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**PRELIMINARY DRAINAGE REPORT
FOR
FLYING HORSE NORTH PRELIMINARY PLAN
AND
FINAL DRAINAGE REPORT
FOR
FLYING HORSE NORTH FILING NO. 1**

NOVEMBER 2017

DRAFT

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SF-18-001



**PRELIMINARY DRAINAGE REPORT
FLYING HORSE NORTH PRELIMINARY PLAN AND
FINAL DRAINAGE REPORT FOR FLYING HORSE NORTH FILING NO. 1**

DRAINAGE REPORT STATEMENT

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.

DRAFT

Marc A. Whorton, P.E. Colorado P.E. #37155

Date

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.

Business Name: PRI #2 LLC

By: _____

Title: _____

Address: 6385 Corporate Drive, Suite 200

Colorado Springs, CO 80919

EL PASO COUNTY:

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

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

Date

Conditions:



PRELIMINARY DRAINAGE REPORT FLYING HORSE NORTH PRELIMINARY PLAN AND FINAL DRAINAGE REPORT FOR FLYING HORSE NORTH FILING NO. 1

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1. Provide road side ditch analysis with recommendations for ditch lining. Given the steep slopes on sections of the proposed road network, additional erosion protection.

2. Provide riprap sizing calculations for the proposed outlet protections.

Include an existing drainage map and provide the narrative for the sub-basin



PURPOSE

The purpose of this Drainage Report is two-fold: first to identify major drainage corridors within this area and recommend preliminary facilities based on the Preliminary Plan layout and secondly to provide specific final design for the necessary facilities within the Filing No. 1 Final Plat area. These proposed facilities will route all developed storm water runoff to adequate outfall facilities. The drainage improvements proposed in this report that are outside of Filing No. 1 are preliminary in nature and future final drainage reports will be required for these areas. The Filing No. 1 design area within the proposed golf course includes the design of a jurisdictional dam facility. This specific facility design is handled in a separate report and submittal package reviewed and approved by the Colorado Dam Safety Board. However, El Paso County Engineering Staff will have the opportunity to review and approved specific aspects of the facility as well.

GENERAL DESCRIPTION

Flying Horse North is a 1,418 acre site located in all of section 36, township 11 south, range 66 west of the sixth principal meridian, and a portion of sections 30 and 31 township 11 south, range 65 west of the sixth principal meridian. The site is bounded on the north by Hodgen Road and the High Forest Ranch Community, to the south by the Cathedral Pines Subdivision and unplatted county land, to the east by Black Forest Road, and to the west by the State Highway 83 and unplatted county land. The site stretches across 2 existing drainage basins, the Black Squirrel Creek Drainage Basin and East Cherry Creek Drainage Basin. Large lot single family residential and a golf course with a club house are included in the proposed Preliminary Plan for this site. A site specific PUD plan and early grading plan for the golf course and associated private access roads was previously approved in the Fall of 2016. Tree removal, grading and erosion control for the golf course and access roads is currently under construction based on this approval.

The average soil condition reflects Hydrologic Group “B” (Brussett Loam, Elbeth Sandy Loam, Kettle Gravelly Loamy Sand, Peyton Sandy Loam, Peyton Pring Complex, Pring Course Sandy Loam, and Tomah-Crowfoot Loamy Sand) as determined by the “Soil Survey of El Paso County Area,” prepared by the Soil Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

As described in the MDDP for Flying Horse North, this site sits in the upper reaches of both the Black Squirrel Creek and the East Cherry Creek Drainage Basins. There are approximately 540 acres in the Black Squirrel Creek Drainage Basin and 878 acres of area in the East Cherry Creek Drainage Basin. The majority of the Filing No. 1 area will be within the Black Squirrel Creek Basin, however, all required improvements for Filing No. 1 including the golf course within both basins will be discussed below.

Black Squirrel Creek Drainage Basin

The Flying Horse North property is located at the top of the Black Squirrel Creek Drainage Basin. Currently there are corrugated metal culverts within Hwy. 83 to convey flows across the existing roadway. Existing conditions in this basin are largely forested with rolling hills and natural valleys and swales draining offsite to the southwest. This basin has been previously studied in the “Black Squirrel Creek Drainage Basin Planning Study” prepared by URS Consultants, January 1989. All the runoff from the area located in the Black Squirrel Drainage Basin converges at the main channel of the Black Squirrel Creek located on the adjacent property. As a part of the MDDP for Flying Horse North, also prepared by Classic consulting, an existing drainage analysis was performed to confirm allowable release rates at key design points along the project boundary. Offsite flows were recreated from surrounding reports that were previously approved. Drainage Criteria has been updated since these reports have been approved. Flow differences will occur due to the updated drainage criteria. Using these previous reports contributing areas, CN values and time of concentrations, this report along with the MDDP have attempted to recreate offsite flows for use in calculating existing conditions. Currently in the Flying Horse North property boundary within the Black Squirrel Drainage basin there are existing stock ponds with berms that retain existing flows from reaching downstream channels until overtopping. There are no records or design plans for these stock ponds. For this existing condition analysis these ponds were removed from the project model.

Along the northern boundary of the property there are numerous locations where off-site flows come onto the site. The High Forest Ranch development has two detention facilities that release concentrated flows directly onto the property. The on-site downstream corridors from these facilities will remain natural to the greatest extent possible and where required improved to accommodate these existing flows. High Forest Ranch Pond 26 releases flows on-site at the northwest corner of the site that then travel through the site towards an existing 48” CMP at Hwy. 83. High Forest Ranch Pond 16 releases flows on-site approximately 4100 LF east of Hwy. 83. These flows cross the site and continue to travel in a southwest direction through the Shamrock Ranch property. This is the start of the headwaters of the Black Squirrel Creek Drainage Basin with the majority of the existing flows coming from the High Forest Ranch Development.

Section 36 lies approximately 1.5 miles east of Hwy. 83 and this is where the bulk of the Flying Horse North property ownership begins. Several major drainage corridors feeding the Black Squirrel Creek Basin traverse



Section 36 and travel in a southwest direction towards the west edge of the property. The MDDP designates four major design points along this boundary. Multiple detention/storm water quality facilities are planned for these corridors and will be constructed along with future land development. Portions of the Cathedral Pines Development to the south contributes developed flows to this property. These flows will be accommodated in the various on-site facility designs. A smaller on-site basin at the southeast corner of section 36 releases historic flows onto the Cathedral Pines and the Edmonds Subdivision. An on-site detention/storm water quality facility is planned in this corridor to help mitigate development.

East Cherry Creek Drainage Basin

The Palmer Divide traverses the eastern half of section 36 which defines the major basin line between the Black Squirrel Creek and the East Cherry Creek Basins. The vegetation also changes drastically in this area. The majority of the East Cherry Creek Basin contains very little trees and more grazing prairie land and meadows. This area defines the edge of Black Forest. In general, historic flow patterns in this basin travel in a northeasterly direction towards Hodgen Road. The MDDP designates several major design points along the north boundary. Again, multiple detention/storm water quality facilities are planned for these corridors and to be constructed along with future land development. Portions of the Palmer Divide Subdivision and multiple large unplatted properties the south contribute developed flows to this property. These flows will be accommodated in the various on-site facility designs.

PROPOSED DRAINAGE CONDITIONS

The proposed land development within the Flying Horse North Filing No. 1 and future development within the remaining portions of the Preliminary Plan will be 2.5-5 acre large lot residential with associated paved streets and roadside ditches. The 18-hole private Golf Course with a club house site, driving range and maintenance facility is also planned as a part of Filing No. 1. Based on the current El Paso County ECM Section I.7.1.B. and given the size of the lots within this entire development area, stormwater quality is not required to be provided. However, detention/EURV will still be provided in specific locations on-site to limit the on-site development flow release to remain consistent with pre-development conditions within the major drainage corridors. These proposed facilities will aide in limiting any detrimental effects on downstream corridors. At specific areas where the Filing No. 1 development creates concentrated flows into future development areas, temporary sediment basins will be constructed to minimize sediment transfer



downstream and off-site. The Filing No. 1 Final Drainage Report portion of this report will define the permanent facilities providing an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2 year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge hydrograph for storms between the 2 year and the 100 year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of this development. Again, prior to any land development beyond the Filing No. 1 Final Plat area, additional final drainage reports, final plats and construction plans will be required detailing this criteria.

The following hydrology descriptions will start at the western edge of the Flying Horse North property and move east into the East Cherry Creek Basin, describing the development within the Filing No. 1 area first.

FLYING HORSE NORTH FILING NO. 1

Black Squirrel Creek Drainage Basin

As mentioned previously, Flying Horse North is located in the upper region of the Black Squirrel Creek Drainage Basin. Per the approved DBPS for Black Squirrel Creek, the reaches in this area were proposed to remain as natural as possible. There were no recommendations for detention facilities within the area that is Flying Horse North, but due to current drainage criteria, detention/EURV facilities will be proposed with this development.

High Forest Ranch Detention Pond 26 outfalls onto the property at the very northwest corner of the site. These existing flows will continue to enter the site and travel within the natural channel towards the existing 48" CMP culvert crossing at Hwy. 83. Drainage easements across the proposed lots in this area will be provided on the final plat. The existing stock pond within lots 2 and 3 will be removed with grading of the road in this area. Tract B is platted in order to provide a detention/EURV facility for the lots and public road in this area. This facility will be constructed with Filing No. 1 with ownership and maintenance by the Flying Horse North HOA.



Design Point 1 ($Q_2 = 2$ cfs $Q_5 = 3$ cfs, $Q_{100} = 11$ cfs) represents the existing off-site and on-site developed flows from Basins OS-1A and BS-2B. The combined flow from these basins travel to a low point just east of Stagecoach Road where a proposed 24" RCP culvert will be installed to convey these flows under the road. (See Appendix for culvert design)

Design Point 2 ($Q_2 = 3$ cfs $Q_5 = 9$ cfs, $Q_{100} = 35$ cfs) represents flows from DP 1 and Basin BS-4. These combined flows are collected at a low point where a proposed 30" RCP culvert will be installed to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design)

The total developed flows entering **Detention Facility 1** including Basin BS-1A equals (**$Q_2 = 3$ cfs $Q_5 = 9$ cfs, $Q_{100} = 38$ cfs**). These combined flows will travel in the natural drainage corridor across lot 1 and enter the detention facility. The following describes the design of this facility (See Appendix for UD Detention pond design sheets):

Detention Pond 1 (Full Spectrum – see multiple storm release)

6.6 per UD Detention Worksheet

0.43 Ac.-ft. EURV required

0.50 Ac.-ft. EURV design with 3:1 max. slopes

0.99 Ac.-ft. 100-yr. Storage

Total In-flow: $Q_2 = 3$ cfs, $Q_5 = 9$ cfs, $Q_{100} = 38$ cfs

Pond Design Release: $Q_2 = 0.1$ cfs, $Q_5 = 0.2$ cfs, $Q_{100} = 25$ cfs

Pre-development Release: $Q_2 = 0.2$ cfs, $Q_5 = 0.4$ cfs, $Q_{100} = 23$ cfs


(Ownership and maintenance by the Flying Horse North HOA)

Design Point 4 ($Q_2 = 3$ cfs $Q_5 = 4$ cfs, $Q_{100} = 8$ cfs) represents existing and developed flows from Basin BS-2 (north side of Stagecoach Rd.) These flows will travel in a side road ditch towards Hwy. 83. A temporary sediment basin will be installed during construction of this portion of the roadway. This development will be required to provide improvements to this intersection and Hwy. 83 per the site traffic study. Upon review/approval from CDOT, these improvements will be constructed along with final design of drainage at this intersection which will include the relocation of the dual 18" ERCP culverts.

BS-2B

Identify the trigger for removal of the TSB.



Design Point 5 ($Q_2 = 2$ cfs $Q_5 = 4$ cfs, $Q_{100} = 13$ cfs) represents existing and developed flows from Basins OS-1B and BS-2A (south side of Stagecoach Rd.) These flows will travel in a side road ditch towards Hwy. 83. A temporary sediment basin will be installed during construction of this portion of the roadway. Upon review/approval from CDOT, these improvements will be constructed along with final design of drainage at this intersection.  **Identify the trigger for removal of the TSB.**

Design Point 6 ($Q_2 = 1$ cfs $Q_5 = 3$ cfs, $Q_{100} = 15$ cfs) represents flows from Basins OS-2 and BS-3. These combined flows are collected at a low point where proposed dual 18" RCP culverts will be installed to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design) These flows then combine with Basin BS-1B and travel in the existing natural channel towards the existing downstream 48" CMP culvert. **Design Point 3 ($Q_2 = 1$ cfs $Q_5 = 6$ cfs, $Q_{100} = 39$ cfs)** then represents the total flow from this site leaving the property at this location. The pre-development on-site flow at this location equals $Q_2 = 1$ cfs $Q_5 = 5$ cfs, $Q_{100} = 41$ cfs. Thus, the downstream facilities will not see a significant change in flows.

Design Point 7 ($Q_2 = 2$ cfs $Q_5 = 8$ cfs, $Q_{100} = 38$ cfs) represents existing and developed flows from Basins OS-3 and BS-5. These flows will travel as sheet flow towards the low point where dual 30" RCP culverts will be installed under Stagecoach Road to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design)

High Forest Ranch Detention Pond 16 outfalls onto the property just upstream of Design Point 8. These existing flows will continue to enter the site and travel through proposed triple 42" RCP culverts under Stagecoach Road. (See Appendix for culvert design) **Design Point 8 ($Q_2 = 21$ cfs $Q_5 = 70$ cfs, $Q_{100} = 284$ cfs)** represents the existing and developed flows exiting the property and continuing south within the natural channel on the Shamrock Ranch property. These flows remain consistent with the historic flows at this location.

Design Point 9 ($Q_2 = 1$ cfs $Q_5 = 5$ cfs, $Q_{100} = 23$ cfs) represents existing flows from Basins OS-7 and BS-12. These combined flows are collected at a low point where proposed dual 24" RCP culverts will be installed to replace the temporary sediment basin installed with early grading. (See Appendix for culvert design)



Design Point 10 ($Q_2 = 11$ cfs $Q_5 = 32$ cfs, $Q_{100} = 143$ cfs) represents existing and developed flows from Basins OS-8, OS-10, OS-11, BS-13 and BS-14. These flows will travel to the low point at this location where dual 42" RCP culverts will be installed for the crossing of Stagecoach Road. (See Appendix for culvert design)

Design Point 11 ($Q_2 = 5$ cfs $Q_5 = 12$ cfs, $Q_{100} = 36$ cfs) represents developed flow from Basin BS-16. These flows will travel to the low point at this location where dual 24" RCP culverts will be installed for the crossing of the road. (See Appendix for culvert design)

Design Point 12 ($Q_2 = 4$ cfs $Q_5 = 11$ cfs, $Q_{100} = 44$ cfs) represents developed flow from Basins BS-16 and BS-15. These flows will travel to the low point at this location where a 30" RCP culvert will be installed and directly enter Detention Pond 4 at the south end. (See Appendix for culvert design)

Explain why the construction plans show a bend & manhole. Is there a future extension of the storm system?

The total developed flows entering **Detention Facility 4**, including the flow from Design Point 12, equal ($Q_2 = 3$ cfs $Q_5 = 52$ cfs, $Q_{100} = 217$ cfs). The major flows enter the facility at the north end through a rock chute. (See Appendix for rock chute and pond design) The following describes the design of this facility: (See Appendix for UD Detention pond design sheets):

Update the 2yr and 5yr to match the ud-detention worksheet.

Detention Pond 4 (Full Spectrum – see multiple storm release data below)

0.99 Ac.-ft. EURV required

1.05 Ac.-ft. EURV design with 4:1 max. slopes

5.06 Ac.-ft. 100-yr. Storage

Total In-flow: $Q_2 = 18$ cfs, $Q_5 = 52$ cfs, $Q_{100} = 217$ cfs

Pond Design Release: $Q_2 = 0.3$ cfs, $Q_5 = 0.3$ cfs, $Q_{100} = 142$ cfs

Pre-development Release: $Q_2 = 1.5$ cfs, $Q_5 = 2.5$ cfs, $Q_{100} = 152$ cfs

(Ownership and maintenance by the Flying Horse North HOA)



Design Point 14 ($Q_2 = 4$ cfs $Q_5 = 12$ cfs, $Q_{100} = 56$ cfs) represents the developed flow from Basin BS-18. These flows will travel to the low point at this location where three 24" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows then enter Basin OS-23 through a drainage easement on the rear of lot 65 and continue to travel towards DP-16.

Design Point 15 ($Q_2 = 2$ cfs $Q_5 = 5$ cfs, $Q_{100} = 15$ cfs) represents the developed flow from Basin BS-19. These flows will travel to the low point at this location where dual 18" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows then enter Basin OS-22 and continue to travel towards the golf course.

Basins BS-20, BS-21, BS-22, BS-23 and BS-23A are relatively large basins that contain both Filing 1 lots, much of the golf course but also future lots that will remain undeveloped at this time. However, these basins all ultimately travel in a southwesterly direction towards the proposed Detention Facility 8. This report analyzes both the "Filing 1 Only" condition as well as the "full build-out condition" in the design of this detention facility. With the development of Filing 1, Detention Facility 8 will be sized and graded for the ultimate design accounting for the future lot development. The outlet structure and emergency overflow weir will also be designed for the ultimate condition. However, we will provide two orifice plate designs for the outlet box. The initial plate will be constructed that will handle the proper release for the Filing 1 development only. Upon the next phase of lot development within these basins (BS-20, BS-21, BS-22, BS-23 and BS-23A) the ultimate plate will be installed to replace this initial plate design. No further changes to the outlet structure or pond will need to take place. Thus, the following describes the two scenarios:

Full Build-out Design (accounting for future lot development)

Design Point 16 ($Q_2 = 25$ cfs $Q_5 = 78$ cfs, $Q_{100} = 362$ cfs) represents the total developed flows from Basins BS-18 thru BS-23 with the fully developed golf course and lots in Filing 1 and the future phases. These flows travel to the low point at this location where dual 60" RCP culverts will be installed to cross under the road. (See Appendix for culvert design) These flows represent the major portion of the flows entering Detention Facility 8 with the remaining flows coming from Basin OS-23A.



The total developed flow entering **Detention Facility 4** includes Basin BS-23A. The following describes the design of this facility: (See Appendix for UD Detention pond – **Full Build-out** design sheets):

Detention Pond 8 (Full Spectrum – see multiple storm release data below)

2.40 Ac.-ft. EURV required

2.45 Ac.-ft. EURV design with 4:1 max. slopes

9.32 Ac.-ft. 100-yr. Storage

Total In-flow: $Q_2 = 28$ cfs, $Q_5 = 85$ cfs, $Q_{100} = 383$ cfs

Pond Design Release: $Q_2 = 0.8$ cfs, $Q_5 = 1.0$ cfs, $Q_{100} = 253$ cfs

Pre-development Release: $Q_2 = 2.6$ cfs, $Q_5 = 4.5$ cfs, $Q_{100} = 274$ cfs

(Ownership and maintenance by the Flying Horse North HOA)

Filing 1 Only Design (accounting for golf course and Filing 1 lot development)

Under this scenario, only the golf course and Filing 1 lots are developed and Basins BS-20, BS-21, BS-22, BS-23 and BS-23A have been adjusted to account for only this initial phase of development. The following describes the facility requirements for this design: (See Appendix for UD Detention pond – **Filing 1 Only** design sheets):

****Detention Pond 8 (Full Spectrum – see multiple storm release data below)**

1.13 Ac.-ft. EURV required

2.45 Ac.-ft. EURV design with 4:1 max. slopes

7.76 Ac.-ft. 100-yr. Storage

Total In-flow: $Q_2 = 12$ cfs, $Q_5 = 50$ cfs, $Q_{100} = 297$ cfs

Pond Design Release: $Q_2 = 0.4$ cfs, $Q_5 = 0.5$ cfs, $Q_{100} = 228$ cfs

Pre-development Release: $Q_2 = 2.2$ cfs, $Q_5 = 3.9$ cfs, $Q_{100} = 237$ cfs

(Ownership and maintenance by the Flying Horse North HOA)

**Please note that all facility design remains the same as the Full Build-out scenario except for the different orifice plate.



Basin BS-24 ($Q_2 = 0.6$ cfs $Q_5 = 3$ cfs, $Q_{100} = 18$ cfs) represents sheet flow from three residential lots within Filing No. 1 that will continue to direct release off-site. However, portions of this historic basin area will be routed into Flying Horse North Pond 8, therefore the developed flows from this basin do not significantly change from the pre-development condition. The pre-development flows from the historic basin area equal $Q_2 = 0.2$ cfs $Q_5 = 2$ cfs, $Q_{100} = 18$ cfs. Also, given the lot size, no water quality is required.

FLYING HORSE NORTH FILING NO. 1

East Cherry Creek Drainage Basin

The following basins are still tributary to the Filing No. 1 platting area but are within the East Chery Creek Drainage Basin:

Design Point 24 ($Q_2 = 2$ cfs $Q_5 = 8$ cfs, $Q_{100} = 45$ cfs) represents developed flows from Basins CC-4C and CC-5. Basin CC-4C represents the flow from the future pond. If the concentrated flow from the future pond is directed to the residential lots, there will likely be drainage impacts. f this design purposes this basin is assumed to release to a site specific detention/SWQ facility. Provide additional guidance in the narrative regarding the release location (consider the 100yr and emergency overflow path). Specific drainage easements may be required if draining through residential lots. design purposes this basin is assumed to release to a site specific detention/SWQ facility. (See Appendix for culvert design)

The total developed flows entering **Detention Facility 12**, including Basin CC-6 equals ($Q_2 = 4$ cfs $Q_5 = 17$ cfs, $Q_{100} = 86$ cfs). The following describes the design of this facility:
(See Appendix for UD Detention pond design sheets):

Detention Pond 12 (Full Spectrum – see multiple storm release data below)

0.66 Ac.-ft. EURV required

0.75 Ac.-ft. EURV design with 4:1 max. slopes

2.69 Ac.-ft. 100-yr. Storage

Total In-flow: $Q_2 = 4$ cfs, $Q_5 = 17$ cfs, $Q_{100} = 86$ cfs

Pond Design Release: $Q_2 = 0.2$ cfs, $Q_5 = 0.3$ cfs, $Q_{100} = 45$ cfs

Pre-development Release: $Q_2 = 0.5$ cfs, $Q_5 = 0.9$ cfs, $Q_{100} = 55$ cfs

(Ownership and maintenance by the Flying Horse North HOA)



Design Point 25 ($Q_2 = 0.2$ cfs $Q_5 = 0.3$ cfs, $Q_{100} = 45$ cfs) then represents the total flow leaving the site at this location. The pre-development flow at this location equals **$Q_2 = 0.5$ cfs $Q_5 = 0.9$ cfs, $Q_{100} = 55$ cfs.** Thus, the downstream facilities will not see a significant change in flows.

Basins OS-12, OS-13, OS-14, CC-1A, CC-1B, CC-2A, CC-2B, CC-2C, CC-3, CC-4A, CC-4B and CC-9 are all tributary to the proposed Flying Horse North Pond 13. Nearly all the proposed residential lots within these basins are part of future development outside of Filing No. 1 platting. The only structure associated with Filing No. 1 development is the pond embankment/outlet structure crossing Stagecoach Road. However, this facility has been classified by the Colorado Dam Safety Branch (DSB) as a low-hazard, jurisdictional facility. As such, a separate Design Report including hydrology/hydraulic design and embankment/structure design has been prepared for DSB and El Paso County review and approval. Please reference this report for the required detention/SWQ design for this facility.

Design Point 26 ($Q_2 = 3$ cfs $Q_5 = 16$ cfs, $Q_{100} = 102$ cfs) represents the full build-out developed flows from Basins CC-8 and CC-10. Basin CC-8 represents future residential lots and CC-10 mostly future passive park area. These flows will continue to sheet flow towards the low-point where a 48" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) After crossing Stagecoach Road, these flows will continue to flow directly into the existing stock pond just north of the roadway. This facility will provide sediment control for the small developed roadway area. Upon future development and platting of the lots planned within these basins, this stock pond will be formally designed into a detention facility.

Basin CC-15 ($Q_2 = 1$ cfs $Q_5 = 4$ cfs, $Q_{100} = 20$ cfs) represents the full build-out developed flows from the future residential lots tributary to this basin. These flows will continue to sheet flow towards the low-point where a 30" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

Design Point 30 ($Q_2 = 0.4$ cfs $Q_5 = 2$ cfs, $Q_{100} = 8$ cfs) represents the full build-out developed flows from Basin CC-18. This Basin represents future residential lots. The flows will continue to sheet flow towards



the low-point where a 24" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) ~~A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.~~

Missing. Include the culvert design in the Appendix and the construction plans.

Design Point 31 ($Q_2 = 0.7$ cfs $Q_5 = 3$ cfs, $Q_{100} = 10$ cfs) represents the full build-out developed flows from Basin CC-19 and the upstream release from Basin CC-17. Basin CC-17 represents future residential 5 ac. lots. The flows will continue to sheet flow towards the low-point where a 24" RCP culvert will be installed to handle the fully developed flows at this location. (See Appendix for culvert design) ~~A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.~~

Include the supporting calculation. Verify there is sufficient drainage easement that covers the natural swale.

