H12** | **0.0984** | **9** | **01Jul2015, 12:18** | **1.7** |
| **HG12** | **0.1297** | **9** | **01Jul2015, 12:36** | **2.2** |
| **H10** | **0.1297** | **9** | **01Jul2015, 12:36** | **2.2** |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

GIECK. HISTORIC

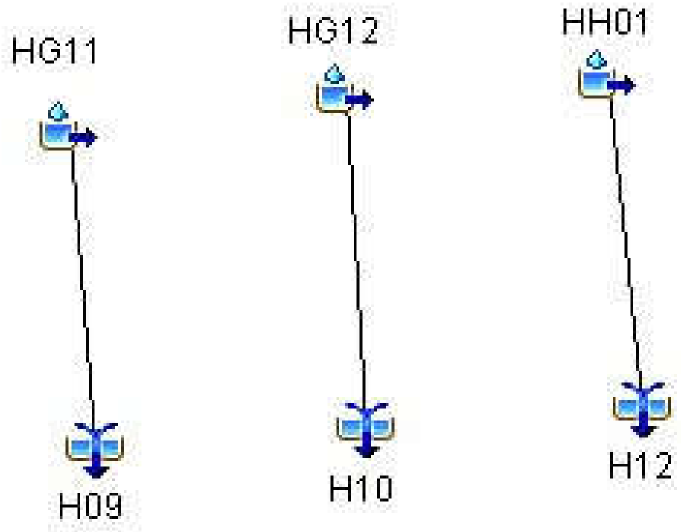


| HISTORIC 5-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_5$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_5$ (AC. FT.) |
| HG07 | 0.0984 | 2.4 | 01Jul2015, 12:42 | 0.8 |
| HG07-G11 | 0.0984 | 2.4 | 01Jul2015, 12:48 | 0.8 |
| HG08 | 0.1328 | 3.6 | 01Jul2015, 12:30 | 1.1 |
| G11 | 0.2312 | 5.7 | 01Jul2015, 12:42 | 2 |
| G11-G12 | 0.2312 | 5.6 | 01Jul2015, 12:54 | 1.9 |
| HG09 | 0.1781 | 4.1 | 01Jul2015, 12:48 | 1.5 |
| G12 | 0.4093 | 9.7 | 01Jul2015, 12:54 | 3.4 |
| G12-H08 | 0.4093 | 9.7 | 01Jul2015, 13:18 | 3.3 |
| **HG10** | **0.1375** | **2.6** | **01Jul2015, 13:30** | **1.1** |
| **H08** | **0.5468** | **12.1** | **01Jul2015, 13:18** | **4.4** |
| **HG11** | **0.2047** | **4.5** | **01Jul2015, 13:00** | **1.7** |
| **H09** | **0.2047** | **4.5** | **01Jul2015, 13:00** | **1.7** |
| **HH01** | **0.0984** | **3** | **01Jul2015, 12:18** | **0.9** |
| **H12** | **0.0984** | **3** | **01Jul2015, 12:18** | **0.9** |
| **HG12** | **0.1297** | **3.1** | **01Jul2015, 12:42** | **1.1** |
| **H10** | **0.1297** | **3.1** | **01Jul2015, 12:42** | **1.1** |

| HISTORIC 2-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_2$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_2$ (AC. FT.) |
| HG07 | 0.0984 | 0.40 | 01Jul2015, 13:42 | 0.3 |
| HG07-G11 | 0.0984 | 0.40 | 01Jul2015, 14:00 | 0.3 |
| HG08 | 0.1328 | 0.50 | 01Jul2015, 13:36 | 0.4 |
| G11 | 0.2312 | 0.90 | 01Jul2015, 13:48 | 0.6 |
| G11-G12 | 0.2312 | 0.90 | 01Jul2015, 14:12 | 0.6 |
| HG09 | 0.1781 | 0.70 | 01Jul2015, 13:54 | 0.5 |
| G12 | 0.4093 | 1.60 | 01Jul2015, 14:06 | 1.0 |
| G12-H08 | 0.4093 | 1.60 | 01Jul2015, 14:54 | 0.9 |
| **HG10** | **0.1375** | **0.50** | **01Jul2015, 14:42** | **0.3** |
| **H08** | **0.5468** | **2.10** | **01Jul2015, 14:48** | **1.3** |
| **HG11** | **0.2047** | **0.80** | **01Jul2015, 14:06** | **0.5** |
| **H09** | **0.2047** | **0.80** | **01Jul2015, 14:06** | **0.5** |
| **HH01** | **0.0984** | **0.40** | **01Jul2015, 13:24** | **0.3** |
| **H12** | **0.0984** | **0.40** | **01Jul2015, 13:24** | **0.3** |
| **HG12** | **0.1297** | **0.50** | **01Jul2015, 13:48** | **0.3** |
| **H10** | **0.1297** | **0.50** | **01Jul2015, 13:48** | **0.3** |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

MISC. HISTORIC



| INTERIM 100-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 117 | 01Jul2015, 12:06 | 10 |
| FG08A-G05 | 0.0750 | 111 | 01Jul2015, 12:12 | 10 |
| FG08B | 0.0630 | 87 | 01Jul2015, 12:12 | 9 |
| FG08B-G05 | 0.0630 | 85 | 01Jul2015, 12:12 | 9 |
| FG11 | 0.0625 | 76 | 01Jul2015, 12:18 | 9 |
| FG09 | 0.0484 | 49 | 01Jul2015, 12:12 | 6 |
| FG09-G05 | 0.0484 | 48 | 01Jul2015, 12:18 | 6 |
| HG10 | 0.0467 | 29 | 01Jul2015, 12:18 | 4 |
| G05 | 0.2956 | 344 | 01Jul2015, 12:12 | 37 |
| FG13 | 0.0661 | 44 | 01Jul2015, 12:24 | 6 |
| FG12 | 0.0328 | 51 | 01Jul2015, 12:12 | 5 |
| POND D | 0.3945 | 107 | 01Jul2015, 13:00 | 39 |
| POND D-G17 | 0.3945 | 107 | 01Jul2015, 13:00 | 39 |
| HG15 | 0.0297 | 13 | 01Jul2015, 12:30 | 2 |
| FG15a | 0.0156 | 28 | 01Jul2015, 12:06 | 2 |
| G17 | 0.4398 | 119 | 01Jul2015, 12:54 | 43 |
| G17-G18 | 0.4398 | 119 | 01Jul2015, 12:54 | 43 |
| FG16 | 0.0773 | 127 | 01Jul2015, 12:06 | 11 |
| G18 | 0.5171 | 167 | 01Jul2015, 12:06 | 54 |
| G18-POND E | 0.5171 | 161 | 01Jul2015, 12:06 | 54 |
| HG30 | 0.1844 | 50 | 01Jul2015, 13:06 | 13 |
| FG30-PONDHS | 0.1844 | 50 | 01Jul2015, 13:12 | 13 |
| FG31 | 0.0922 | 118 | 01Jul2015, 12:18 | 14 |
| POND HS | 0.2766 | 102 | 01Jul2015, 12:36 | 27 |
| FG17a | 0.0694 | 108 | 01Jul2015, 12:06 | 10 |
| FG17a-POND E | 0.0694 | 106 | 01Jul2015, 12:06 | 10 |
| **FG18** | **0.0644** | **56** | **01Jul2015, 12:24** | **8** |
| FG18-POND E | 0.0644 | 56 | 01Jul2015, 12:24 | 8 |
| FG19 | 0.0527 | 85 | 01Jul2015, 12:06 | 8 |
| FG17c | 0.0313 | 32 | 01Jul2015, 12:06 | 3 |
| FG17b | 0.0214 | 40 | 01Jul2015, 12:06 | 3 |
| **POND E** | **1.0329** | **199** | **01Jul2015, 13:48** | **89** |
| **H08** | **1.0329** | **173** | **01Jul2015, 13:48** | **78** |
| **H09** | **0.0000** | **25** | **01Jul2015, 13:48** | **11** |
| **FH01** | **0.1348** | **120** | **01Jul2015, 12:24** | **17** |
| **POND H** | **0.1348** | **47** | **01Jul2015, 13:06** | **14** |
| **FH02** | **0.0091** | **11** | **01Jul2015, 12:06** | **1** |
| FH03 | 0.0081 | 14 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1520 | 50 | 01Jul2015, 13:06 | 16 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| INTERIM 50-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 91 | 01Jul2015, 12:06 | 8 |
| FG08A-G05 | 0.0750 | 86 | 01Jul2015, 12:12 | 8 |
| FG08B | 0.0630 | 67 | 01Jul2015, 12:12 | 7 |
| FG08B-G05 | 0.0630 | 66 | 01Jul2015, 12:12 | 7 |
| FG11 | 0.0625 | 59 | 01Jul2015, 12:18 | 7 |
| FG09 | 0.0484 | 36 | 01Jul2015, 12:12 | 4 |
| FG09-G05 | 0.0484 | 36 | 01Jul2015, 12:18 | 4 |
| HG10 | 0.0467 | 20 | 01Jul2015, 12:18 | 3 |
| G05 | 0.2956 | 261 | 01Jul2015, 12:12 | 29 |
| FG13 | 0.0661 | 31 | 01Jul2015, 12:24 | 5 |
| FG12 | 0.0328 | 40 | 01Jul2015, 12:12 | 4 |
| POND D | 0.3945 | 70 | 01Jul2015, 13:12 | 29 |
| POND D-G17 | 0.3945 | 69 | 01Jul2015, 13:12 | 29 |
| HG15 | 0.0297 | 9 | 01Jul2015, 12:36 | 2 |
| FG15a | 0.0156 | 22 | 01Jul2015, 12:06 | 2 |
| G17 | 0.4398 | 77 | 01Jul2015, 13:06 | 32 |
| G17-G18 | 0.4398 | 77 | 01Jul2015, 13:06 | 32 |
| FG16 | 0.0773 | 98 | 01Jul2015, 12:06 | 9 |
| G18 | 0.5171 | 126 | 01Jul2015, 12:06 | 40 |
| G18-POND E | 0.5171 | 121 | 01Jul2015, 12:06 | 40 |
| HG30 | 0.1844 | 33 | 01Jul2015, 13:12 | 9 |
| FG30-PONDHS | 0.1844 | 33 | 01Jul2015, 13:18 | 9 |
| FG31 | 0.0922 | 92 | 01Jul2015, 12:18 | 11 |
| POND HS | 0.2766 | 62 | 01Jul2015, 12:48 | 20 |
| FG17a | 0.0694 | 84 | 01Jul2015, 12:06 | 8 |
| FG17a-POND E | 0.0694 | 82 | 01Jul2015, 12:06 | 8 |
| **FG18** | **0.0644** | **42** | **01Jul2015, 12:24** | **6** |
| FG18-POND E | 0.0644 | 42 | 01Jul2015, 12:24 | 6 |
| FG19 | 0.0527 | 67 | 01Jul2015, 12:06 | 6 |
| FG17c | 0.0313 | 22 | 01Jul2015, 12:06 | 2 |
| FG17b | 0.0214 | 31 | 01Jul2015, 12:06 | 3 |
| **POND E** | **1.0329** | **119** | **01Jul2015, 14:24** | **62** |
| **H08** | **1.0329** | **107** | **01Jul2015, 14:24** | **54** |
| **H09** | **0.0000** | **12** | **01Jul2015, 14:24** | **8** |
| **FH01** | **0.1348** | **91** | **01Jul2015, 12:24** | **13** |
| **POND H** | **0.1348** | **26** | **01Jul2015, 13:24** | **10** |
| **FH02** | **0.0091** | **8** | **01Jul2015, 12:06** | **1** |
| FH03 | 0.0081 | 11 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1520 | 28 | 01Jul2015, 13:18 | 12 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| INTERIM 25-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 67 | 01Jul2015, 12:06 | 6 |
| FG08A-G05 | 0.0750 | 65 | 01Jul2015, 12:12 | 6 |
| FG08B | 0.0630 | 50 | 01Jul2015, 12:12 | 5 |
| FG08B-G05 | 0.0630 | 49 | 01Jul2015, 12:12 | 5 |
| FG11 | 0.0625 | 45 | 01Jul2015, 12:18 | 5 |
| FG09 | 0.0484 | 26 | 01Jul2015, 12:18 | 3 |
| FG09-G05 | 0.0484 | 25 | 01Jul2015, 12:18 | 3 |
| HG10 | 0.0467 | 12 | 01Jul2015, 12:18 | 2 |
| G05 | 0.2956 | 190 | 01Jul2015, 12:12 | 21 |
| FG13 | 0.0661 | 20 | 01Jul2015, 12:24 | 3 |
| FG12 | 0.0328 | 31 | 01Jul2015, 12:12 | 3 |
| POND D | 0.3945 | 34 | 01Jul2015, 13:42 | 20 |
| POND D-G17 | 0.3945 | 34 | 01Jul2015, 13:42 | 20 |
| HG15 | 0.0297 | 5 | 01Jul2015, 12:36 | 1 |
| FG15a | 0.0156 | 17 | 01Jul2015, 12:06 | 1 |
| G17 | 0.4398 | 38 | 01Jul2015, 13:30 | 23 |
| G17-G18 | 0.4398 | 38 | 01Jul2015, 13:36 | 22 |
| FG16 | 0.0773 | 74 | 01Jul2015, 12:06 | 7 |
| G18 | 0.5171 | 93 | 01Jul2015, 12:06 | 29 |
| G18-POND E | 0.5171 | 89 | 01Jul2015, 12:06 | 29 |
| HG30 | 0.1844 | 20 | 01Jul2015, 13:12 | 6 |
| FG30-PONDHS | 0.1844 | 20 | 01Jul2015, 13:24 | 6 |
| FG31 | 0.0922 | 71 | 01Jul2015, 12:18 | 9 |
| POND HS | 0.2766 | 40 | 01Jul2015, 13:00 | 14 |
| FG17a | 0.0694 | 63 | 01Jul2015, 12:06 | 6 |
| FG17a-POND E | 0.0694 | 61 | 01Jul2015, 12:06 | 6 |
| **FG18** | **0.0644** | **30** | **01Jul2015, 12:24** | **4** |
| FG18-POND E | 0.0644 | 30 | 01Jul2015, 12:24 | 4 |
| FG19 | 0.0527 | 51 | 01Jul2015, 12:06 | 5 |
| FG17c | 0.0313 | 15 | 01Jul2015, 12:06 | 1 |
| FG17b | 0.0214 | 24 | 01Jul2015, 12:06 | 2 |
| **POND E** | **1.0329** | **61** | **01Jul2015, 15:18** | **40** |
| **H08** | **1.0329** | **54** | **01Jul2015, 15:18** | **33** |
| **H09** | **0.0000** | **7** | **01Jul2015, 15:18** | **6** |
| **FH01** | **0.1348** | **66** | **01Jul2015, 12:24** | **10** |
| **POND H** | **0.1348** | **15** | **01Jul2015, 13:42** | **7** |
| **FH02** | **0.0091** | **6** | **01Jul2015, 12:12** | **1** |
| FH03 | 0.0081 | 8 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1520 | 16 | 01Jul2015, 13:36 | 8 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| INTERIM 10-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 42 | 01Jul2015, 12:06 | 4 |
| FG08A-G05 | 0.0750 | 41 | 01Jul2015, 12:12 | 4 |
| FG08B | 0.0630 | 31 | 01Jul2015, 12:12 | 3 |
| FG08B-G05 | 0.0630 | 30 | 01Jul2015, 12:12 | 3 |
| FG11 | 0.0625 | 29 | 01Jul2015, 12:18 | 4 |
| FG09 | 0.0484 | 15 | 01Jul2015, 12:18 | 2 |
| FG09-G05 | 0.0484 | 14 | 01Jul2015, 12:18 | 2 |
| HG10 | 0.0467 | 5 | 01Jul2015, 12:24 | 1 |
| G05 | 0.2956 | 115 | 01Jul2015, 12:12 | 13 |
| FG13 | 0.0661 | 10 | 01Jul2015, 12:30 | 2 |
| FG12 | 0.0328 | 20 | 01Jul2015, 12:12 | 2 |
| POND D | 0.3945 | 15 | 01Jul2015, 14:24 | 12 |
| POND D-G17 | 0.3945 | 15 | 01Jul2015, 14:30 | 12 |
| HG15 | 0.0297 | 2 | 01Jul2015, 12:42 | 1 |
| FG15a | 0.0156 | 11 | 01Jul2015, 12:06 | 1 |
| G17 | 0.4398 | 17 | 01Jul2015, 13:36 | 13 |
| G17-G18 | 0.4398 | 17 | 01Jul2015, 13:36 | 13 |
| FG16 | 0.0773 | 47 | 01Jul2015, 12:06 | 4 |
| G18 | 0.5171 | 59 | 01Jul2015, 12:06 | 17 |
| G18-POND E | 0.5171 | 56 | 01Jul2015, 12:12 | 17 |
| HG30 | 0.1844 | 8 | 01Jul2015, 13:24 | 3 |
| FG30-PONDHS | 0.1844 | 8 | 01Jul2015, 13:36 | 3 |
| FG31 | 0.0922 | 46 | 01Jul2015, 12:18 | 6 |
| POND HS | 0.2766 | 27 | 01Jul2015, 12:42 | 9 |
| FG17a | 0.0694 | 40 | 01Jul2015, 12:06 | 4 |
| FG17a-POND E | 0.0694 | 39 | 01Jul2015, 12:12 | 4 |
| **FG18** | **0.0644** | **17** | **01Jul2015, 12:24** | **3** |
| FG18-POND E | 0.0644 | 17 | 01Jul2015, 12:30 | 3 |
| FG19 | 0.0527 | 33 | 01Jul2015, 12:12 | 3 |
| FG17c | 0.0313 | 7 | 01Jul2015, 12:06 | 1 |
| FG17b | 0.0214 | 16 | 01Jul2015, 12:06 | 1 |
| **POND E** | **1.0329** | **24** | **01Jul2015, 18:36** | **20** |
| **H08** | **1.0329** | **19** | **01Jul2015, 18:36** | **15** |
| **H09** | **0.0000** | **5** | **01Jul2015, 18:36** | **5** |
| **FH01** | **0.1348** | **39** | **01Jul2015, 12:24** | **6** |
| **POND H** | **0.1348** | **6** | **01Jul2015, 14:30** | **4** |
| **FH02** | **0.0091** | **3** | **01Jul2015, 12:12** | **0** |
| FH03 | 0.0081 | 6 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1520 | 9 | 01Jul2015, 12:12 | 5 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| INTERIM 5-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 27 | 01Jul2015, 12:06 | 3 |
| FG08A-G05 | 0.0750 | 27 | 01Jul2015, 12:12 | 3 |
| FG08B | 0.0630 | 20 | 01Jul2015, 12:12 | 2 |
| FG08B-G05 | 0.0630 | 20 | 01Jul2015, 12:18 | 2 |
| FG11 | 0.0625 | 19 | 01Jul2015, 12:18 | 2 |
| FG09 | 0.0484 | 8 | 01Jul2015, 12:18 | 1 |
| FG09-G05 | 0.0484 | 8 | 01Jul2015, 12:18 | 1 |
| HG10 | 0.0467 | 2 | 01Jul2015, 12:24 | 1 |
| G05 | 0.2956 | 72 | 01Jul2015, 12:18 | 9 |
| FG13 | 0.0661 | 5 | 01Jul2015, 12:30 | 1 |
| FG12 | 0.0328 | 14 | 01Jul2015, 12:12 | 1 |
| POND D | 0.3945 | 9 | 01Jul2015, 15:00 | 7 |
| POND D-G17 | 0.3945 | 9 | 01Jul2015, 15:00 | 7 |
| HG15 | 0.0297 | 1 | 01Jul2015, 12:48 | 0 |
| FG15a | 0.0156 | 7 | 01Jul2015, 12:06 | 1 |
| G17 | 0.4398 | 9 | 01Jul2015, 14:36 | 8 |
| G17-G18 | 0.4398 | 9 | 01Jul2015, 14:42 | 8 |
| FG16 | 0.0773 | 31 | 01Jul2015, 12:06 | 3 |
| G18 | 0.5171 | 38 | 01Jul2015, 12:06 | 11 |
| G18-POND E | 0.5171 | 37 | 01Jul2015, 12:12 | 11 |
| HG30 | 0.1844 | 3 | 01Jul2015, 13:36 | 2 |
| FG30-PONDHS | 0.1844 | 3 | 01Jul2015, 13:48 | 2 |
| FG31 | 0.0922 | 31 | 01Jul2015, 12:18 | 4 |
| POND HS | 0.2766 | 19 | 01Jul2015, 12:42 | 5 |
| FG17a | 0.0694 | 26 | 01Jul2015, 12:12 | 3 |
| FG17a-POND E | 0.0694 | 26 | 01Jul2015, 12:12 | 3 |
| **FG18** | **0.0644** | **10** | **01Jul2015, 12:30** | **2** |
| FG18-POND E | 0.0644 | 10 | 01Jul2015, 12:30 | 2 |
| FG19 | 0.0527 | 23 | 01Jul2015, 12:12 | 2 |
| FG17c | 0.0313 | 3 | 01Jul2015, 12:12 | 0 |
| FG17b | 0.0214 | 11 | 01Jul2015, 12:06 | 1 |
| **POND E** | **1.0329** | **12** | **01Jul2015, 21:24** | **10** |
| **H08** | **1.0329** | **8** | **01Jul2015, 21:24** | **7** |
| **H09** | **0.0000** | **3** | **01Jul2015, 21:24** | **3** |
| **FH01** | **0.1348** | **24** | **01Jul2015, 12:30** | **4** |
| **POND H** | **0.1348** | **2** | **01Jul2015, 17:00** | **2** |
| **FH02** | **0.0091** | **2** | **01Jul2015, 12:12** | **0** |
| FH03 | 0.0081 | 4 | 01Jul2015, 12:06 | 0 |
| H12 | 0.1520 | 6 | 01Jul2015, 12:12 | 3 |

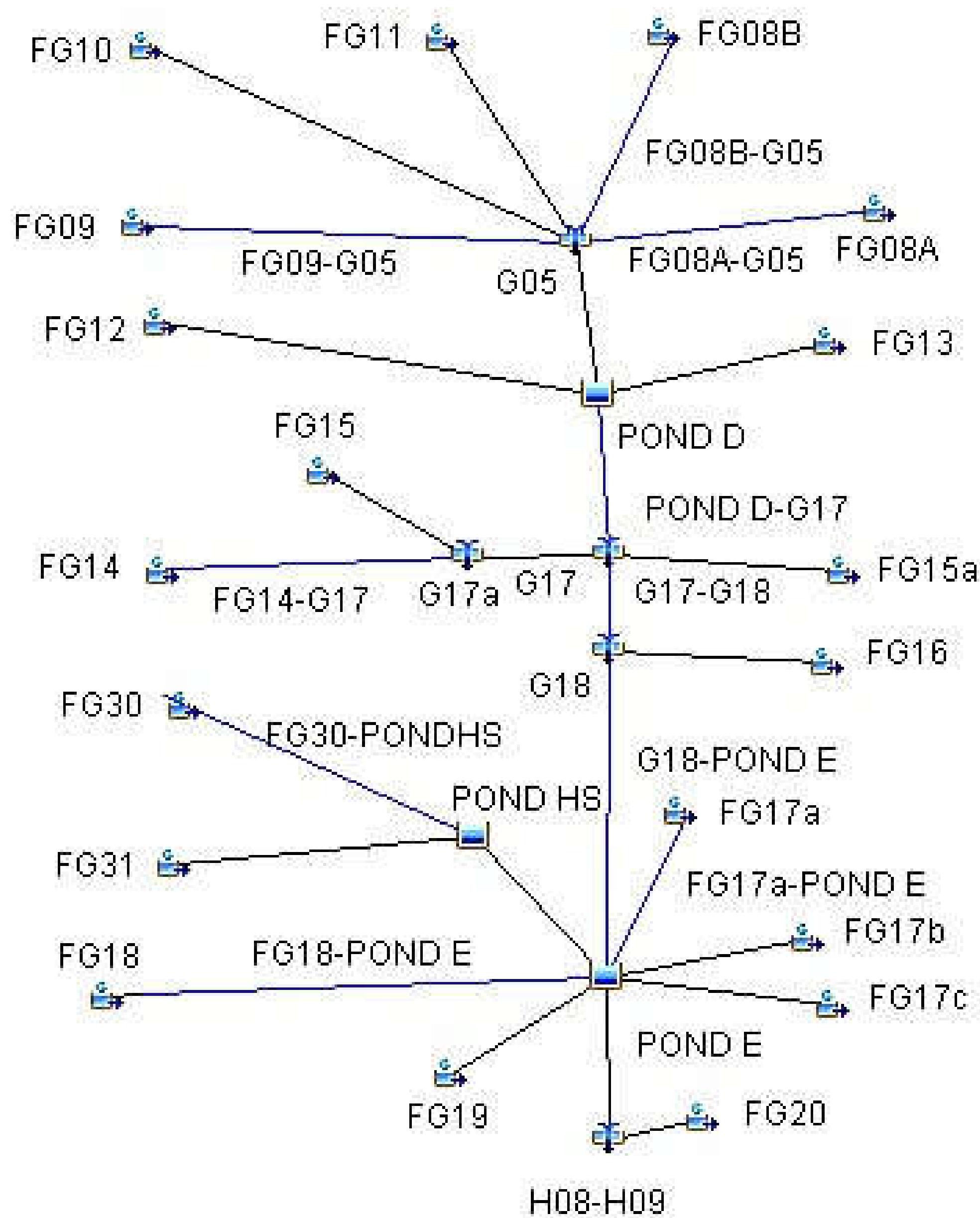
Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| INTERIM 2-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 14 | 01Jul2015, 12:12 | 2 |
| FG08A-G05 | 0.0750 | 14 | 01Jul2015, 12:12 | 2 |
| FG08B | 0.0630 | 10 | 01Jul2015, 12:12 | 1 |
| FG08B-G05 | 0.0630 | 10 | 01Jul2015, 12:18 | 1 |
| FG11 | 0.0625 | 10 | 01Jul2015, 12:18 | 1 |
| FG09 | 0.0484 | 3 | 01Jul2015, 12:18 | 1 |
| FG09-G05 | 0.0484 | 3 | 01Jul2015, 12:24 | 1 |
| HG10 | 0.0467 | 0 | 01Jul2015, 13:00 | 0 |
| G05 | 0.2956 | 36 | 01Jul2015, 12:18 | 5 |
| FG13 | 0.0661 | 1 | 01Jul2015, 12:42 | 1 |
| FG12 | 0.0328 | 8 | 01Jul2015, 12:12 | 1 |
| POND D | 0.3945 | 3 | 01Jul2015, 20:18 | 3 |
| POND D-G17 | 0.3945 | 3 | 01Jul2015, 20:18 | 3 |
| HG15 | 0.0297 | 0 | 01Jul2015, 13:36 | 0 |
| FG15a | 0.0156 | 4 | 01Jul2015, 12:06 | 0 |
| G17 | 0.4398 | 4 | 01Jul2015, 12:06 | 3 |
| G17-G18 | 0.4398 | 4 | 01Jul2015, 12:12 | 3 |
| FG16 | 0.0773 | 16 | 01Jul2015, 12:06 | 2 |
| G18 | 0.5171 | 20 | 01Jul2015, 12:06 | 5 |
| G18-POND E | 0.5171 | 20 | 01Jul2015, 12:12 | 5 |
| HG30 | 0.1844 | 1 | 01Jul2015, 14:48 | 1 |
| FG30-PONDHS | 0.1844 | 1 | 01Jul2015, 15:12 | 0 |
| FG31 | 0.0922 | 18 | 01Jul2015, 12:18 | 2 |
| POND HS | 0.2766 | 10 | 01Jul2015, 12:42 | 3 |
| FG17a | 0.0694 | 14 | 01Jul2015, 12:12 | 2 |
| FG17a-POND E | 0.0694 | 14 | 01Jul2015, 12:12 | 2 |
| **FG18** | **0.0644** | **5** | **01Jul2015, 12:30** | **1** |
| FG18-POND E | 0.0644 | 5 | 01Jul2015, 12:30 | 1 |
| FG19 | 0.0527 | 13 | 01Jul2015, 12:12 | 1 |
| FG17c | 0.0313 | 1 | 01Jul2015, 12:18 | 0 |
| FG17b | 0.0214 | 6 | 01Jul2015, 12:06 | 1 |
| **POND E** | **1.0329** | **6** | **02Jul2015, 00:00** | **5** |
| **H08** | **1.0329** | **3** | **02Jul2015, 00:00** | **3** |
| **H09** | **0.0000** | **2** | **02Jul2015, 00:00** | **2** |
| **FH01** | **0.1348** | **11** | **01Jul2015, 12:30** | **2** |
| **POND H** | **0.1348** | **1** | **01Jul2015, 18:36** | **1** |
| **FH02** | **0.0091** | **1** | **01Jul2015, 12:12** | **0** |
| FH03 | 0.0081 | 2 | 01Jul2015, 12:12 | 0 |
| H12 | 0.1520 | 3 | 01Jul2015, 12:12 | 2 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

HAEGLER INTERIM CONDITIONS


GIECK INTERIM CONDITIONS



| FUTURE 100-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{100}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{100}$ (AC. FT.) |
| FG08A | 0.0750 | 117 | 01Jul2015, 12:06 | 10 |
| FG08A-G05 | 0.0750 | 111 | 01Jul2015, 12:12 | 10 |
| FG10 | 0.0669 | 46 | 01Jul2015, 12:36 | 8 |
| FG08B | 0.0630 | 87 | 01Jul2015, 12:12 | 9 |
| FG08B-G05 | 0.0630 | 85 | 01Jul2015, 12:12 | 9 |
| FG11 | 0.0625 | 76 | 01Jul2015, 12:18 | 9 |
| FG09 | 0.0484 | 49 | 01Jul2015, 12:12 | 6 |
| FG09-G05 | 0.0484 | 48 | 01Jul2015, 12:18 | 6 |
| G05 | 0.3158 | 342 | 01Jul2015, 12:12 | 41 |
| FG13 | 0.0661 | 44 | 01Jul2015, 12:24 | 6 |
| FG14 | 0.0331 | 42 | 01Jul2015, 12:12 | 5 |
| FG12 | 0.0328 | 51 | 01Jul2015, 12:12 | 5 |
| POND D | 0.4478 | 131 | 01Jul2015, 13:06 | 47 |
| POND D-G17 | 0.4478 | 131 | 01Jul2015, 13:06 | 47 |
| FG15 | 0.1017 | 95 | 01Jul2015, 12:18 | 12 |
| G17a | 0.1017 | 95 | 01Jul2015, 12:18 | 12 |
| FG15a | 0.0156 | 28 | 01Jul2015, 12:06 | 2 |
| G17 | 0.5651 | 184 | 01Jul2015, 12:30 | 61 |
| G17-G18 | 0.5651 | 184 | 01Jul2015, 12:36 | 61 |
| FG16 | 0.0773 | 127 | 01Jul2015, 12:06 | 11 |
| G18 | 0.6424 | 235 | 01Jul2015, 12:12 | 72 |
| G18-POND E | 0.6424 | 233 | 01Jul2015, 12:12 | 72 |
| FG31 | 0.0922 | 118 | 01Jul2015, 12:18 | 14 |
| FG30 | 0.0400 | 76 | 01Jul2015, 12:06 | 6 |
| FG30-PONDHS | 0.0400 | 74 | 01Jul2015, 12:12 | 6 |
| POND HS | 0.1322 | 156 | 01Jul2015, 12:24 | 20 |
| FG17a | 0.0694 | 102 | 01Jul2015, 12:06 | 9 |
| FG17a-POND E | 0.0694 | 100 | 01Jul2015, 12:06 | 9 |
| **FG18** | **0.0644** | **57** | **01Jul2015, 12:24** | **8** |
| FG18-POND E | 0.0644 | 57 | 01Jul2015, 12:24 | 8 |
| FG19 | 0.0527 | 85 | 01Jul2015, 12:06 | 8 |
| FG17c | 0.0313 | 32 | 01Jul2015, 12:06 | 3 |
| FG17b | 0.0214 | 40 | 01Jul2015, 12:06 | 3 |
| **POND E** | **1.0138** | **240** | **01Jul2015, 13:30** | **99** |
| **H08** | **1.0138** | **204** | **01Jul2015, 13:30** | **87** |
| **H09** | **0.0000** | **36** | **01Jul2015, 13:30** | **13** |
| **FH01** | **0.1344** | **152** | **01Jul2015, 12:18** | **18** |
| **POND H** | **0.1344** | **57** | **01Jul2015, 12:54** | **15** |
| **FH02** | **0.0091** | **11** | **01Jul2015, 12:06** | **1** |
| FH03 | 0.0081 | 14 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1516 | 62 | 01Jul2015, 12:48 | 17 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| FUTURE 50-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{50}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{50}$ (AC. FT.) |
| FG08A | 0.0750 | 91 | 01Jul2015, 12:06 | 8 |
| FG08A-G05 | 0.0750 | 86 | 01Jul2015, 12:12 | 8 |
| FG10 | 0.0669 | 34 | 01Jul2015, 12:36 | 6 |
| FG08B | 0.0630 | 67 | 01Jul2015, 12:12 | 7 |
| FG08B-G05 | 0.0630 | 66 | 01Jul2015, 12:12 | 7 |
| FG11 | 0.0625 | 59 | 01Jul2015, 12:18 | 7 |
| FG09 | 0.0484 | 36 | 01Jul2015, 12:12 | 4 |
| FG09-G05 | 0.0484 | 36 | 01Jul2015, 12:18 | 4 |
| G05 | 0.3158 | 262 | 01Jul2015, 12:12 | 32 |
| FG13 | 0.0661 | 31 | 01Jul2015, 12:24 | 5 |
| FG14 | 0.0331 | 32 | 01Jul2015, 12:12 | 4 |
| FG12 | 0.0328 | 40 | 01Jul2015, 12:12 | 4 |
| POND D | 0.4478 | 89 | 01Jul2015, 13:12 | 35 |
| POND D-G17 | 0.4478 | 89 | 01Jul2015, 13:12 | 35 |
| FG15 | 0.1017 | 71 | 01Jul2015, 12:18 | 9 |
| G17a | 0.1017 | 71 | 01Jul2015, 12:18 | 9 |
| FG15a | 0.0156 | 22 | 01Jul2015, 12:06 | 2 |
| G17 | 0.5651 | 121 | 01Jul2015, 12:42 | 46 |
| G17-G18 | 0.5651 | 121 | 01Jul2015, 12:42 | 46 |
| FG16 | 0.0773 | 98 | 01Jul2015, 12:06 | 9 |
| G18 | 0.6424 | 177 | 01Jul2015, 12:12 | 54 |
| G18-POND E | 0.6424 | 176 | 01Jul2015, 12:12 | 54 |
| FG31 | 0.0922 | 92 | 01Jul2015, 12:18 | 11 |
| FG30 | 0.0400 | 60 | 01Jul2015, 12:06 | 5 |
| FG30-PONDHS | 0.0400 | 59 | 01Jul2015, 12:12 | 5 |
| POND HS | 0.1322 | 107 | 01Jul2015, 12:30 | 16 |
| FG17a | 0.0694 | 79 | 01Jul2015, 12:06 | 7 |
| FG17a-POND E | 0.0694 | 77 | 01Jul2015, 12:06 | 7 |
| **FG18** | **0.0644** | **43** | **01Jul2015, 12:24** | **6** |
| FG18-POND E | 0.0644 | 42 | 01Jul2015, 12:24 | 6 |
| FG19 | 0.0527 | 67 | 01Jul2015, 12:06 | 6 |
| FG17c | 0.0313 | 22 | 01Jul2015, 12:06 | 2 |
| FG17b | 0.0214 | 31 | 01Jul2015, 12:06 | 3 |
| **POND E** | **1.0138** | **151** | **01Jul2015, 14:00** | **71** |
| **H08** | **1.0138** | **136** | **01Jul2015, 14:00** | **62** |
| **H09** | **0.0000** | **16** | **01Jul2015, 14:00** | **9** |
| **FH01** | **0.1344** | **117** | **01Jul2015, 12:18** | **14** |
| **POND H** | **0.1344** | **32** | **01Jul2015, 13:06** | **11** |
| **FH02** | **0.0091** | **8** | **01Jul2015, 12:06** | **1** |
| FH03 | 0.0081 | 11 | 01Jul2015, 12:06 | 1 |
| H12 | 0.1516 | 35 | 01Jul2015, 13:00 | 13 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| FUTURE 25-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{25}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{25}$ (AC. FT.) |
| FG08A | 0.0750 | 67 | 01Jul2015, 12:06 | 6.0 |
| FG08A-G05 | 0.0750 | 65 | 01Jul2015, 12:12 | 6.0 |
| FG10 | 0.0669 | 24 | 01Jul2015, 12:36 | 4.4 |
| FG08B | 0.0630 | 50 | 01Jul2015, 12:12 | 5.0 |
| FG08B-G05 | 0.0630 | 49 | 01Jul2015, 12:12 | 5.0 |
| FG11 | 0.0625 | 45 | 01Jul2015, 12:18 | 5.3 |
| FG09 | 0.0484 | 26 | 01Jul2015, 12:18 | 3.0 |
| FG09-G05 | 0.0484 | 25 | 01Jul2015, 12:18 | 3.0 |
| G05 | 0.3158 | 192 | 01Jul2015, 12:12 | 23.7 |
| FG13 | 0.0661 | 20 | 01Jul2015, 12:24 | 3.2 |
| FG14 | 0.0331 | 24 | 01Jul2015, 12:12 | 2.7 |
| FG12 | 0.0328 | 31 | 01Jul2015, 12:12 | 3.0 |
| POND D | 0.4478 | 51 | 01Jul2015, 13:30 | 24.6 |
| POND D-G17 | 0.4478 | 51 | 01Jul2015, 13:30 | 24.6 |
| FG15 | 0.1017 | 51 | 01Jul2015, 12:18 | 6.8 |
| G17a | 0.1017 | 51 | 01Jul2015, 12:18 | 6.8 |
| FG15a | 0.0156 | 17 | 01Jul2015, 12:06 | 1.4 |
| G17 | 0.5651 | 72 | 01Jul2015, 12:24 | 32.7 |
| G17-G18 | 0.5651 | 72 | 01Jul2015, 12:24 | 32.6 |
| FG16 | 0.0773 | 74 | 01Jul2015, 12:06 | 6.5 |
| G18 | 0.6424 | 127 | 01Jul2015, 12:12 | 39.1 |
| G18-POND E | 0.6424 | 126 | 01Jul2015, 12:12 | 39.1 |
| FG31 | 0.0922 | 71 | 01Jul2015, 12:18 | 8.5 |
| FG30 | 0.0400 | 46 | 01Jul2015, 12:06 | 3.7 |
| FG30-PONDHS | 0.0400 | 45 | 01Jul2015, 12:12 | 3.7 |
| POND HS | 0.1322 | 60 | 01Jul2015, 12:36 | 12.1 |
| FG17a | 0.0694 | 58 | 01Jul2015, 12:06 | 5.5 |
| FG17a-POND E | 0.0694 | 57 | 01Jul2015, 12:12 | 5.5 |
| **FG18** | **0.0644** | **31** | **01Jul2015, 12:24** | **4.4** |
| FG18-POND E | 0.0644 | 30 | 01Jul2015, 12:24 | 4.4 |
| FG19 | 0.0527 | 51 | 01Jul2015, 12:06 | 4.9 |
| FG17c | 0.0313 | 15 | 01Jul2015, 12:06 | 1.4 |
| FG17b | 0.0214 | 24 | 01Jul2015, 12:06 | 2.0 |
| **POND E** | **1.0138** | **81** | **01Jul2015, 14:36** | **47.1** |
| **H08** | **1.0138** | **73** | **01Jul2015, 14:36** | **40.3** |
| **H09** | **0.0000** | **8** | **01Jul2015, 14:36** | **6.8** |
| **FH01** | **0.1344** | **87** | **01Jul2015, 12:18** | **10.5** |
| **POND H** | **0.1344** | **18** | **01Jul2015, 13:18** | **7.9** |
| **FH02** | **0.0091** | **6** | **01Jul2015, 12:12** | **0.6** |
| FH03 | 0.0081 | 8 | 01Jul2015, 12:06 | 0.8 |
| H12 | 0.1516 | 20 | 01Jul2015, 13:12 | 9.2 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

| FUTURE 10-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_{10}$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_{10}$ (AC. FT.) |
| FG08A | 0.0750 | 42 | 01Jul2015, 12:06 | 3.9 |
| FG08A-G05 | 0.0750 | 41 | 01Jul2015, 12:12 | 3.9 |
| FG10 | 0.0669 | 14 | 01Jul2015, 12:42 | 2.7 |
| FG08B | 0.0630 | 31 | 01Jul2015, 12:12 | 3.2 |
| FG08B-G05 | 0.0630 | 30 | 01Jul2015, 12:12 | 3.2 |
| FG11 | 0.0625 | 29 | 01Jul2015, 12:18 | 3.5 |
| FG09 | 0.0484 | 15 | 01Jul2015, 12:18 | 1.8 |
| FG09-G05 | 0.0484 | 14 | 01Jul2015, 12:18 | 1.8 |
| G05 | 0.3158 | 117 | 01Jul2015, 12:18 | 15.1 |
| FG13 | 0.0661 | 10 | 01Jul2015, 12:30 | 1.8 |
| FG14 | 0.0331 | 15 | 01Jul2015, 12:18 | 1.8 |
| FG12 | 0.0328 | 20 | 01Jul2015, 12:12 | 2.0 |
| POND D | 0.4478 | 19 | 01Jul2015, 14:30 | 15.0 |
| POND D-G17 | 0.4478 | 19 | 01Jul2015, 14:30 | 15.0 |
| FG15 | 0.1017 | 29 | 01Jul2015, 12:24 | 4.2 |
| G17a | 0.1017 | 29 | 01Jul2015, 12:24 | 4.2 |
| FG15a | 0.0156 | 11 | 01Jul2015, 12:06 | 0.9 |
| G17 | 0.5651 | 40 | 01Jul2015, 12:24 | 20.0 |
| G17-G18 | 0.5651 | 40 | 01Jul2015, 12:30 | 20.0 |
| FG16 | 0.0773 | 47 | 01Jul2015, 12:06 | 4.2 |
| G18 | 0.6424 | 77 | 01Jul2015, 12:12 | 24.2 |
| G18-POND E | 0.6424 | 77 | 01Jul2015, 12:12 | 24.2 |
| FG31 | 0.0922 | 46 | 01Jul2015, 12:18 | 5.7 |
| FG30 | 0.0400 | 31 | 01Jul2015, 12:06 | 2.5 |
| FG30-PONDHS | 0.0400 | 29 | 01Jul2015, 12:12 | 2.4 |
| POND HS | 0.1322 | 37 | 01Jul2015, 12:42 | 8.1 |
| FG17a | 0.0694 | 36 | 01Jul2015, 12:06 | 3.5 |
| FG17a-POND E | 0.0694 | 36 | 01Jul2015, 12:12 | 3.5 |
| **FG18** | **0.0644** | **18** | **01Jul2015, 12:24** | **2.7** |
| FG18-POND E | 0.0644 | 18 | 01Jul2015, 12:30 | 2.7 |
| FG19 | 0.0527 | 33 | 01Jul2015, 12:12 | 3.3 |
| FG17c | 0.0313 | 7 | 01Jul2015, 12:06 | 0.8 |
| FG17b | 0.0214 | 16 | 01Jul2015, 12:06 | 1.3 |
| **POND E** | **1.0138** | **30** | **01Jul2015, 17:42** | **24.6** |
| **H08** | **1.0138** | **24** | **01Jul2015, 17:42** | **19.2** |
| **H09** | **0.0000** | **6** | **01Jul2015, 17:42** | **5.4** |
| **FH01** | **0.1344** | **53** | **01Jul2015, 12:18** | **6.7** |
| **POND H** | **0.1344** | **8** | **01Jul2015, 13:54** | **4.6** |
| **FH02** | **0.0091** | **3** | **01Jul2015, 12:12** | **0.3** |
| FH03 | 0.0081 | 6 | 01Jul2015, 12:06 | 0.5 |
| H12 | 0.1516 | 10 | 01Jul2015, 12:12 | 5.5 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