Design Point 32 ($Q_2 = 2$ cfs $Q_5 = 8$ cfs, $Q_{100} = 40$ cfs) represents the full build-out developed flows from Basins OS-16 and CC-17. Basin CC-17 represents future residential lots and OS-16 unplatted, 5-ac. zoned residential property. These flows will continue to sheet flow towards the low-point where a 36" RCP culvert is sized to handle the fully developed flows at this location. (See Appendix for culvert design) A downstream sediment basin will be installed to provide sediment control for the small developed roadway area.

FLYING HORSE NORTH PRELIMINARY PLAN (Future Platting)

Black Squirrel Creek Drainage Basin

The following basins are in the Black Squirrel Creek Drainage Basin but are not a part of Filing 1 lot development. These areas will require future final drainage report(s) upon future lot development.

Design Point 18 ($Q_2 = 5$ cfs $Q_5 = 22$ cfs, $Q_{100} = 115$ cfs) represents developed flows from Basins BS-28, BS-29, BS-30 and OS-18. Portions of basins BS-28 and BS-29 include golf course development taking place with Filing No. 1. However, the majority of these basins include forested future residential lots with basin OS-18 being existing 2.5 ac. minimum lots. Future developed flows will be routed to this location where a future detention facility will be installed. This facility will be sized to meet EURV requirements and release pre-development flow quantities. In the interim, with only the golf course construction, a temporary sediment basin located within the developed area will be installed to provide sediment control from the developed golf course area.

Elaborate on where this drains to. From the drainage map it seems to drain into the future detention facility at DP 19. If this is the case then identify that ponds DP18 and DP19 must be designed/analyzed as ponds in a series.

Identify and discuss the emergency overflow path for Pond 18. It appears that it would cross over residential lots and into Pond DP19



Design Point 19 ($Q_2 = 4$ cfs $Q_5 = 17$ cfs, $Q_{100} = 126$ cfs) represents developed flows from Basins BS-27 and OS-17. These basins include forested future residential lots with basin OS-17 being existing 2.5 ac. minimum lots. Future developed flows will be routed to this location where a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. Both of these future facilities will be constructed in tracts with ownership and maintenance by the Flying Horse North HOA.

Basin BS-26 ($Q_2 = 0.04$ cfs $Q_5 = 0.4$ cfs, $Q_{100} = 3$ cfs) represents sheet flow from the extreme rear portion of a future residential lot. This area of the lot will likely not be built upon, therefore not significantly changing the drainage conditions from the pre-development condition. The pre-development flow from the historic basin area equals $Q_2 = 0.04$ cfs $Q_5 = 0.4$ cfs, $Q_{100} = 3$ cfs. Also, given the lot size, no water quality is required.

Basins BS-31 ($Q_2 = 0.3$ cfs $Q_5 = 2$ cfs, $Q_{100} = 12$ cfs), BS-32 ($Q_2 = 0.3$ cfs $Q_5 = 2$ cfs, $Q_{100} = 9$ cfs) and BS-33 ($Q_2 = 0.8$ cfs $Q_5 = 3$ cfs, $Q_{100} = 15$ cfs) represent smaller basins that will continue to sheet flow off-site to the south. These basins represent some golf course development and multiple future residential lots. Given the lot size, no water quality is required. However, permanent sediment basins will be installed downstream of the golf course development to provide sediment control. Developed flows released from these basins will not be significantly different than the pre-development flows.

East Cherry Creek Drainage Basin

The following basins are not tributary to the Filing No. 1 platting area but are within the East Chery Creek Drainage Basin and planned for future residential lot development.

Design Point 28 ($Q_2 = 5$ cfs $Q_5 = 20$ cfs, $Q_{100} = 110$ cfs) represents the full build-out developed flows from Basins OS-13 and CC-13A. Basin CC-13A represents future residential lots and OS-13 platted, 5-ac. zoned residential property. These flows will continue to sheet flow towards the low-point where a future culvert will be installed to handle the fully developed flows at this location. The flows are then conveyed in the natural channel towards Design Point 29.



Design Point 29 ($Q_2 = 6$ cfs $Q_5 = 27$ cfs, $Q_{100} = 155$ cfs) represents the full build-out developed flows from Basins CC-13B, CC-13C and release from DP-28. These basins represent future residential lots. At this location, a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

Basin CC-13D ($Q_2 = 2$ cfs $Q_5 = 6$ cfs, $Q_{100} = 29$ cfs) represents future residential lots that will continue to sheet flow off-site. Given the lot size, no water quality is required. However, a permanent sediment basin will be installed just prior to release off-site to provide sediment control. Developed flows released from this basin will not be significantly different than the pre-development flows.

Basin CC-14 ($Q_2 = 0.4$ cfs $Q_5 = 2$ cfs, $Q_{100} = 8$ cfs) represents sheet flow from the rear portion of two future residential lots. The majority of this area is not anticipated to be developed, therefore not significantly changing the drainage conditions from the pre-development condition. Also, given the lot size, no water quality is required.

Design Point 27 ($Q_2 = 4$ cfs $Q_5 = 17$ cfs, $Q_{100} = 81$ cfs) represents the full build-out developed flows from the previously described basin CC-15 and CC-20. These basins represent future residential lots. At this location, a future detention facility will be installed to meet EURV requirements and release pre-development flow quantities. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

Basins CC-21 ($Q_2 = 0.1$ cfs $Q_5 = 1$ cfs, $Q_{100} = 9$ cfs) and CC-22 ($Q_2 = 1$ cfs $Q_5 = 5$ cfs, $Q_{100} = 21$ cfs) represent future residential 5 ac. lots and park area that will continue to sheet flow off-site. Given the lot size, no water quality is required. However, a permanent sediment basin will be installed just prior to release off-site to provide sediment control. Developed flows released from this basin will not be significantly different than the pre-development flows.

Basins CC-23 ($Q_2 = 0.4$ cfs $Q_5 = 1$ cfs, $Q_{100} = 8$ cfs) and CC-24 ($Q_2 = 3$ cfs $Q_5 = 13$ cfs, $Q_{100} = 62$ cfs) represent future 5 ac. residential lots that will continue to sheet flow off-site. Given the lot size, no water quality is required. Given that the proposed lots are planned for 5 ac. residential, the developed flows



released from this basin will not be significantly different than the pre-development flows. However, multiple permanent sediment basins may be installed just prior to release off-site to provide sediment control. This basin also contains a portion of the adjacent Franktown/Parker Reservoir emergency spillway crossing two proposed lots. This existing facility, which doesn't appear to be within any existing easement, will be further analyzed with a final drainage report for this area. Appropriate drainage easements may be provided at time of final plating.

Basin CC-25 ($Q_2 = 0.3$ cfs $Q_5 = 1$ cfs, $Q_{100} = 6$ cfs) represents a small portion of two future residential 5 ac. lots that will continue to sheet flow off-site. Given that the proposed lots are planned for 5 ac. residential, the developed flows released from this basin will not be significantly different than the pre-development flows.

Design Point 34 ($Q_2 = 6$ cfs $Q_5 = 24$ cfs, $Q_{100} = 168$ cfs) represents the full build-out developed flows from Basins CC-26, CC-27, CC-28 and release from DP-32. These basins represent future residential lots and park area. At this location, a future detention facility will be installed and likely replace the existing stock pond to meet EURV requirements and release pre-development flow quantities. This future facility will be constructed in a tract with ownership and maintenance by the Flying Horse North HOA.

FACILITY MAINTENANCE

All proposed drainage structures within the platted County ROW will be owned and maintained by El Paso County. All proposed drainage structures within easements or tracts will be owned and maintained by the Flying Horse North HOA of Golf Course owner.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Detention storage and storm sewer conveyance to Black Squirrel Creek Drainage Basin was established with the Black Squirrel DBPS, previously referenced. The IDF curves from Figure 6-5 of the City of Colorado Springs/El Paso County DCM was used to estimate storm water runoff anticipated from design storms for the 2 year, 5 year and 100 year recurrence interval. (See Appendix)



FLOODPLAIN STATEMENT

A small portion of the Preliminary Plan (future lots not platted at this time) is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C 0295F, 0841C 0315F, 04081C 0325F effective date, March 17, 1997 (See Appendix). However, no portion of property proposed to be platted with Filing No. 1 is within the floodplain.

DRAINAGE AND BRIDGE FEES

FLYING HORSE NORTH FILING NO. 1

The East Cherry Creek Basin does not currently have a Drainage Basin Fee. However, the following fees for the Filing No. 1 platted area within the Black Squirrel Creek Basin are due prior to platting:

The fees are calculated using the following impervious acreage method approved by El Paso County. The acreage for Flying Horse Filing No. 1 within the Black Squirrel Creek Basin is 342.7 acres. This total area is broken into two uses: 2.5 ac. lots (including roads and tracts) and golf course. The 2.5 ac. lot area equals 234.4 acres and the golf course area equals 108.3 acres. Thus, the percent imperviousness for this subdivision is calculated as follows (See Figure 1.1 for Basin Area Exhibit):

2.5 ac. lots (incl. roads and tracts)

(Per El Paso County Percent Impervious Chart: 11%)

234.4 Ac. x 11% = **25.78 Impervious Ac.**

25% reduction for 2.5 ac. lots

25.78 Imp. ac. x .75% = **19.34 Impervious Ac.**

Golf Course Development

(Per El Paso County Percent Impervious Chart for greenbelts: 2%)

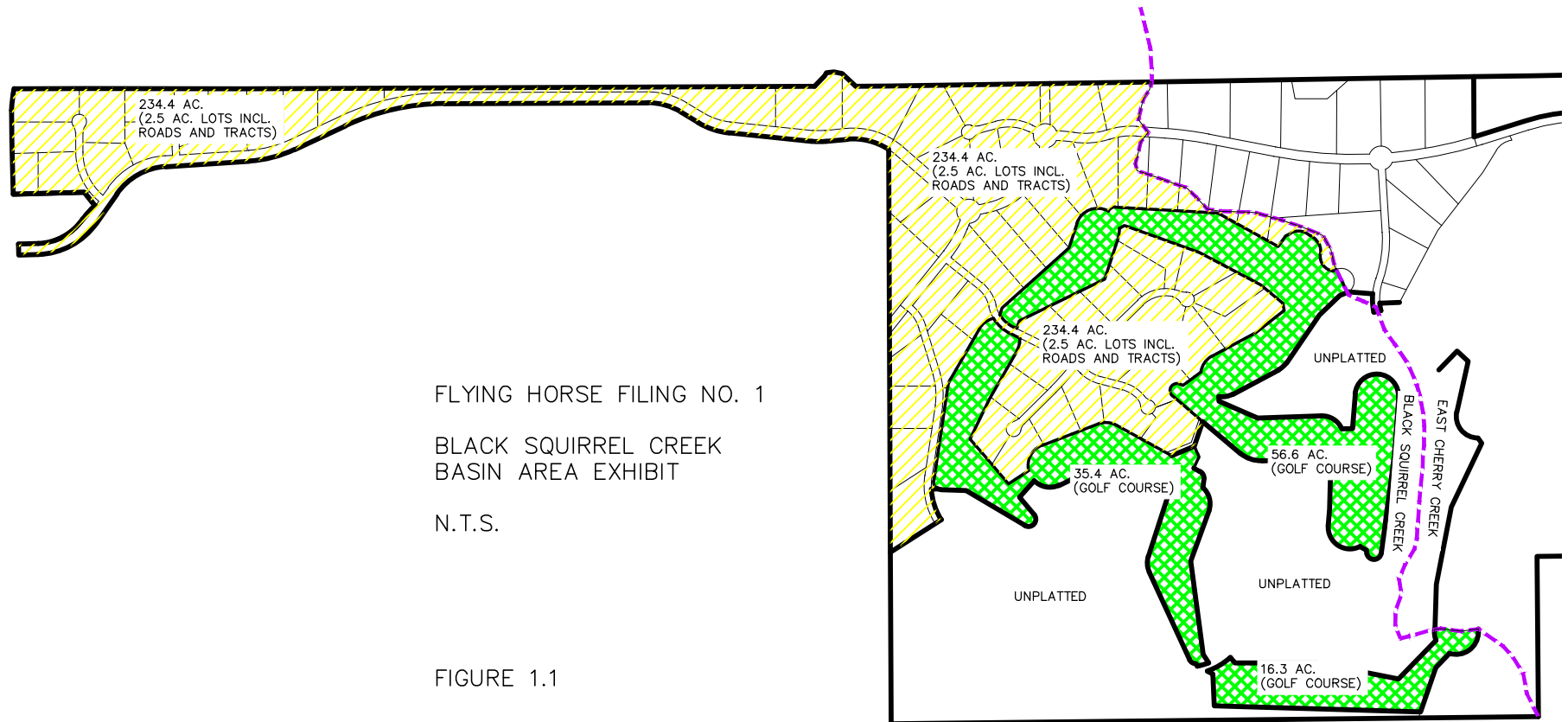
108.3 Ac. x 2% = **2.17 Impervious Ac.**

25% reduction for golf course development

2.17 Imp. ac. x .75% = **1.62 Impervious Ac.**

Total Impervious Acreage for Filing 1: 20.96 Imp. Ac.





FLYING HORSE FILING NO. 1
BLACK SQUIRREL CREEK
BASIN AREA EXHIBIT
N.T.S.

FIGURE 1.1

The following calculations are based on the 2017 drainage/bridge fees for the Black Squirrel Creek Drainage Basin:

Update the calculation based on the 2018 rates since the application was submitted in 2018.

FILING 1 FEE TOTALS:

Bridge Fees

$$\text{\$ } 465.00 \times 20.96 \text{ Impervious Ac.} = \text{\$ } \underline{9,746.40}$$

Drainage Fees

$$\text{\$ } 7,387.00 \times 20.96 \text{ Impervious Ac.} = \text{\$ } \underline{154,831.52}$$

Add a section listing the 4 step process (ECM Appendix I Section I.7.2) with narrative on how each step was considered and/or incorporated in the drainage design.

SUMMARY

This proposed development remains consistent with the previously approved Flying Horse North MDDP and Preliminary Drainage Report for Flying Horse North (Golf Course grading and private access roads). The proposed storm facilities have been sized to adequately handle the 100-yr. developed flows. All proposed detention facilities meet current criteria and provide full spectrum design. Upon future development outside of Filing No. 1, final drainage reports will be required finalizing final design of the proposed future drainage facilities. The proposed development will not adversely impact surrounding developments.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

Maw/109611/reports/109611PDR.doc



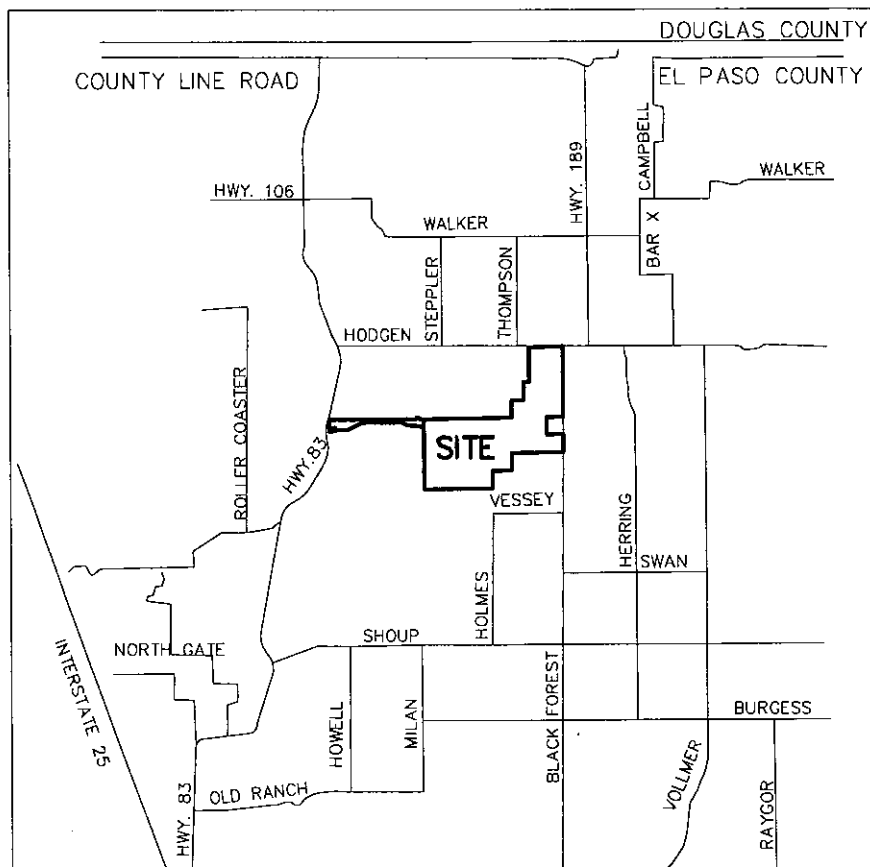
REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual, as revised in November 1991 and 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.
2. “Master Development Drainage Plan for Flying Horse North”, Classic Consulting, dated September 2016.
3. “Preliminary Drainage Report for Flying Horse North (Golf Course Grading and Private Access Roads)”, Classic Consulting, dated September 2016.
4. “Final Drainage Report High Forest Ranch Filing No. 1” JR Engineering, dated March 2001.
5. “Final Drainage Report for High Forest Ranch Filing No. 2 and High Forest Ranch Filing No. 3” Classic Consulting Engineers and Surveyors dated May 2001.
6. “Final Drainage Report and Plan for Cathedral Pines Subdivision Filing No. 2,” Leigh Whitehead & Associates, dated March 2005.
7. “Final Drainage Report and Plan for Cathedral Pines Subdivision Filing No. 3,” Stillwater Engineering, dated July 2006.
8. “Black Squirrel Creek Drainage Basin Planning Study,” URS Corporation, dated August 1987.
9. “Final Drainage Report for Country View Estates” Associated Design Professionals Inc, dated October 1998.
10. “Urban Storm Drainage Criteria Manual Volume 1, 2 & 3” Urban Drainage and Flood Control District, dated January 2016.



APPENDIX

VICINITY MAP

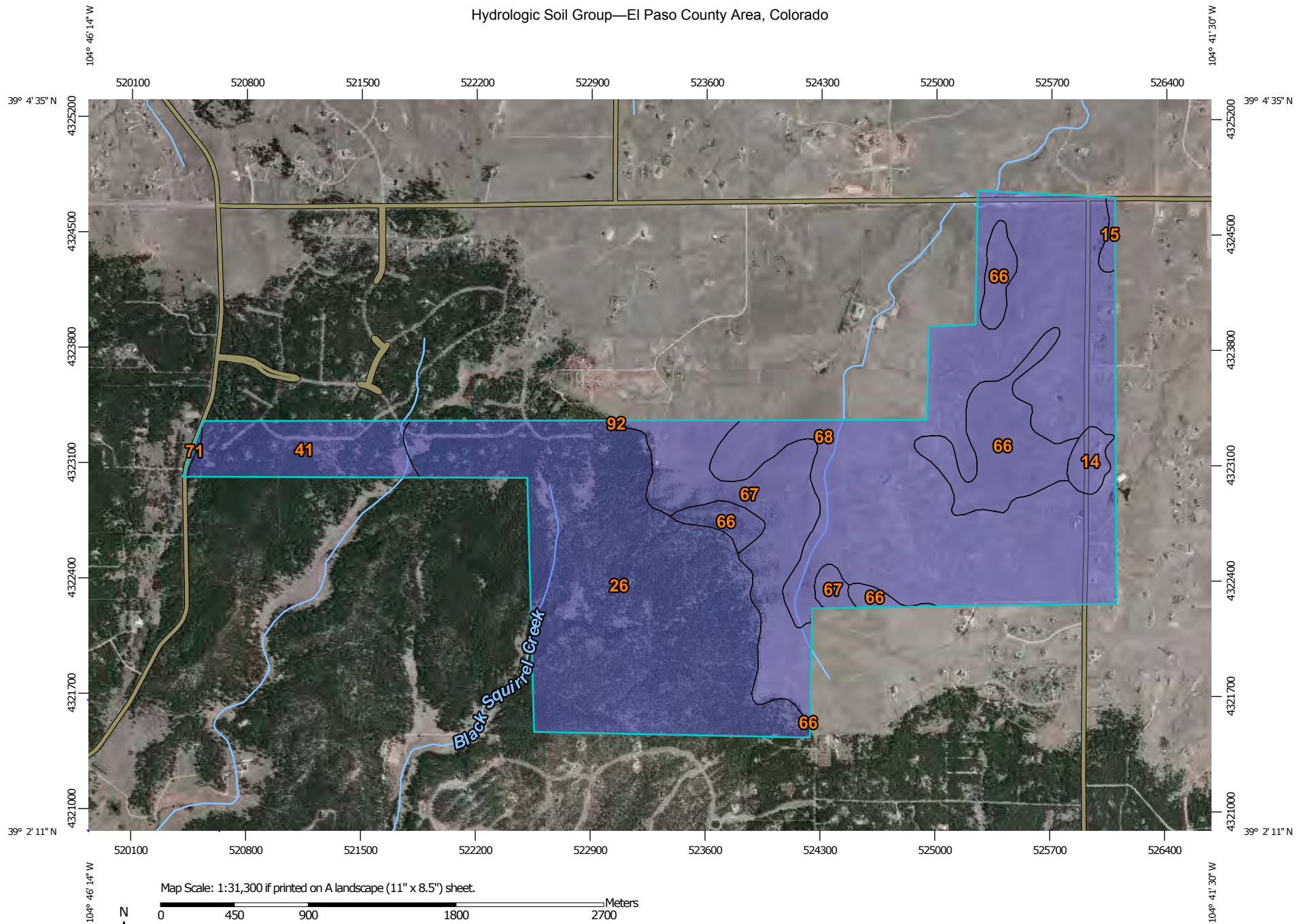


VICINITY MAP

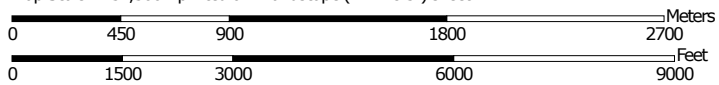
NTS

SOILS MAP (WEB SOIL SURVEY)

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:31,300 if printed on A landscape (11" x 8.5") sheet.



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




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

3/21/2016
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 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 13, Sep 22, 2015

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

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	B	19.6	1.1%
15	Brussett loam, 3 to 5 percent slopes	B	7.0	0.4%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	615.7	33.6%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	109.3	6.0%
66	Peyton sandy loam, 1 to 5 percent slopes	B	160.6	8.8%
67	Peyton sandy loam, 5 to 9 percent slopes	B	198.8	10.8%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	719.7	39.3%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	1.7	0.1%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	0.8	0.0%
Totals for Area of Interest			1,833.2	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

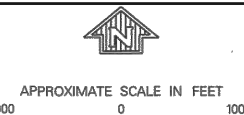
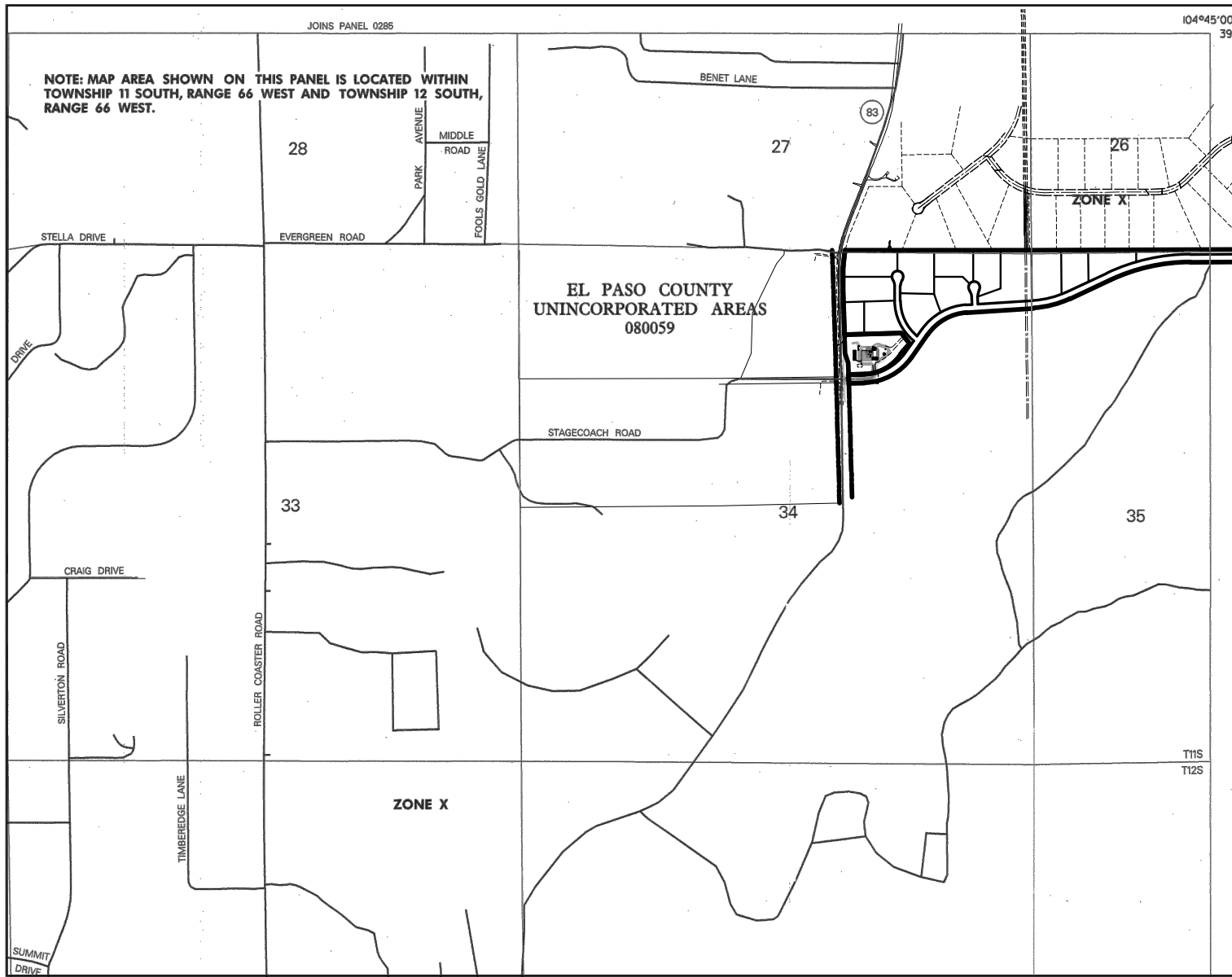
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

F.E.M.A. MAP



NATIONAL FLOOD INSURANCE PROGRAM

FIRM FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 295 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080050	0295	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0295	F

MAP NUMBER
08041C0295 F

EFFECTIVE DATE:
MARCH 17, 1997



Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

HYDROLOGY / HYDRAULIC CALCULATIONS

ALL LAND ASSUMED 2 ACRE RESIDENTIAL LOTS, UNDEVELOPED WOODS OR
GOOD CONDITION OPEN SPACE (LAWNS, PARKS GOLF COURSES, CEMETARIES ETC.)