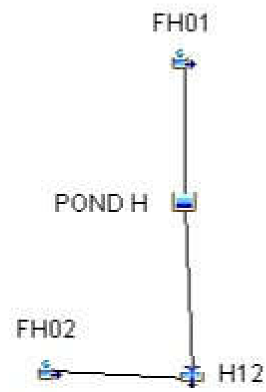
| FUTURE 5-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_5$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_5$ (AC. FT.) |
| FG08A | 0.0750 | 27 | 01Jul2015, 12:06 | 2.6 |
| FG08A-G05 | 0.0750 | 27 | 01Jul2015, 12:12 | 2.6 |
| FG10 | 0.0669 | 8 | 01Jul2015, 12:42 | 1.7 |
| FG08B | 0.0630 | 20 | 01Jul2015, 12:12 | 2.2 |
| FG08B-G05 | 0.0630 | 20 | 01Jul2015, 12:18 | 2.2 |
| FG11 | 0.0625 | 19 | 01Jul2015, 12:18 | 2.4 |
| FG09 | 0.0484 | 8 | 01Jul2015, 12:18 | 1.2 |
| FG09-G05 | 0.0484 | 8 | 01Jul2015, 12:18 | 1.2 |
| G05 | 0.3158 | 75 | 01Jul2015, 12:18 | 10.1 |
| FG13 | 0.0661 | 5 | 01Jul2015, 12:30 | 1.1 |
| FG14 | 0.0331 | 10 | 01Jul2015, 12:18 | 1.2 |
| FG12 | 0.0328 | 14 | 01Jul2015, 12:12 | 1.4 |
| POND D | 0.4478 | 12 | 01Jul2015, 14:42 | 9.3 |
| POND D-G17 | 0.4478 | 12 | 01Jul2015, 14:42 | 9.3 |
| FG15 | 0.1017 | 18 | 01Jul2015, 12:24 | 2.7 |
| G17a | 0.1017 | 18 | 01Jul2015, 12:24 | 2.7 |
| FG15a | 0.0156 | 7 | 01Jul2015, 12:06 | 0.6 |
| G17 | 0.5651 | 23 | 01Jul2015, 12:18 | 12.6 |
| G17-G18 | 0.5651 | 23 | 01Jul2015, 12:24 | 12.6 |
| FG16 | 0.0773 | 31 | 01Jul2015, 12:06 | 2.9 |
| G18 | 0.6424 | 49 | 01Jul2015, 12:12 | 15.5 |
| G18-POND E | 0.6424 | 48 | 01Jul2015, 12:12 | 15.5 |
| FG31 | 0.0922 | 31 | 01Jul2015, 12:18 | 4.0 |
| FG30 | 0.0400 | 21 | 01Jul2015, 12:06 | 1.7 |
| FG30-PONDHS | 0.0400 | 20 | 01Jul2015, 12:12 | 1.7 |
| POND HS | 0.1322 | 27 | 01Jul2015, 12:36 | 5.7 |
| FG17a | 0.0694 | 23 | 01Jul2015, 12:12 | 2.4 |
| FG17a-POND E | 0.0694 | 23 | 01Jul2015, 12:12 | 2.4 |
| **FG18** | **0.0644** | **11** | **01Jul2015, 12:30** | **1.8** |
| FG18-POND E | 0.0644 | 11 | 01Jul2015, 12:30 | 1.8 |
| FG19 | 0.0527 | 23 | 01Jul2015, 12:12 | 2.3 |
| FG17c | 0.0313 | 3 | 01Jul2015, 12:12 | 0.4 |
| FG17b | 0.0214 | 11 | 01Jul2015, 12:06 | 0.9 |
| **POND E** | **1.0138** | **16** | **01Jul2015, 20:06** | **13.1** |
| **H08** | **1.0138** | **12** | **01Jul2015, 20:06** | **9.3** |
| **H09** | **0.0000** | **4** | **01Jul2015, 20:06** | **3.8** |
| **FH01** | **0.1344** | **34** | **01Jul2015, 12:18** | **4.5** |
| **POND H** | **0.1344** | **3** | **01Jul2015, 15:24** | **2.6** |
| **FH02** | **0.0091** | **2** | **01Jul2015, 12:12** | **0.2** |
| FH03 | 0.0081 | 4 | 01Jul2015, 12:06 | 0.4 |
| H12 | 0.1516 | 6 | 01Jul2015, 12:12 | 3.2 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

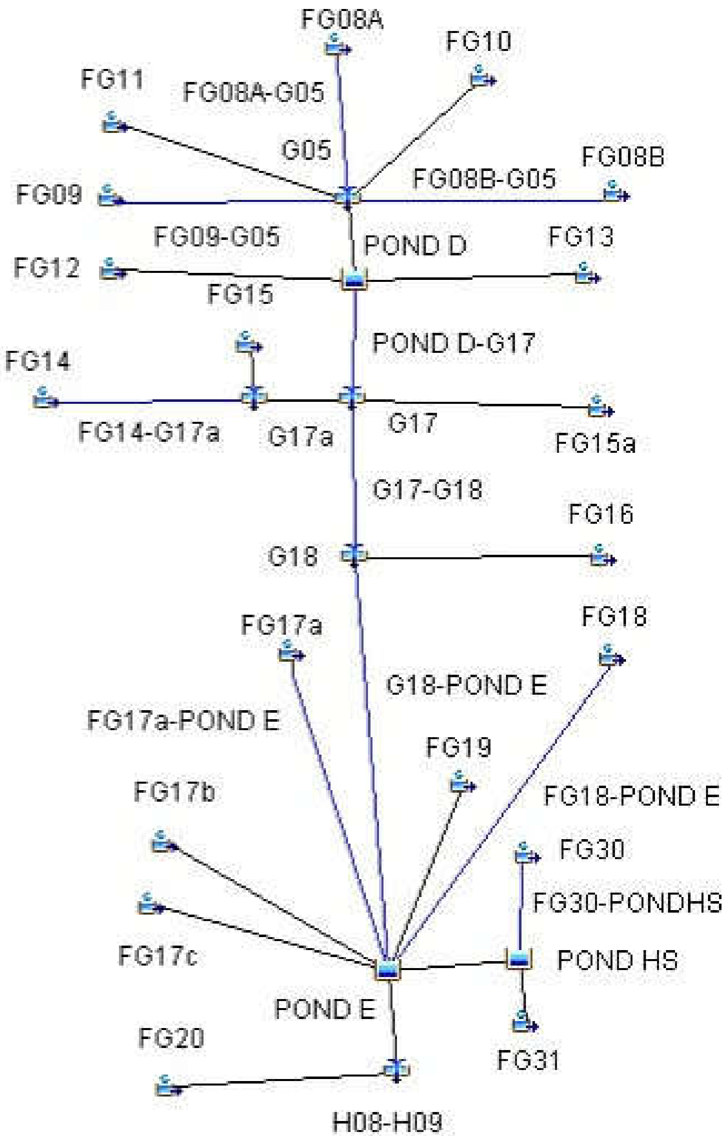
| FUTURE 2-YEAR | | | | |
|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK $Q_2$ (CFS) | TIME OF PEAK | TOTAL VOLUME $Q_2$ (AC. FT.) |
| FG08A | 0.0750 | 13.6 | 01Jul2015, 12:12 | 1.5 |
| FG08A-G05 | 0.0750 | 13.6 | 01Jul2015, 12:12 | 1.5 |
| FG10 | 0.0669 | 3.6 | 01Jul2015, 12:48 | 0.9 |
| FG08B | 0.0630 | 10.3 | 01Jul2015, 12:12 | 1.3 |
| FG08B-G05 | 0.0630 | 10.1 | 01Jul2015, 12:18 | 1.2 |
| FG11 | 0.0625 | 10.0 | 01Jul2015, 12:18 | 1.4 |
| FG09 | 0.0484 | 3.3 | 01Jul2015, 12:18 | 0.6 |
| FG09-G05 | 0.0484 | 3.3 | 01Jul2015, 12:24 | 0.6 |
| G05 | 0.3158 | 37.9 | 01Jul2015, 12:18 | 5.6 |
| FG13 | 0.0661 | 1.4 | 01Jul2015, 12:42 | 0.5 |
| FG14 | 0.0331 | 5.2 | 01Jul2015, 12:18 | 0.7 |
| FG12 | 0.0328 | 7.9 | 01Jul2015, 12:12 | 0.9 |
| POND D | 0.4478 | 4.5 | 01Jul2015, 17:48 | 4.1 |
| POND D-G17 | 0.4478 | 4.5 | 01Jul2015, 17:54 | 4.1 |
| FG15 | 0.1017 | 7.5 | 01Jul2015, 12:24 | 1.4 |
| G17a | 0.1017 | 7.5 | 01Jul2015, 12:24 | 1.4 |
| FG15a | 0.0156 | 4.0 | 01Jul2015, 12:06 | 0.4 |
| G17 | 0.5651 | 10.8 | 01Jul2015, 12:24 | 5.9 |
| G17-G18 | 0.5651 | 10.7 | 01Jul2015, 12:30 | 5.9 |
| FG16 | 0.0773 | 16.1 | 01Jul2015, 12:06 | 1.7 |
| G18 | 0.6424 | 24.4 | 01Jul2015, 12:12 | 7.6 |
| G18-POND E | 0.6424 | 23.9 | 01Jul2015, 12:12 | 7.6 |
| FG31 | 0.0922 | 17.5 | 01Jul2015, 12:18 | 2.4 |
| FG30 | 0.0400 | 12.2 | 01Jul2015, 12:06 | 1.0 |
| FG30-PONDHS | 0.0400 | 11.3 | 01Jul2015, 12:18 | 1.0 |
| POND HS | 0.1322 | 15.1 | 01Jul2015, 12:42 | 3.4 |
| FG17a | 0.0694 | 11.9 | 01Jul2015, 12:12 | 1.4 |
| FG17a-POND E | 0.0694 | 11.8 | 01Jul2015, 12:12 | 1.4 |
| **FG18** | **0.0644** | **4.8** | **01Jul2015, 12:30** | **0.9** |
| FG18-POND E | 0.0644 | 4.7 | 01Jul2015, 12:30 | 0.9 |
| FG19 | 0.0527 | 13.3 | 01Jul2015, 12:12 | 1.4 |
| FG17c | 0.0313 | 0.5 | 01Jul2015, 12:18 | 0.2 |
| FG17b | 0.0214 | 6.2 | 01Jul2015, 12:06 | 0.6 |
| **POND E** | **1.0138** | **6.6** | **02Jul2015, 00:00** | **5.9** |
| **H08** | **1.0138** | **4.2** | **02Jul2015, 00:00** | **3.6** |
| **H09** | **0.0000** | **2.4** | **02Jul2015, 00:00** | **2.3** |
| **FH01** | **0.1344** | **16.6** | **01Jul2015, 12:18** | **2.5** |
| **POND H** | **0.1344** | **1.2** | **01Jul2015, 18:36** | **1.4** |
| **FH02** | **0.0091** | **0.7** | **01Jul2015, 12:12** | **0.1** |
| FH03 | 0.0081 | 2.2 | 01Jul2015, 12:12 | 0.2 |
| H12 | 0.1516 | 3.5 | 01Jul2015, 12:12 | 1.7 |

Highlighted green rows reference Drainage Elements associated with the WindingWalk Filing 2 Final Plat.
Highlighted yellow rows reference key design points (Typical all charts this section).

HAEGLER FUTURE CONDITIONS




GIECK FUTURE CONDITIONS


FG08A
FG10
FG11
FG08A-G05
G05
FG08B
FG09
FG08B-G05
FG09-G05
POND D
FG13
FG12
FG15
POND D-G17
FG14
FG14-G17a
G17a
G17
FG15a
G17-G18
FG16
G18
FG17a
FG18
G18-POND E
FG17a-POND E
FG19
FG17b
FG18-POND E
FG30
FG30-PONDHS
FG17c
POND HS
POND E
FG20
FG31
H08-H09

# Appendix D - Detention Pond Information

# STAGE/STORAGE/DISCHARGE CURVES FOR DETENTION POND ANALYSIS

## Meridian Ranch Proposed Detention Pond H-INTERIM - WindingWalk Filing 2

### Gieck Basin - El Paso County, Colorado

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 500 |
| embankment elev = | 6976 |
| spillway length = | 50 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.3 |
| 100 year storage vol.= | 7.2 |
| 100 year discharge= | 47 |
| 5 year storage elev.= | 6971.6 |
| 5 year storage vol.= | 2.5 |
| 5 year discharge= | 2.3 |
| WQCV storage elev.= | 6970.3 |
| WQCV storage vol.= | 0.5 |
| 1/2 WQCV storage elev.= | 6969.9 |
| 1/2 WQCV storage vol.= | 0.25 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | Bottom |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0195 | 1.33 | | Area = | 0.026 | Invert Elev = | 6968.5 |
| **Rectangular** | Orifice 2: | V | 4.5000 | 1.40 | | Area = | 6.300 | Invert Elev = | 6971.50 |
| **None Selected** | Orifice 3: | V | | | | Area = | 0.000 | Invert Elev = | |
| **Circular** | Orifice 4: | H | | | 6 | Area = | 0.196 | Invert Elev = | 6970 |

Stand Pipe Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| Rec Grate | | 9 | x | 4.5 | Elev = | 6972.90 |
| Circ. Grate | | | dia. | | Elev = | 6972.90 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6968.5 | | 6972.38 | | |
| Wall Thick. | 4.5 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6972.9 |
| 50 year discharge= | 26 |
| 25 year storage elev.= | 6972.5 |
| 25 year discharge= | 15 |
| 10 year storage elev.= | 6972.0 |
| 10 year discharge= | 6.0 |
| 2 year storage elev.= | 6971.0 |
| 2 year discharge= | 1.1 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | 1 | 2 | | |
| 6968.5 | 0 | 0 | 0.00 | 0.0 | 0.0 | | | - | - | - | - | - | - | | - | - |
| 6969 | 0.5 | 477 | 0.01 | 0.00 | 0.003 | - | - | 0.02 | - | - | - | - | 1 | | 0.02 | 0.021 |
| 6969.5 | 1 | 11450 | 0.26 | 0.07 | 0.07 | - | - | 0.06 | - | - | - | - | 5 | | 0.06 | 0.059 |
| 6970 | 1.5 | 22422 | 0.51 | 0.26 | 0.27 | - | - | 0.11 | - | - | - | - | 10 | | 0.1 | 0.107 |
| 6970.25 | 1.75 | 33514 | 0.77 | 0.16 | 0.43 | - | - | 0.13 | - | - | 0.5 | - | 14 | | 0.6 | 0.603 |
| 6970.5 | 2 | 44606 | 1.02 | 0.78 | 0.78 | - | - | 0.14 | - | - | 0.7 | - | 18 | | 0.8 | 0.813 |
| 6971 | 2.5 | 67898 | 1.56 | 1.04 | 1.30 | - | - | 0.17 | - | - | 0.9 | - | 27 | | 1.1 | 1.115 |
| 6971.5 | 3 | 92319 | 2.12 | 0.92 | 2.22 | - | - | 0.19 | - | - | 1.2 | - | 36 | | 1.3 | 1.349 |
| 6971.75 | 3.25 | 104529 | 2.40 | 0.56 | 2.79 | - | - | 0.20 | 1.7 | - | 1.3 | - | 42 | | 3.1 | 3.139 |
| 6972 | 3.5 | 116739 | 2.68 | 1.20 | 3.42 | - | - | 0.21 | 4.8 | - | 1.3 | - | 47 | | 6.3 | 6.321 |
| 6972.5 | 4 | 125636 | 2.88 | 1.39 | 4.81 | - | - | 0.23 | 13.5 | - | 1.5 | - | 58 | | 15.2 | 15.223 |
| 6973 | 4.5 | 134533 | 3.09 | 1.49 | 6.31 | - | - | 0.25 | 24.8 | - | 1.6 | 2 | 70 | | 28.4 | 28.391 |
| 6973.5 | 5 | 141972 | 3.26 | 1.59 | 7.89 | - | - | 0.26 | 34.6 | - | 1.8 | 25 | 79 | | 62 | 61.713 |
| 6974 | 5.5 | 149410 | 3.43 | 1.67 | 9.57 | - | - | 0.28 | 40.7 | - | 1.9 | 62 | 86 | | 86 | 85.780 |
| 6975 | 6.5 | 165140 | 3.79 | 3.61 | 13.18 | 53.0 | 53.0 | 0.30 | 50.8 | - | 2.1 | 164 | 98 | | 98 | 151.443 |
| 6976 | 7.5 | 192114 | 4.41 | 4.10 | 17.28 | 275.6 | 275.6 | 0.33 | 59.1 | - | 2.3 | 295 | 110 | | 110 | 385.158 |

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)^.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 H-FUTURE & INTERIM

### Gieck Basin - El Paso County, Colorado

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 500 |
| embankment elev = | 6976 |
| spillway length = | 50 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.4 |
| 100 year storage vol.= | 7.7 |
| 100 year discharge= | 57 |
| 5 year storage elev.= | 6971.7 |
| 5 year storage vol.= | 2.8 |
| 5 year discharge= | 3.1 |
| WQCV storage elev.= | 6970.3 |
| WQCV storage vol.= | 0.5 |
| 1/2 WQCV storage elev.= | 6969.9 |
| 1/2 WQCV storage vol.= | 0.25 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | Bottom |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0195 | 1.33 | | Area = | 0.026 | Invert Elev = | 6968.5 |
| **Rectangular** | Orifice 2: | V | 4.5000 | 1.40 | | Area = | 6.300 | Invert Elev = | 6971.50 |
| **None Selected** | Orifice 3: | V | | | | Area = | 0.000 | Invert Elev = | |
| **Circular** | Orifice 4: | H | | | 6 | Area = | 0.196 | Invert Elev = | 6970 |

Stand Pipe Dimensions

| | | | | | |
|---|---|---|---|---|---|
| Rec Grate | 9 | x | 4.5 | Elev = | 6972.90 |
| Circ. Grate | | dia. | | Elev = | 6972.90 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6968.5 | | 6972.38 | | |
| Wall Thick. | 4.5 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6973.1 |
| 50 year discharge= | 32 |
| 25 year storage elev.= | 6972.6 |
| 25 year discharge= | 18 |
| 10 year storage elev.= | 6972.1 |
| 10 year discharge= | 7.8 |
| 2 year storage elev.= | 6971.2 |
| 2 year discharge= | 1.20 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | 1 | 2 | | |
| 6968.5 | 0 | 0 | 0.00 | 0.0 | 0.0 | | | - | - | - | - | - | - | | - | - |
| 6969 | 0.5 | 477 | 0.01 | 0.00 | 0.003 | - | - | 0.02 | - | - | - | - | 1 | | 0.02 | 0.02 |
| 6969.5 | 1 | 11450 | 0.26 | 0.07 | 0.07 | - | - | 0.06 | - | - | - | - | 5 | | 0.06 | 0.06 |
| 6970 | 1.5 | 22422 | 0.51 | 0.26 | 0.27 | - | - | 0.11 | - | - | - | - | 10 | | 0.1 | 0.11 |
| 6970.25 | 1.75 | 33514 | 0.77 | 0.16 | 0.43 | - | - | 0.13 | - | - | 0.5 | - | 14 | | 0.6 | 0.60 |
| 6970.5 | 2 | 44606 | 1.02 | 0.78 | 0.78 | - | - | 0.14 | - | - | 0.7 | - | 18 | | 0.8 | 0.81 |
| 6971 | 2.5 | 67898 | 1.56 | 1.04 | 1.30 | - | - | 0.17 | - | - | 0.9 | - | 27 | | 1.1 | 1.1 |
| 6971.5 | 3 | 92319 | 2.12 | 0.92 | 2.22 | - | - | 0.19 | - | - | 1.2 | - | 36 | | 1.3 | 1.3 |
| 6971.75 | 3.25 | 104529 | 2.40 | 0.56 | 2.79 | - | - | 0.20 | 1.7 | - | 1.3 | - | 42 | | 3.1 | 3.1 |
| 6972 | 3.5 | 116739 | 2.68 | 1.20 | 3.42 | - | - | 0.21 | 4.8 | - | 1.3 | - | 47 | | 6.3 | 6.3 |
| 6972.5 | 4 | 125636 | 2.88 | 1.39 | 4.81 | - | - | 0.23 | 13.5 | - | 1.5 | - | 58 | | 15 | 15 |
| 6973 | 4.5 | 134533 | 3.09 | 1.49 | 6.31 | - | - | 0.25 | 24.8 | - | 1.6 | 2 | 70 | | 28 | 28 |
| 6973.5 | 5 | 141972 | 3.26 | 1.59 | 7.89 | - | - | 0.26 | 34.6 | - | 1.8 | 25 | 79 | | 62 | 62 |
| 6974 | 5.5 | 149410 | 3.43 | 1.67 | 9.57 | - | - | 0.28 | 40.7 | - | 1.9 | 62 | 86 | | 86 | 86 |
| 6975 | 6.5 | 165140 | 3.79 | 3.61 | 13.18 | 53.0 | 53.0 | 0.30 | 50.8 | - | 2.1 | 164 | 98 | | 98 | 151 |
| 6976 | 7.5 | 192114 | 4.41 | 4.10 | 17.28 | 275.6 | 275.6 | 0.33 | 59.1 | - | 2.3 | 295 | 110 | | 110 | 385 |

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)^.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 Existing Detention Pond E- FINAL INTERIM - WindingWalk Filing 2 (TOTAL FLOWS)