C_N VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE / WOODS (B)		2 AC. RESIDENTIAL (B)		COMPOSITE C _N
		CN	AREA (Ac.)	CN	AREA (Ac.)	
OS-1A	4.4	61	4.4	65	0.0	61.0
OS-1B	5.6	61	5.6	65	0.0	61.0
EX-DP-3 (Pre-Dev.)	36.0	60	36.0	65	0.0	60.0
OS-2	2.9	61	2.9	65	0.0	61.0
OS-3	10.2	61	0.0	65	10.2	65.0
OS-4	32.9	61	0.0	65	32.9	65.0
OS-5	29.7	61	0.0	65	29.7	65.0
OS-6	9.2	61	0.0	65	9.2	65.0
OS-7	5.0	61	0.0	65	5.0	65.0
OS-8	14.2	61	0.0	65	14.2	65.0
OS-9	9.8	60	9.8	65	0.0	60.0
OS-10	4.1	61	0.0	65	4.1	65.0
OS-11	28.0	61	0.0	65	28.0	65.0
OS-12	68.1	61	40.0	65	28.1	62.7
OS-13	36.9	61	18.0	65	18.9	63.0
OS-14	26.4	61	20.0	65	6.4	62.0
OS-15	70.8	61	20.0	65	50.8	63.9
OS-16	4.5	61	0.0	65	4.5	65.0
OS-17	15.8	61	0.0	65	15.8	65.0
OS-18	13.0	61	0.0	65	13.0	65.0

ALL LAND ASSUMED 2 ACRE RESIDENTIAL LOTS, UNDEVELOPED WOODS OR
GOOD CONDITION OPEN SPACE (LAWNS, PARKS GOLF COURSES, CEMETARIES ETC.)

C_N VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE / WOODS (B)		2 AC. RESIDENTIAL (B)		COMPOSITE C _N
		CN	AREA (Ac.)	CN	AREA (Ac.)	
BS-1A	3.5	61	0.0	65	3.5	65.0
BS-1B	8.9	61	0.0	65	8.9	65.0
BS-2	1.9	61	0.0	89	1.9	89.0
BS-2A	0.8	61	0.0	89	0.8	89.0
BS-2B	0.9	61	0.0	89	0.9	89.0
BS-3	6.2	61	0.0	65	6.2	65.0
BS-4	13.0	61	0.0	67	13.0	67.0
BS-5	11.2	61	0.0	65	11.2	65.0
BS-6	1.2	61	0.0	89	1.2	89.0
BS-7	2.9	61	0.0	65	2.9	65.0
BS-8	1.0	61	0.0	89	1.0	89.0
BS-9	1.5	61	0.0	89	1.5	89.0
BS-10	4.5	61	0.0	65	4.5	65.0
BS-11	0.9	61	0.0	89	0.9	89.0
BS-12	7.7	61	0.0	65	7.7	65.0
BS-13	25.6	61	0.0	65	25.6	65.0
BS-14	13.4	61	0.0	65	13.4	65.0
BS-15	5.3	61	0.0	65	5.3	65.0
BS-16	21.6	61	0.0	65	21.6	65.0
BS-17	12.1	61	0.0	65	12.1	65.0
BS-18	33.8	61	12.1	65	21.7	63.6
BS-19	6.3	61	0.0	65	6.3	65.0
BS-20	73.9	61	30.2	65	43.7	63.4
BS-21	69.5	61	12.1	65	57.4	64.3
BS-22	18.1	61	2.5	65	15.6	64.4
BS-23	37.1	61	15.4	65	21.7	63.3
BS-23A	16.3	61	2.5	65	13.8	64.4
BS-24	10.9	60	4.3	65	6.6	63.0
EX-24 (Pre-Dev.)	13.2	60	13.2	65	0.0	60.0
BS-25	12.7	60	5.0	65	7.7	63.0
BS-26	2.5	60	2.5	65	0.0	60.0
BS-27	23.3	61	0.0	65	23.3	65.0
BS-28	36.9	61	5.6	65	31.3	64.4
BS-29	27.7	61	7.2	65	20.5	64.0
BS-30	6.7	61	0.0	65	6.7	65.0
BS-31	8.4	60	4.2	65	4.2	62.5
BS-32	6.2	60	3.0	65	3.2	62.6
BS-33	8.9	60	0.6	65	8.3	64.7

ALL LAND ASSUMED 2 ACRE RESIDENTIAL LOTS, UNDEVELOPED WOODS OR
GOOD CONDITION OPEN SPACE (LAWNS, PARKS GOLF COURSES, CEMETARIES ETC.)

C_N VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE / WOODS (B)		2 AC. RESIDENTIAL (B)		COMPOSITE C _N
		CN	AREA (Ac.)	CN	AREA (Ac.)	
CC-1A	9.8	61	0.0	65	9.8	65.0
CC-1B	12.6	61	0.5	65	12.1	64.8
CC-2A	11.0	61	0.0	65	11.0	65.0
CC-2B	20.8	61	0.0	65	20.8	65.0
CC-2C	6.4	61	0.0	65	6.4	65.0
CC-3	52.5	61	25.0	65	27.5	63.1
CC-4A	108.7	61	65.0	65	43.7	62.6
CC-4B	8.1	85	4.5	65	3.6	76.1
CC-4C (Pre-Dev.)	7.4	61	7.4	65	0.0	61.0
CC-5	22.4	61	0.0	65	22.4	65.0
CC-6	27.8	61	0.0	65	27.8	65.0
CC-7	18.4	61	0.0	65	18.4	65.0
CC-8	7.7	61	0.0	65	7.7	65.0
CC-9	5.6	61	0.0	65	5.6	65.0
CC-10	85.6	61	51.0	65	34.6	62.6
CC-11	18.6	61	9.0	65	9.6	63.1
CC-12	12.2	61	0.0	65	12.2	65.0
CC-13A	19.3	61	0.0	65	19.3	65.0
CC-13B	25.5	61	0.0	65	25.5	65.0
CC-13C	9.9	61	0.0	65	9.9	65.0
CC-13D	18.8	61	0.0	65	18.8	65.0
CC-14	4.6	61	0.0	65	4.6	65.0
CC-15	12.8	61	0.0	65	12.8	65.0
CC-16	16.3	61	0.0	65	16.3	65.0
CC-17	25.0	61	0.0	65	25.0	65.0
CC-18	5.8	61	0.0	65	5.8	65.0
CC-19	3.7	61	0.0	65	3.7	65.0
CC-20	39.3	61	0.0	65	39.3	65.0
CC-21	6.2	61	6.2	65	0.0	61.0
CC-22	13.8	61	0.0	65	13.8	65.0
CC-23	5.7	61	0.4	65	5.3	64.7
CC-24	39.6	61	0.0	65	39.6	65.0
CC-25	3.5	61	0.0	65	3.5	65.0
CC-26	16.7	61	0.0	65	16.7	65.0
CC-27	18.9	61	3.0	65	15.9	64.4
CC-28	154.8	61	23.0	65	131.8	64.4

BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-1A	4.40	61.0	0.20	0.4	1.6	7.7
OS-1B	5.60	61.0	0.21	0.5	1.9	9.4
EX-DP-3 (Pre-Dev.)	36.00	60.0	0.25	0.5	4.8	41.3
OS-2	2.90	61.0	0.20	0.1	0.6	4.0
OS-3	10.20	65.0	0.19	1.0	3.8	17.9
OS-4	32.90	65.0	0.23	2.8	11.2	53.6
OS-5	29.70	65.0	0.39	1.9	7.1	37.0
OS-6	9.20	65.0	0.21	0.9	3.2	15.5
OS-7	5.00	65.0	0.18	0.5	2.0	9.0
OS-8	14.20	65.0	0.27	2.1	6.2	24.7
OS-9	9.80	60.0	0.37	0.1	1.0	9.1
OS-10	4.10	65.0	0.17	0.7	2.1	8.2
OS-11	28.00	65.0	0.35	2.4	8.2	38.7
OS-12	68.10	62.7	0.37	2.2	11.9	75.8
OS-13	36.90	63.0	0.33	1.4	7.4	45.0
OS-14	26.40	62.0	0.31	0.7	4.6	31.0
OS-15	70.80	63.9	0.38	3.3	14.8	84.2
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6

BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
BS-1A	3.50	65.0	0.17	0.4	1.4	6.3
BS-1B	8.90	65.0	0.20	0.4	2.4	13.8
BS-2	1.90	89.0	0.35	2.9	4.2	8.4
BS-2A	0.80	89.0	0.13	1.2	1.8	3.5
BS-2B	0.90	89.0	0.12	1.4	2.0	4.0
BS-3	6.20	65.0	0.20	0.6	2.3	10.8
BS-4	13.00	67.0	0.23	1.9	5.5	23.6
BS-5	11.20	65.0	0.18	1.1	4.4	20.1
BS-6	1.20	89.0	0.09	1.9	2.8	5.4
BS-7	2.90	65.0	0.13	4.4	6.4	12.8
BS-8	1.00	89.0	0.12	1.6	2.2	4.5
BS-9	1.50	89.0	0.13	2.3	3.3	6.6
BS-10	4.50	65.0	0.24	6.0	8.7	17.5
BS-11	0.90	89.0	0.08	1.5	2.1	4.1
BS-12	7.70	65.0	0.19	0.8	3.0	13.8
BS-13	25.60	65.0	0.23	3.7	10.2	40.7
BS-14	13.40	65.0	0.23	2.6	6.8	26.5
BS-15	5.30	65.0	0.18	1.6	3.7	12.2
BS-16	21.60	65.0	0.34	4.6	11.8	44.1
BS-17	12.10	65.0	0.21	3.1	7.7	26.7
BS-18	33.80	63.6	0.41	3.5	12.4	56.0
BS-19	6.30	65.0	0.18	2.1	4.6	15.0
BS-20	73.90	63.4	0.31	7.4	24.6	112.4
BS-21	69.50	64.3	0.35	7.8	23.9	103.0
BS-22	18.10	64.4	0.22	3.7	9.6	36.5
BS-23	37.10	63.3	0.33	4.5	13.6	58.2
BS-23A	16.30	64.4	0.29	5.5	12.0	38.3
BS-24	10.90	63.0	0.17	0.6	3.3	17.6
EX-24 (Pre-Dev.)	13.20	60.0	0.17	0.2	2.2	17.8
BS-25	12.70	63.0	0.23	0.4	2.7	17.3
BS-26	2.50	60.0	0.18	0.0	0.4	3.4
BS-27	23.30	65.0	0.22	2.1	8.0	38.8
BS-28	36.90	64.4	0.32	2.2	9.3	49.4
BS-29	27.70	64.0	0.33	1.4	6.5	35.9
BS-30	6.70	65.0	0.20	0.7	2.4	11.7
BS-31	8.40	62.5	0.23	0.3	1.9	11.8
BS-32	6.20	62.6	0.20	0.3	1.6	9.4
BS-33	8.90	64.7	0.19	0.8	3.2	15.3

BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6
CC-2C	6.40	65.0	0.18	0.7	2.5	11.5
CC-3	52.50	63.1	0.43	1.8	8.8	54.5
CC-4A	108.70	62.6	0.44	15.4	39.0	156.0
CC-4B	8.10	76.1	0.26	4.0	7.3	20.6
CC-4C (Pre-Dev.)	7.40	61.0	0.13	0.2	1.8	11.2
CC-5	22.40	65.0	0.26	1.8	7.1	34.3
CC-6	27.80	65.0	0.25	2.3	9.1	43.2
CC-7	18.40	65.0	0.29	1.4	5.4	27.0
CC-8	7.70	65.0	0.25	0.6	2.5	12.0
CC-9	5.60	65.0	0.19	0.6	2.1	9.8
CC-10	85.60	62.6	0.39	2.6	14.1	91.9
CC-11	18.60	63.1	0.21	0.9	5.0	28.1
CC-12	12.20	65.0	0.26	1.0	3.9	18.7
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1
CC-13C	9.90	65.0	0.22	0.9	3.4	16.5
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2
CC-14	4.60	65.0	0.21	0.4	1.6	7.8
CC-15	12.80	65.0	0.24	1.1	4.3	20.4
CC-16	16.30	65.0	0.30	1.2	4.6	23.6
CC-17	25.00	65.0	0.35	1.7	6.5	32.8
CC-18	5.80	65.0	0.30	0.4	1.7	8.4
CC-19	3.70	65.0	0.25	0.3	1.2	5.8
CC-20	39.30	65.0	0.25	3.2	12.9	61.0
CC-21	6.20	61.0	0.20	0.1	1.2	8.5
CC-22	13.80	65.0	0.25	1.1	4.5	21.4
CC-23	5.70	64.7	0.33	0.4	1.5	7.7
CC-24	39.60	65.0	0.25	3.3	13.0	61.5
CC-25	3.50	65.0	0.23	0.3	1.2	5.7
CC-26	16.70	65.0	0.26	1.4	5.3	25.6
CC-27	18.90	64.4	0.31	1.2	4.9	25.8
CC-28	154.80	64.4	0.63	6.5	24.7	136.3

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-1 DEV	OS-1A, BS-2B	1.6	3.4	11
DP-2 DEV	DP-1, BS-4	3.2	8.8	35
TOTAL INFLOW TO FHN POND 1	DP-1, DP-2, BS-1A	3	9	38
DP-3 DEV	OS-2, BS-3, BS-1B, Release from FHN Pond 1	1	6	39
DP-4 DEV	BS-2	2.9	4.2	8
DP-5 DEV	OS-1B, BS-2A	1.5	3.5	13
DP-6 DEV	OS-2, BS-3	0.6	2.8	15
DP-7 DEV	OS-3, BS-5	2.1	8.2	38
DP-8 DEV	OS-4, OS-5, OS-6, BS-7, BS-10, Release from Exist. HFR Pond 16	20.9	70.4	284
DP-9 DEV	OS-7, BS-12	1.3	5.0	23
DP-10 DEV	OS-8, OS-10, OS-11, BS-13, BS-14	10.7	32.0	143
DP-11 DEV	BS-16	4.6	11.8	36
DP-12 DEV	DP-11, BS-15	4.0	11.0	44
TOTAL INFLOW TO FHN POND 4	DP-10, DP-12, BS-17, OS-9	18	52	217
DP-13 DEV	Release from FHN Pond 4	0.3	0.3	142
DP-14 DEV	BS-18	3.5	12.4	56
DP-15 DEV	BS-19	2.1	4.6	15
DP-16 DEV	DP-14, DP-15, BS-20, BS-21, BS-22, BS-23	25.0	78.0	362
TOTAL INFLOW TO FHN POND 8 (Full Build-out)	DP-10, DP-12, BS-17, OS-9	28	85	383
DP-17 DEV (Full Build-out)	Release from FHN Pond 8	0.8	1.0	253
TOTAL INFLOW TO FHN POND 8 (Filing 1 Only)	DP-10, DP-12, BS-17, OS-9	12	50	297
DP-17 DEV (Filing 1 Only)	Release from FHN Pond 8	0.4	0.5	228

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-18 DEV	BS-28, BS-29, BS-30, OS-18	5.0	21.6	115
DP-19 DEV	BS-27, OS-17, Release from DP-18	3.8	16.8	126
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev.), CC-5	1.9	8.4	45
TOTAL INFLOW TO FHN POND 12	CC-4C, CC-5, CC-6	4	17	86
DP-25 DEV	Release from FHN Pond 12	0.2	0.3	45
DP-26 DEV	CC-8, CC-10	3.0	15.9	102
DP-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.4	1.7	8
DP-31 DEV	CC-19, Release from DP-30	0.7	2.7	14
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-16, CC-26, CC-27, CC-28, Release from DP-32	6.0	23.5	168

ALL LAND ASSUMED 2 ACRE RESIDENTIAL LOTS, UNDEVELOPED WOODS (FUTURE FILING) OR
GOOD CONDITION OPEN SPACE (LAWNS, PARKS GOLF COURSES, CEMETARIES ETC.)

C_N VALUES - DEVELOPED CONDITIONS (FILING 1 ONLY)

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE (B)		2 AC. RESIDENTIAL (B)		UNDEVELOPED WOODS (B)		COMPOSITE C _N
		CN	AREA (Ac.)	CN	AREA (Ac.)	CN	AREA (Ac.)	
BS-20	73.9	61	30.2	60	1.0	60	42.7	60.4
BS-21	69.5	61	12.1	65	34.4	60	23.0	62.6
BS-22	18.1	61	2.5	65	5.1	60	10.5	61.5
BS-23	37.1	61	15.4	65	20.2	60	1.5	63.1
BS-23A	16.3	61	0.0	65	2.5	60	13.8	60.8

TIME OF CONCENTRATION DEVELOPED (FILING 1 ONLY)

BASIN	COMPOSITE Cn	C(5)	Length (ft)	OVERLAND Height (ft)	Tc (min)	STREET / CHANNEL FLOW (DCM Vol. 1 Fig. 6-25)				Tc TOTAL (min)	Tc LAG (0.6tc) (min)	Tc LAG (0.6tc) (hr)
						Length (ft)	Slope (%)	Velocity (fps)	Tc (min)			
BS-20	60.4	0.08	1000	60	32.2					32.2	19.3	0.32
BS-21	62.6	0.08	1000	30	40.5	500	4.0%	1.7	4.9	45.4	27.3	0.45
BS-22	61.5	0.08	300	21	16.8	500	4.0%	1.5	5.6	22.3	13.4	0.22
BS-23	63.1	0.08	300	14	19.2	800	4.0%	1.0	13.3	32.5	19.5	0.33
BS-23A	60.8	0.08	1000	64	31.6	200	2.0%	1.5	2.2	33.8	20.3	0.34

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Nov 20 2017

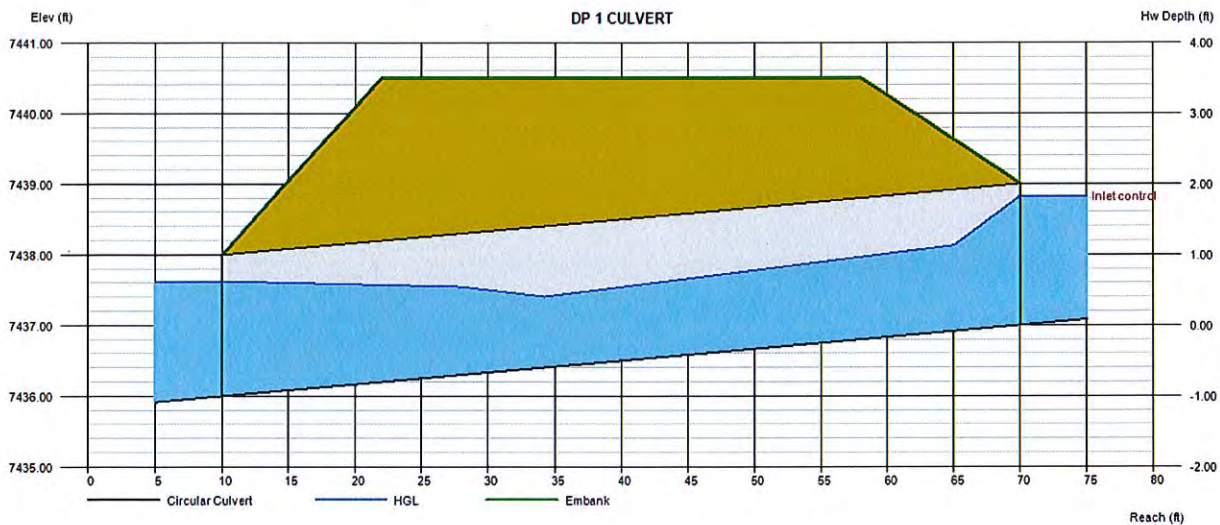
DP 1 CULVERT

Invert Elev Dn (ft) = 7436.00
Pipe Length (ft) = 60.00
Slope (%) = 1.67
Invert Elev Up (ft) = 7437.00
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment
Top Elevation (ft) = 7440.50
Top Width (ft) = 36.00
Crest Width (ft) = 60.00

Calculations
Qmin (cfs) = 0.00
Qmax (cfs) = 12.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted
Qtotal (cfs) = 12.00
Qpipe (cfs) = 12.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 4.40
Veloc Up (ft/s) = 5.85
HGL Dn (ft) = 7437.62
HGL Up (ft) = 7438.24
Hw Elev (ft) = 7438.82
Hw/D (ft) = 0.91
Flow Regime = Inlet Control



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DP 2 CULVERT

Invert Elev Dn (ft) = 7417.60
Pipe Length (ft) = 90.00
Slope (%) = 6.00
Invert Elev Up (ft) = 7423.00
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

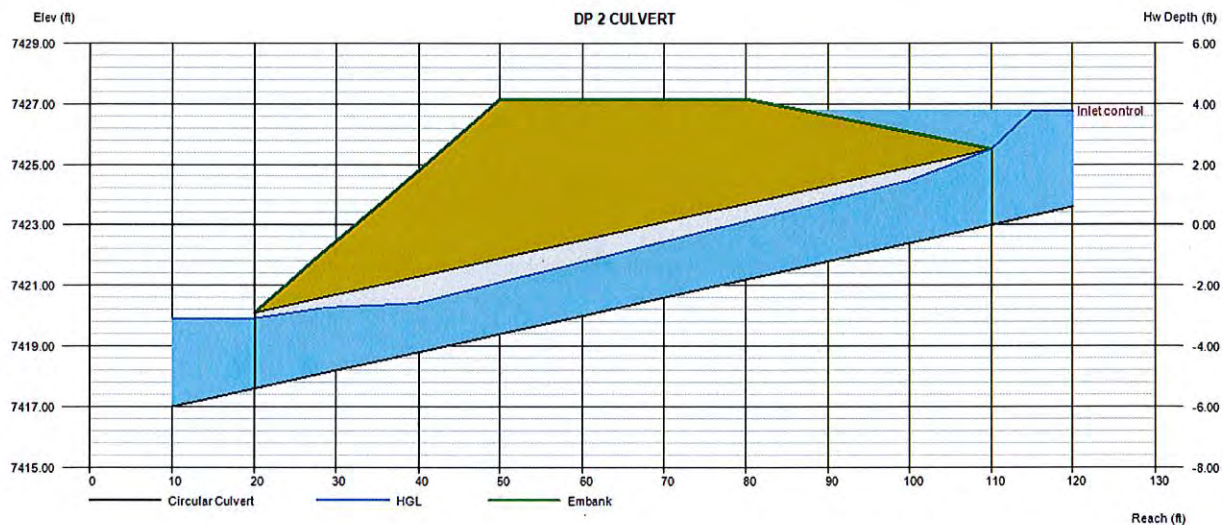
Top Elevation (ft) = 7427.15
Top Width (ft) = 30.00
Crest Width (ft) = 60.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 40.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 40.00
Qpipe (cfs) = 40.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 8.43
Veloc Up (ft/s) = 8.99
HGL Dn (ft) = 7419.91
HGL Up (ft) = 7425.13
Hw Elev (ft) = 7426.76
Hw/D (ft) = 1.50
Flow Regime = Inlet Control



Culvert Report

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DP 6 CULVERTS

Invert Elev Dn (ft) = 7422.00
Pipe Length (ft) = 60.00
Slope (%) = 1.00
Invert Elev Up (ft) = 7422.60
Rise (in) = 18.0
Shape = Circular
Span (in) = 18.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

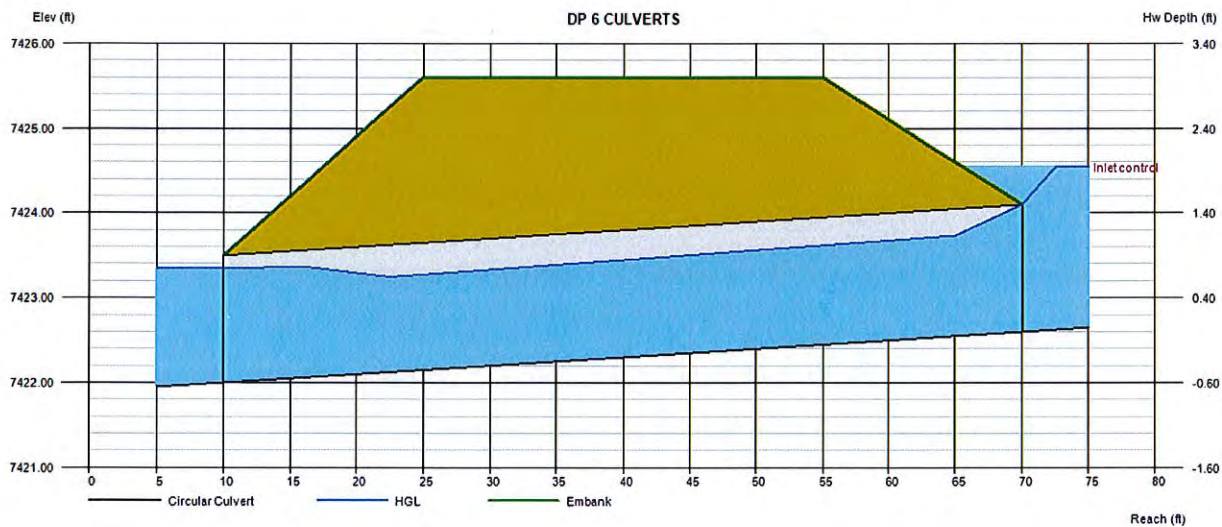
Top Elevation (ft) = 7425.60
Top Width (ft) = 30.00
Crest Width (ft) = 60.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 19.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 19.00
Qpipe (cfs) = 19.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 5.69
Veloc Up (ft/s) = 6.32
HGL Dn (ft) = 7423.35
HGL Up (ft) = 7423.79
Hw Elev (ft) = 7424.54
Hw/D (ft) = 1.30
Flow Regime = Inlet Control



Culvert Report

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Monday, Nov 20 2017

DP 7 CULVERT

Invert Elev Dn (ft) = 7453.00
Pipe Length (ft) = 66.00
Slope (%) = 4.00
Invert Elev Up (ft) = 7455.64
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

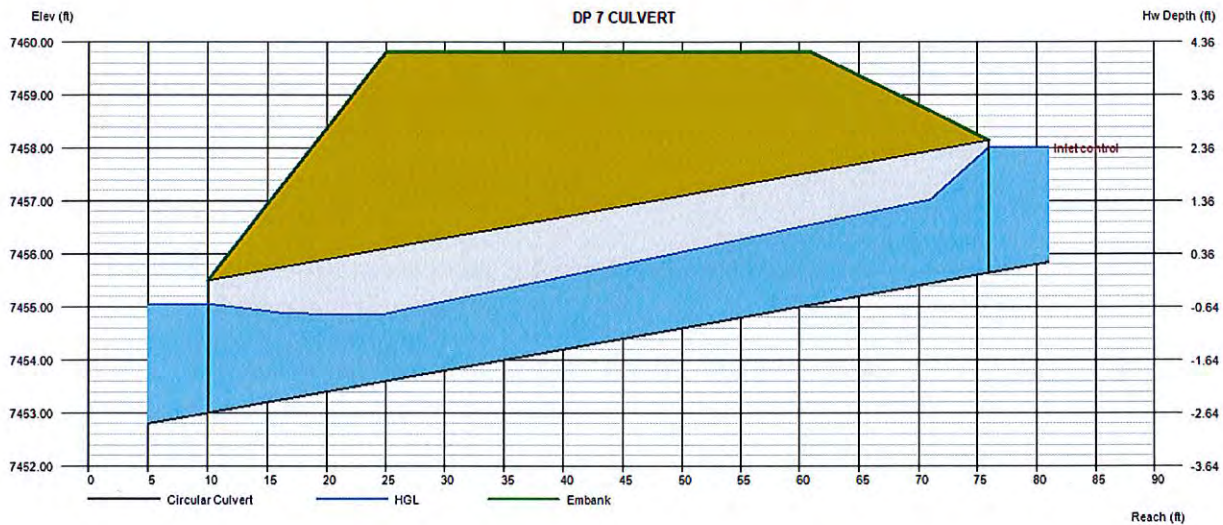
Top Elevation (ft) = 7459.80
Top Width (ft) = 36.00
Crest Width (ft) = 60.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 45.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 45.00
Qpipe (cfs) = 45.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 5.21
Veloc Up (ft/s) = 6.72
HGL Dn (ft) = 7455.06
HGL Up (ft) = 7457.25
Hw Elev (ft) = 7458.00
Hw/D (ft) = 0.94
Flow Regime = Inlet Control



Culvert Report

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Monday, Nov 20 2017

DP 8 CULVERTS

Invert Elev Dn (ft) = 7438.30
Pipe Length (ft) = 100.00
Slope (%) = 5.70
Invert Elev Up (ft) = 7444.00
Rise (in) = 42.0
Shape = Circular
Span (in) = 42.0
No. Barrels = 3
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 280.00
Tailwater Elev (ft) = (dc+D)/2

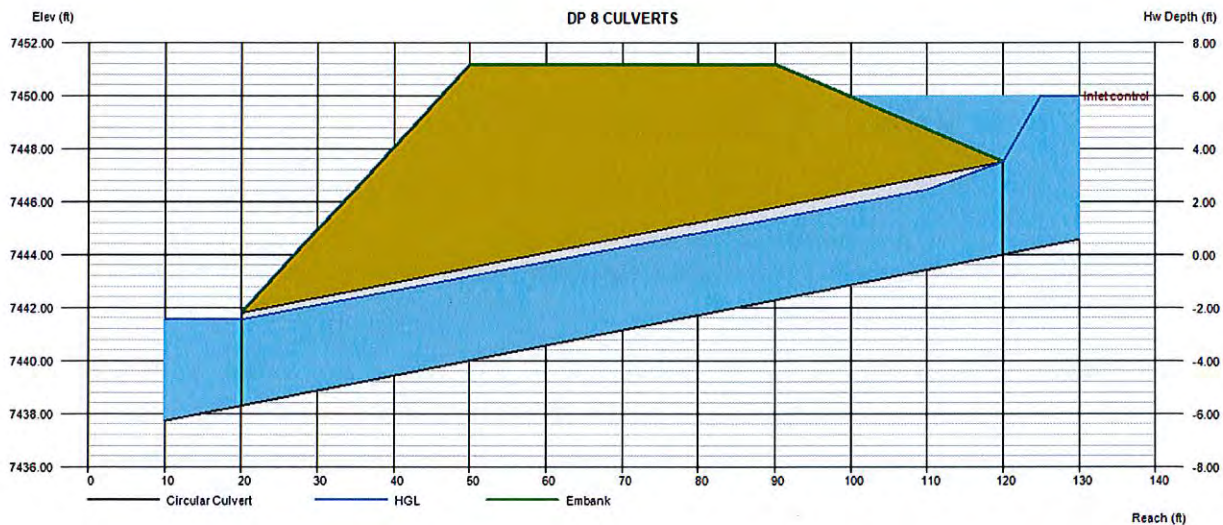
Highlighted

Qtotal (cfs) = 280.00
Qpipe (cfs) = 280.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 10.03
Veloc Up (ft/s) = 10.67
HGL Dn (ft) = 7441.54
HGL Up (ft) = 7446.99
Hw Elev (ft) = 7449.99
Hw/D (ft) = 1.71
Flow Regime = Inlet Control

Embankment

Top Elevation (ft) = 7451.17
Top Width (ft) = 40.00
Crest Width (ft) = 50.00

Hw/D must be less than
1.5



Culvert Report

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DP 9 CULVERTS

Invert Elev Dn (ft) = 7486.10
Pipe Length (ft) = 60.00
Slope (%) = 2.30
Invert Elev Up (ft) = 7487.48
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Calculations

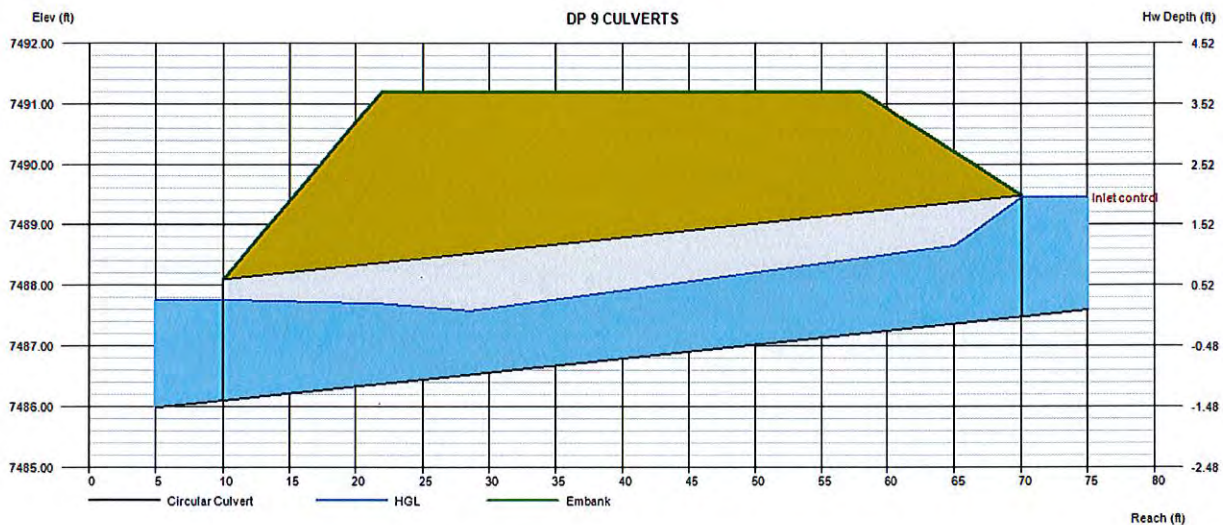
Qmin (cfs) = 0.00
Qmax (cfs) = 27.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 27.00
Qpipe (cfs) = 27.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 4.84
Veloc Up (ft/s) = 6.13
HGL Dn (ft) = 7487.76
HGL Up (ft) = 7488.80
Hw Elev (ft) = 7489.45
Hw/D (ft) = 0.98
Flow Regime = Inlet Control

Embankment

Top Elevation (ft) = 7491.20
Top Width (ft) = 36.00
Crest Width (ft) = 60.00



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 10 CULVERT

Invert Elev Dn (ft) = 7455.80
Pipe Length (ft) = 112.07
Slope (%) = 4.00
Invert Elev Up (ft) = 7460.28
Rise (in) = 42.0
Shape = Circular
Span (in) = 42.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

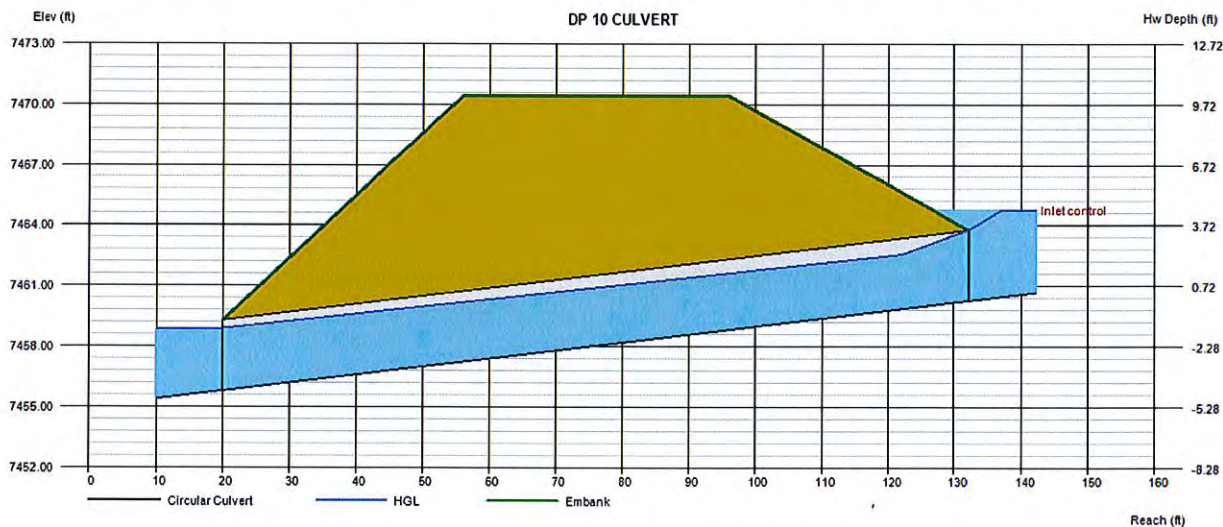
Top Elevation (ft) = 7470.42
Top Width (ft) = 40.00
Crest Width (ft) = 50.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 144.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 144.00
Qpipe (cfs) = 144.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 8.03
Veloc Up (ft/s) = 9.19
HGL Dn (ft) = 7458.88
HGL Up (ft) = 7462.94
Hw Elev (ft) = 7464.78
Hw/D (ft) = 1.29
Flow Regime = Inlet Control



Culvert Report

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Thursday, Nov 30 2017

DP 11 CULVERT

Invert Elev Dn (ft) = 7451.50
Pipe Length (ft) = 75.00
Slope (%) = 2.00
Invert Elev Up (ft) = 7453.00
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

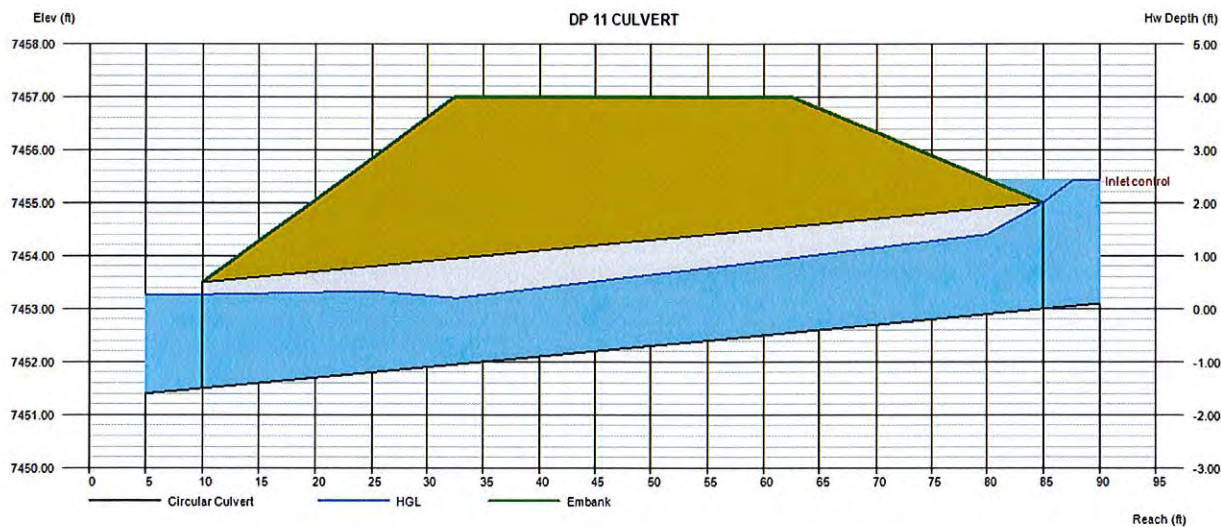
Top Elevation (ft) = 7457.00
Top Width (ft) = 30.00
Crest Width (ft) = 20.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 36.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 36.00
Qpipe (cfs) = 36.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 6.14
Veloc Up (ft/s) = 6.99
HGL Dn (ft) = 7453.26
HGL Up (ft) = 7454.53
Hw Elev (ft) = 7455.42
Hw/D (ft) = 1.21
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 12 CULVERT

Invert Elev Dn (ft) = 7426.00
Pipe Length (ft) = 130.00
Slope (%) = 1.15
Invert Elev Up (ft) = 7427.50
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment

Top Elevation (ft) = 7432.30
Top Width (ft) = 30.00
Crest Width (ft) = 20.00

Calculations

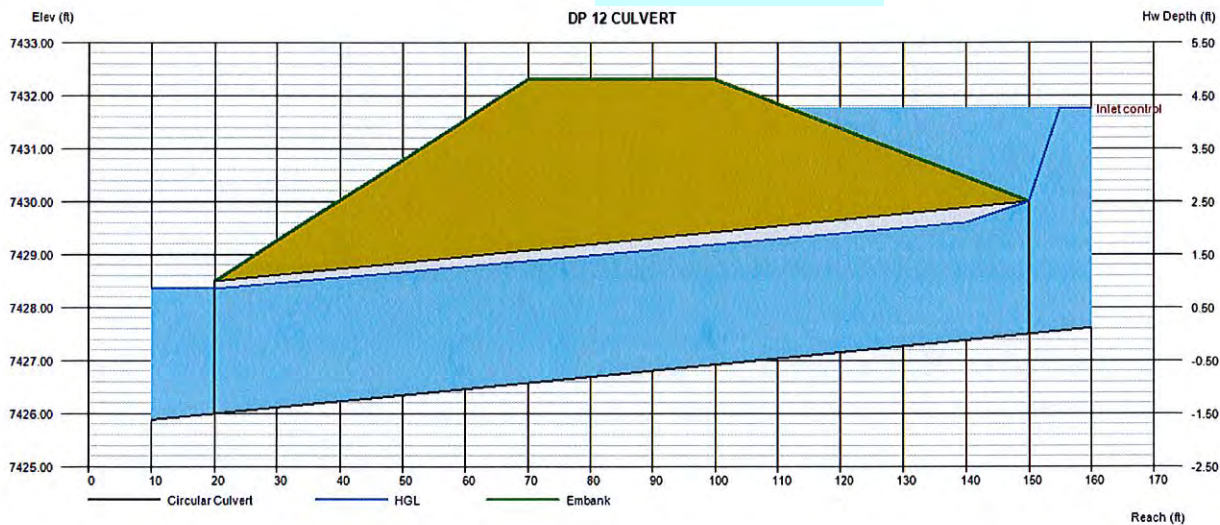
Qmin (cfs) = 0.00
Qmax (cfs) = 44.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 44.00
Qpipe (cfs) = 44.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 9.18
Veloc Up (ft/s) = 9.59
HGL Dn (ft) = 7428.35
HGL Up (ft) = 7429.71
Hw Elev (ft) = 7431.76
Hw/D (ft) = 1.70
Flow Regime = Inlet Control

is the bend and manhole modeled?

Hw/D must be 1.5 or less.



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 14 CULVERT

Invert Elev Dn (ft) = 7448.18
Pipe Length (ft) = 111.84
Slope (%) = 3.92
Invert Elev Up (ft) = 7452.57
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 3
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

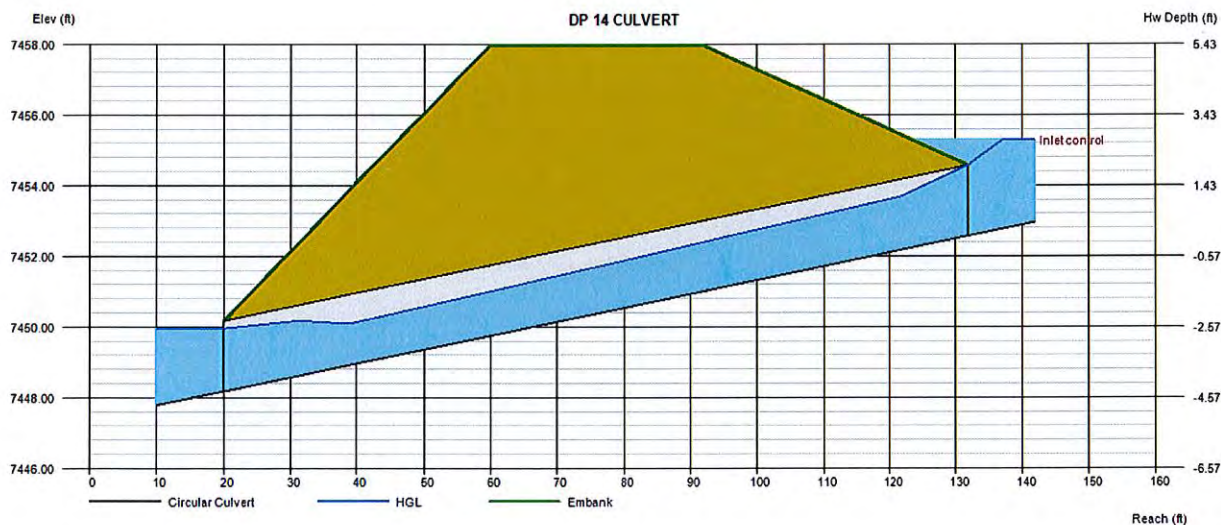
Top Elevation (ft) = 7457.97
Top Width (ft) = 32.00
Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 56.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 56.00
Qpipe (cfs) = 56.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 6.33
Veloc Up (ft/s) = 7.13
HGL Dn (ft) = 7449.96
HGL Up (ft) = 7454.12
Hw Elev (ft) = 7455.28
Hw/D (ft) = 1.35
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 15 CULVERT

Invert Elev Dn (ft) = 7465.95
Pipe Length (ft) = 61.74
Slope (%) = 1.15
Invert Elev Up (ft) = 7466.66
Rise (in) = 18.0
Shape = Circular
Span (in) = 18.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

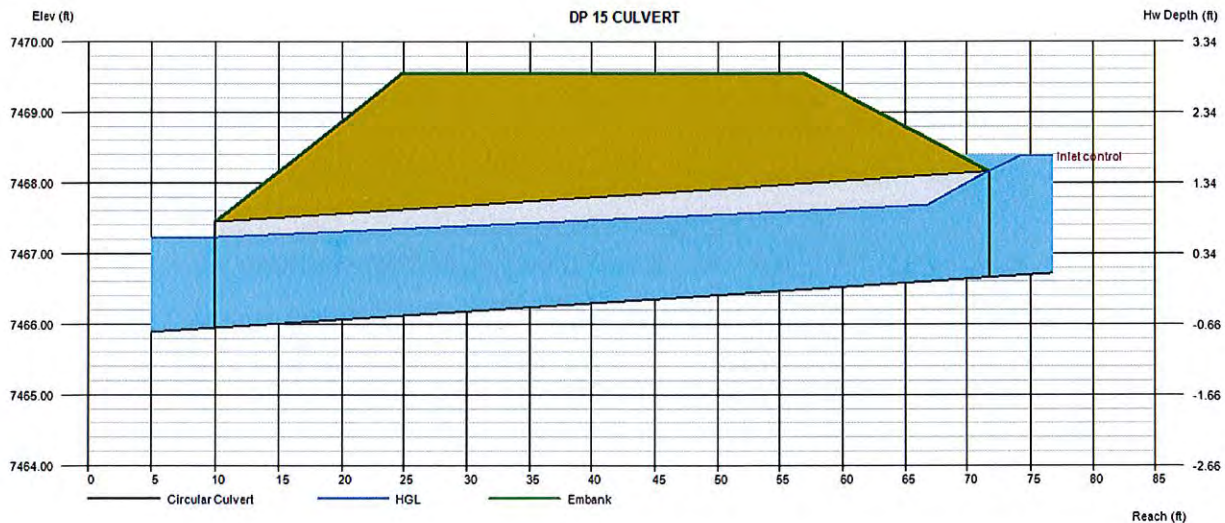
Top Elevation (ft) = 7469.55
Top Width (ft) = 32.00
Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 15.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 15.00
Qpipe (cfs) = 15.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 4.67
Veloc Up (ft/s) = 5.62
HGL Dn (ft) = 7467.23
HGL Up (ft) = 7467.72
Hw Elev (ft) = 7468.38
Hw/D (ft) = 1.15
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 16 CULVERT

Invert Elev Dn (ft) = 7373.00
Pipe Length (ft) = 200.00
Slope (%) = 6.00
Invert Elev Up (ft) = 7385.00
Rise (in) = 60.0
Shape = Circular
Span (in) = 60.0
No. Barrels = 2
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end w/headwall (C)
Coeff. K,M,c,Y,k = 0.0018, 2, 0.0292, 0.74, 0.2

Embankment

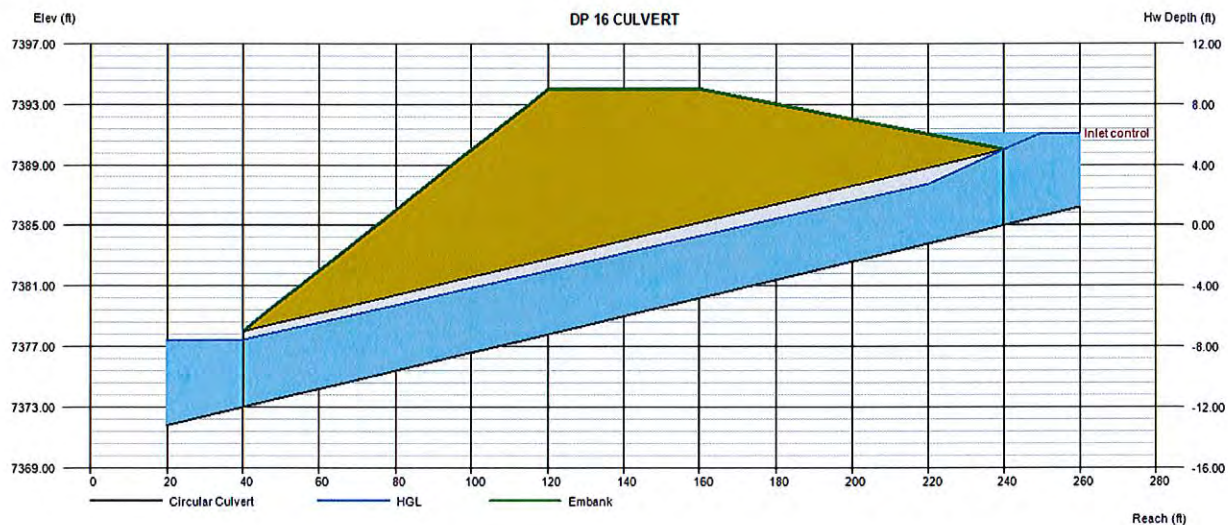
Top Elevation (ft) = 7394.00
Top Width (ft) = 40.00
Crest Width (ft) = 80.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 365.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 365.00
Qpipe (cfs) = 365.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 9.92
Veloc Up (ft/s) = 11.21
HGL Dn (ft) = 7377.43
HGL Up (ft) = 7388.87
Hw Elev (ft) = 7391.07
Hw/D (ft) = 1.21
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 24 CULVERT