### Gieck Basin - El Paso County, Colorado

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.3 |
| 100 year storage vol.= | 39.2 |
| 100 year discharge= | 193 |
| 5 year storage elev.= | 6971.1 |
| 5 year storage vol.= | 15.7 |
| 5 year discharge= | 12 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| WQCV depth = | 1.9 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

| | |
|---|---|
| 50 year storage elev.= | 6972.8 |
| 50 year storage vol.= | 33.2 |
| 50 year discharge= | 115 |
| 25 year storage elev.= | 6972.3 |
| 25 year storage vol.= | 27.5 |
| 25 year discharge= | 58 |
| 10 year storage elev.= | 6971.7 |
| 10 year storage vol.= | 21.1 |
| 10 year discharge= | 24 |
| 2 year storage elev.= | 6970.3 |
| 2 year storage vol.= | 8.6 |
| 2 year discharge= | 5.5 |

| STAGE | | STORAGE | | | | TOTAL DISCHARGE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF BANK | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | | | 1 | 2 | 3 | 4 | Rectangular | | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.00 | | | - | - | - | - | - | - | 1.4 | - | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.10 | - | - | 0.0 | - | - | - | - | - | 13 | - | 0.03 | 0.03 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.37 | - | - | 0.1 | - | - | - | - | - | 26 | - | 0.11 | 0.11 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.01 | - | - | 0.2 | - | - | - | - | - | 47 | - | 0.23 | 0.23 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.23 | - | - | 0.4 | - | - | - | - | - | 77 | - | 0.4 | 0.37 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.14 | - | - | 0.5 | - | 3.0 | - | - | - | 110 | - | 3.5 | 3.5 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.85 | - | - | 0.6 | - | 4.3 | - | - | - | 146 | - | 5 | 4.9 |
| 6970.5 | 3.5 | 329360 | 7.56 | 3.4 | 10.30 | - | - | 0.6 | 0.2 | 5.3 | - | - | - | 183 | - | 6 | 6.1 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.27 | | | 0.7 | 1.2 | 5.7 | - | - | - | 203 | - | 8 | 7.6 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14.41 | - | - | 0.7 | 3.1 | 6.1 | - | - | - | 218 | - | 10 | 10 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 16.70 | - | - | 0.7 | 5.5 | 6.5 | 0.2 | - | - | 236 | - | 13 | 13 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19.10 | - | - | 0.7 | 7.9 | 6.8 | 3.0 | - | - | 252 | - | 18 | 18 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 21.63 | - | - | 0.8 | 9.8 | 7.1 | 7.3 | - | - | 266 | - | 25 | 25 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24.28 | - | - | 0.8 | 11.6 | 7.5 | 12.9 | 2.4 | - | 280 | - | 35 | 35 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27.02 | - | - | 0.8 | 12.9 | 7.8 | 16.9 | 15.5 | - | 292 | - | 54 | 54 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 29.82 | - | - | 0.8 | 14.1 | 8.1 | 20.2 | 34.9 | - | 304 | - | 78 | 78 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 35.60 | - | - | 0.9 | 16.2 | 8.6 | 29.5 | 86.5 | - | 327 | - | 142 | 142 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 38.57 | - | - | 0.9 | 17.2 | 8.9 | 35.0 | 121.5 | - | 338 | - | 183 | 183 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 41.55 | - | - | 0.9 | 18.1 | 9.1 | 40.8 | 162.7 | - | 349 | - | 232 | 232 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 47.58 | - | - | 1.0 | 19.8 | 9.6 | 53.4 | 259.0 | - | 369 | - | 307 | 307 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72.42 | - | 1,102 | 1.1 | 25.4 | 11.4 | 82.8 | 729.0 | - | 443 | - | 443 | 1,545 |

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)^.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 Existing Detention Pond E-FINAL INTERIM - WindingWalk Filing 2 (H08)

**Gieck Basin - El Paso County, Colorado**

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974 |
| 100 year storage elev.= | 6973.3 |
| 100 year storage vol.= | 39.2 |
| 100 year discharge= | 173 |
| 5 year storage elev.= | 6971.15 |
| 5 year storage vol.= | 15.7 |
| 5 year discharge= | 8.3 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0248 | 1.65 | | Area = | 0.041 | Invert Elev = | 6967.18 |
| **Rectangular** | Orifice 2: | V | 2 | 0.8 | | Area = | 1.600 | Invert Elev = | 6970.40 |
| **Circular** | Orifice 3: | H | | | 10 | Area = | 0.545 | Invert Elev = | 6969.00 |
| **Rectangular** | Orifice 4: | V | 6 | 0.7 | | Area = | 4.200 | Invert Elev = | 6971.20 |

Stand Pipe Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| Rec Grate | | 11 | x | 7 | Elev = | 6971.90 |
| Circ. Grate | | | dia. | | Elev = | 6971.90 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6966.8 | | 6970.58 | | |
| Wall Thick. | 4 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6972.8 |
| 50 year discharge= | 107 |
| 25 year storage elev.= | 6972.3 |
| 25 year discharge= | 54 |
| 10 year storage elev.= | 6971.7 |
| 10 year discharge= | 19 |
| 2 year storage elev.= | 6970.3 |
| 2 year discharge= | 3.3 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.0 | | | - | - | - | - | - | 1 | | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.1 | | | 0.0 | - | - | - | - | 8 | | 0.01 | 0.01 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.4 | | | 0.1 | - | - | - | - | 18 | | 0.06 | 0.06 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.0 | | | 0.1 | - | - | - | - | 30 | | 0.11 | 0.11 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.2 | | | 0.2 | - | - | - | - | 52 | | 0.2 | 0.18 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.1 | | | 0.2 | - | 1.9 | - | - | 75 | | 2.1 | 2.1 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.9 | | | 0.3 | - | 2.6 | - | - | 97 | | 2.9 | 2.9 |
| 6970.5 | 3.5 | 329359.5 | 7.56 | 3.4 | 10 | | | 0.3 | 0.2 | 3.2 | - | - | 122 | | 3.7 | 3.7 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.3 | | | 0.3 | 1.2 | 3.5 | - | - | 135 | | 5 | 5.0 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14 | | | 0.3 | 2.8 | 3.7 | - | - | 146 | | 7 | 6.8 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 17 | | | 0.4 | 4.7 | 3.9 | 0.2 | - | 157 | | 9 | 9.2 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19 | | | 0.4 | 6.4 | 4.2 | 3.0 | - | 167 | | 14 | 14 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 22 | | | 0.4 | 7.5 | 4.4 | 7.3 | - | 176 | | 20 | 20 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24 | | | 0.4 | 8.4 | 4.5 | 12.9 | 2 | 185 | | 29 | 29 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27 | | | 0.4 | 9.3 | 4.7 | 16.9 | 16 | 193 | | 47 | 47 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 30 | | | 0.4 | 10.0 | 4.9 | 19.7 | 35 | 201 | | 70 | 70 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 36 | | | 0.4 | 11.4 | 5.3 | 24.4 | 87 | 217 | | 128 | 128 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 39 | | | 0.5 | 12.1 | 5.4 | 26.4 | 118 | 224 | | 162 | 162 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 42 | | | 0.5 | 12.7 | 5.6 | 28.2 | 152 | 231 | | 199 | 199 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 48 | | | 0.5 | 13.8 | 5.9 | 31.7 | 228 | 244 | | 244 | 244 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72 | | | 0.6 | 17.6 | 6.9 | 42.7 | 623 | 291 | | 291 | 291 |

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)^.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 Existing Detention Pond E-FINAL INTERIM - WindingWalk Filing 2 (H09)

### Gieck Basin - El Paso County, Colorado

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.3 |
| 100 year storage vol.= | 39.2 |
| 100 year discharge= | 25 |
| 5 year storage elev.= | 6971.15 |
| 5 year storage vol.= | 15.7 |
| 5 year discharge= | 3.4 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0248 | 1.65 | | Area = | 0.041 | Invert Elev = | 6967.18 |
| **Rectangular** | Orifice 2: | V | 0.75 | 1 | | Area = | 0.750 | Invert Elev = | 6970.75 |
| **Circular** | Orifice 3: | H | | | 8 | Area = | 0.349 | Invert Elev = | 6969.00 |
| **Rectangular** | Orifice 4: | V | 3.5 | 1.25 | | Area = | 4.375 | Invert Elev = | 6971.75 |

Stand Pipe Dimensions

| | | | | | |
|---|---|---|---|---|---|
| Rec Grate | 4.25 | x | 3 | Elev = | 6973.00 |
| Circ. Grate | | dia. | | Elev = | 6973.00 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6966.8 | | 6970.7 | | |
| Wall Thick. | 5 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6972.79 |
| 50 year discharge= | 12 |
| 25 year storage elev.= | 6972.29 |
| 25 year discharge= | 7.3 |
| 10 year storage elev.= | 6971.70 |
| 10 year discharge= | 5.3 |
| 2 year storage elev.= | 6970.26 |
| 2 year discharge= | 2.2 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.0 | | | - | - | - | - | - | 0.5 | | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.1 | | | 0.0 | - | - | - | - | 5.0 | | 0.01 | 0.01 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.4 | | | 0.1 | - | - | - | - | 8.8 | | 0.06 | 0.06 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.0 | | | 0.1 | - | - | - | - | 17.0 | | 0.11 | 0.11 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.2 | | | 0.2 | - | - | - | - | 25.8 | | 0.2 | 0.18 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.1 | | | 0.2 | - | 1.2 | - | - | 35.0 | | 1.4 | 1.4 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.9 | | | 0.3 | - | 1.7 | - | - | 48.4 | | 2.0 | 2.0 |
| 6970.5 | 3.5 | 329359.5 | 7.56 | 3.4 | 10.3 | | | 0.3 | - | 2.1 | - | - | 60.7 | | 2.4 | 2.4 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.3 | | | 0.3 | - | 2.2 | - | - | 68.0 | | 2.6 | 2.6 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14.4 | | | 0.3 | 0.3 | 2.4 | - | - | 72.6 | | 3.0 | 3.0 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 16.7 | | | 0.4 | 0.8 | 2.5 | - | - | 78.9 | | 3.7 | 3.7 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19.1 | | | 0.4 | 1.5 | 2.7 | - | - | 84.7 | | 4.5 | 4.5 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 21.6 | | | 0.4 | 2.3 | 2.8 | - | - | 90.1 | | 5.4 | 5.4 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24.3 | | | 0.4 | 3.1 | 2.9 | - | - | 94.8 | | 6.4 | 6.4 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27.0 | | | 0.4 | 3.6 | 3.0 | - | - | 98.7 | | 7.0 | 7.0 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 29.8 | | | 0.4 | 4.0 | 3.1 | 0.5 | - | 102.7 | | 8 | 8.1 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 35.6 | | | 0.4 | 4.8 | 3.4 | 5.2 | - | 110.5 | | 14 | 14 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 38.6 | | | 0.5 | 5.1 | 3.5 | 8.6 | 4 | 114.3 | | 21 | 21 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 41.6 | | | 0.5 | 5.4 | 3.6 | 12.5 | 11 | 118.1 | | 33 | 33 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 47.6 | | | 0.5 | 6.0 | 3.8 | 21.8 | 31 | 125.3 | | 63 | 63 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72.4 | | | 0.6 | 7.9 | 4.4 | 40.1 | 106 | 151.4 | | 151 | 151 |

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)^.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 Existing Detention Pond E- FINAL FUTURE (TOTAL FLOWS)

**Gieck Basin - El Paso County, Colorado**

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.6 |
| 100 year storage vol.= | 42.2 |
| 100 year discharge= | 240 |
| 5 year storage elev.= | 6971.4 |
| 5 year storage vol.= | 18.0 |
| 5 year discharge= | 16 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| WQCV depth = | 1.9 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

| | |
|---|---|
| 50 year storage elev.= | 6973.1 |
| 50 year storage vol.= | 36.3 |
| 50 year discharge= | 151 |
| 25 year storage elev.= | 6972.5 |
| 25 year storage vol.= | 30.1 |
| 25 year discharge= | 81 |
| 10 year storage elev.= | 6971.9 |
| 10 year storage vol.= | 23.0 |
| 10 year discharge= | 30 |
| 2 year storage elev.= | 6970.6 |
| 2 year storage vol.= | 11.0 |
| 2 year discharge= | 6.6 |

| STAGE | | STORAGE | | | | TOTAL DISCHARGE | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.00 | | | - | - | - | - | - | - | 1.4 | - | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.10 | - | - | 0.0 | - | - | - | - | - | 13 | - | 0.03 | 0.03 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.37 | - | - | 0.1 | - | - | - | - | - | 26 | - | 0.11 | 0.11 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.01 | - | - | 0.2 | - | - | - | - | - | 47 | - | 0.23 | 0.23 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.23 | - | - | 0.4 | - | - | - | - | - | 77 | - | 0.4 | 0.37 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.14 | - | - | 0.5 | - | 3.0 | - | - | - | 110 | - | 3.5 | 3.5 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.85 | - | - | 0.6 | - | 4 | - | - | - | 146 | - | 5 | 4.9 |
| 6970.5 | 3.5 | 329360 | 7.56 | 3.4 | 10.30 | - | - | 0.6 | 0.2 | 5 | - | - | - | 183 | - | 6 | 6.1 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.27 | | | 0.7 | 1.2 | 6 | - | - | - | 203 | - | 8 | 7.6 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14.41 | - | - | 0.7 | 3.1 | 6 | - | - | - | 218 | - | 10 | 9.8 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 16.70 | - | - | 0.7 | 5.5 | 6 | 0.20 | - | - | 236 | - | 13 | 13 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19.10 | - | - | 0.7 | 8 | 7 | 3.0 | - | - | 252 | - | 18 | 18 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 21.63 | - | - | 0.8 | 10 | 7 | 7.3 | - | - | 266 | - | 25 | 25 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24.28 | - | - | 0.8 | 12 | 7 | 13 | 2.4 | - | 280 | - | 35 | 35 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27.02 | - | - | 0.8 | 13 | 8 | 17 | 16 | - | 292 | - | 54 | 54 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 29.82 | - | - | 0.8 | 14 | 8 | 20 | 35 | - | 304 | - | 78 | 78 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 35.60 | - | - | 0.9 | 16 | 9 | 30 | 87 | - | 327 | - | 142 | 142 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 38.57 | - | - | 0.9 | 17 | 9 | 35 | 121 | - | 338 | - | 183 | 183 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 41.55 | - | - | 0.9 | 18 | 9 | 41 | 163 | - | 349 | - | 232 | 232 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 47.58 | - | - | 1.0 | 20 | 10 | 53 | 259 | - | 369 | - | 307 | 307 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72.42 | - | 1,102 | 1.1 | 25 | 11 | 83 | 729 | - | 443 | - | 443 | 1,545 |

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)^.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 Existing Detention Pond E-FINAL FUTURE (H08)

### Gieck Basin - El Paso County, Colorado

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974 |
| 100 year storage elev.= | 6973.6 |
| 100 year storage vol.= | 42.2 |
| 100 year discharge= | 204 |
| 5 year storage elev.= | 6971.4 |
| 5 year storage vol.= | 18.0 |
| 5 year discharge= | 12 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0248 | 1.65 | | Area = | 0.041 | Invert Elev = | 6967.18 |
| **Rectangular** | Orifice 2: | V | 2 | 0.8 | | Area = | 1.600 | Invert Elev = | 6970.40 |
| **Circular** | Orifice 3: | H | | | 10 | Area = | 0.545 | Invert Elev = | 6969.00 |
| **Rectangular** | Orifice 4: | V | 6 | 0.7 | | Area = | 4.200 | Invert Elev = | 6971.20 |

Stand Pipe Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| Rec Grate | | 11 | x | 7 | Elev = | 6971.90 |
| Circ. Grate | | | dia. | | Elev = | 6971.90 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6966.8 | | 6970.58 | | |
| Wall Thick. | 4 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6973.1 |
| 50 year discharge= | 136 |
| 25 year storage elev.= | 6972.5 |
| 25 year discharge= | 73 |
| 10 year storage elev.= | 6971.9 |
| 10 year discharge= | 24 |
| 2 year storage elev.= | 6970.6 |
| 2 year discharge= | 4.2 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | Rectangular | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.0 | | | - | - | - | - | - | 0.91 | | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.1 | | | 0.0 | - | - | - | - | 8.0 | | 0.01 | 0.01 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.4 | | | 0.1 | - | - | - | - | 18 | | 0.06 | 0.06 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.0 | | | 0.1 | - | - | - | - | 30 | | 0.11 | 0.11 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.2 | | | 0.2 | - | - | - | - | 52 | | 0.2 | 0.2 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.1 | | | 0.2 | - | 1.9 | - | - | 75 | | 2.1 | 2.1 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.9 | | | 0.3 | - | 2.6 | - | - | 97 | | 2.9 | 2.9 |
| 6970.5 | 3.5 | 329359.5 | 7.56 | 3.4 | 10 | | | 0.3 | 0.2 | 3.2 | - | - | 122 | | 3.7 | 3.7 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.3 | | | 0.3 | 1.2 | 3.5 | - | - | 135 | | 5 | 5.0 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14 | | | 0.3 | 2.8 | 3.7 | - | - | 146 | | 7 | 6.8 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 17 | | | 0.4 | 4.7 | 3.9 | 0.2 | - | 157 | | 9 | 9.2 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19 | | | 0.4 | 6.4 | 4 | 3.0 | - | 167 | | 14 | 14 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 22 | | | 0.4 | 7.5 | 4 | 7.3 | - | 176 | | 20 | 20 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24 | | | 0.4 | 8 | 5 | 13 | 2 | 185 | | 29 | 29 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27 | | | 0.4 | 9 | 5 | 17 | 16 | 193 | | 47 | 47 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 30 | | | 0.4 | 10 | 5 | 20 | 35 | 201 | | 70 | 70 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 36 | | | 0.4 | 11 | 5 | 24 | 87 | 217 | | 128 | 128 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 39 | | | 0.5 | 12 | 5 | 26 | 118 | 224 | | 162 | 162 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 42 | | | 0.5 | 13 | 6 | 28 | 152 | 231 | | 199 | 199 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 48 | | | 0.5 | 14 | 6 | 32 | 228 | 244 | | 244 | 244 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72 | | | 0.6 | 18 | 7 | 43 | 623 | 291 | | 291 | 291 |

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)^.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 Existing Detention Pond E-FINAL FUTURE (H09)

### Gieck Basin - El Paso County, Colorado

Data for spillway and embankment:

| | |
|---|---|
| embankment length = | 1860 |
| embankment elev = | 6976 |
| spillway length = | 200 |
| spillway elevation = | 6974.5 |
| 100 year storage elev.= | 6973.6 |
| 100 year storage vol.= | 42.2 |
| 100 year discharge= | 36 |
| 5 year storage elev.= | 6971.4 |
| 5 year storage vol.= | 18.0 |
| 5 year discharge= | 4.2 |
| WQCV storage elev.= | 6968.9 |
| WQCV storage vol.= | 1.5 |
| 1/2 WQCV storage elev.= | 6968.3 |
| 1/2 WQCV storage vol.= | 0.8 |

Data for outlet pipe and grate:

| Type | | H or V | Dimensions Width (ft.) | X Height (ft.) | Dia.(in) | | (sqft) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rectangular** | Orifice 1: | V | 0.0248 | 1.65 | | Area = | 0.041 | Invert Elev = | 6967.18 |
| **Rectangular** | Orifice 2: | V | 0.75 | 1 | | Area = | 0.750 | Invert Elev = | 6970.75 |
| **Circular** | Orifice 3: | H | | | 8 | Area = | 0.349 | Invert Elev = | 6969.00 |
| **Rectangular** | Orifice 4: | V | 3.5 | 1.25 | | Area = | 4.375 | Invert Elev = | 6971.75 |

Stand Pipe Dimensions

| | | | | | | |
|---|---|---|---|---|---|---|
| Rec Grate | | 4.25 | x | 3 | Elev = | 6973.00 |
| Circ. Grate | | | dia. | | Elev = | 6973.00 |

Outlet Culvert Dimensions

| | Width (ft.) | | Height (ft.) | Dia. (ft.) | Type |
|---|---|---|---|---|---|
| Outlet Culvert | | x | | 3.5 | **Circular** |
| Area | 9.6 | | TOP | | |
| Outlet I. E. | 6966.8 | | 6970.7 | | |
| Wall Thick. | 5 | in. | | | |

| | |
|---|---|
| 50 year storage elev.= | 6973.1 |
| 50 year discharge= | 16 |
| 25 year storage elev.= | 6972.5 |
| 25 year discharge= | 8.4 |
| 10 year storage elev.= | 6971.9 |
| 10 year discharge= | 6.0 |
| 2 year storage elev.= | 6970.6 |
| 2 year discharge= | 2.4 |

| STAGE | | STORAGE | | | | DISCHARGE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELEV | HEIGHT | AREA | | VOLUME | | TOP OF | SPILLWAY | ORIFICE (max outflow) | | | | GRATE (max outflow) | PIPE | | REALIZED CULVERT OUTFLOW | TOTAL FLOW |
| | | sqft | acre | acft | cum acft | BANK | | 1 | 2 | 3 | 4 | **Rectangular** | 1 | 2 | | |
| 6967 | 0 | 1808 | 0.04 | 0.0 | 0.0 | | | - | - | - | - | - | 0.45 | | - | - |
| 6967.5 | 0.5 | 16136.5 | 0.37 | 0.1 | 0.1 | | | 0.0 | - | - | - | - | 5.0 | | 0.01 | 0.01 |
| 6968 | 1 | 30465 | 0.70 | 0.3 | 0.4 | | | 0.1 | - | - | - | - | 8.8 | | 0.06 | 0.06 |
| 6968.5 | 1.5 | 81028.5 | 1.86 | 0.6 | 1.0 | | | 0.1 | - | - | - | - | 17 | | 0.11 | 0.11 |
| 6969 | 2 | 131592 | 3.02 | 1.2 | 2.2 | | | 0.2 | - | - | - | - | 26 | | 0.2 | 0.18 |
| 6969.5 | 2.5 | 201294.5 | 4.62 | 1.9 | 4.1 | | | 0.2 | - | 1.2 | - | - | 35 | | 1.4 | 1.4 |
| 6970 | 3 | 270997 | 6.22 | 4.6 | 6.9 | | | 0.3 | - | 1.7 | - | - | 48 | | 2.0 | 2.0 |
| 6970.5 | 3.5 | 329359.5 | 7.56 | 3.4 | 10.3 | | | 0.3 | - | 2.1 | - | - | 61 | | 2.4 | 2.4 |
| 6970.75 | 3.75 | 358540.75 | 8.23 | 2.0 | 12.3 | | | 0.3 | - | 2.2 | - | - | 68 | | 2.6 | 2.6 |
| 6971 | 4 | 387722 | 8.90 | 7.6 | 14.4 | | | 0.3 | 0.3 | 2.4 | - | - | 73 | | 3.0 | 3.0 |
| 6971.25 | 4.25 | 408751 | 9.38 | 2.3 | 16.7 | | | 0.4 | 0.8 | 2.5 | - | - | 79 | | 3.7 | 3.7 |
| 6971.5 | 4.5 | 429780 | 9.87 | 4.7 | 19.1 | | | 0.4 | 1.5 | 2.7 | - | - | 85 | | 4.5 | 4.5 |
| 6971.75 | 4.75 | 450809 | 10.35 | 2.5 | 21.6 | | | 0.4 | 2.3 | 2.8 | - | - | 90 | | 5.4 | 5.4 |
| 6972 | 5 | 471838 | 10.83 | 5.2 | 24.3 | | | 0.4 | 3.1 | 2.9 | - | - | 95 | | 6.4 | 6.4 |
| 6972.25 | 5.25 | 482595.75 | 11.08 | 2.7 | 27.0 | | | 0.4 | 3.6 | 3.0 | - | - | 99 | | 7.0 | 7.0 |
| 6972.5 | 5.5 | 493354 | 11.33 | 5.5 | 29.8 | | | 0.4 | 4.0 | 3.1 | 0.5 | - | 103 | | 8 | 8.1 |
| 6973 | 6 | 514869 | 11.82 | 5.8 | 35.6 | | | 0.4 | 4.8 | 3.4 | 5.2 | - | 111 | | 14 | 14 |
| 6973.25 | 6.25 | 518272 | 11.90 | 3.0 | 38.6 | | | 0.5 | 5.1 | 3.5 | 8.6 | 4 | 114 | | 21 | 21 |
| 6973.5 | 6.5 | 521675 | 11.98 | 5.9 | 41.6 | | | 0.5 | 5.4 | 3.6 | 13 | 11 | 118 | | 33 | 33 |
| 6974 | 7 | 528481 | 12.13 | 12.0 | 47.6 | | | 0.5 | 6.0 | 3.8 | 22 | 31 | 125 | | 63 | 63 |
| 6976 | 9 | 553685 | 12.71 | 24.8 | 72.4 | | | 0.6 | 7.9 | 4.4 | 40 | 106 | 151 | | 151 | 151 |

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)^.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.

## WINDINGWALK FILING 2 INTERIM CONDITION

### Simulation Run: WW2-100 YR Reservoir: POND H

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | WW Grading |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 120(CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:24 |
| Peak Outflow: | 47 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 13:06 |
| Total Inflow : | 16.9 (AC-FT) | Peak Storage: | 7.2 (AC-FT) |
| Total Outflow: | 14.0 (AC-FT) | Peak Elevation: | 6973.3 (FT) |

### Simulation Run: WW2-005 YR Reservoir: POND H

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | WW Grading |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 24 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:30 |
| Peak Outflow: | 2.3 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 17:00 |
| Total Inflow : | 4.0 (AC-FT) | Peak Storage: | 2.5 (AC-FT) |
| Total Outflow: | 2.1 (AC-FT) | Peak Elevation: | 6971.6 (FT) |

### Simulation Run: WW2-100 YR Reservoir: POND E

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | WW Grading |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 484 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:12 |
| Peak Outflow: | 199 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 13:48 |
| Total Inflow : | 112.5 (AC-FT) | Peak Storage: | 39.5 (AC-FT) |
| Total Outflow: | 88.5 (AC-FT) | Peak Elevation: | 6973.3 (FT) |

**Simulation Run: WW2-005 YR Reservoir: POND E**

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | WW Grading |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 113 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:12 |
| Peak Outflow: | 12 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 21:24 |
| Total Inflow : | 24.1 (AC-FT) | Peak Storage: | 15.9 (AC-FT) |
| Total Outflow: | 9.8 (AC-FT) | Peak Elevation: | 6971.2 (FT) |

**WINDINGWALK FILING 2 FUTURE CONDITION**
**Simulation Run: F-100 YR Reservoir: POND H**

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 152(CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:06 |
| Peak Outflow: | 57 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 12:32 |
| Total Inflow : | 18.0 (AC-FT) | Peak Storage: | 7.7 (AC-FT) |
| Total Outflow: | 15.2 (AC-FT) | Peak Elevation: | 6973.4 (FT) |

**Simulation Run: F-005 YR Reservoir: POND H**

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| Compute Time: | 14Mar2018 13:26:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 34 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 06:14 |
| Peak Outflow: | 3.1 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 08:24 |
| Total Inflow : | 4.5 (AC-FT) | Peak Storage: | 2.8 (AC-FT) |
| Total Outflow: | 2.6 (AC-FT) | Peak Elevation: | 6971.7 (FT) |

**Simulation Run: F-100 YR Reservoir: POND E**

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 100YR |
| Compute Time: | 14Mar2018 13:11:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 609 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 12:06 |
| Peak Outflow: | 240 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 12:32 |
| Total Inflow : | 123.4 (AC-FT) | Peak Storage: | 42.2 (AC-FT) |
| Total Outflow: | 99.4 (AC-FT) | Peak Elevation: | 6973.6 (FT) |

**Simulation Run: F-005 YR Reservoir: POND E**

| | | | |
|---|---|---|---|
| Start of Run: | 01Jul2015, 00:00 | Basin Model: | Future SCS |
| End of Run: | 02Jul2015, 00:00 | Meteorologic Model: | SCS TYPE IIA 005YR |
| Compute Time: | 14Mar2018 13:26:34 | Control Specifications: | 24 HR-2 MIN. |
| | | Volume Units: | AC-FT |

Computed Results:

| | | | |
|---|---|---|---|
| Peak Inflow: | 126 (CFS) | Date/Time of Peak Inflow: | 01Jul2015, 06:14 |
| Peak Outflow: | 16 (CFS) | Date/Time of Peak Outflow: | 01Jul2015, 08:24 |
| Total Inflow : | 29.0 (AC-FT) | Peak Storage: | 17.9 (AC-FT) |
| Total Outflow: | 13.1 (AC-FT) | Peak Elevation: | 6971.9 (FT) |

# Appendix E – Outlet Protection

# RIP RAP PLUNGE POOL

Urban Drainage & Flood Control District Pipe Outlet Design

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

OUTLET # EXIST OS-3

| | | | | | |
|---|---|---|---|---|---|
| Outlet Size (D) : | 54 | in. | Discharge (q): | 193 | CFS |
| Capacity (Q): (full flow) | 158 | CFS | Flow depth (d): (calculated) | 4 | ft. |

| | | | |
|---|---|---|---|
| $Q_{full}$ = | 193 CFS | $q/Q_{full}$ = | 1.00 |
| $A_{full}$ = | 15.9 SF | | |
| $V_{full}$ = | 12.1 FPS | $Q/D^{2.5}$ = | 4.5 |

| | | |
|---|---|---|
| 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 ($a=A' \times A_{full}$) | 14.5 | SF |

Outlet Velocity (V = q/a) 13.3 FPS

$P_d = (V^2 + gd)^{1/2}$ = 18

RIP-RAP SIZE: M from HS-20c

$d_{50}$= 12 in T=1.75x$d_{50}$ 1.75 ft

| | | | | |
|---|---|---|---|---|
| Basin Length (L) | 18.0 FT. | Cutoff Wall Depth (B=D/2+T) | 4 | FT |
| Basin Width (W) | 18.0 FT. | | | |

# RIP RAP PLUNGE POOL

Urban Drainage & Flood Control District Pipe Outlet Design

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

OUTLET # OS-4

| | | | | | |
|---|---|---|---|---|---|
| Outlet Size (D) : | 24 | in. | Discharge (q): | 16 | CFS |
| Capacity (Q): (full flow) | 23 | CFS | Flow depth (d): (calculated) | 1.6 | ft. |

| | | | | |
|---|---|---|---|---|
| $Q_{full}$ = | 23 | CFS | $q/Q_{full}$ = | 0.69 |
| $A_{full}$ = | 3.1 | SF | | |
| $V_{full}$ = | 7.4 | FPS | $Q/D^{2.5}$ = | 2.8 |

| | | |
|---|---|---|
| d/D | 0.67 | from HS-20a using $q/Q_{full}$ |
| d/D | 0.68 | from HS-20b using $Q/D^{2.5}$ |

| | | | | | |
|---|---|---|---|---|---|
| A' ($A/A_{full}$) | 0.67 | from HS-20a using smaller d/D from above | Flow Area ($a=A' \times A_{full}$) | 2.1 | SF |

Outlet Velocity (V = q/a) 7.6 FPS

$P_d = (V^2 + gd)^{1/2}$ = 10

RIP-RAP SIZE: L from HS-20c

$d_{50}$= 9 in $T=1.75xd_{50}$ 1.313 ft

| | | | | | |
|---|---|---|---|---|---|
| Basin Length (L) | 8.0 | FT. | Cutoff Wall Depth (B=D/2+T) | 2.313 | FT |
| Basin Width (W) | 8.0 | FT. | | | |

# Appendix F – Sideyard Overflow Analysis

# Worksheet for Sump Inlets 42 & 43

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.035 | |
| Channel Slope | 0.02000 | ft/ft |
| Left Side Slope | 10.00 | ft/ft (H:V) |
| Right Side Slope | 10.00 | ft/ft (H:V) |
| Discharge | 27.00 | ft³/s |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.88 | ft |
| Flow Area | 7.79 | ft² |
| Wetted Perimeter | 17.73 | ft |
| Hydraulic Radius | 0.44 | ft |
| Top Width | 17.65 | ft |
| Critical Depth | 0.85 | ft |
| Critical Slope | 0.02387 | ft/ft |
| Velocity | 3.47 | ft/s |
| Velocity Head | 0.19 | ft |
| Specific Energy | 1.07 | ft |
| Froude Number | 0.92 | |
| Flow Type | Subcritical | |

## GVF Input Data

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

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.88 | ft |
| Critical Depth | 0.85 | ft |
| Channel Slope | 0.02000 | ft/ft |
| Critical Slope | 0.02387 | ft/ft |

# Appendix G – Soil Resource Report

USDA 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

## WindingWalk Filing 2


June 27, 2018

# 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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# Contents

# 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.

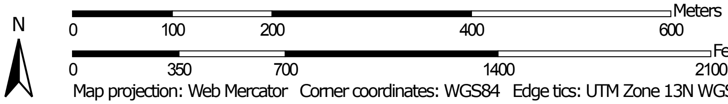
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in 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.

# Soil Map


Map Scale: 1:7,580 if printed on A landscape (11" x 8.5") sheet.




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

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

**Special Point Features**

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 15, Oct 10, 2017

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

Date(s) aerial images were photographed: May 22, 2016—Mar 9, 2017

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 | 0.1 | 0.1% |
| 83 | Stapleton sandy loam, 3 to 8 percent slopes | 187.8 | 99.9% |
| **Totals for Area of Interest** | | **187.9** | **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:* 85 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Columbine

#### Setting

*Landform:* Fan terraces, fans, flood plains
*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
*Natural 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 storage in profile:* Very low (about 2.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 4e
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* Gravelly Foothill (R049BY214CO)
*Hydric soil rating:* No

### Minor Components

#### Fluvaquentic haplaquolls

*Percent of map unit:*
*Landform:* Swales
*Hydric soil rating:* Yes

#### Other soils

*Percent of map unit:*

*Hydric soil rating:* No

**Pleasant**

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

## 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:* 80 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
*Natural 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 storage in profile:* Low (about 4.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* B

*Ecological site:* Gravelly Foothill (R049BY214CO)
*Hydric soil rating:* No

**Minor Components**

**Fluvaquentic haplaquolls**
*Percent of map unit:*
*Landform:* Swales
*Hydric soil rating:* Yes

**Other soils**
*Percent of map unit:*
*Hydric soil rating:* No

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

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**Figure 4 - Meridian Ranch Rational Basin Map**

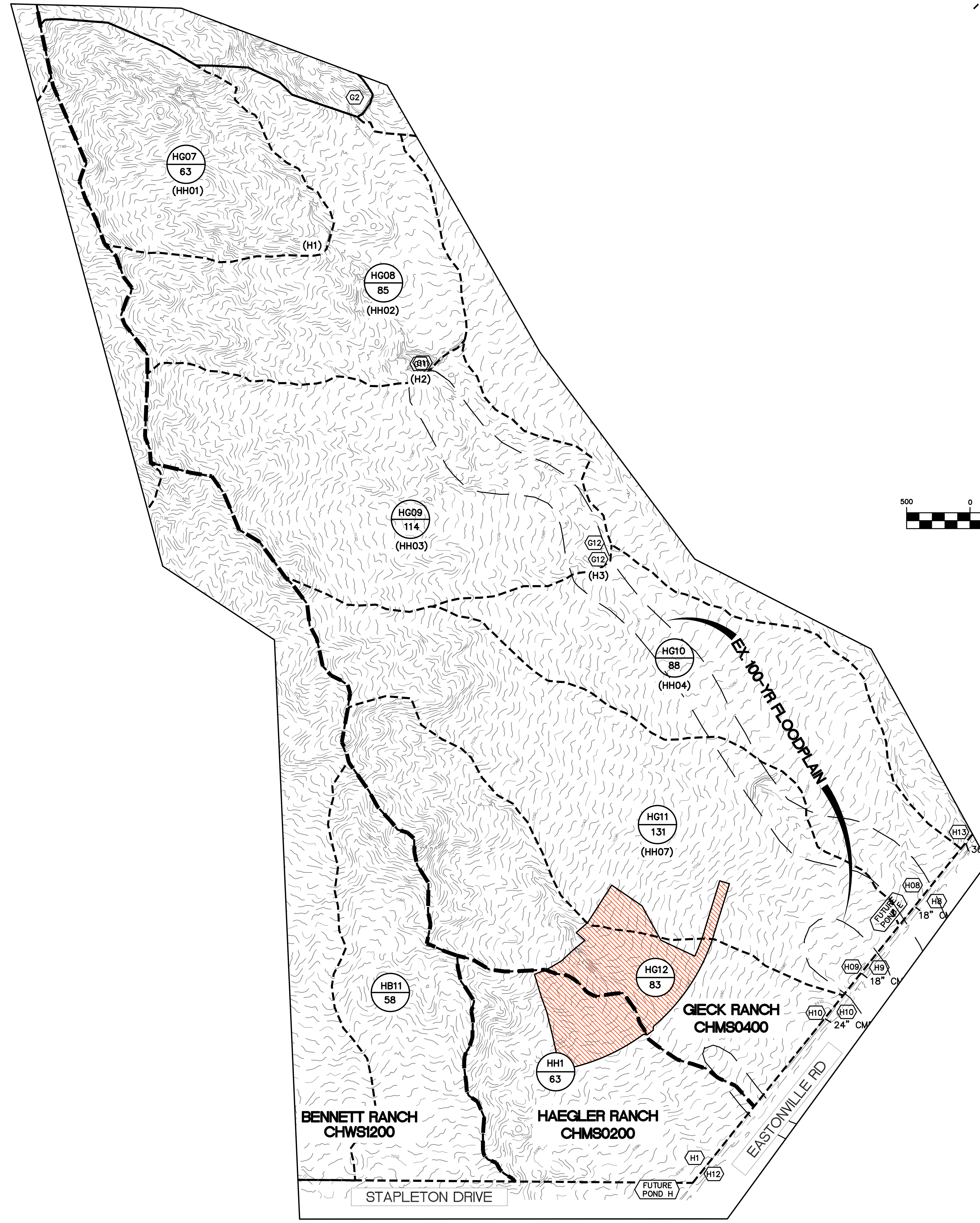
**Figure 5 - Meridian Ranch SCS Method – Historic Basins Map**

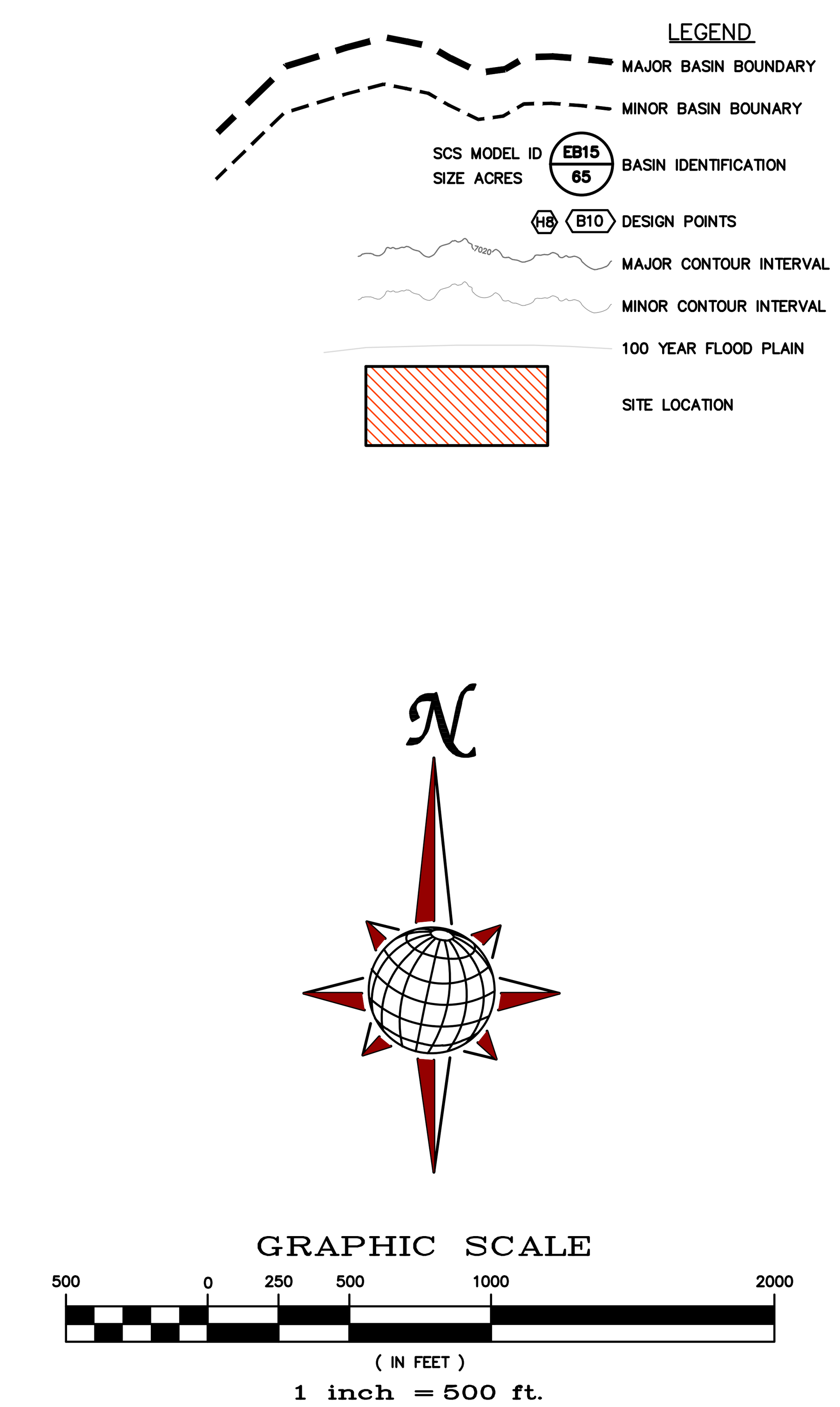
**Figure 6 - Meridian Ranch SCS Method – Interim Basins Map**

**Figure 7 - Meridian Ranch SCS Method – Future Basins Map**

# SCS DRAINAGE MAP
# MERIDIAN RANCH WINDINGWALK FILING 2

| HISTORIC | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| HG07 | 0.0984 | 47 | 31 | 18 | 7.1 | 2.4 | 0.4 |
| HG07-G11 | 0.0984 | 47 | 31 | 18 | 7.0 | 2.4 | 0.4 |
| HG08 | 0.1328 | 73 | 48 | 28 | 11 | 3.6 | 0.5 |
| G11 | 0.2312 | 115 | 75 | 44 | 17 | 5.7 | 0.9 |
| G11-G12 | 0.2312 | 114 | 75 | 44 | 17 | 5.6 | 0.9 |
| HG09 | 0.1781 | 73 | 48 | 29 | 11 | 4.1 | 0.7 |
| G12 | 0.4093 | 187 | 122 | 72 | 28 | 9.7 | 1.6 |
| G12-H08 | 0.4093 | 183 | 121 | 71 | 28 | 9.7 | 1.6 |
| HG10 | 0.1375 | 39 | 26 | 16 | 6.5 | 2.6 | 0.5 |
| H08 | 0.5468 | 216 | 142 | 85 | 34 | 12 | 2.1 |
| **HG11** | **0.2047** | **77** | **51** | **30** | **12** | **4.5** | **0.8** |
| **H09** | **0.2047** | **77** | **51** | **30** | **12** | **4.5** | **0.8** |
| **HH01** | **0.0984** | **65** | **43** | **25** | **9.4** | **3.0** | **0.4** |
| **H12** | **0.0984** | **65** | **43** | **25** | **9.4** | **3.0** | **0.4** |
| **HG12** | **0.1297** | **57** | **38** | **22** | **8.7** | **3.1** | **0.5** |
| **H10** | **0.1297** | **57** | **38** | **22** | **8.7** | **3.1** | **0.5** |