Invert Elev Dn (ft) = 7562.87
Pipe Length (ft) = 89.81
Slope (%) = 3.49
Invert Elev Up (ft) = 7566.00
Rise (in) = 36.0
Shape = Circular
Span (in) = 36.0
No. Barrels = 1
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

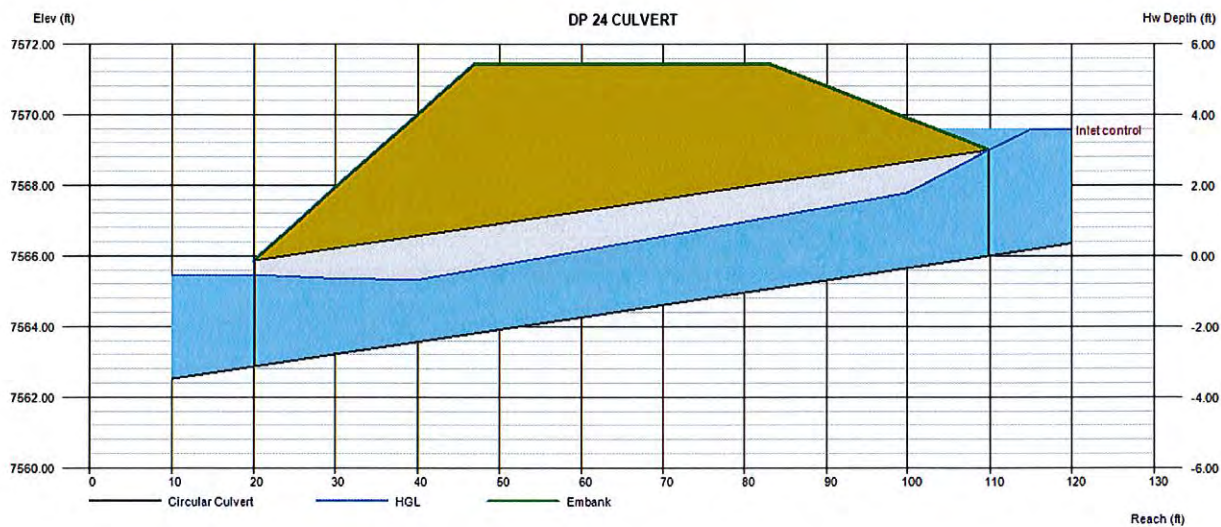
Top Elevation (ft) = 7571.44
Top Width (ft) = 36.00
Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 45.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 45.00
Qpipe (cfs) = 45.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 6.93
Veloc Up (ft/s) = 8.16
HGL Dn (ft) = 7565.46
HGL Up (ft) = 7568.18
Hw Elev (ft) = 7569.57
Hw/D (ft) = 1.19
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 26 CULVERT

Invert Elev Dn (ft) = 7532.00
Pipe Length (ft) = 123.98
Slope (%) = 1.33
Invert Elev Up (ft) = 7533.65
Rise (in) = 48.0
Shape = Circular
Span (in) = 48.0
No. Barrels = 1
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Calculations

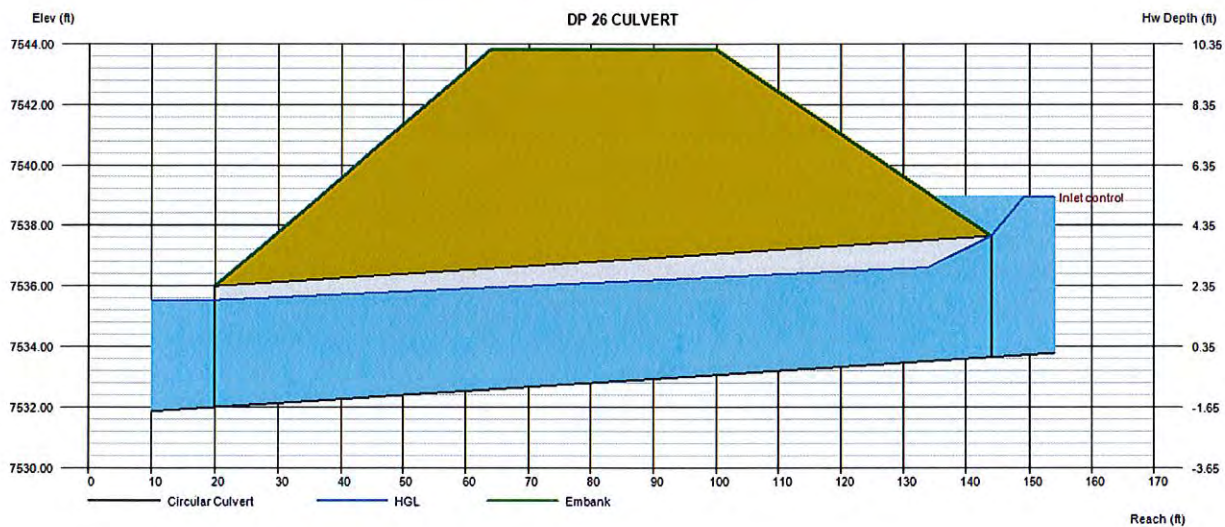
Qmin (cfs) = 0.00
Qmax (cfs) = 102.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 102.00
Qpipe (cfs) = 102.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 8.69
Veloc Up (ft/s) = 9.90
HGL Dn (ft) = 7535.53
HGL Up (ft) = 7536.71
Hw Elev (ft) = 7538.93
Hw/D (ft) = 1.32
Flow Regime = Inlet Control

Embankment

Top Elevation (ft) = 7543.81
Top Width (ft) = 36.00
Crest Width (ft) = 50.00



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

BASIN CC-15 CULVERT

Invert Elev Dn (ft) = 7564.75
Pipe Length (ft) = 82.63
Slope (%) = 4.54
Invert Elev Up (ft) = 7568.50
Rise (in) = 30.0
Shape = Circular
Span (in) = 30.0
No. Barrels = 1
n-Value = 0.012
Culvert Type = Circular Concrete
Culvert Entrance = Square edge w/headwall (C)
Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

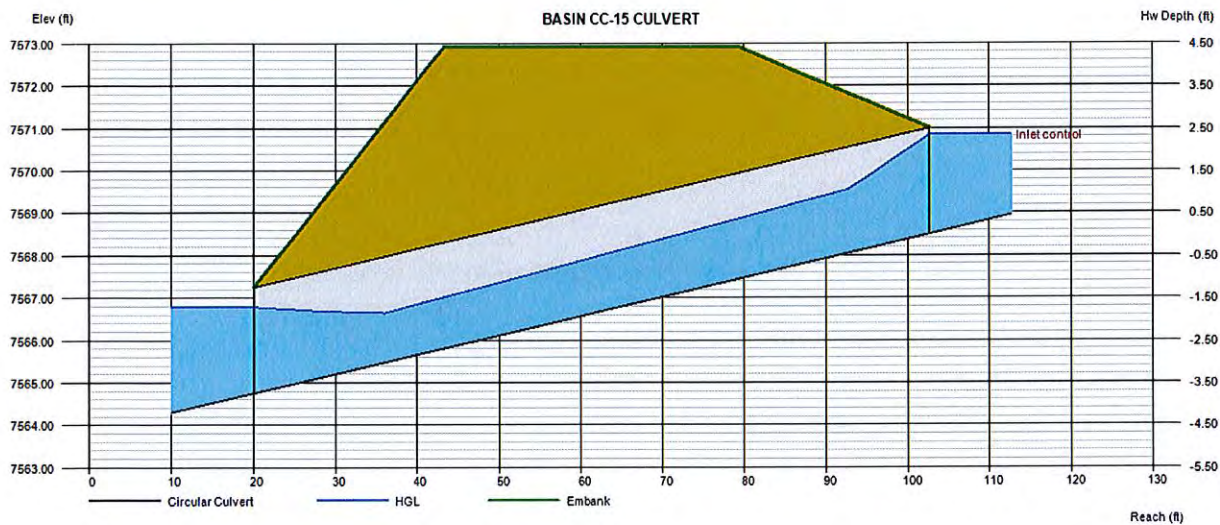
Top Elevation (ft) = 7572.92
Top Width (ft) = 36.00
Crest Width (ft) = 50.00

Calculations

Qmin (cfs) = 0.00
Qmax (cfs) = 21.00
Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 21.00
Qpipe (cfs) = 21.00
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 4.92
Veloc Up (ft/s) = 6.54
HGL Dn (ft) = 7566.78
HGL Up (ft) = 7570.06
Hw Elev (ft) = 7570.84
Hw/D (ft) = 0.94
Flow Regime = Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Thursday, Nov 30 2017

DP 32 CULVERT

Invert Elev Dn (ft) = 7543.08
 Pipe Length (ft) = 83.29
 Slope (%) = 2.91
 Invert Elev Up (ft) = 7545.50
 Rise (in) = 36.0
 Shape = Circular
 Span (in) = 36.0
 No. Barrels = 1
 n-Value = 0.012
 Culvert Type = Circular Concrete
 Culvert Entrance = Square edge w/headwall (C)
 Coeff. K,M,c,Y,k = 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

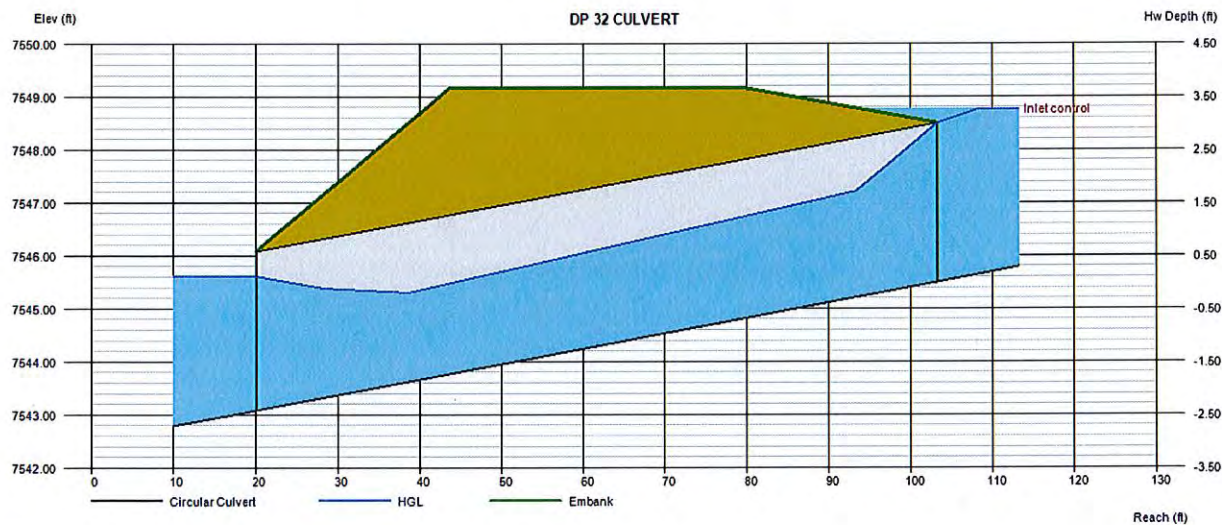
Top Elevation (ft) = 7549.16
 Top Width (ft) = 36.00
 Crest Width (ft) = 40.00

Calculations

Qmin (cfs) = 0.00
 Qmax (cfs) = 40.00
 Tailwater Elev (ft) = (dc+D)/2

Highlighted

Qtotal (cfs) = 40.00
 Qpipe (cfs) = 40.00
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 6.29
 Veloc Up (ft/s) = 7.74
 HGL Dn (ft) = 7545.61
 HGL Up (ft) = 7547.56
 Hw Elev (ft) = 7548.76
 Hw/D (ft) = 1.09
 Flow Regime = Inlet Control



Rock Chute Design Data

(Version 4.01 - 04/23/03, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Flying Horse Filing No. 1 (Pond 4)
Designer: Marc Whorton
Date: 11/30/2017

County: EL Paso
Checked by: _____
Date: _____

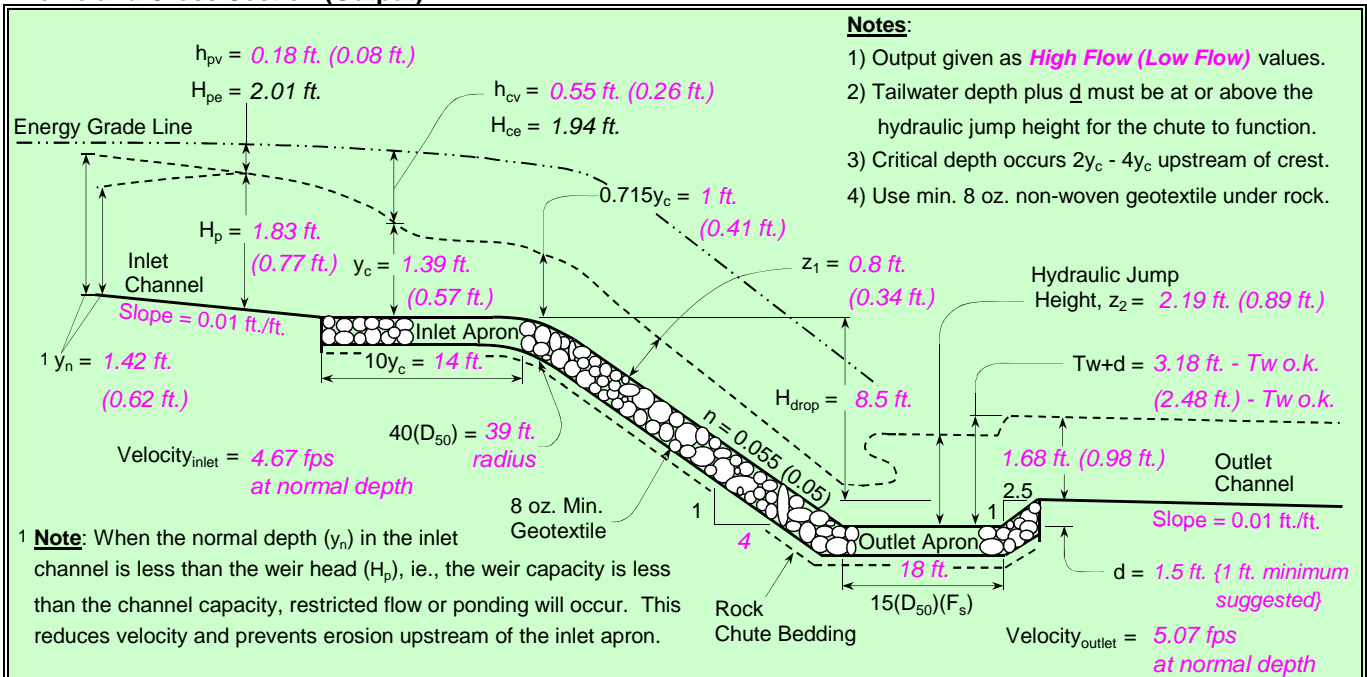
Input Channel Geometry

Inlet Channel	Chute	Outlet Channel
Bw = 20.0 ft.	Bw = 15.0 ft.	Bw = 18.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.20 (F_s)	Side slopes = 4.0 (m:1)
n-value = 0.035	Side slopes = 4.0 (m:1) → 2.0:1 max.	n-value = 0.035
Bed slope = 0.0100 ft./ft.	Bed slope (4:1) = 0.250 ft./ft. → 2.5:1 max.	Bed slope = 0.0100 ft./ft.
Freeboard = 2.0 ft.	Outlet apron depth, d = 1.5 ft.	Base flow = 40.0 cfs

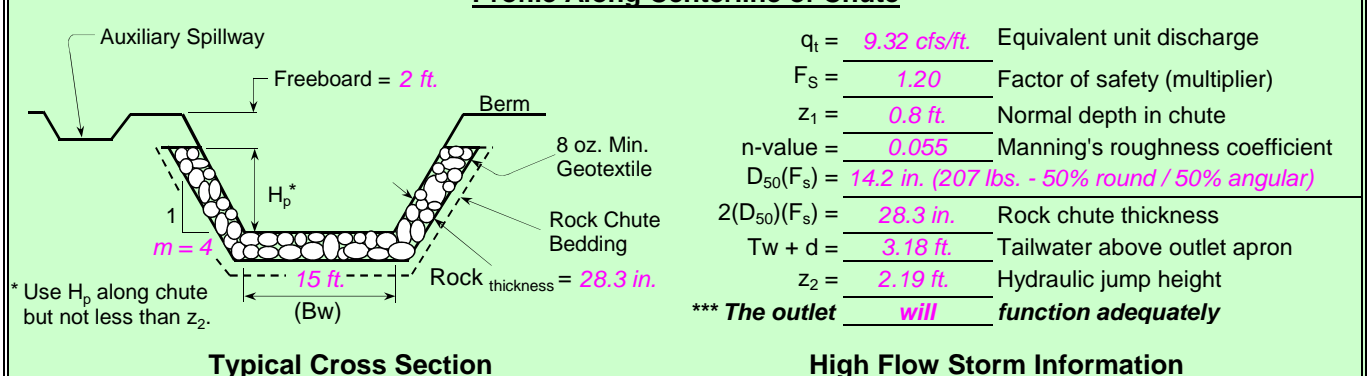
Design Storm Data (Table 2, NHCP, NRCS Grade Stabilization Structure No. 410)

Drainage area = _____ acres	Rainfall = <input type="radio"/> 0 - 3 in. <input checked="" type="radio"/> 3 - 5 in. <input type="radio"/> 5+ in.	Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.
Apron elev. --- Inlet = 7436.0 ft. --- Outlet = 7426.0 ft. --- ($H_{drop} = 8.5$ ft.)		Input tailwater (T_w):
Chute capacity = Q10-year	Minimum capacity (based on a 5-year, 24-hour storm with a 3 - 5 inch rainfall)	
Total capacity = Q25-year		
$Q_{high} = 170.0$ cfs	High flow storm through chute	T_w (ft.) = Program 0.25
$Q_{low} = 40.0$ cfs	Low flow storm through chute	T_w (ft.) = Program

Profile and Cross Section (Output)



Profile Along Centerline of Chute



Rock Chute Design - Plan Sheet

(Version 4.0 - 07/10/00, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Flying Horse Filing No. 1 (Pond 4)
Designer: Marc Whorton
Date: 11/30/2017

County: EL Paso
Checked by: _____
Date: _____

Design Values

Angular D_{50} dia. = 14.2 in.
 Rock_{chute} thickness = 28.3 in.
 Inlet apron length = 14 ft.
 Outlet apron length = 18 ft.
 Radius = 39 ft.

Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D_{100} -----	21 - 28 (704 - 1669)
D_{85} -----	18 - 26 (458 - 1217)
D_{50} -----	14 - 21 (209 - 704)
D_{10} -----	11 - 18 (107 - 458)

Quantities^a

Angular Rock = 291 yd³
 Geotextile (8 oz.)^b = 456 yd²
 Bedding (6 in.) = 79 yd³
 Excavation = 700 yd³
 Earthfill = 500 yd³
 Seeding = 1.0 acres

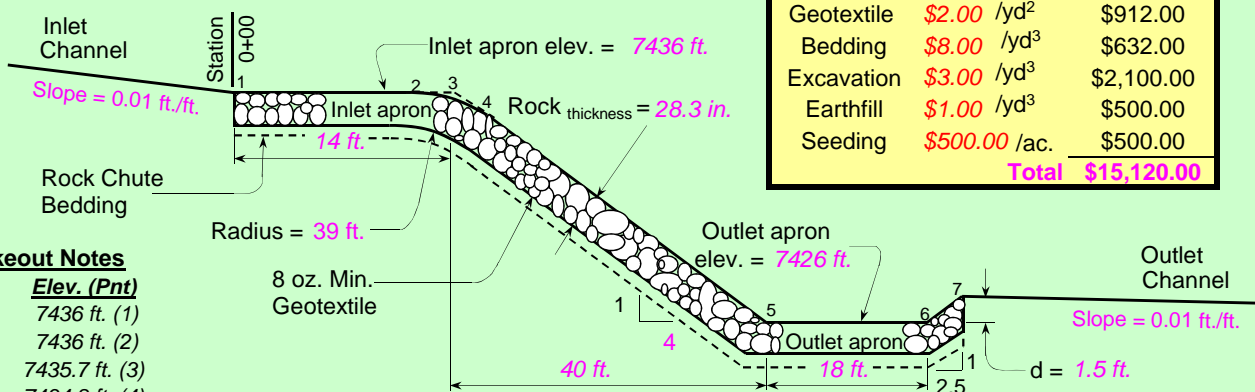
Will bedding be used? Yes ----- Depth (in.) = 6.0

Notes: ^a Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).

^b Geotextile shall be overlapped (18-in. min.) and anchored (18-in. min. along sides and 24-in. min. on the ends).

Rock Chute Cost Estimate

Unit	Unit Cost	Cost
Rock	\$36.00 /yd ³	\$10,476.00
Geotextile	\$2.00 /yd ²	\$912.00
Bedding	\$8.00 /yd ³	\$632.00
Excavation	\$3.00 /yd ³	\$2,100.00
Earthfill	\$1.00 /yd ³	\$500.00
Seeding	\$500.00 /ac.	\$500.00
Total		\$15,120.00

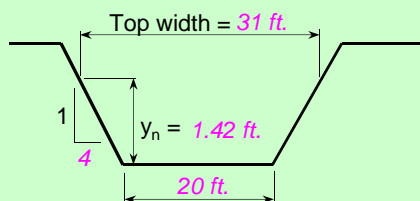


Profile Along Centerline of Rock Chute

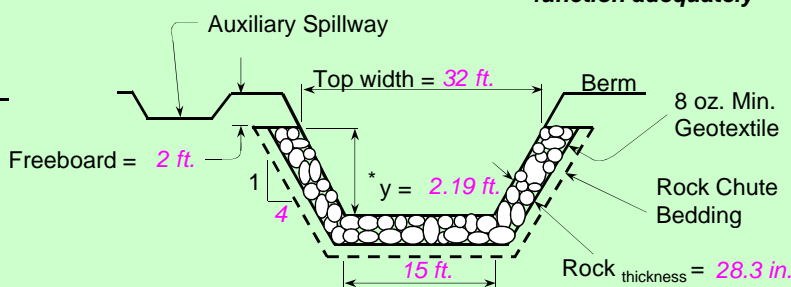
****Note:** The outlet **will** function adequately

Stakeout Notes

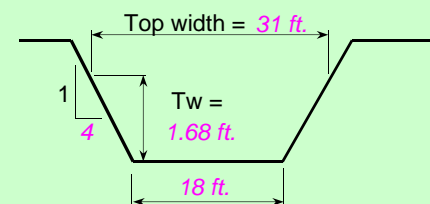
Sta.	Elev. (Pnt)
0+00	7436 ft. (1)
0+9.2	7436 ft. (2)
0+14	7435.7 ft. (3)
0+18.7	7434.8 ft. (4)
0+54	7426 ft. (5)
0+72	7426 ft. (6)
0+75.8	7427.5 ft. (7)



Inlet Channel Cross Section



Rock Chute Cross Section * Use H_p throughout chute but not less than z_2 .



Outlet Channel Cross Section

Profile, Cross Sections, and Quantities

Project: Flying Horse Filing No. 1 (Pond 4)
Location: EL Paso County

**U.S. Department of Agriculture
 Natural Resources Conservation Service**

Designed: Marc Whorton	Approved by: _____
Drawn: NRCS Standard Dwg.	Title: _____
Traced: _____	Title: _____
Checked: _____	Sheet No. _____
	Drawing No. _____

DETENTION FACILITY CALCULATIONS

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing No. 1
Location: Pond 1

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 20.0$ %

$i = 0.200$

Area = 21.800 ac

$d_6 = 0.42$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.210$ ac-ft

$V_{DESIGN \text{ OTHER}} = 0.205$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

Choose One

- ☐ A
☒ B
☐ C / D

EURV = 0.434 ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

$L : W = 2.0 : 1$

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

$Z = 4.00$ ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

No concentrated inflow. Flows will enter as sheet flow

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing No. 1
Location: Pond 1

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = 2\%$ of the WQCV)

$V_{FMIN} = 0.004$ ac-ft

B) Actual Forebay Volume

$V_F = 0.005$ ac-ft

C) Forebay Depth
($D_F = 18$ inch maximum)

$D_F = 12.0$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = 38.00$ cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = 0.76$ cfs

E) Forebay Discharge Design

Choose One
☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

(flow too small for berm w/ pipe)

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p =$ in

G) Rectangular Notch Width

Calculated $W_N = 5.1$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☐ Concrete
☒ Soft Bottom

PROVIDE A CONSISTENT LONGITUDINAL SLOPE FROM FOREBAY TO MICROPOL WITH NO MEANDERING. RIPRAP AND SOIL RIPRAP LINED CHANNELS ARE NOT RECOMMENDED. MINIMUM DEPTH OF 1.5 FEET

F) Slope of Trickle Channel

$S = 0.0100$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = 2.5$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M = 50$ sq ft

C) Outlet Type

Choose One
☒ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} = 1.13$ inches

E) Total Outlet Area

$A_{ot} = 5.16$ square inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: Marc A. Whorton, P.E.
 Company: Classic Consulting
 Date: November 27, 2017
 Project: Flying Horse North Filing No. 1
 Location: Pond 1

8. Initial Surge Volume

- A) Depth of Initial Surge Volume
(Minimum recommended depth is 4 inches)
- B) Minimum Initial Surge Volume
(Minimum volume of 0.3% of the WQCV)
- C) Initial Surge Provided Above Micropool

$D_{IS} =$ 6 in

$V_{IS} =$ cu ft

$V_s =$ 25.0 cu ft

9. Trash Rack

- A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$
- B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)
- Other (Y/N): N
- C) Ratio of Total Open Area to Total Area (only for type 'Other')
- D) Total Water Quality Screen Area (based on screen type)
- E) Depth of Design Volume (EURV or WQCV)
(Based on design concept chosen under 1E)
- F) Height of Water Quality Screen (H_{TR})
- G) Width of Water Quality Screen Opening ($W_{opening}$)
(Minimum of 12 inches is recommended)

$A_t =$ 179 square inches

S.S. Well Screen with 60% Open Area

User Ratio =

$A_{total} =$ 298 sq. in.