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FALCON, CO 80831
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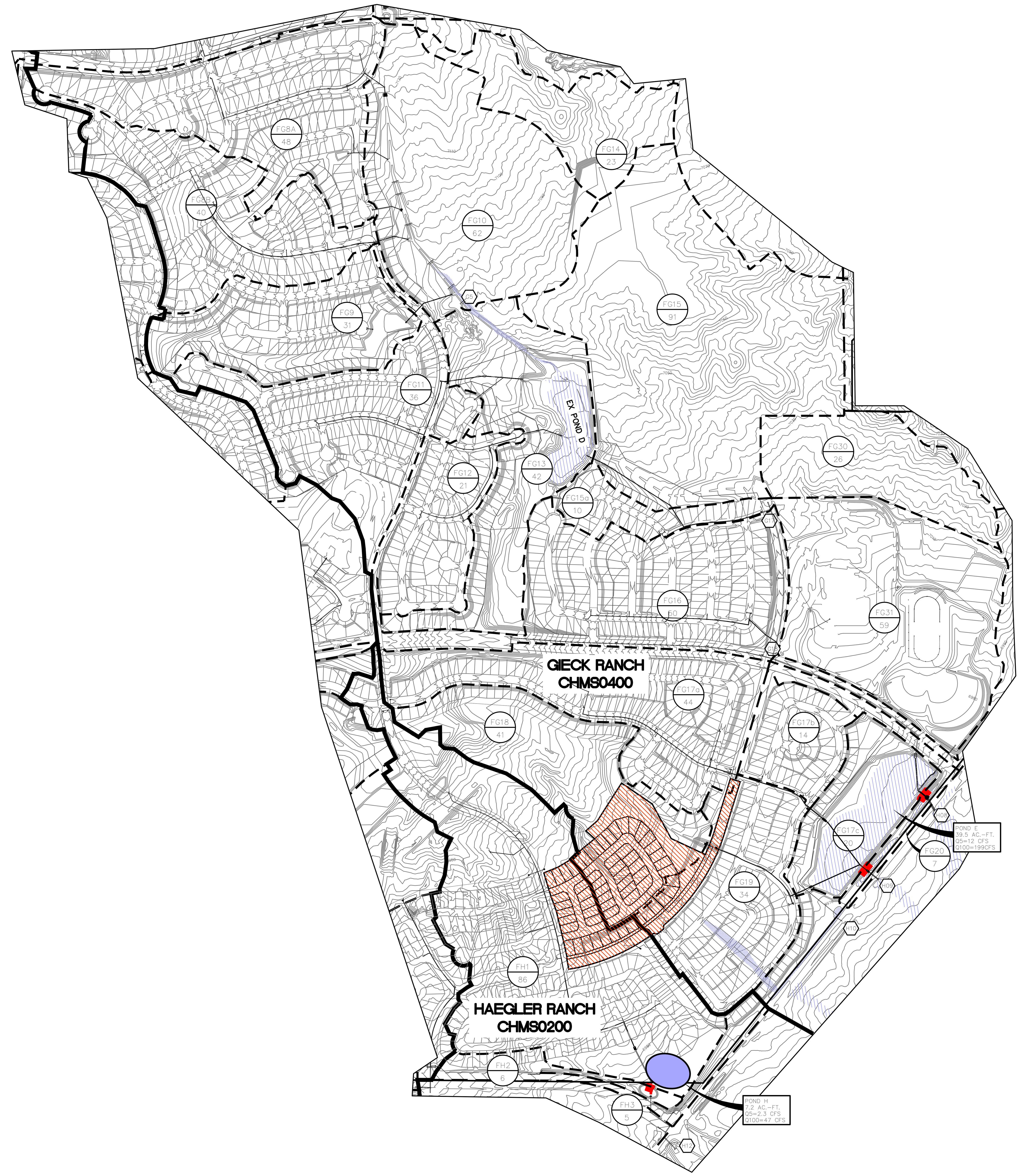
# *HISTORIC CONDITIONS*

**FIGURE 4**

AUG 2018

# SCS DRAINAGE MAP
# MERIDIAN RANCH WINDINGWALK FILING 2

| INTERIM CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG08A | 0.075 | 117 | 91 | 67 | 42 | 27.1 | 13.6 |
| FG08A-G05 | 0.075 | 111 | 86 | 65 | 41 | 26.7 | 13.6 |
| FG08B | 0.063 | 87 | 67 | 50 | 31 | 20.4 | 10.3 |
| FG08B-G05 | 0.063 | 85 | 66 | 49 | 30 | 19.5 | 10.1 |
| FG11 | 0.0625 | 76 | 59 | 45 | 29 | 18.8 | 10.0 |
| FG09 | 0.0484 | 49 | 36 | 26 | 15 | 8.4 | 3.3 |
| FG09-G05 | 0.0484 | 48 | 36 | 25 | 14 | 8.2 | 3.3 |
| HG10 | 0.0467 | 29 | 20 | 12 | 5 | 2.1 | 0.4 |
| G05 | 0.2956 | 344 | 261 | 190 | 115 | 72.3 | 36.3 |
| FG13 | 0.0661 | 44 | 31 | 20 | 10 | 4.9 | 1.4 |
| FG12 | 0.0328 | 51 | 40 | 31 | 20 | 13.9 | 7.9 |
| POND D | 0.3945 | 107 | 70 | 34 | 15 | 8.6 | 2.7 |
| POND D-G17 | 0.3945 | 107 | 69 | 34 | 15 | 8.6 | 2.7 |
| HG15 | 0.0297 | 13 | 8.8 | 5.4 | 2.2 | 0.9 | 0.2 |
| FG15a | 0.0156 | 28 | 22 | 17 | 11 | 7.3 | 4.0 |
| G17 | 0.4398 | 119 | 77 | 38 | 17 | 9.3 | 4.3 |
| G17-G18 | 0.4398 | 119 | 77 | 38 | 17 | 9.3 | 4.0 |
| FG16 | 0.0773 | 127 | 98 | 74 | 47 | 31 | 16 |
| G18 | 0.5171 | 167 | 126 | 93 | 59 | 38 | 20 |
| G18-POND E | 0.5171 | 161 | 121 | 89 | 56 | 37 | 20 |
| HG30 | 0.1844 | 50 | 33 | 20 | 8.4 | 3.3 | 0.7 |
| FG30-PONDHS | 0.1844 | 50 | 33 | 20 | 8.4 | 3.3 | 0.7 |
| FG31 | 0.0922 | 118 | 92 | 71 | 46 | 31 | 18 |
| POND HS | 0.2766 | 102 | 62 | 40 | 27 | 19 | 10 |
| FG17a | 0.0694 | 108 | 84 | 63 | 40 | 26 | 14 |
| FG17a-POND E | 0.0694 | 106 | 82 | 61 | 39 | 26 | 14 |
| **FG18** | **0.0644** | **56** | **42** | **30** | **17** | **10.4** | **4.6** |
| FG18-POND E | 0.0644 | 56 | 42 | 30 | 17 | 10.4 | 4.5 |
| FG19 | 0.0527 | 85 | 67 | 51 | 33 | 23 | 13.3 |
| FG17c | 0.0313 | 32 | 22 | 15 | 7 | 2.9 | 0.5 |
| FG17b | 0.0214 | 40 | 31 | 24 | 16 | 11 | 6.2 |
| **POND E** | **1.0329** | **199** | **119** | **61** | **24** | **12** | **5.5** |
| **H08** | | **173** | **107** | **54** | **19** | **8.3** | **3.3** |
| **H09** | | **25** | **12** | **7.3** | **5.3** | **3.4** | **2.2** |
| **FH01** | **0.1348** | **120** | **91** | **66** | **39** | **24** | **11.0** |
| **POND H** | **0.1348** | **47** | **26** | **15** | **6.0** | **2.3** | **1.1** |
| **FH02** | **0.0091** | **11** | **8.0** | **5.6** | **3.2** | **1.9** | **0.7** |
| FH03 | 0.0081 | 14 | 11 | 8.3 | 5.5 | 3.8 | 2.2 |
| H12 | 0.152 | 50 | 28 | 16 | 9.2 | 6.2 | 3.1 |




N

GRAPHIC SCALE

500 0 250 500 1000 2000

( IN FEET )

1 inch = 500 ft.

LEGEND

MAJOR BASIN BOUNDARY

MINOR BASIN BOUNARY

SCS MODEL ID EB15 SIZE ACRES 65 BASIN IDENTIFICATION

H8 B10 DESIGN POINTS

MAJOR CONTOUR INTERVAL

MINOR CONTOUR INTERVAL

100 YEAR FLOOD PLAIN

SITE LOCATION

# INTERIM CONDITIONS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FALCON, CO 80831
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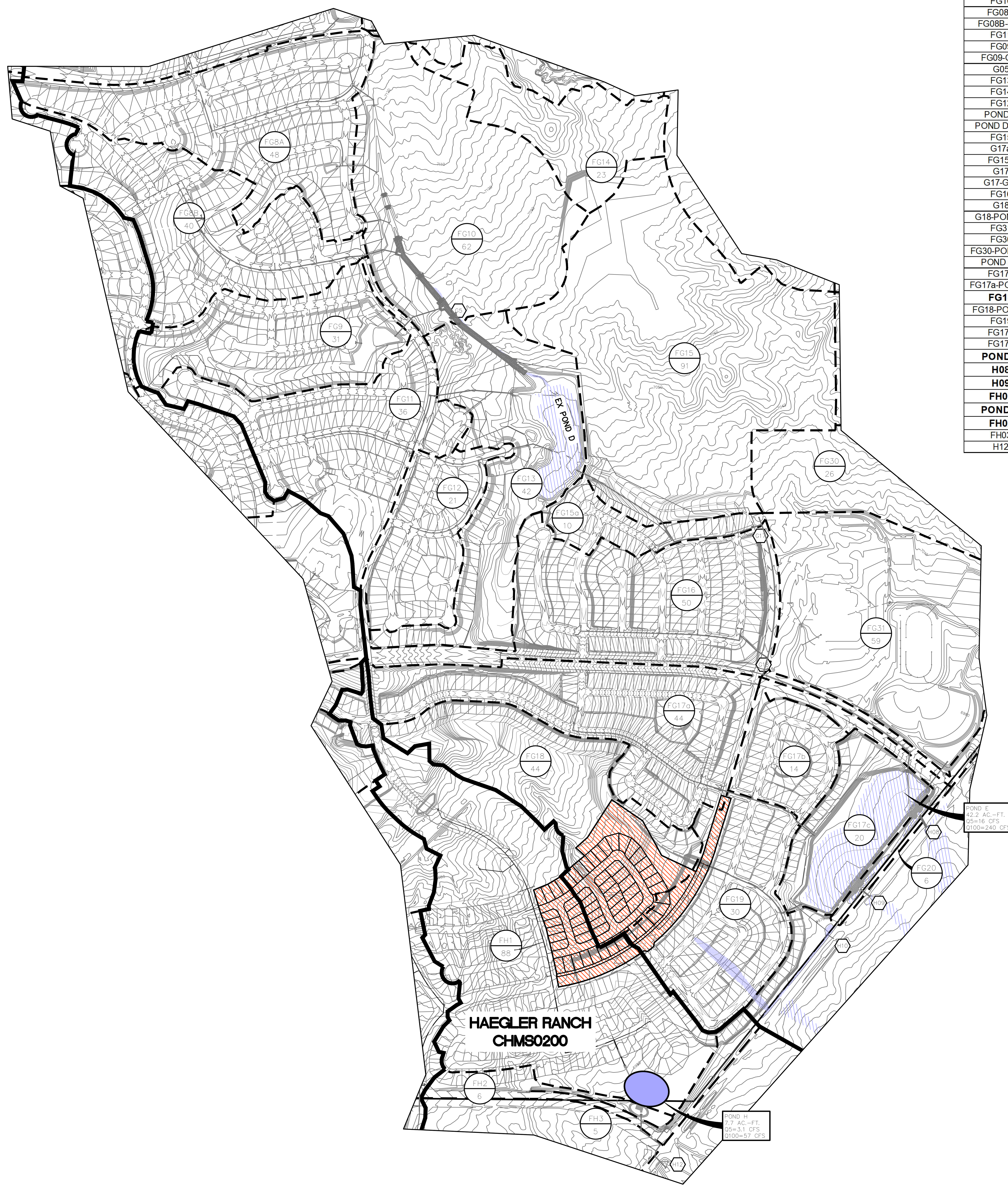
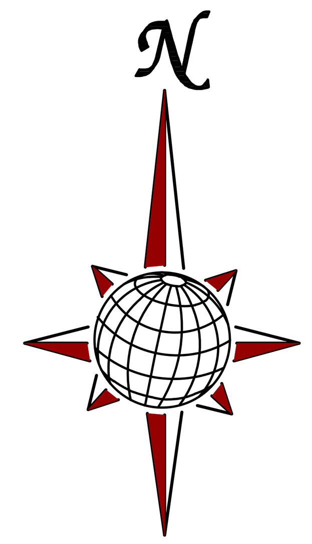
**FIGURE 5**

AUG 2018

# SCS DRAINAGE MAP
# MERIDIAN RANCH WINDINGWALK FILING 2

| FUTURE CONDITIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| HYDROLOGIC ELEMENT | DRAINAGE AREA (SQ. MI.) | DISCHARGE PEAK Q100 (CFS) | DISCHARGE PEAK Q50 (CFS) | DISCHARGE PEAK Q25 (CFS) | DISCHARGE PEAK Q10 (CFS) | DISCHARGE PEAK Q5 (CFS) | DISCHARGE PEAK Q2 (CFS) |
| FG08A | 0.0750 | 117 | 91 | 67 | 42 | 27 | 14 |
| FG08A-G05 | 0.0750 | 111 | 86 | 65 | 41 | 27 | 14 |
| FG10 | 0.0669 | 46 | 34 | 24 | 14 | 8.3 | 3.6 |
| FG08B | 0.0630 | 87 | 67 | 50 | 31 | 20 | 10 |
| FG08B-G05 | 0.0630 | 85 | 66 | 49 | 30 | 20 | 10 |
| FG11 | 0.0625 | 76 | 59 | 45 | 29 | 19 | 10 |
| FG09 | 0.0484 | 49 | 36 | 26 | 15 | 8.4 | 3.3 |
| FG09-G05 | 0.0484 | 48 | 36 | 25 | 14 | 8.2 | 3.3 |
| G05 | 0.3158 | 342 | 262 | 192 | 117 | 75 | 38 |
| FG13 | 0.0661 | 44 | 31 | 20 | 10 | 4.9 | 1.4 |
| FG14 | 0.0331 | 42 | 32 | 24 | 15 | 10 | 5.2 |
| FG12 | 0.0328 | 51 | 40 | 31 | 20 | 14 | 7.9 |
| POND D | 0.4478 | 131 | 89 | 51 | 19 | 12 | 4.5 |
| POND D-G17 | 0.4478 | 131 | 89 | 51 | 19 | 12 | 4.5 |
| FG15 | 0.1017 | 95 | 71 | 51 | 29 | 18 | 7.5 |
| G17a | 0.1017 | 95 | 71 | 51 | 29 | 18 | 7.5 |
| FG15a | 0.0156 | 28 | 22 | 17 | 11 | 7.3 | 4.0 |
| G17 | 0.5651 | 184 | 121 | 72 | 40 | 23 | 11 |
| G17-G18 | 0.5651 | 184 | 121 | 72 | 40 | 23 | 11 |
| FG16 | 0.0773 | 127 | 98 | 74 | 47 | 31 | 16 |
| G18 | 0.6424 | 235 | 177 | 127 | 77 | 49 | 24 |
| G18-POND E | 0.6424 | 233 | 176 | 126 | 77 | 48 | 24 |
| FG31 | 0.0922 | 118 | 92 | 71 | 46 | 31 | 18 |
| FG30 | 0.0400 | 76 | 60 | 46 | 31 | 21 | 12 |
| FG30-PONDHS | 0.0400 | 74 | 59 | 45 | 29 | 20 | 11 |
| POND HS | 0.1322 | 156 | 107 | 60 | 37 | 27 | 15 |
| FG17a | 0.0694 | 102 | 79 | 58 | 36 | 23 | 12 |
| FG17a-POND E | 0.0694 | 100 | 77 | 57 | 36 | 23 | 12 |
| **FG18** | **0.0644** | **57** | **43** | **31** | **18** | **11** | **4.8** |
| FG18-POND E | 0.0644 | 57 | 42 | 30 | 18 | 11 | 4.7 |
| FG19 | 0.0527 | 85 | 67 | 51 | 33 | 23 | 13 |
| FG17c | 0.0313 | 32 | 22 | 15 | 6.7 | 2.9 | 0.5 |
| FG17b | 0.0214 | 40 | 31 | 24 | 16 | 11 | 6.2 |
| **POND E** | **1.0138** | **240** | **151** | **81** | **30** | **16** | **7** |
| **H08** | **1.0138** | **204** | **136** | **73** | **24** | **12** | **4.2** |
| **H09** | **0.0000** | **36** | **16** | **8** | **6.0** | **4.2** | **2.4** |
| **FH01** | **0.1344** | **152** | **117** | **87** | **53** | **34** | **17** |
| **POND H** | **0.1344** | **57** | **32** | **18** | **7.8** | **3.0** | **1.2** |
| **FH02** | **0.0091** | **11** | **8.0** | **5.6** | **3.2** | **1.9** | **0.7** |
| FH03 | 0.0081 | 14 | 11 | 8 | 5.5 | 3.8 | 2.2 |
| H12 | 0.1516 | 62 | 35 | 20 | 10 | 6.3 | 3.5 |




GRAPHIC SCALE

500 0 250 500 1000 2000

( IN FEET )

1 inch = 500 ft.