$H =$ 2.75 feet

$H_{TR} =$ 61 inches

$W_{opening} =$ 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 4 of 4

Designer: Marc A. Whorton, P.E.
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing No. 1
Location: Pond 1

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

Soil Rip-Rap

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

4.00

11. Vegetation

Choose One

☐ Irrigated

☒ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.42	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	

Max Intensity for Optional User Defined Storm	2.51496
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Designer: Marc A. Whorton, P.E.

Company: Classic Consulting

Date: November 30, 2017

Project: Flying Horse North (Trib. Basins to Pond 4)

Location: Black Forest, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	OS-8	OS-9	OS-10	OS-11	BS-13	BS-14	BS-15	BS-16	BS-17					
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand					
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	14.200	9.800	4.100	28.000	25.600	13.400	5.300	21.600	12.100					
Directly Connected Impervious Area (DCIA, acres)	0.950	0.000	0.180	0.500	2.200	1.100	0.760	1.900	1.600					
Unconnected Impervious Area (UIA, acres)	0.520	0.000	0.200	0.500	1.000	0.500	0.200	1.200	0.400					
Receiving Pervious Area (RPA, acres)	3.000	0.000	1.200	6.300	5.000	3.000	1.000	6.000	2.000					
Separate Pervious Area (SPA, acres)	9.730	9.800	2.520	20.700	17.400	8.800	3.340	12.500	8.100					
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C					

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	14.200	9.800	4.100	28.000	25.600	13.400	5.300	21.600	12.100					
Directly Connected Impervious Area (DCIA, %)	6.7%	0.0%	4.4%	1.8%	8.6%	8.2%	14.3%	8.8%	13.2%					
Unconnected Impervious Area (UIA, %)	3.7%	0.0%	4.9%	1.8%	3.9%	3.7%	3.8%	5.6%	3.3%					
Receiving Pervious Area (RPA, %)	21.1%	0.0%	29.3%	22.5%	19.5%	22.4%	18.9%	27.8%	16.5%					
Separate Pervious Area (SPA, %)	68.5%	100.0%	61.5%	73.9%	68.0%	65.7%	63.0%	57.9%	66.9%					
A _u (RPA / UIA)	5.769	0.000	6.000	12.600	5.000	6.000	5.000	5.000	5.000					
I _u Check	0.150	1.000	0.140	0.070	0.170	0.140	0.170	0.170	0.170					
f / i for WQCV Event:	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6					
f / i for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5					
f / i for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4					
f / i for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39					
IRF for WQCV Event:	0.32	1.00	0.30	0.15	0.37	0.30	0.37	0.37	0.37					
IRF for 5-Year Event:	0.63	1.00	0.59	0.29	0.71	0.59	0.71	0.71	0.71					
IRF for 100-Year Event:	0.65	1.00	0.61	0.30	0.73	0.61	0.73	0.73	0.73					
IRF for Optional User Defined Storm CUHP:	0.65	1.00	0.61	0.30	0.73	0.61	0.73	0.73	0.73					
Total Site Imperviousness: I _{total}	10.4%	0.0%	9.3%	3.6%	12.5%	11.9%	18.1%	14.4%	16.5%					
Effective Imperviousness for WQCV Event:	7.9%	0.0%	5.9%	2.1%	10.0%	9.3%	15.7%	10.8%	14.4%					
Effective Imperviousness for 5-Year Event:	9.0%	0.0%	7.3%	2.3%	11.4%	10.4%	17.0%	12.8%	15.6%					
Effective Imperviousness for 100-Year Event:	9.1%	0.0%	7.3%	2.3%	11.5%	10.5%	17.1%	12.9%	15.7%					
Effective Imperviousness for Optional User Defined Storm CUHP:	9.1%	0.0%	7.3%	2.3%	11.5%	10.5%	17.1%	12.9%	15.7%					

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	21.0%	N/A	33.4%	41.1%	16.8%	18.7%	10.1%	20.5%	9.9%	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	15.3%	N/A	26.4%	79.5%	9.8%	14.7%	6.1%	11.8%	6.0%	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	7.4%	0.0%	12.1%	13.6%	5.1%	7.6%	3.6%	6.5%	3.4%					

Total Site Imperviousness: 10.2%

Total Site Effective Imperviousness for WQCV Event: 8.0%

Total Site Effective Imperviousness for 5-Year Event: 9.0%

Total Site Effective Imperviousness for 100-Year Event: 9.1%

Total Site Effective Imperviousness for Optional User Defined Storm CUHP: 9.1%

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposes

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing 1 (Pond 4)
Location: Black Forest, CO

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 8.0$ %

$i = 0.080$

Area = 134.100 ac

$d_6 = 0.42$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.617$ ac-ft

$V_{DESIGN \text{ OTHER}} = 0.603$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

Choose One

- ☐ A
☒ B
☐ C / D

EURV = 0.993 ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing 1 (Pond 4)
Location: Black Forest, CO

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = 3\%$ of the WQCV)

$V_{FMIN} = 0.018$ ac-ft

B) Actual Forebay Volume

$V_F = 0.019$ ac-ft

C) Forebay Depth
($D_F = 18$ inch maximum)

$D_F = 12.0$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = 217.00$ cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = 4.34$ cfs

E) Forebay Discharge Design

Choose One
☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

(flow too small for berm w/ pipe)

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p =$ in

G) Rectangular Notch Width

Calculated $W_N = 18.0$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

F) Slope of Trickle Channel

$S = 0.0100$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = 2.5$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M = 160$ sq ft

C) Outlet Type

Choose One
☒ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} = 1.88$ inches

E) Total Outlet Area

$A_{ot} = 8.58$ square inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: Marc A. Whorton
 Company: Classic Consulting
 Date: November 27, 2017
 Project: Flying Horse North Filing 1 (Pond 4)
 Location: Black Forest, CO

8. Initial Surge Volume

- A) Depth of Initial Surge Volume
(Minimum recommended depth is 4 inches)
- B) Minimum Initial Surge Volume
(Minimum volume of 0.3% of the WQCV)
- C) Initial Surge Provided Above Micropool

$D_{IS} =$ 6 in

$V_{IS} =$ 78.8 cu ft

$V_s =$ 80.0 cu ft

9. Trash Rack

- A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$
- B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)
- Other (Y/N): N
- C) Ratio of Total Open Area to Total Area (only for type 'Other')
- D) Total Water Quality Screen Area (based on screen type)
- E) Depth of Design Volume (EURV or WQCV)
(Based on design concept chosen under 1E)
- F) Height of Water Quality Screen (H_{TR})
- G) Width of Water Quality Screen Opening ($W_{opening}$)
(Minimum of 12 inches is recommended)

$A_t =$ 276 square inches

Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.

User Ratio =

$A_{total} =$ 389 sq. in.

$H =$ 4 feet

$H_{TR} =$ 76 inches

$W_{opening} =$ 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 4 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 27, 2017
Project: Flying Horse North Filing 1 (Pond 4)
Location: Black Forest, CO

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

Soil Rip-Rap

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

4.00

11. Vegetation

Choose One

☐ Irrigated

☒ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 4 - North Forbay Design)
Location: Black Forest, CO

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 8.0$ %

$i = 0.080$

Area = 107.200 ac

$d_6 = 0.42$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.494$ ac-ft

$V_{DESIGN \text{ OTHER}} = 0.482$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

Choose One

- ☐ A
☒ B
☐ C / D

EURV = 0.794 ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 4 - North Forbay Design)
Location: Black Forest, CO

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = 3\%$ of the WQCV)

$V_{FMIN} = 0.015$ ac-ft

B) Actual Forebay Volume

$V_F = 0.015$ ac-ft

C) Forebay Depth
($D_F = 18$ inch maximum)

$D_F = 12.0$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = 170.00$ cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = 3.40$ cfs

E) Forebay Discharge Design

Choose One
☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

(flow too small for berm w/ pipe)

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p =$ in

G) Rectangular Notch Width

Calculated $W_N = 14.7$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

F) Slope of Trickle Channel

$S = 0.0100$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = 2.5$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M = 160$ sq ft

C) Outlet Type

Choose One
☒ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} = 1.88$ inches

E) Total Outlet Area

$A_{ot} = 8.58$ square inches

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 4 - South Forbay Design)
Location: Black Forest, CO

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 8.0$ %

$i = 0.080$

Area = 26.900 ac

$d_6 = 0.42$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 0.124$ ac-ft

$V_{DESIGN \text{ OTHER}} = 0.121$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

Choose One

- ☐ A
☒ B
☐ C / D

EURV = 0.199 ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 4 - South Forbay Design)
Location: Black Forest, CO

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = \underline{2\%}$ of the WQCV)

$V_{FMIN} = \underline{0.002}$ ac-ft

B) Actual Forebay Volume

$V_F = \underline{0.002}$ ac-ft

C) Forebay Depth
($D_F = \underline{18}$ inch maximum)

$D_F = \underline{8.0}$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = \underline{56.00}$ cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = \underline{1.12}$ cfs

E) Forebay Discharge Design

Choose One
☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

(flow too small for berm w/ pipe)

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p = \underline{\hspace{1cm}}$ in

G) Rectangular Notch Width

Calculated $W_N = \underline{9.0}$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

F) Slope of Trickle Channel

$S = \underline{0.0100}$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = \underline{2.5}$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M = \underline{160}$ sq ft

C) Outlet Type

Choose One
☒ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} = \underline{1.88}$ inches

E) Total Outlet Area

$A_{ot} = \underline{8.58}$ square inches

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.42	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	

Max Intensity for Optional User Defined Storm 2.51496

Designer: Marc A. Whorton, P.E.

Company: Classic Consulting

Date: November 30, 2017

Project: Flying Horse North (Trib. Basins to Pond 8)

Location: Black Forest, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	BS-18	BS-19	BS-20	BS-21	BS-22	BS-23	BS-23A								
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand	Loamy Sand								
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	33.800	6.300	73.900	69.500	18.100	37.100	16.300								
Directly Connected Impervious Area (DCIA, acres)	1.500	1.000	4.500	4.200	1.500	3.200	2.900								
Unconnected Impervious Area (UIA, acres)	1.200	0.300	3.400	3.500	1.700	2.300	1.800								
Receiving Pervious Area (RPA, acres)	5.200	0.700	11.500	10.100	4.000	5.500	2.500								
Separate Pervious Area (SPA, acres)	25.900	4.300	54.500	51.700	10.900	26.100	9.100								
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C								

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	33.800	6.300	73.900	69.500	18.100	37.100	16.300								
Directly Connected Impervious Area (DCIA, %)	4.4%	15.9%	6.1%	6.0%	8.3%	8.6%	17.8%								
Unconnected Impervious Area (UIA, %)	3.6%	4.8%	4.6%	5.0%	9.4%	6.2%	11.0%								
Receiving Pervious Area (RPA, %)	15.4%	11.1%	15.6%	14.5%	22.1%	14.8%	15.3%								
Separate Pervious Area (SPA, %)	76.6%	68.3%	73.7%	74.4%	60.2%	70.4%	55.8%								
A _p (RPA / UIA)	4.333	2.333	3.382	2.886	2.353	2.391	1.389								
I _p Check	0.190	0.300	0.230	0.260	0.300	0.290	0.420								
f / i for WQCV Event:	4.6	4.6	4.6	4.6	4.6	4.6	4.6								
f / i for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5								
f / i for 100-Year Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4								
f / i for Optional User Defined Storm CUHP:	0.39	0.39	0.39	0.39	0.39	0.39	0.39								
IRF for WQCV Event:	0.41	0.49	0.45	0.47	0.49	0.49	0.56								
IRF for 5-Year Event:	0.80	0.86	0.84	0.85	0.86	0.85	0.88								
IRF for 100-Year Event:	0.82	0.88	0.87	0.88	0.88	0.88	0.90								
IRF for Optional User Defined Storm CUHP:	0.82	0.88	0.87	0.88	0.88	0.88	0.90								
Total Site Imperviousness: I _{total}	8.0%	20.6%	10.7%	11.1%	17.7%	14.8%	28.8%								
Effective Imperviousness for WQCV Event:	5.9%	18.2%	8.2%	8.4%	12.9%	11.6%	24.0%								
Effective Imperviousness for 5-Year Event:	7.3%	19.9%	10.0%	10.3%	16.3%	13.9%	27.5%								
Effective Imperviousness for 100-Year Event:	7.4%	20.1%	10.1%	10.4%	16.6%	14.1%	27.7%								
Effective Imperviousness for Optional User Defined Storm CUHP:	7.4%	20.1%	10.1%	10.4%	16.6%	14.1%	27.7%								

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	23.8%	8.6%	20.6%	21.0%	21.7%	17.7%	11.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	10.5%	3.0%	6.8%	6.9%	7.0%	5.7%	4.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:	4.4%	1.8%	3.3%	3.4%	4.1%	3.2%	2.7%								

Total Site Imperviousness:	12.9%
Total Site Effective Imperviousness for WQCV Event:	10.0%
Total Site Effective Imperviousness for 5-Year Event:	12.1%
Total Site Effective Imperviousness for 100-Year Event:	12.2%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	12.2%

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 8) (Ultimate Build-out)
Location: Black Forest, CO

1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area, I_a
- B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * \text{Area})$)
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV \text{ OTHER}} = (d_6 * (V_{DESIGN} / 0.43))$)
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume
 For HSG A: $EURV_A = 1.68 * i^{1.28}$
 For HSG B: $EURV_B = 1.36 * i^{1.08}$
 For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$

$I_a = 10.0$ %

$i = 0.100$

Area = 255.000 ac

$d_6 = 0.42$ in

Choose One

- ☐ Water Quality Capture Volume (WQCV)
☒ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 1.424$ ac-ft

$V_{DESIGN \text{ OTHER}} = 1.391$ ac-ft

$V_{DESIGN \text{ USER}} =$ ac-ft

Choose One

- ☐ A
☒ B
☐ C / D

EURV = 2.404 ac-ft

2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

3. Basin Side Slopes

- A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 8) (Ultimate Build-out)
Location: Black Forest, CO

5. Forebay

A) Minimum Forebay Volume
($V_{FMIN} = 3\%$ of the WQCV)

$V_{FMIN} = 0.042$ ac-ft

B) Actual Forebay Volume

$V_F = 0.042$ ac-ft

C) Forebay Depth
($D_F = 30$ inch maximum)

$D_F = 18.0$ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} = 390.00$ cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)

$Q_F = 7.80$ cfs

E) Forebay Discharge Design

Choose One
☐ Berm With Pipe
☒ Wall with Rect. Notch
☐ Wall with V-Notch Weir

F) Discharge Pipe Size (minimum 8-inches)

Calculated $D_p =$ in

G) Rectangular Notch Width

Calculated $W_N = 18.9$ in

6. Trickle Channel

A) Type of Trickle Channel

Choose One
☒ Concrete
☐ Soft Bottom

F) Slope of Trickle Channel

$S = 0.0100$ ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = 2.5$ ft

B) Surface Area of Micropool (10 ft² minimum)

$A_M = 384$ sq ft

C) Outlet Type

Choose One
☒ Orifice Plate
☐ Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing
(Use UD-Detention)

$D_{orifice} = 2.61$ inches

E) Total Outlet Area

$A_{ot} = 16.08$ square inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: Marc A. Whorton
 Company: Classic Consulting
 Date: November 30, 2017
 Project: Flying Horse North Filing 1 (Pond 8) (Ultimate Build-out)
 Location: Black Forest, CO

8. Initial Surge Volume

- A) Depth of Initial Surge Volume
(Minimum recommended depth is 4 inches)
- B) Minimum Initial Surge Volume
(Minimum volume of 0.3% of the WQCV)
- C) Initial Surge Provided Above Micropool

$D_{IS} =$ 6 in

$V_{IS} =$ 181.8 cu ft

$V_s =$ 192.0 cu ft

9. Trash Rack

- A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5 * (e^{-0.095D})$
- B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open area to the total screen area for the material specified.)

Other (Y/N): N

- C) Ratio of Total Open Area to Total Area (only for type 'Other')

- D) Total Water Quality Screen Area (based on screen type)

- E) Depth of Design Volume (EURV or WQCV)
(Based on design concept chosen under 1E)

- F) Height of Water Quality Screen (H_{TR})

- G) Width of Water Quality Screen Opening ($W_{opening}$)
(Minimum of 12 inches is recommended)

$A_t =$ 483 square inches

Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.

User Ratio =

$A_{total} =$ 680 sq. in.

$H =$ 5.25 feet

$H_{TR} =$ 91 inches

$W_{opening} =$ 12.0 inches

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 4 of 4

Designer: Marc A. Whorton
Company: Classic Consulting
Date: November 30, 2017
Project: Flying Horse North Filing 1 (Pond 8) (Ultimate Build-out)
Location: Black Forest, CO

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

Soil Rip-Rap

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

4.00

11. Vegetation

Choose One

☐ Irrigated

☒ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

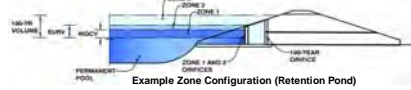
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North Filing No. 1

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	21.80	acres
Watershed Length =	1.500	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	20.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Group C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.250	acre-feet
Excess Urban Runoff Volume (EURV) =	0.439	acre-feet
2-yr Runoff Volume (P1 = 1.19 in) =	0.317	1.19 inches
5-yr Runoff Volume (P1 = 1.57 in) =	0.469	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in) =	0.809	1.75 inches
25-yr Runoff Volume (P1 = 2.21 in) =	1.596	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in) =	2.099	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in) =	2.758	2.52 inches
50-yr Runoff Volume (P1 = 3.39 in) =	4.375	3.39 inches
Approximate 2-yr Detention Volume =	0.297	acre-feet
Approximate 5-yr Detention Volume =	0.440	acre-feet
Approximate 10-yr Detention Volume =	0.711	acre-feet
Approximate 25-yr Detention Volume =	0.880	acre-feet
Approximate 50-yr Detention Volume =	0.930	acre-feet
Approximate 100-yr Detention Volume =	1.143	acre-feet

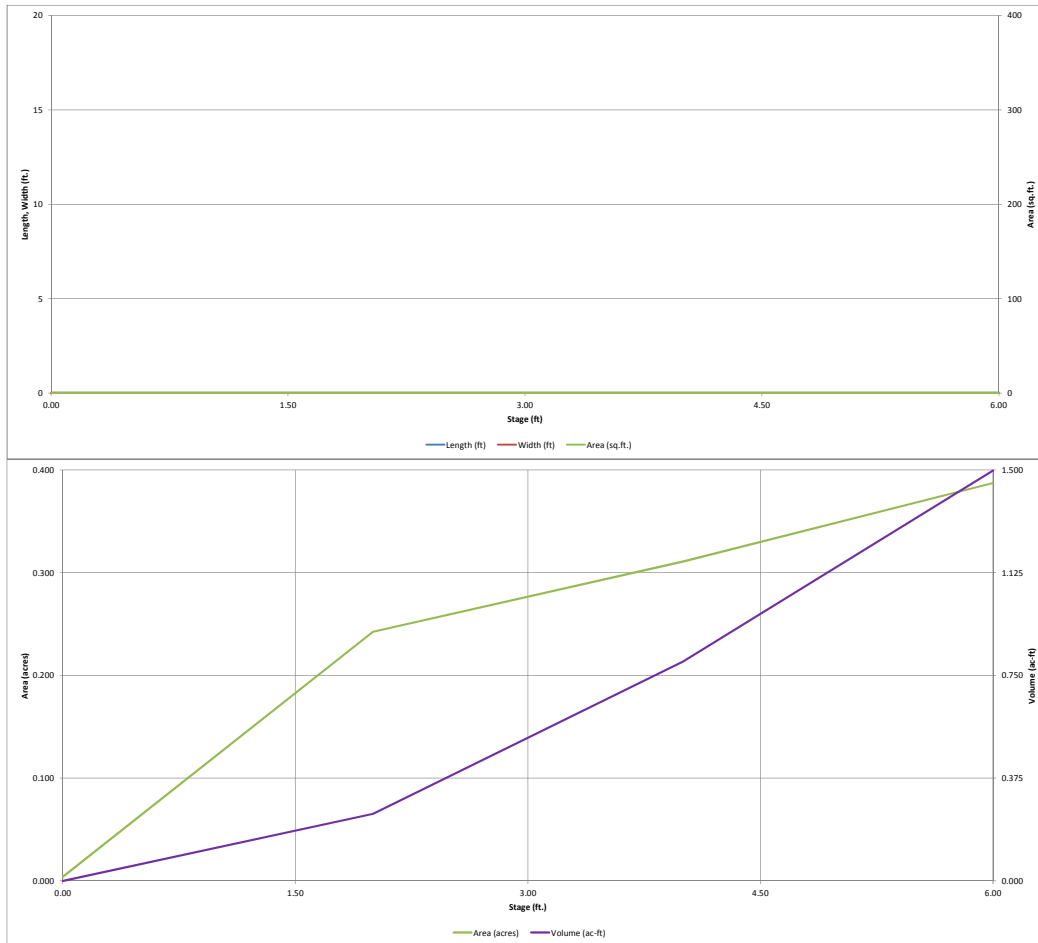
Stage-Storage Calculation

Zone 1 Volume (WCV_1) =	0.210	acre-feet
Zone 2 Volume ($EVRV - Zone 1$) =	0.223	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.710	acre-feet
Total Detention Basin Volume =	1.143	acre-feet
Initial Surcharge Volume (ISV) =	user	π^3
Initial Surcharge Depth (ISD) =	user	π
Total Available Detention Depth (H_{total}) =	user	π
Depth of Trickle Channel (H_{TC}) =	user	π
Slope of Trickle Channel (S_{TC}) =	user	π ft
Slopes of Main Basin Sides (S_{main}) =	user	π ft
Basin Length-to-Width Ratio (R_{LW}) =	user	π ft
Initial Surcharge Area (A_{SV}) =	user	π^2
Surcharge Volume Length (L_{SV}) =	user	π
Surcharge Volume Width (W_{SV}) =	user	π
Depth of Basin Floor ($H_{b,000}$) =	user	π
Length of Basin Floor ($L_{b,000}$) =	user	π
Width of Basin Floor ($W_{b,000}$) =	user	π
Area of Basin Floor ($A_{b,000}$) =	user	π^2
Volume of Basin Floor ($V_{b,000}$) =	user	π^3
Depth of Main Basin (H_{main}) =	user	π
Length of Main Basin (L_{main}) =	user	π
Width of Main Basin (W_{main}) =	user	π
Area of Main Basin (A_{main}) =	user	π^2
Volume of Main Basin (V_{main}) =	user	π^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

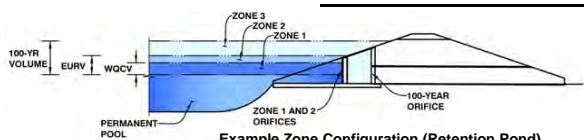


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North Filing No. 1

Basin ID: Pond 1



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.85	0.210	Orifice Plate
Zone 2 (EURV)	2.74	0.223	Orifice Plate
Zone 3 (100-year)	5.04	0.710	Weir&Pipe (Restrict)
		1.143	Total

0

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.90	1.80	2.70				
Orifice Area (sq. inches)	0.99	1.43	1.43	1.43				

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = % grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H₁ = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