LEGEND

MAJOR BASIN BOUNDARY

MINOR BASIN BOUNARY

SCS MODEL ID EB15 SIZE ACRES 65 BASIN IDENTIFICATION

H8 B10 DESIGN POINTS

MAJOR CONTOUR INTERVAL

MINOR CONTOUR INTERVAL

100 YEAR FLOOD PLAIN

SITE LOCATION

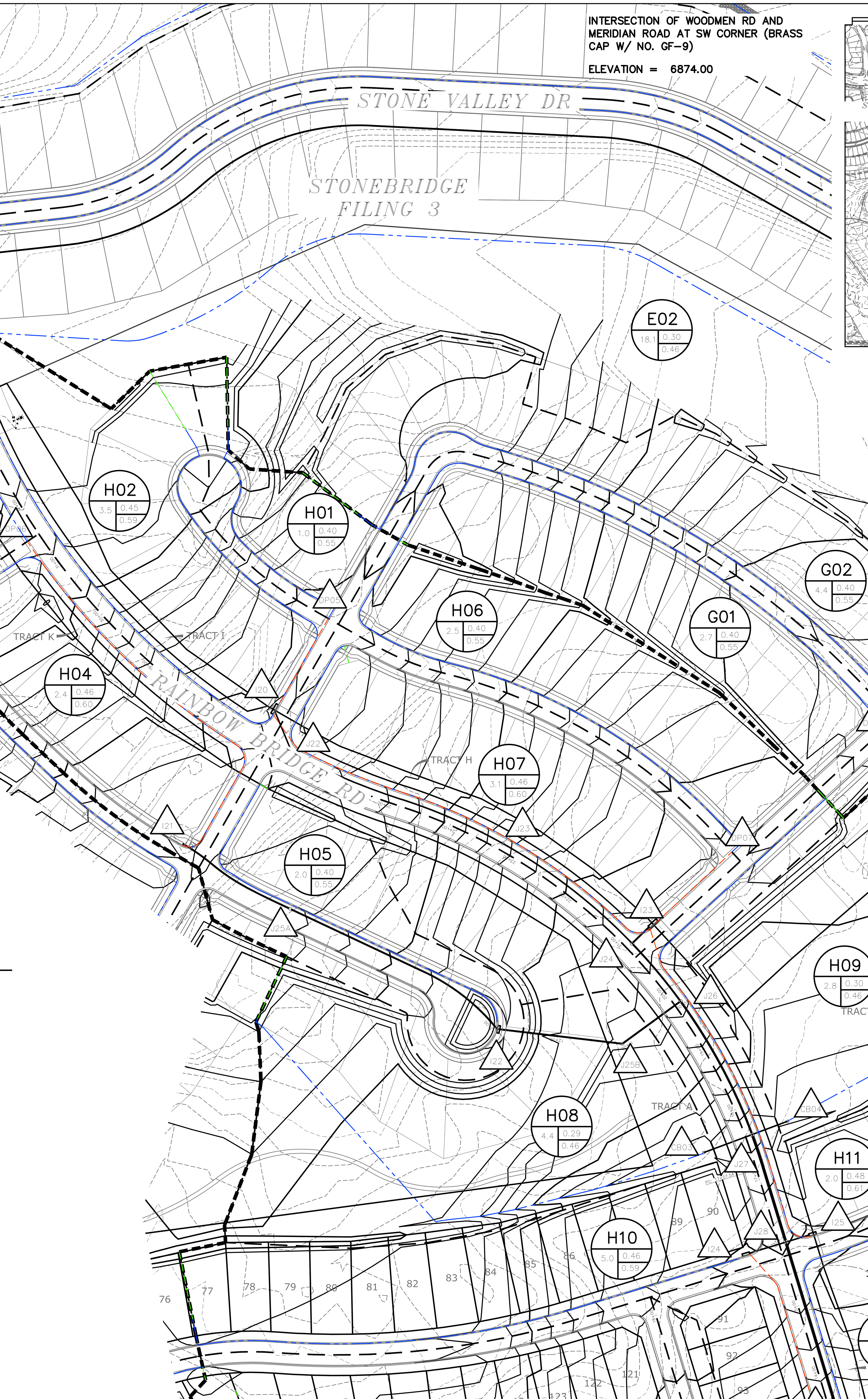
# FUTURE CONDITIONS


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


**FIGURE 6**

AUG 2018

| DP | BASIN | AREA (AC) | Q(10) (CFS) | Q(100) (CFS) | | INLET | PIPE |
|---|---|---|---|---|---|---|---|
| DP05 | H01 | 0.99 | 1.5 | 3.5 | | | |
| I20 | H02 | 3.48 | 7.4 | 16 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J22 | | | | | | | 18 " RCP |
| J23 | | | | | | | 18 " RCP |
| DP07 | H06 | 2.52 | 4.3 | 9.9 | | | |
| I23 | H07 | 3.14 | 8.4 | 20 | | PR 15 ' FORCED SUMP | 24 " RCP |
| J24 | | | | | | | 24 " RCP |
| DP06 | H03 | 2.97 | 5.8 | 12 | | | |
| I21 | H04 | 2.37 | 9.0 | 19 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J25A | | | | | | | 24 " RCP |
| I22 | H05 | 2.04 | 3.5 | 7.9 | | PR 10 ' SUMP | 24 " RCP |
| J25B | | | | | | | 24 " RCP |
| J26 | | | | | | | 30 " RCP |
| CB03 | H08 | 4.40 | 4.6 | 12 | | PR Type C | 18 " RCP |
| CB04 | H09 | 2.78 | 3.1 | 8.0 | | PR Type C | 18 " RCP |
| J27 | | | | | | | 42 " RCP |
| I24 | H10 | 4.98 | 8.2 | 18 | | PR 10 ' FORCED SUMP | 18 " RCP |
| I25 | H11 | 1.98 | 3.8 | 11 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J28 | | | | | | | 42 " RCP |
| I26 | H12 | 4.88 | 6.9 | 16 | | PR 5 ' SUMP | 18 " RCP |
| I27 | H13 | 1.28 | 2.1 | 8.7 | | PR 10 ' SUMP | 24 " RCP |
| J29 | | | | | | | 42 " RCP |
| DP08 | H14 | 1.53 | 2.7 | 6.2 | | | |
| I28 | H15 | 1.88 | 5.8 | 13 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J30 | | | | | | | 42 " RCP |
| I29 | H16 | 4.15 | 7.7 | 21 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J31 | | | | | | | 48 " RCP |
| I30 | H17 | 3.44 | 6.2 | 13 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J32 | | | | | | | 48 " RCP |
| I31 | H18 | 5.99 | 8.6 | 22 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J33 | | | | | | | 48 " RCP |
| J34 | | | | | | | 48 " RCP |
| I32 | H19 | 3.83 | 5.4 | 12 | | PR 10 ' FORCED SUMP | 24 " RCP |
| I33 | H20 | 4.59 | 7.0 | 16 | | PR 5 ' SUMP | 18 " RCP |
| J35 | | | | | | | 48 " RCP |
| I34 | H21 | 4.01 | 5.0 | 17 | | PR 10 ' SUMP | 48 " RCP |
| I35 | H22 | 3.03 | 5.7 | 12 | | PR 5 ' SUMP | 18 " RCP |
| I36 | H23 | 1.02 | 3.0 | 5.7 | | PR 5 ' SUMP | 24 " RCP |
| OS4 | H24 | 3.28 | 11 | 24 | | | |
| POND | H25 | 11.31 | 12 | 32 | | | |
| EI37a | H26 | 3.60 | 4.6 | 12 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI37b | | | 0.9 | 4.0 | | EX 20 ' FLOW-BY | 30 " RCP |
| DP09 | H27 | 2.21 | 5.7 | 14.6 | | | |
| EI38 | H28 | 1.68 | 5.7 | 10 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI39 | | | 1.3 | 3.2 | | EX 20 ' FLOW-BY | |
| DP10 | G01 | 2.70 | 4.6 | 11 | | | |
| I40 | G02 | 4.36 | 9.7 | 22 | | PR 10 ' SUMP | 18 " RCP |
| I41 | G03 | 1.21 | 2.1 | 8.1 | | PR 10 ' SUMP | 24 " RCP |
| J33 | | | | | | | 24 " RCP |
| DP11 | G04 | 1.64 | 2.9 | 6.6 | | | |
| I42 | G05 | 3.42 | 8.3 | 19 | | PR 10 ' SUMP | 18 " RCP |
| I43 | G06 | 3.53 | 4.7 | 12 | | PR 10 ' SUMP | 24 " RCP |
| J37 | | | | | | | 30 " RCP |
| J38 | | | | | | | 30 " RCP |
| DP12 | E02 | 18.07 | 17 | 42 | | | |
| DP13 | E03 | 6.26 | 19 | 48 | | | 42 " RCP |
| I44 | E04 | 3.91 | 8.4 | 17 | | PR 10 ' SUMP | 42 " RCP |
| J39 | | | | | | | 24 " RCP |
| I45 | E05 | 1.72 | 3.6 | 7.5 | | PR 10 ' SUMP | 42 " RCP |
| EI04 | E06 | 5.41 | 8.4 | 19 | | EX 10 ' SUMP | 42 " RCP |
| EI05 | E07 | 4.88 | 6.9 | 16 | | EX 10 ' FORCED SUMP | 18 " RCP |
| EJ04 | | | | | | | 42 " RCP |
| DP1 | E09 | 2.93 | 4.3 | 9.8 | | | |
| EI06 | E10 | 4.87 | 9.2 | 21 | | | |
| DP2 | E11 | 2.98 | 4.4 | 10 | | | |
| EI06 | E12 | 2.59 | 7.5 | 17 | | | |
| EI06 | 0 | 0.00 | 15.8 | 36 | | EX 20 ' SUMP | 24 " RCP |
| EI07 | E13 | 3.17 | 5.8 | 20 | | | |
| EI07 | E08 | 1.24 | 2.3 | 7.5 | | EX 15 ' SUMP | 24 " RCP |
| EJ05 | | | | | | | 36 " RCP |
| EJ06 | | | | | | | 48 " RCP |




NOTE:

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GNERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

G01 — BASIN DESIGNATION
SUB–WATERSHED DESIGNATION
MINOR/MAJOR STORM COEFFICIENT
BASIN AREA IN ACRES

61 — DESIGN POINT DESIGNATION

MAJOR BASIN BOUNDARY

SUB–BASIN BOUNDARY

6130 — EXISTING CONTOUR

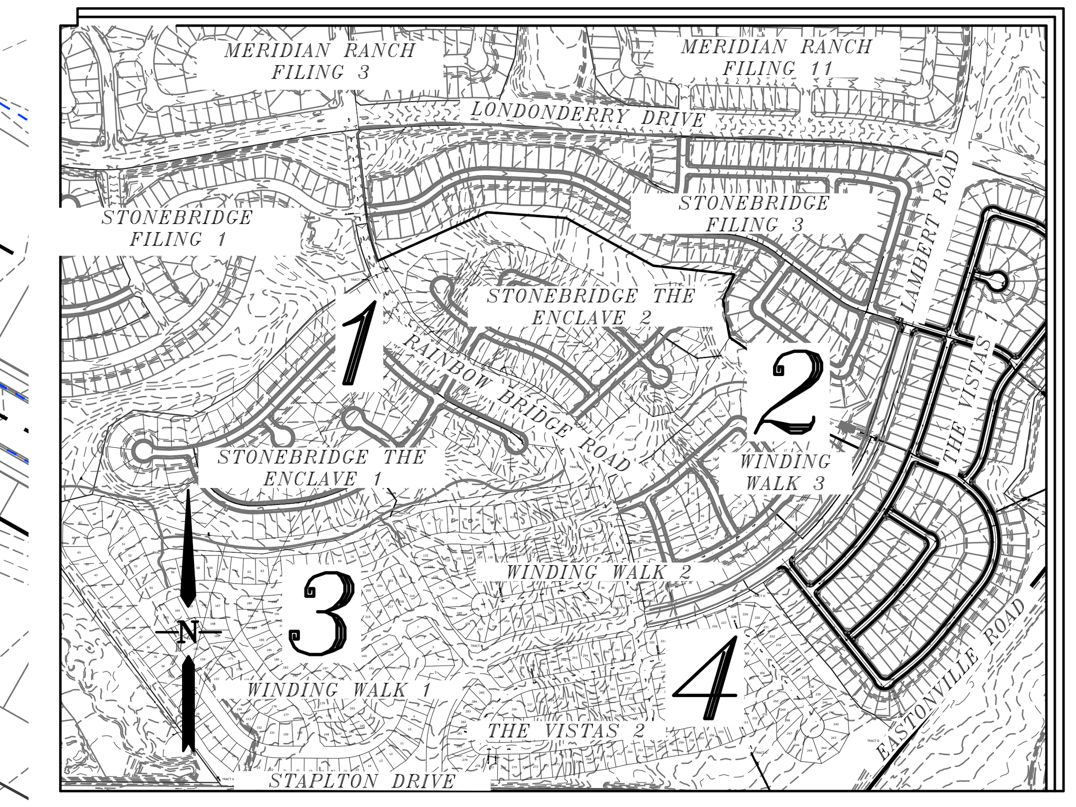
6130 — PROPOSED COUNTOUR

PROPOSED STORM SEWER

INITIAL OVERLAND TIME (Ti)

TRAVEL TIME (Tt)

OVERLAND TIME (To)




## INDEX MAP

N.T.S.

GRAPHIC SCALE

100 0 50 100 200 400

( IN FEET )

1 inch = 100 ft.

No. | Revisions | Date | Init. | Appr. | Date

TECH CONTRACTORS
12311 REX ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.2457

MERIDIAN RANCH

RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
WINDINGWALK FILING 2

Drawn by LCG
Checked by TAK
Date JUL 2018

Scale AS SHOWN

1 of 4

FIGURE 7

S:\CivilProj\Windingwalk Filing 2\DWG\PLAN SHEETS\BASIN MAPS\FDR\FDR-WW2-RATIONAL-FUTURE.dwg, 6/27/2018 11:59:54 AM

INTERSECTION OF WOODMEN RD AND MERIDIAN ROAD AT SW CORNER (BRASS CAP W/ NO. GF-9)

ELEVATION = 6874.00

NOTE:

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR THE COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.

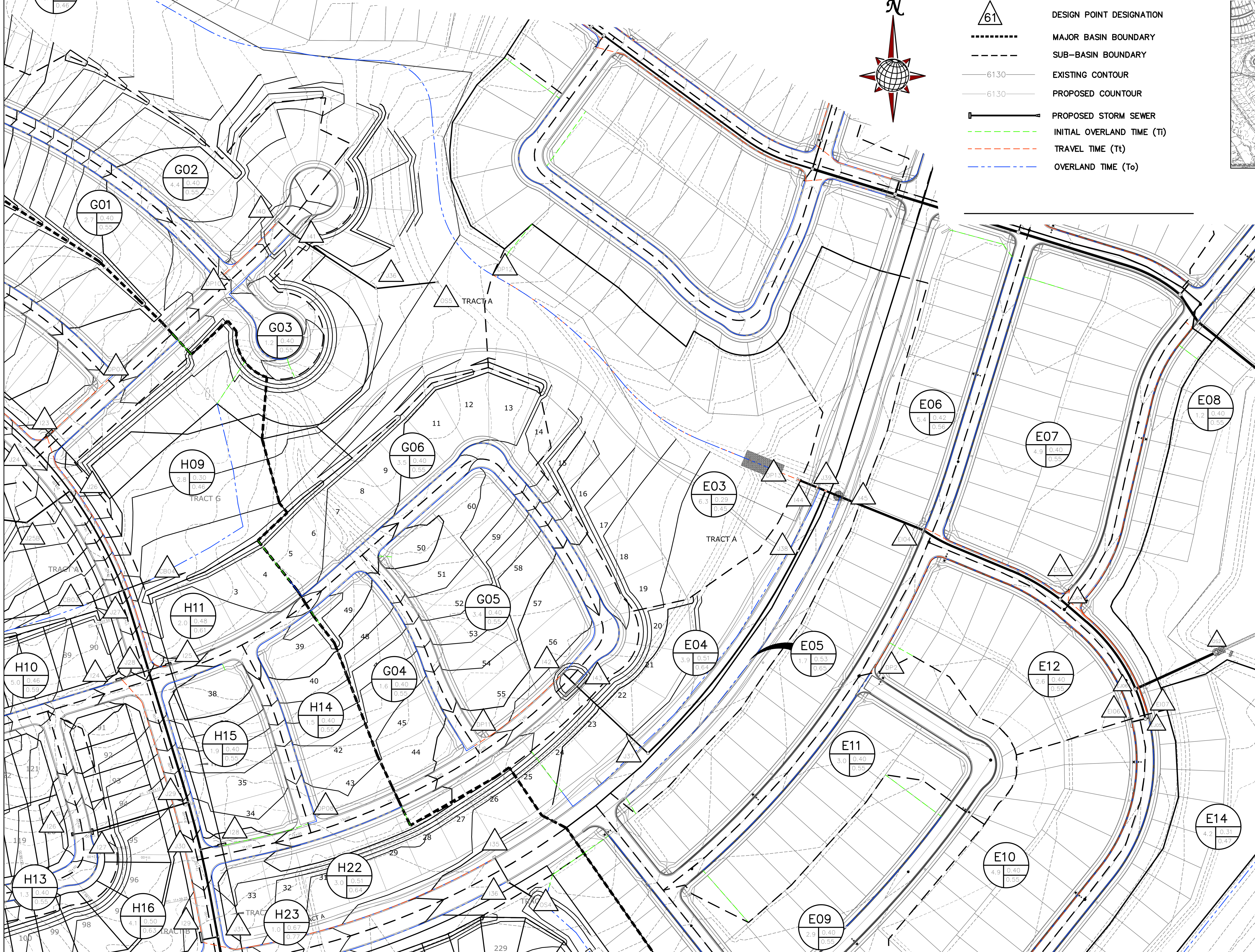
GRAPHIC SCALE

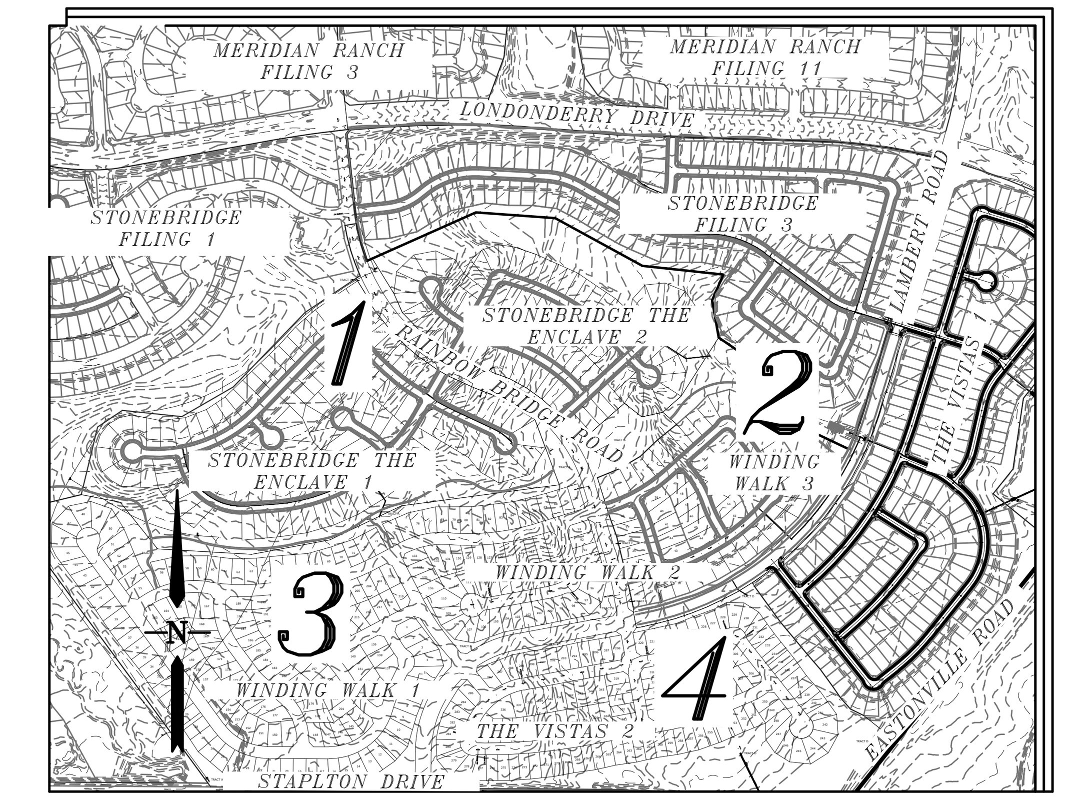
100 0 50 100 200 400

( IN FEET )

1 inch = 100 ft.

BASIN DESIGNATION
SUB-WATERSHED DESIGNATION
MINOR/MAJOR STORM COEFFICIENT
BASIN AREA IN ACRES
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)




## INDEX MAP

N.T.S.

| DP | BASIN | AREA (AC) | Q(10) (CFS) | Q(100) (CFS) | | INLET | PIPE |
|---|---|---|---|---|---|---|---|
| DP05 | H01 | 0.99 | 1.5 | 3.5 | | | |
| I20 | H02 | 3.48 | 7.4 | 16 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J22 | | | | | | | 18 " RCP |
| J23 | | | | | | | 18 " RCP |
| DP07 | H06 | 2.52 | 4.3 | 9.9 | | | |
| I23 | H07 | 3.14 | 8.4 | 20 | | PR 15 ' FORCED SUMP | 24 " RCP |
| J24 | | | | | | | 24 " RCP |
| DP06 | H03 | 2.97 | 5.8 | 12 | | | |
| I21 | H04 | 2.37 | 9.0 | 19 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J25A | | | | | | | 24 " RCP |
| I22 | H05 | 2.04 | 3.5 | 7.9 | | PR 10 ' SUMP | 24 " RCP |
| J25B | | | | | | | 24 " RCP |
| J26 | | | | | | | 30 " RCP |
| CB03 | H08 | 4.40 | 4.6 | 12 | | PR Type C | 18 " RCP |
| CB04 | H09 | 2.78 | 3.1 | 8.0 | | PR Type C | 18 " RCP |
| J27 | | | | | | | 42 " RCP |
| I24 | H10 | 4.98 | 8.2 | 18 | | PR 10 ' FORCED SUMP | 18 " RCP |
| I25 | H11 | 1.98 | 3.8 | 11 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J28 | | | | | | | 42 " RCP |
| I26 | H12 | 4.88 | 6.9 | 16 | | PR 5 ' SUMP | 18 " RCP |
| I27 | H13 | 1.28 | 2.1 | 8.7 | | PR 10 ' SUMP | 24 " RCP |
| J29 | | | | | | | 42 " RCP |
| DP08 | H14 | 1.53 | 2.7 | 6.2 | | | |
| I28 | H15 | 1.88 | 5.8 | 13 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J30 | | | | | | | 42 " RCP |
| I29 | H16 | 4.15 | 7.7 | 21 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J31 | | | | | | | 48 " RCP |
| I30 | H17 | 3.44 | 6.2 | 13 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J32 | | | | | | | 48 " RCP |
| I31 | H18 | 5.99 | 8.6 | 22 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J33 | | | | | | | 48 " RCP |
| J34 | | | | | | | 48 " RCP |
| I32 | H19 | 3.83 | 5.4 | 12 | | PR 10 ' FORCED SUMP | 24 " RCP |
| I33 | H20 | 4.59 | 7.0 | 16 | | PR 5 ' SUMP | 18 " RCP |
| J35 | | | | | | | 48 " RCP |
| I34 | H21 | 4.01 | 5.0 | 17 | | PR 10 ' SUMP | 48 " RCP |
| I35 | H22 | 3.03 | 5.7 | 12 | | PR 5 ' SUMP | 18 " RCP |
| I36 | H23 | 1.02 | 3.0 | 5.7 | | PR 5 ' SUMP | 24 " RCP |
| OS4 | H24 | 3.28 | 11 | 24 | | | |
| POND | H25 | 11.31 | 12 | 32 | | | |
| EI37a | H26 | 3.60 | 4.6 | 12 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI37b | | | 0.9 | 4.0 | | EX 20 ' FLOW-BY | 30 " RCP |
| DP09 | H27 | 2.21 | 5.7 | 14.6 | | | |
| EI38 | H28 | 1.68 | 5.7 | 10 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI39 | | | 1.3 | 3.2 | | EX 20 ' FLOW-BY | |
| DP10 | G01 | 2.70 | 4.6 | 11 | | | |
| I40 | G02 | 4.36 | 9.7 | 22 | | PR 10 ' SUMP | 18 " RCP |
| I41 | G03 | 1.21 | 2.1 | 8.1 | | PR 10 ' SUMP | 24 " RCP |
| J33 | | | | | | | 24 " RCP |
| DP11 | G04 | 1.64 | 2.9 | 6.6 | | | |
| I42 | G05 | 3.42 | 8.3 | 19 | | PR 10 ' SUMP | 18 " RCP |
| I43 | G06 | 3.53 | 4.7 | 12 | | PR 10 ' SUMP | 24 " RCP |
| J37 | | | | | | | 30 " RCP |
| J38 | | | | | | | 30 " RCP |
| DP12 | E02 | 18.07 | 17 | 42 | | | |
| DP13 | E03 | 6.26 | 19 | 48 | | | 42 " RCP |
| I44 | E04 | 3.91 | 8.4 | 17 | | PR 10 ' SUMP | 42 " RCP |
| J39 | | | | | | | 24 " RCP |
| I45 | E05 | 1.72 | 3.6 | 7.5 | | PR 10 ' SUMP | 42 " RCP |
| EI04 | E06 | 5.41 | 8.4 | 19 | | EX 10 ' SUMP | 42 " RCP |
| EI05 | E07 | 4.88 | 6.9 | 16 | | EX 10 ' FORCED SUMP | 18 " RCP |
| EJ04 | | | | | | | 42 " RCP |
| DP1 | E09 | 2.93 | 4.3 | 9.8 | | | |
| EI06 | E10 | 4.87 | 9.2 | 21 | | | |
| DP2 | E11 | 2.98 | 4.4 | 10 | | | |
| EI06 | E12 | 2.59 | 7.5 | 17 | | | |
| EI06 | 0 | 0.00 | 15.8 | 36 | | EX 20 ' SUMP | 24 " RCP |
| EI07 | E13 | 3.17 | 5.8 | 20 | | | |
| EI07 | E08 | 1.24 | 2.3 | 7.5 | | EX 15 ' SUMP | 24 " RCP |
| EJ05 | | | | | | | 36 " RCP |
| EJ06 | | | | | | | 48 " RCP |

FIGURE 7

| No. | Revisions | Date | Init. | Appr. | Date |
|---|---|---|---|---|---|

TECH CONTRACTORS
12311 REX ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.2457