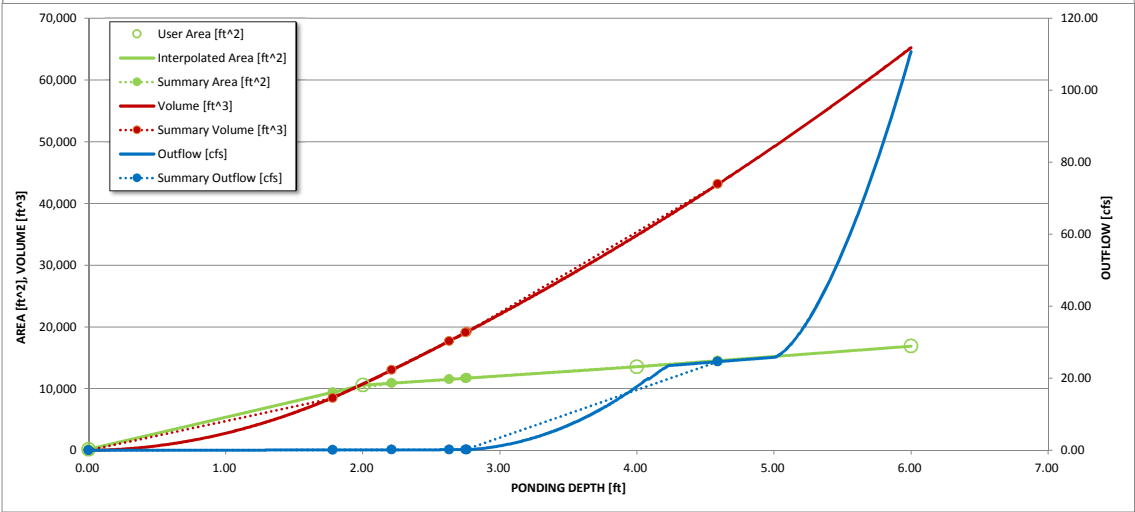
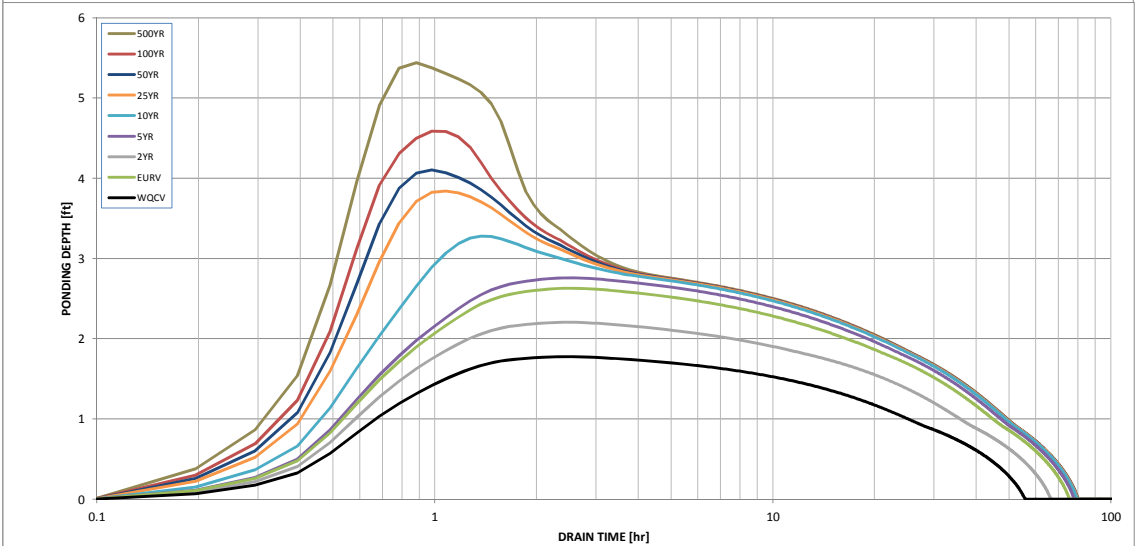
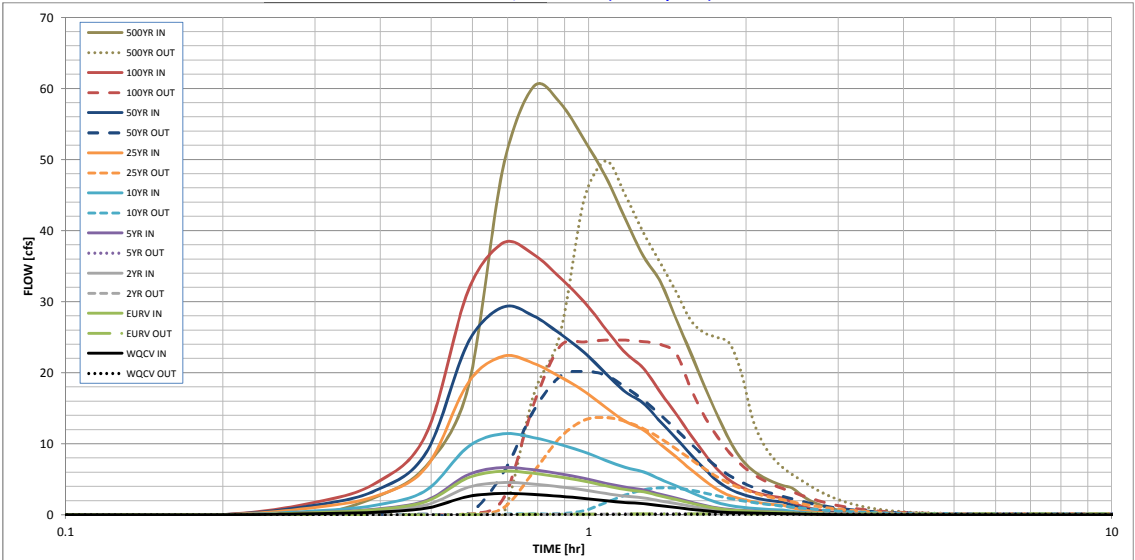
Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.39
Calculated Runoff Volume (acre-ft) =	0.210	0.433	0.319	0.469	0.809	1.596	2.099	2.758	4.375
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.210	0.432	0.319	0.469	0.809	1.596	2.099	2.757	4.375
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.16	0.55	0.77	1.04	1.66
Predevelopment Peak Q (cfs) =	0.0	0.0	0.2	0.4	3.5	12.0	16.7	22.6	36.2
Peak Inflow Q (cfs) =	3.0	6.1	4.5	6.6	11.4	22.3	29.2	38.2	60.2
Peak Outflow Q (cfs) =	0.1	0.2	0.1	0.2	3.8	13.7	20.2	24.6	49.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	1.1	1.1	1.2	1.1	1.4
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.0	0.3	1.1	1.6	1.9	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	50	66	59	67	64	54	49	45	37
Time to Drain 99% of Inflow Volume (hours) =	53	71	63	73	72	68	66	63	56
Maximum Ponding Depth (ft) =	1.78	2.63	2.21	2.76	3.28	3.84	4.10	4.59	5.44
Area at Maximum Ponding Depth (acres) =	0.21	0.26	0.25	0.27	0.29	0.31	0.31	0.33	0.37
Maximum Volume Stored (acre-ft) =	0.194	0.403	0.295	0.438	0.582	0.750	0.831	0.986	1.283

0.9 for full spectrum detention.
Comment applies for all Full Spectrum Pond design

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

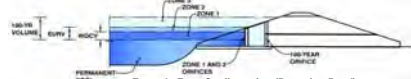
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: FLYING HORSE NORTH FILING 1

Basin ID: POND 4

Basin ID: POND 4



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	134.10	acres
Watershed Length =	3.900	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	8.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depth = User Input		
Water Quality Capture Volume (WQCV) =	0.617	ac-ft=feet
Excess Urban Runoff Volume (EURV) =	0.990	ac-ft=feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.666	ac-ft=feet
5-yr Runoff Volume (P1 = 1.55 in.) =	1.050	ac-ft=feet
10-yr Runoff Volume (P1 = 1.75 in.) =	2.694	ac-ft=feet
25-yr Runoff Volume (P1 = 2 in.) =	7.780	ac-ft=feet
50-yr Runoff Volume (P1 = 2.25 in.) =	10.959	ac-ft=feet
100-yr Runoff Volume (P1 = 2.52 in.) =	15.099	ac-ft=feet
500-yr Runoff Volume (P1 = 3.85 in.) =	28.334	ac-ft=feet
Approximate 2-yr Detention Volume =	0.618	ac-ft=feet
Approximate 5-yr Detention Volume =	0.988	ac-ft=feet
Approximate 10-yr Detention Volume =	2.274	ac-ft=feet
Approximate 25-yr Detention Volume =	3.285	ac-ft=feet
Approximate 50-yr Detention Volume =	3.412	ac-ft=feet
Approximate 100-yr Detention Volume =	4.464	ac-ft=feet

Water Quality Capture Volume (WQCV) =	0.617	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	0.990	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.666	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.51 in.) =	1.055	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.694	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	7.789	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	10.959	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	15.099	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.85 in.) =	28.334	acre-feet	3.85 inches

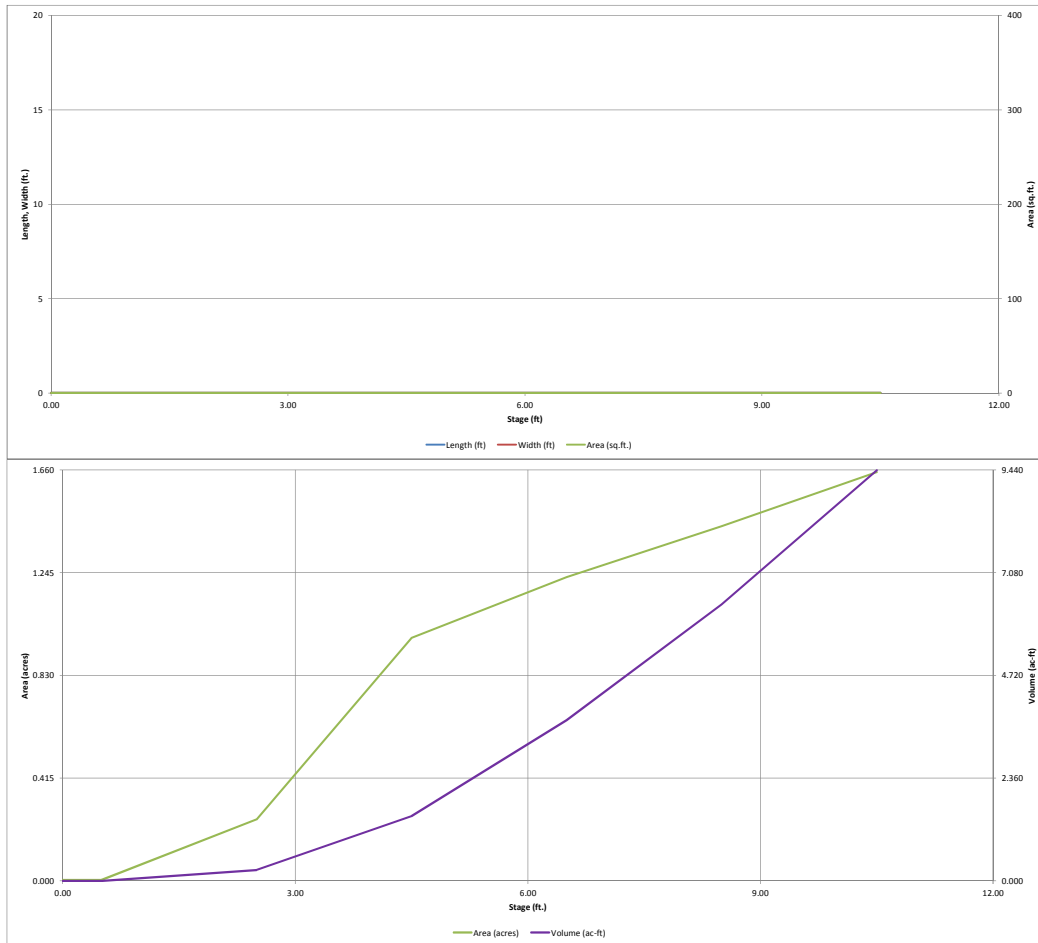
Stage-Storage Calculation

Zone 1 Volume (V_{QC1})	0.617	acre-feet
Zone 2 Volume (V_{EURV} - Zone 1)	0.373	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	3.474	acre-feet
Total Detention Basin Volume	4.464	acre-feet
Initial Surge Volume (ISV)	user	ft ³
Initial Surge Depth (ISD)	user	ft
Total Available Detention Depth (H_{det})	user	ft
Depth of Trickle Channel (H_{TC})	user	ft
Slope of Trickle Channel (S_{TC})	user	ft/ft
Slopes of Main Basin Sides (S_{basin})	user	H-V
Basin Length-to-Width Ratio (R_{BW})	user	
Initial Surge Area (A_{ISD})	user	ft ²
Surge Volume Length (L_{ISD})	user	ft
Surge Volume Width (W_{ISD})	user	ft
Depth of Basin Floor ($H_{1,100}$)	user	ft
Length of Basin Floor ($L_{1,100}$)	user	ft
Width of Basin Floor ($W_{1,100}$)	user	ft
Area of Basin Floor ($A_{1,100}$)	user	ft ²
Volume of Basin Floor ($V_{1,100}$)	user	ft ³
Depth of Main Basin (H_{basin})	user	ft
Length of Main Basin (L_{basin})	user	ft
Width of Main Basin (W_{basin})	user	ft
Area of Main Basin (A_{basin})	user	ft ²
Volume of Main Basin (V_{basin})	user	ft ³
Calculated Total Basin Volume (V_{total})	user	acre-feet

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

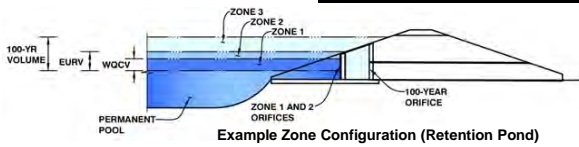


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: FLYING HORSE NORTH FILING 1

Basin ID: POND 4



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.39	0.617	Orifice Plate
Zone 2 (EURV)	3.94	0.373	Orifice Plate
Zone 3 (100-year)	7.12	3.474	Weir&Pipe (Restrict)
		4.464	Total

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.30	2.60	3.90				
Orifice Area (sq. inches)	2.19	2.19	1.23	1.23				

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %, grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_t = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

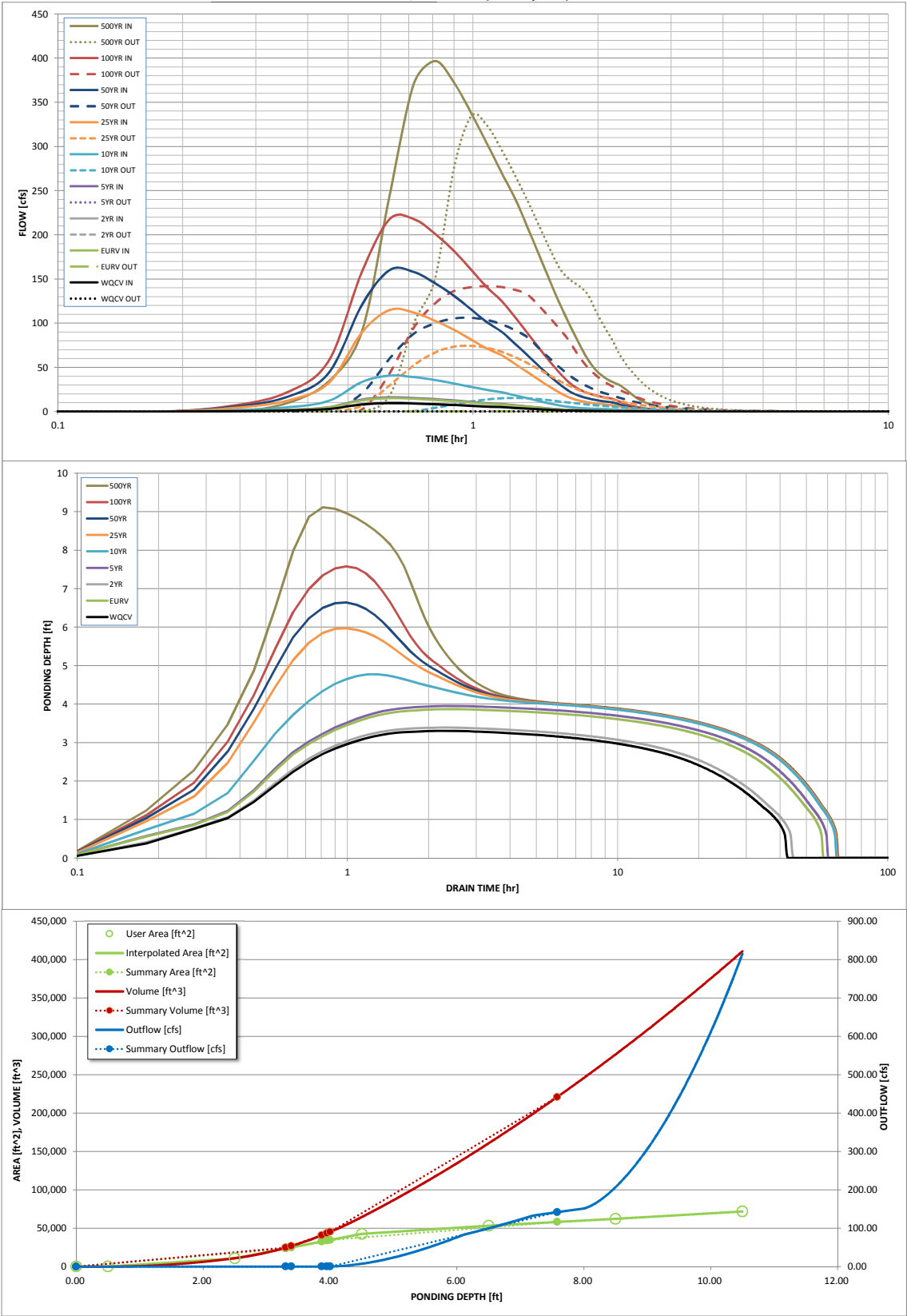
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	0.617	0.990	0.666	1.055	2.694	7.789	10.959	15.099	28.334
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.617	0.989	0.665	1.054	2.692	7.773	10.944	15.081	28.305
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.18	0.60	0.84	1.13	2.05
Predevelopment Peak Q (cfs) =	0.0	0.0	1.5	2.5	24.1	81.1	112.3	151.7	275.3
Peak Inflow Q (cfs) =	9.5	15.1	10.2	16.1	40.7	114.9	160.1	217.9	396.7
Peak Outflow Q (cfs) =	0.3	0.3	0.3	0.3	15.5	74.5	106.2	142.1	334.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.6	0.9	0.9	0.9	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.5	2.4	3.4	4.6	5.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	52	41	55	53	43	37	31	14
Time to Drain 99% of Inflow Volume (hours) =	41	56	43	58	60	54	51	48	40
Maximum Ponding Depth (ft) =	3.30	3.87	3.39	3.95	4.77	5.97	6.64	7.58	9.12
Area at Maximum Ponding Depth (acres) =	0.54	0.75	0.57	0.78	1.01	1.16	1.24	1.34	1.50
Maximum Volume Stored (acre-ft) =	0.569	0.930	0.614	0.999	1.752	3.046	3.850	5.061	7.242

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

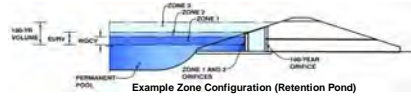
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: FLYING HORSE NORTH FILING 1

Basin ID: POND 8 (FULL BUILD-OUT)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	255.00	acres
Watershed Length =	5,500	ft
Watershed Slope =	0.017	ft/ft
Watershed Imperviousness =	10.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	1,424	acre-feet
Excess Urban Runoff Volume (EURV) =	2,647	acre-feet
2-yr Runoff Volume (P1 = 1.75 in.) =	1,647	acre-feet
5-yr Runoff Volume (P1 = 1.75 in.) =	2,564	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5,846	acre-feet
25-yr Runoff Volume (P1 = 2.25 in.) =	15,453	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	21,458	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	29,303	acre-feet
500-yr Runoff Volume (P1 = 3.85 in.) =	54,586	acre-feet
Approximate 2-yr Detention Volume =	1,530	acre-feet
Approximate 5-yr Detention Volume =	2,400	acre-feet
Approximate 10-yr Detention Volume =	4,982	acre-feet
Approximate 25-yr Detention Volume =	6,957	acre-feet
Approximate 50-yr Detention Volume =	7,278	acre-feet
Approximate 100-yr Detention Volume =	9,408	acre-feet

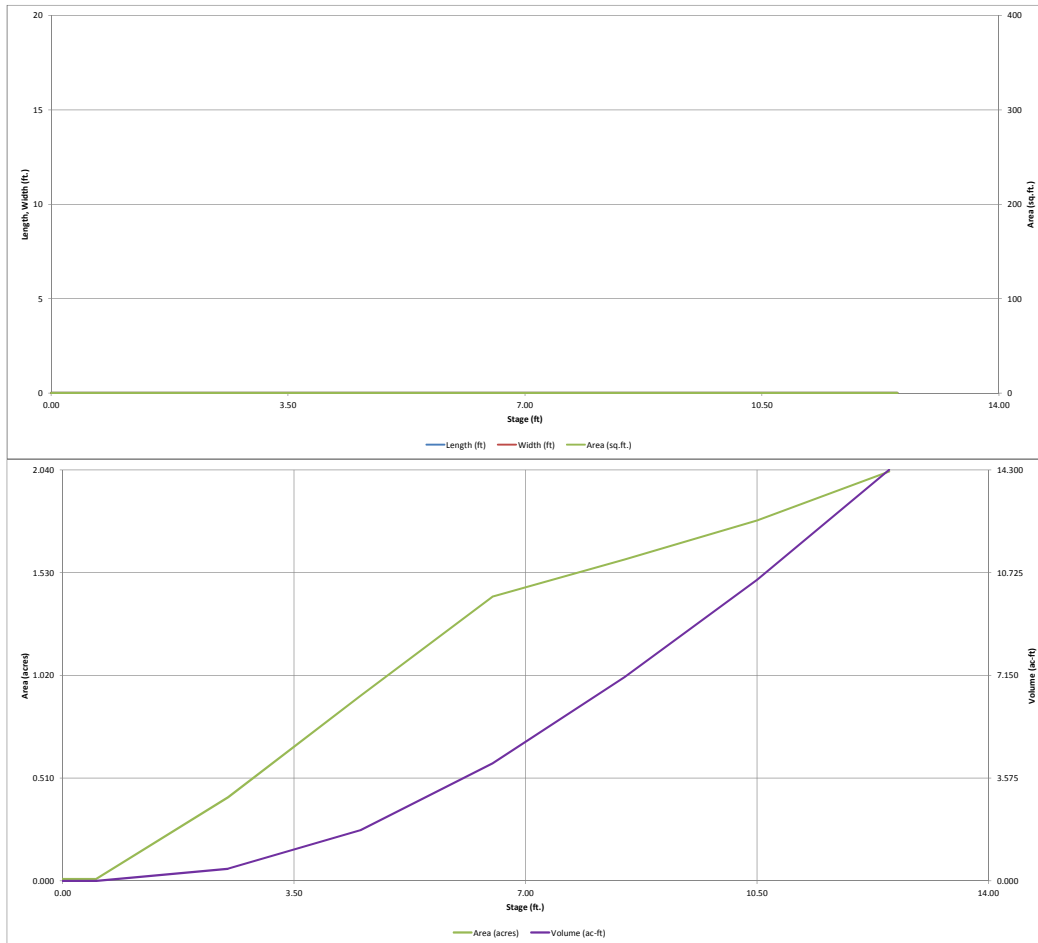
Stage-Storage Calculation

Zone 1 Volume (WQCV)	1.424	acre-feet
Zone 2 Volume (EURV - Zone 1)	0.973	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	7.011	acre-feet
Total Detention Basin Volume =	9.408	acre-feet
Initial Surcharge Volume (ISV)	user	ft ³
Initial Surcharge Depth (ISD)	user	ft
Total Available Detention Depth ($H_{(u)}$)	user	ft
Depth of Trickle Channel ($H_{(TC)}$)	user	ft
Slope of Trickle Channel ($S_{(TC)}$)	user	ft/V
Slopes of Main Basin Sides ($S_{(u)}$)	user	ft/V
Basin Length-to-Width Ratio ($R_{(u)}$)	user	
Initial Surcharge Area ($A_{(u)}$)	user	ft ²
Surcharge Volume Length ($L_{(u)}$)	user	ft
Surcharge Volume Width ($W_{(u)}$)	user	ft
Depth of Basin Floor ($H_{(f,loc)}$)	user	ft
Length of Basin Floor ($L_{(f,loc)}$)	user	ft
Width of Basin Floor ($W_{(f,loc)}$)	user	ft
Area of Basin Floor ($A_{(f,loc)}$)	user	ft ²
Volume of Basin Floor ($V_{(f,loc)}$)	user	ft ³
Depth of Main Basin ($H_{(u,m)}$)	user	ft
Length of Main Basin ($L_{(u,m)}$)	user	ft
Width of Main Basin ($W_{(u,m)}$)	user	ft
Area of Main Basin ($A_{(u,m)}$)	user	ft ²
Volume of Main Basin ($V_{(u,m)}$)	user	ft ³
Calculated Total Basin Volume ($V_{(u,t)}$)	user	acre-feet

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

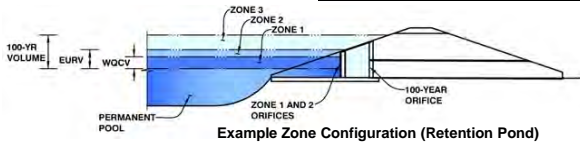


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: FLYING HORSE NORTH FILING 1

Basin ID: POND 8 (FULL BUILD-OUT)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.12	1.424	Orifice Plate
Zone 2 (EURV)	5.14	0.973	Orifice Plate
Zone 3 (100-year)	9.90	7.011	Weir&Pipe (Restrict)
		9.408	Total

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	5.25	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	21.00	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.80	3.60					
Orifice Area (sq. inches)	5.35	5.35	5.35					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.25	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	16.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H ₁ =	6.25	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	2.66	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	49.48	N/A	ft ²
Overflow Grate Open Area w/ Debris =	24.74	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	60.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	54.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	18.61	N/A	ft ²
Outlet Orifice Centroid =	2.38	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.50	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	75.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