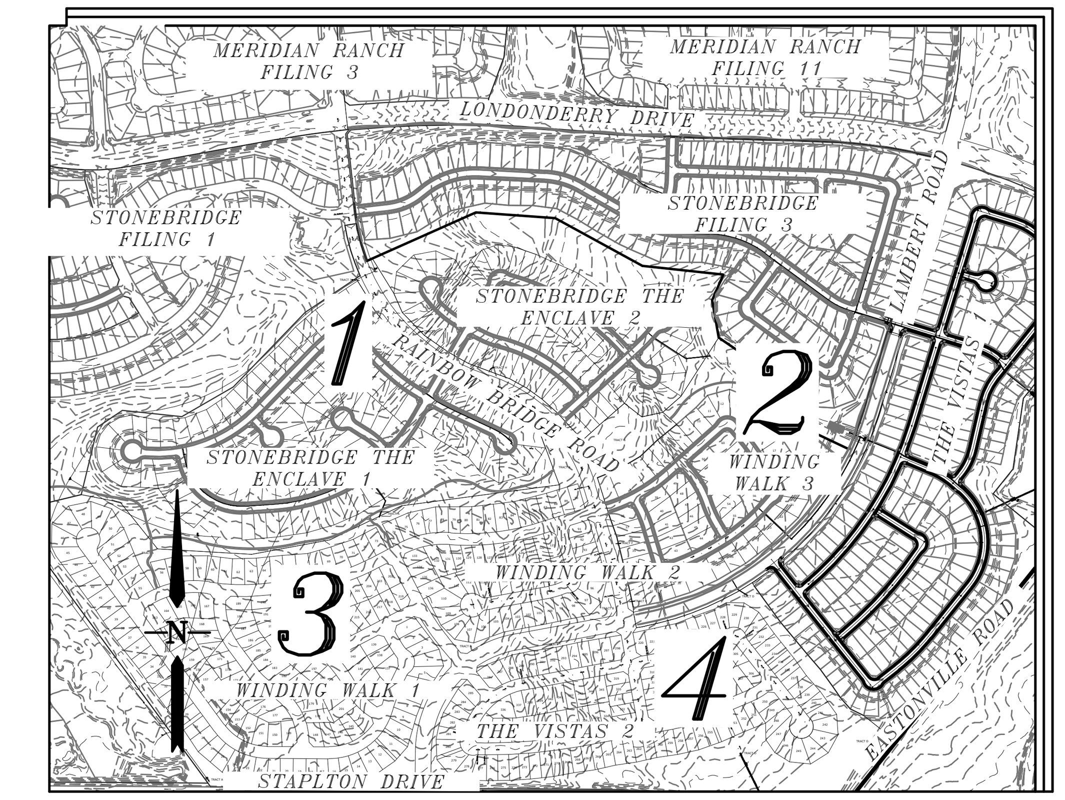
MERIDIAN RANCH

RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
WINDINGWALK FILING 2

Drawn by LCG
Checked by TAK
Date JUL 2018
Scale AS SHOWN
2 of 4

S:\CivilProj\Windingwalk Filing 2\DWG\PLAN SHEETS\BASIN MAPS\FDR\FDR-WW2-RATIONAL-FUTURE.dwg, 6/27/2018 12:00:35 PM

| DP | BASIN | AREA (AC) | Q(10) (CFS) | Q(100) (CFS) | | INLET | PIPE |
|---|---|---|---|---|---|---|---|
| DP05 | H01 | 0.99 | 1.5 | 3.5 | | | |
| I20 | H02 | 3.48 | 7.4 | 16 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J22 | | | | | | | 18 " RCP |
| J23 | | | | | | | 18 " RCP |
| DP07 | H06 | 2.52 | 4.3 | 9.9 | | | |
| I23 | H07 | 3.14 | 8.4 | 20 | | PR 15 ' FORCED SUMP | 24 " RCP |
| J24 | | | | | | | 24 " RCP |
| DP06 | H03 | 2.97 | 5.8 | 12 | | | |
| I21 | H04 | 2.37 | 9.0 | 19 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J25A | | | | | | | 24 " RCP |
| I22 | H05 | 2.04 | 3.5 | 7.9 | | PR 10 ' SUMP | 24 " RCP |
| J25B | | | | | | | 24 " RCP |
| J26 | | | | | | | 30 " RCP |
| CB03 | H08 | 4.40 | 4.6 | 12 | | PR Type C | 18 " RCP |
| CB04 | H09 | 2.78 | 3.1 | 8.0 | | PR Type C | 18 " RCP |
| J27 | | | | | | | 42 " RCP |
| I24 | H10 | 4.98 | 8.2 | 18 | | PR 10 ' FORCED SUMP | 18 " RCP |
| I25 | H11 | 1.98 | 3.8 | 11 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J28 | | | | | | | 42 " RCP |
| I26 | H12 | 4.88 | 6.9 | 16 | | PR 5 ' SUMP | 18 " RCP |
| I27 | H13 | 1.28 | 2.1 | 8.7 | | PR 10 ' SUMP | 24 " RCP |
| J29 | | | | | | | 42 " RCP |
| DP08 | H14 | 1.53 | 2.7 | 6.2 | | | |
| I28 | H15 | 1.88 | 5.8 | 13 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J30 | | | | | | | 42 " RCP |
| I29 | H16 | 4.15 | 7.7 | 21 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J31 | | | | | | | 48 " RCP |
| I30 | H17 | 3.44 | 6.2 | 13 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J32 | | | | | | | 48 " RCP |
| I31 | H18 | 5.99 | 8.6 | 22 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J33 | | | | | | | 48 " RCP |
| J34 | | | | | | | 48 " RCP |
| I32 | H19 | 3.83 | 5.4 | 12 | | PR 10 ' FORCED SUMP | 24 " RCP |
| I33 | H20 | 4.59 | 7.0 | 16 | | PR 5 ' SUMP | 18 " RCP |
| J35 | | | | | | | 48 " RCP |
| I34 | H21 | 4.01 | 5.0 | 17 | | PR 10 ' SUMP | 48 " RCP |
| I35 | H22 | 3.03 | 5.7 | 12 | | PR 5 ' SUMP | 18 " RCP |
| I36 | H23 | 1.02 | 3.0 | 5.7 | | PR 5 ' SUMP | 24 " RCP |
| OS4 | H24 | 3.28 | 11 | 24 | | | |
| POND | H25 | 11.31 | 12 | 32 | | | |
| EI37a | H26 | 3.60 | 4.6 | 12 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI37b | | | 0.9 | 4.0 | | EX 20 ' FLOW-BY | 30 " RCP |
| DP09 | H27 | 2.21 | 5.7 | 14.6 | | | |
| EI38 | H28 | 1.68 | 5.7 | 10 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI39 | | | 1.3 | 3.2 | | EX 20 ' FLOW-BY | |
| DP10 | G01 | 2.70 | 4.6 | 11 | | | |
| I40 | G02 | 4.36 | 9.7 | 22 | | PR 10 ' SUMP | 18 " RCP |
| I41 | G03 | 1.21 | 2.1 | 8.1 | | PR 10 ' SUMP | 24 " RCP |
| J33 | | | | | | | 24 " RCP |
| DP11 | G04 | 1.64 | 2.9 | 6.6 | | | |
| I42 | G05 | 3.42 | 8.3 | 19 | | PR 10 ' SUMP | 18 " RCP |
| I43 | G06 | 3.53 | 4.7 | 12 | | PR 10 ' SUMP | 24 " RCP |
| J37 | | | | | | | 30 " RCP |
| J38 | | | | | | | 30 " RCP |
| DP12 | E02 | 18.07 | 17 | 42 | | | |
| DP13 | E03 | 6.26 | 19 | 48 | | | 42 " RCP |
| I44 | E04 | 3.91 | 8.4 | 17 | | PR 10 ' SUMP | 42 " RCP |
| J39 | | | | | | | 24 " RCP |
| I45 | E05 | 1.72 | 3.6 | 7.5 | | PR 10 ' SUMP | 42 " RCP |
| EI04 | E06 | 5.41 | 8.4 | 19 | | EX 10 ' SUMP | 42 " RCP |
| EI05 | E07 | 4.88 | 6.9 | 16 | | EX 10 ' FORCED SUMP | 18 " RCP |
| EJ04 | | | | | | | 42 " RCP |
| DP1 | E09 | 2.93 | 4.3 | 9.8 | | | |
| EI06 | E10 | 4.87 | 9.2 | 21 | | | |
| DP2 | E11 | 2.98 | 4.4 | 10 | | | |
| EI06 | E12 | 2.59 | 7.5 | 17 | | | |
| EI06 | 0 | 0.00 | 15.8 | 36 | | EX 20 ' SUMP | 24 " RCP |
| EI07 | E13 | 3.17 | 5.8 | 20 | | | |
| EI07 | E08 | 1.24 | 2.3 | 7.5 | | EX 15 ' SUMP | 24 " RCP |
| EJ05 | | | | | | | 36 " RCP |
| EJ06 | | | | | | | 48 " RCP |


## INDEX MAP

N.T.S.

| | |
|---|---|
| G01 | BASIN DESIGNATION |
| | SUB-WATERSHED DESIGNATION |
| 0.40 / 0.55 | MINOR/MAJOR STORM COEFFICIENT |
| 2.7 | 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) |

N

GRAPHIC SCALE

100 0 50 100 200 400

( IN FEET )

1 inch = 100 ft.

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

| No. | Revisions | Date | Init. | Appr. | Date |
|---|---|---|---|---|---|
| | | | | | |

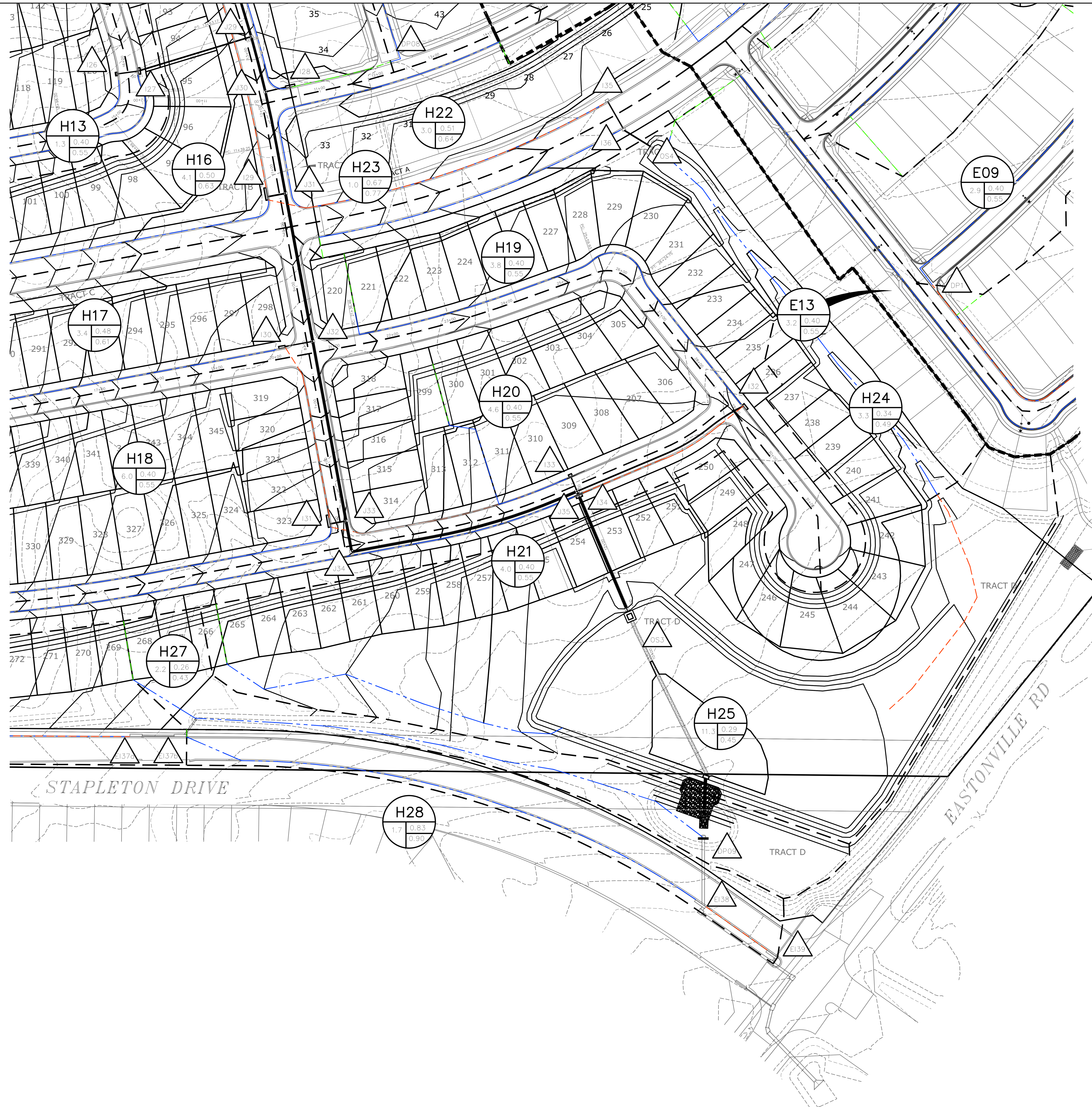

TECH CONTRACTORS
12311 REX ROAD
FALCON, CO 80831
TELEPHONE: 719.495.7444
FAX: 719.495.2457

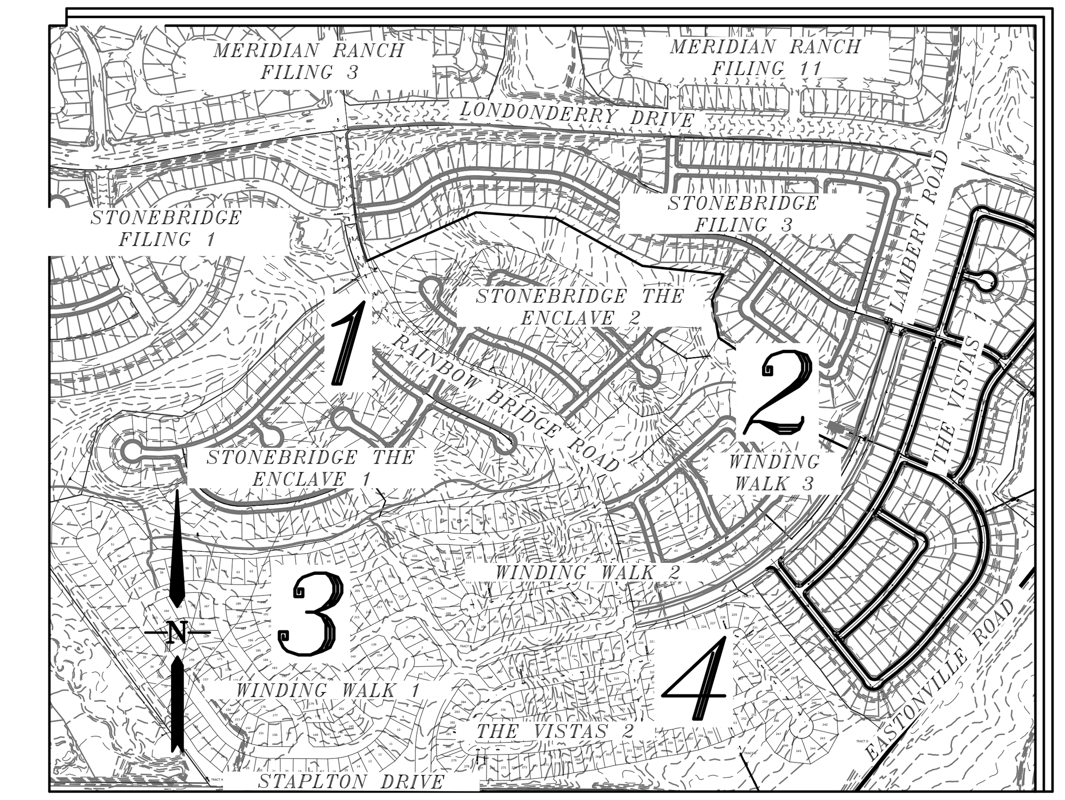

MERIDIAN RANCH

RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
WINDINGWALK FILING 2

Drawn by LGG
Checked by TAK
Date JUL 2018
Scale AS SHOWN
3 of 4

| DP | BASIN | AREA (AC) | Q(10) (CFS) | Q(100) (CFS) | | INLET | PIPE |
|---|---|---|---|---|---|---|---|
| DP05 | H01 | 0.99 | 1.5 | 3.5 | | | |
| I20 | H02 | 3.48 | 7.4 | 16 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J22 | | | | | | | 18 " RCP |
| J23 | | | | | | | 18 " RCP |
| DP07 | H06 | 2.52 | 4.3 | 9.9 | | | |
| I23 | H07 | 3.14 | 8.4 | 20 | | PR 15 ' FORCED SUMP | 24 " RCP |
| J24 | | | | | | | 24 " RCP |
| DP06 | H03 | 2.97 | 5.8 | 12 | | | |
| I21 | H04 | 2.37 | 9.0 | 19 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J25A | | | | | | | 24 " RCP |
| I22 | H05 | 2.04 | 3.5 | 7.9 | | PR 10 ' SUMP | 24 " RCP |
| J25B | | | | | | | 24 " RCP |
| J26 | | | | | | | 30 " RCP |
| CB03 | H08 | 4.40 | 4.6 | 12 | | PR Type C | 18 " RCP |
| CB04 | H09 | 2.78 | 3.1 | 8.0 | | PR Type C | 18 " RCP |
| J27 | | | | | | | 42 " RCP |
| I24 | H10 | 4.98 | 8.2 | 18 | | PR 10 ' FORCED SUMP | 18 " RCP |
| I25 | H11 | 1.98 | 3.8 | 11 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J28 | | | | | | | 42 " RCP |
| I26 | H12 | 4.88 | 6.9 | 16 | | PR 5 ' SUMP | 18 " RCP |
| I27 | H13 | 1.28 | 2.1 | 8.7 | | PR 10 ' SUMP | 24 " RCP |
| J29 | | | | | | | 42 " RCP |
| DP08 | H14 | 1.53 | 2.7 | 6.2 | | | |
| I28 | H15 | 1.88 | 5.8 | 13 | | PR 15 ' FORCED SUMP | 18 " RCP |
| J30 | | | | | | | 42 " RCP |
| I29 | H16 | 4.15 | 7.7 | 21 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J31 | | | | | | | 48 " RCP |
| I30 | H17 | 3.44 | 6.2 | 13 | | PR 10 ' FORCED SUMP | 18 " RCP |
| J32 | | | | | | | 48 " RCP |
| I31 | H18 | 5.99 | 8.6 | 22 | | PR 20 ' FORCED SUMP | 24 " RCP |
| J33 | | | | | | | 48 " RCP |
| J34 | | | | | | | 48 " RCP |
| I32 | H19 | 3.83 | 5.4 | 12 | | PR 10 ' FORCED SUMP | 24 " RCP |
| I33 | H20 | 4.59 | 7.0 | 16 | | PR 5 ' SUMP | 18 " RCP |
| J35 | | | | | | | 48 " RCP |
| I34 | H21 | 4.01 | 5.0 | 17 | | PR 10 ' SUMP | 48 " RCP |
| I35 | H22 | 3.03 | 5.7 | 12 | | PR 5 ' SUMP | 18 " RCP |
| I36 | H23 | 1.02 | 3.0 | 5.7 | | PR 5 ' SUMP | 24 " RCP |
| OS4 | H24 | 3.28 | 11 | 24 | | | |
| POND | H25 | 11.31 | 12 | 32 | | | |
| EI37a | H26 | 3.60 | 4.6 | 12 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI37b | | | 0.9 | 4.0 | | EX 20 ' FLOW-BY | 30 " RCP |
| DP09 | H27 | 2.21 | 5.7 | 14.6 | | | |
| EI38 | H28 | 1.68 | 5.7 | 10 | | EX 20 ' FLOW-BY | 30 " RCP |
| EI39 | | | 1.3 | 3.2 | | EX 20 ' FLOW-BY | |
| DP10 | G01 | 2.70 | 4.6 | 11 | | | |
| I40 | G02 | 4.36 | 9.7 | 22 | | PR 10 ' SUMP | 18 " RCP |
| I41 | G03 | 1.21 | 2.1 | 8.1 | | PR 10 ' SUMP | 24 " RCP |
| J33 | | | | | | | 24 " RCP |
| DP11 | G04 | 1.64 | 2.9 | 6.6 | | | |
| I42 | G05 | 3.42 | 8.3 | 19 | | PR 10 ' SUMP | 18 " RCP |
| I43 | G06 | 3.53 | 4.7 | 12 | | PR 10 ' SUMP | 24 " RCP |
| J37 | | | | | | | 30 " RCP |
| J38 | | | | | | | 30 " RCP |
| DP12 | E02 | 18.07 | 17 | 42 | | | |
| DP13 | E03 | 6.26 | 19 | 48 | | | 42 " RCP |
| I44 | E04 | 3.91 | 8.4 | 17 | | PR 10 ' SUMP | 42 " RCP |
| J39 | | | | | | | 24 " RCP |
| I45 | E05 | 1.72 | 3.6 | 7.5 | | PR 10 ' SUMP | 42 " RCP |
| EI04 | E06 | 5.41 | 8.4 | 19 | | EX 10 ' SUMP | 42 " RCP |
| EI05 | E07 | 4.88 | 6.9 | 16 | | EX 10 ' FORCED SUMP | 18 " RCP |
| EJ04 | | | | | | | 42 " RCP |
| DP1 | E09 | 2.93 | 4.3 | 9.8 | | | |
| EI06 | E10 | 4.87 | 9.2 | 21 | | | |
| DP2 | E11 | 2.98 | 4.4 | 10 | | | |
| EI06 | E12 | 2.59 | 7.5 | 17 | | | |
| EI06 | 0 | 0.00 | 15.8 | 36 | | EX 20 ' SUMP | 24 " RCP |
| EI07 | E13 | 3.17 | 5.8 | 20 | | | |
| EI07 | E08 | 1.24 | 2.3 | 7.5 | | EX 15 ' SUMP | 24 " RCP |
| EJ05 | | | | | | | 36 " RCP |
| EJ06 | | | | | | | 48 " RCP |




## INDEX MAP

N.T.S.

GRAPHIC SCALE

100 0 50 100 200 400

( IN FEET )

1 inch = 100 ft.

G01 — BASIN DESIGNATION

SUB-WATERSHED DESIGNATION

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INTERSECTION OF WOODMEN RD AND MERIDIAN ROAD AT SW CORNER (BRASS CAP W/ NO. GF-9)

ELEVATION = 6874.00

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| | | | | | |


TECH CONTRACTORS
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FALCON, CO 80831
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FAX: 719.495.2457


MERIDIAN RANCH

RATIONAL DRAINAGE MAP
FINAL DRAINAGE REPORT
WINDINGWALK FILING 2

Drawn by LCG
Checked by TAK
Date JUL 2018
Scale AS SHOWN

4 of 4

S:\CivilProj\Windingwalk Filing 2\DWG\PLAN SHEETS\BASIN MAPS\FDR\FDR-WW2-RATIONAL-FUTURE.dwg, 6/27/2018 12:02:49 PM