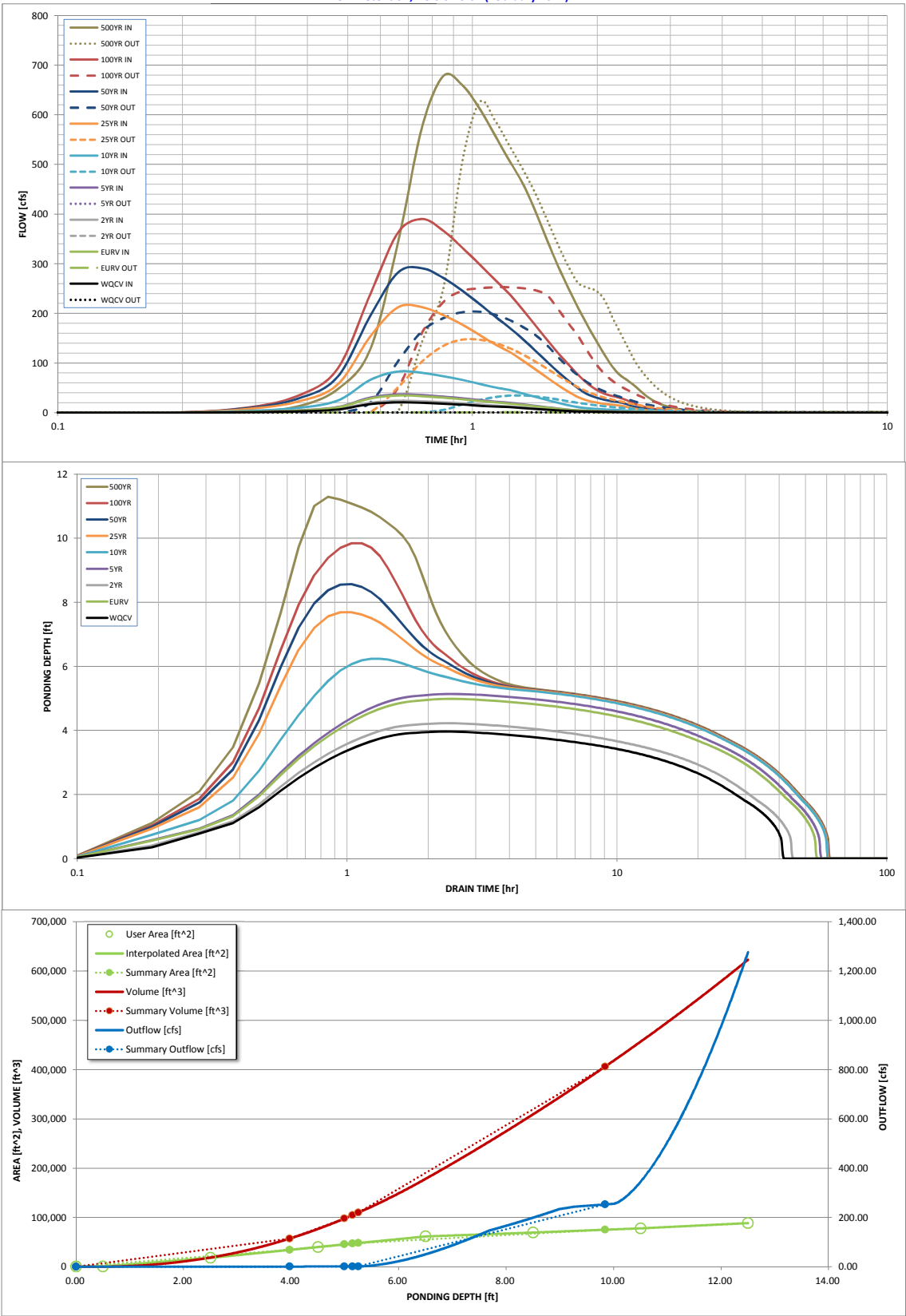
Spillway Design Flow Depth =	1.38	feet
Stage at Top of Freeboard =	12.38	feet
Basin Area at Top of Freeboard =	2.02	acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	1.424	2.397	1.648	2.564	5.846	15.453	21.458	29.303	54.585
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.423	2.395	1.646	2.562	5.839	15.442	21.440	29.281	54.548
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.17	0.57	0.79	1.07	1.95
Predevelopment Peak Q (cfs) =	0.0	0.0	2.6	4.5	42.9	145.9	202.2	273.7	497.4
Peak Inflow Q (cfs) =	20.6	34.5	23.8	36.9	82.8	212.4	290.8	390.0	677.9
Peak Outflow Q (cfs) =	0.7	0.9	0.8	1.0	34.7	147.2	203.6	252.9	625.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.8	1.0	1.0	0.9	1.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.7	2.9	4.1	5.1	5.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	50	41	52	50	40	36	31	18
Time to Drain 99% of Inflow Volume (hours) =	40	53	43	55	56	51	48	46	39
Maximum Ponding Depth (ft) =	3.97	4.99	4.22	5.14	6.24	7.69	8.57	9.84	11.30
Area at Maximum Ponding Depth (acres) =	0.78	1.04	0.85	1.07	1.35	1.52	1.60	1.72	1.88
Maximum Volume Stored (acre-ft) =	1.303	2.231	1.515	2.389	3.733	5.835	7.192	9.319	11.929

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

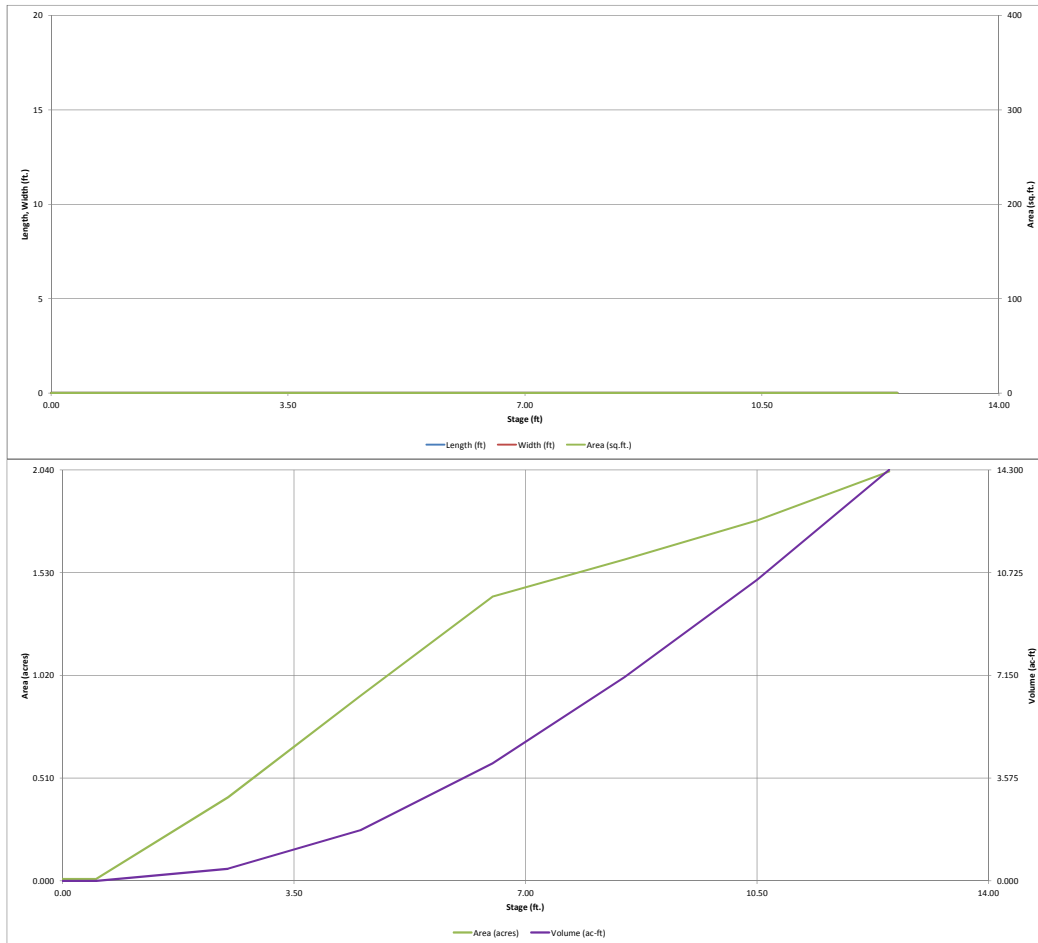
The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

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

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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

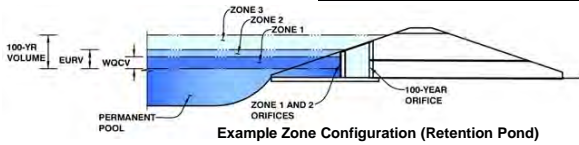


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: FLYING HORSE NORTH FILING 1

Basin ID: POND 8 (FILING 1 ONLY INCL. GOLF COURSE)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.18	0.768	Orifice Plate
Zone 2 (EURV)	3.74	0.366	Orifice Plate
Zone 3 (100-year)	8.39	5.782	Weir&Pipe (Restrict)
		6.915	Total

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.80	3.60					
Orifice Area (sq. inches)	3.75	3.75	3.75					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %, grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_t = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

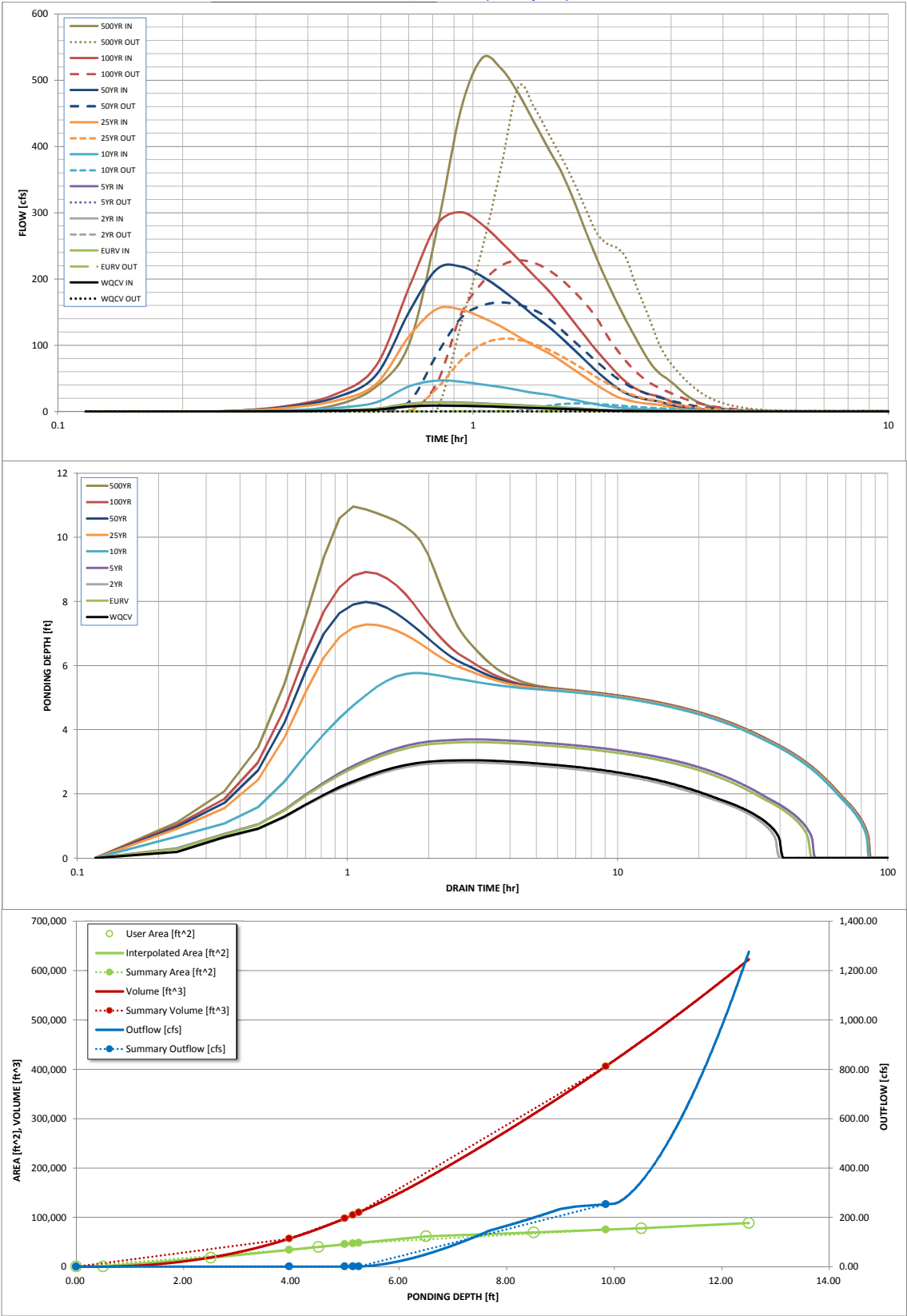
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.85
Calculated Runoff Volume (acre-ft) =	0.768	1.134	0.728	1.198	4.039	13.847	19.909	27.825	52.818
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.768	1.133	0.728	1.197	4.038	13.842	19.906	27.823	52.817
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.49	0.68	0.93	1.69
Predevelopment Peak Q (cfs) =	0.0	0.0	2.2	3.9	35.8	125.2	173.8	236.6	431.3
Peak Inflow Q (cfs) =	9.1	13.3	8.6	14.1	46.7	154.6	218.8	300.7	533.2
Peak Outflow Q (cfs) =	0.4	0.4	0.4	0.5	12.4	109.9	164.8	228.2	489.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.3	0.9	0.9	1.0	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	2.2	3.3	4.6	5.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	37	49	74	58	52	44	25
Time to Drain 99% of Inflow Volume (hours) =	40	50	38	52	80	73	69	65	55
Maximum Ponding Depth (ft) =	3.05	3.61	2.98	3.70	5.77	7.28	7.98	8.92	10.96
Area at Maximum Ponding Depth (acres) =	0.55	0.69	0.53	0.71	1.23	1.48	1.55	1.63	1.84
Maximum Volume Stored (acre-ft) =	0.689	1.044	0.651	1.100	3.114	5.220	6.280	7.758	11.295

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

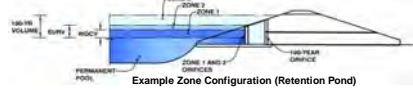
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North Filing No. 1

Basin ID: Pond 12



Required Volume Calculation

Selected BMP Type =	EDB

Watershed Area =	57.60	acres	
Watershed Length =	3,000	ft	
Watershed Slope =	0.014	ft/ft	
Watershed Imperviousness =	12.00%	percent	
Percentage Hydrologic Soil Group A =	0.0%	percent	
Percentage Hydrologic Soil Group B =	100.0%	percent	
Percentage Hydrologic Soil Groups C/D =	0.0%	percent	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	Use Input		
Water Quality Capture Volume (WQCV) =	0.375	acre-feet	Optional User Override
Excess Urban Runoff Volume (EURV) =	0.659	acre-feet	1-hr Precipitation
2-yr Runoff Volume (P1 = 1.19 in.) =	0.461	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.708	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.484	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	3.636	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.987	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	6.752	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.39 in.) =	10.997	acre-feet	3.39 inches
Approximate 2-yr Detention Volume =	0.429	acre-feet	
Approximate 5-yr Detention Volume =	0.663	acre-feet	
Approximate 10-yr Detention Volume =	1.275	acre-feet	
Approximate 25-yr Detention Volume =	1.727	acre-feet	
Approximate 50-yr Detention Volume =	1.814	acre-feet	
Approximate 100-yr Detention Volume =	2.319	acre-feet	

Zone 1 Volume (WQCV) =	0.375	acre-feet
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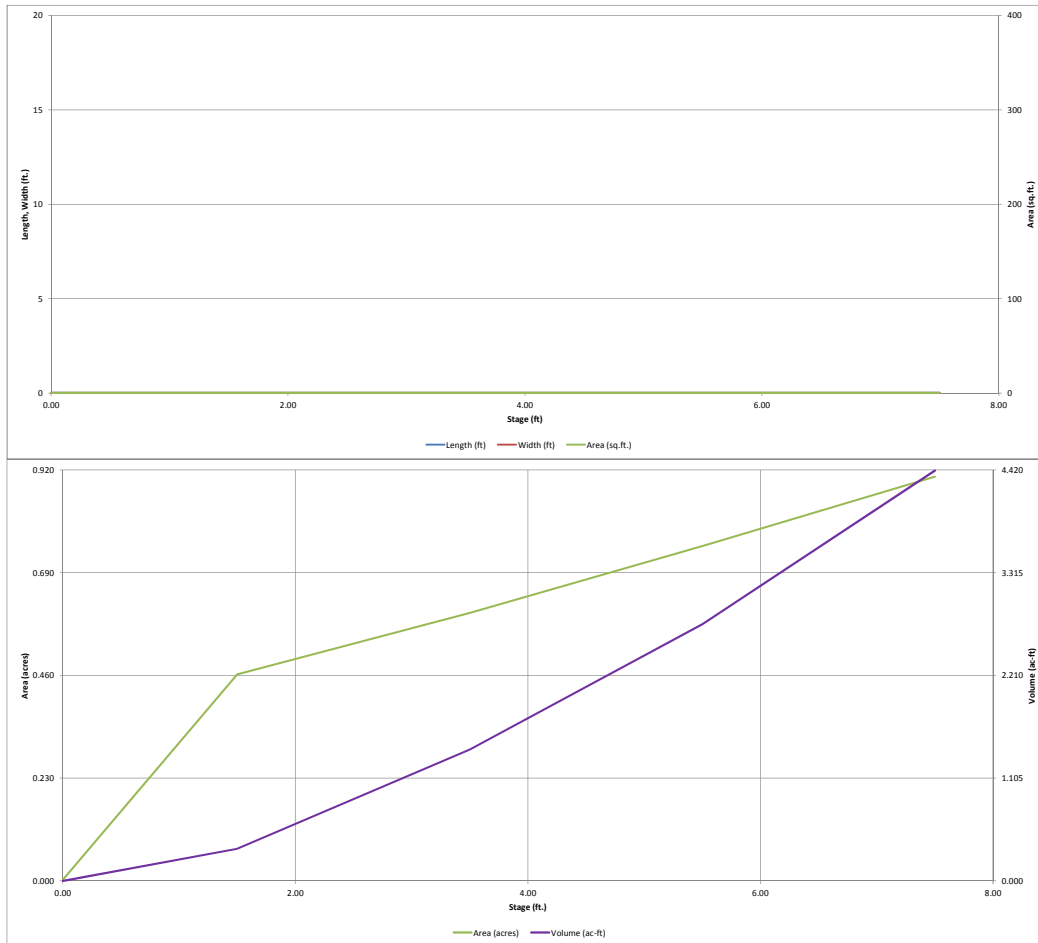
Zone 2 Volume (E _{URV - Zone 1})	=	0.285	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	=	1.660	acre-feet
Total Detention Basin Volume	=	2.319	acre-feet
Initial Surcharge Volume (V _{SV})	=	USER	ft ³
Initial Surcharge Depth (H _{SD})	=	USER	ft
Total Available Detention Depth (H _{TA})	=	USER	ft
Depth of Trickle Channel (H _{TC})	=	USER	ft
Slope of Trickle Channel (S _{TC})	=	USER	ft/ft
Slopes of Main Basin Sides (S _{MB})	=	USER	ft/V
Basin Length-to-Width Ratio (R _{L/WB})	=	USER	
Initial Surcharge Area (A _{SV})	=	USER	ft ²
Surcharge Volume Length (L _{SV})	=	USER	ft
Surcharge Volume Width (W _{SV})	=	USER	ft
Depth of Basin Floor (H _{BF})	=	USER	ft
Length of Basin Floor (L _{BF})	=	USER	ft
Width of Basin Floor (W _{BF})	=	USER	ft
Area of Basin Floor (A _{BF})	=	USER	ft ²
Volume of Basin Floor (V _{BF})	=	USER	ft ³
Depth of Main Basin (H _{MB})	=	USER	ft
Length of Main Basin (L _{MB})	=	USER	ft
Width of Main Basin (W _{MB})	=	USER	ft
Area of Main Basin (A _{MB})	=	USER	ft ²
Volume of Main Basin (V _{MB})	=	USER	ft ³
Calculated Total Basin Volume (V _{TOTAL})	=	USER	acre-feet

Stage - Storage	Stage	Optional Override	Length	Width	Area	Optional Override	Area	Volume	Volume
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

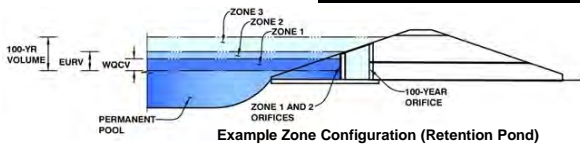


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North Filing No. 1

Basin ID: Pond 12



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.56	0.375	Orifice Plate
Zone 2 (EURV)	2.15	0.285	Orifice Plate
Zone 3 (100-year)	4.90	1.660	Weir&Pipe (Restrict)
		2.319	Total

0

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	2.41	2.79	2.79					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Slope = H:V (enter zero for flat grate)
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %, grate open area/total area
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_t = feet
Over Flow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = should be ≥ 4
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

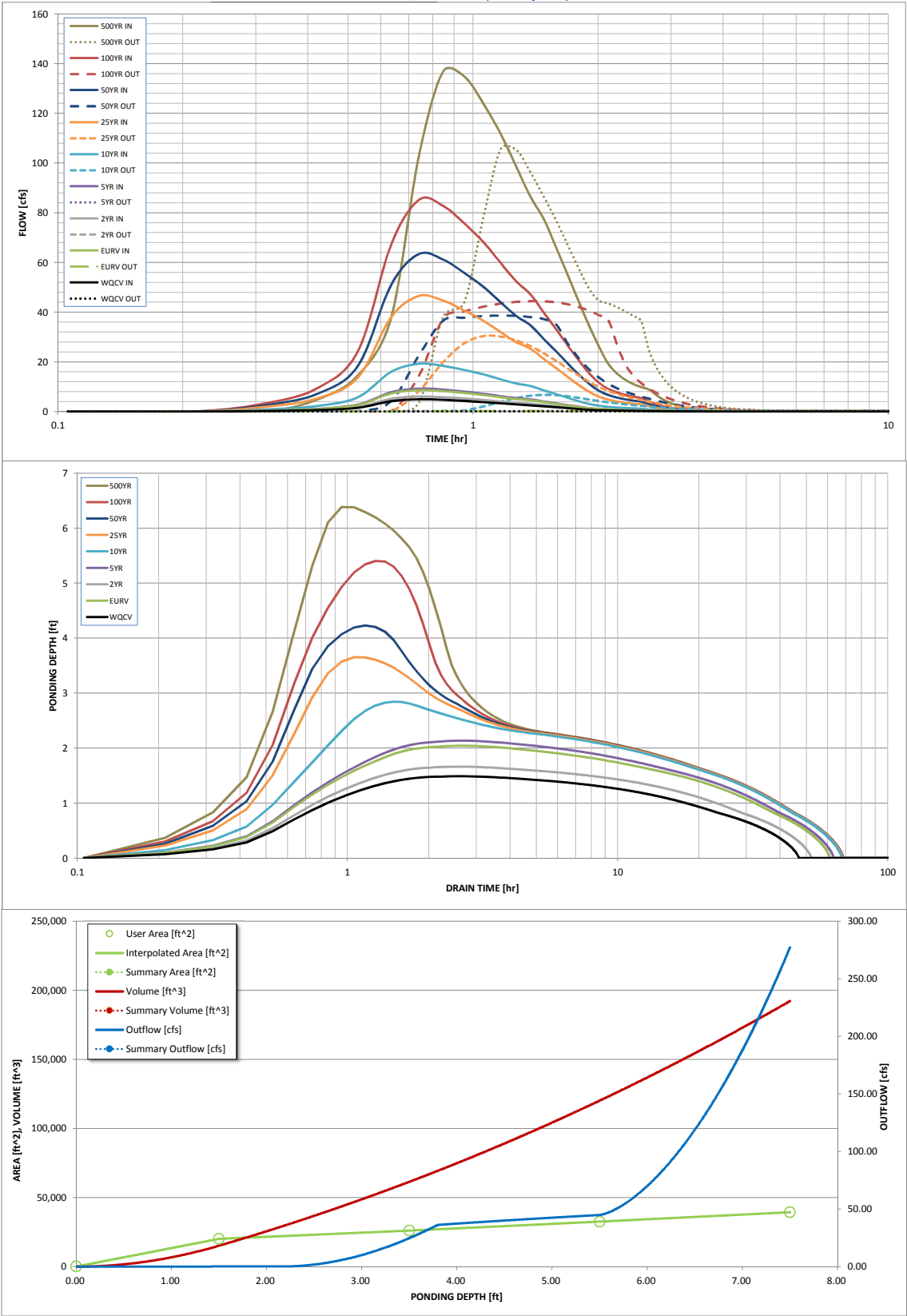
Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.39
Calculated Runoff Volume (acre-ft) =	0.375	0.659	0.461	0.708	1.484	3.636	4.987	6.752	10.997
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.374	0.659	0.461	0.707	1.483	3.636	4.986	6.752	10.992
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.50	0.70	0.95	1.52
Predevelopment Peak Q (cfs) =	0.0	0.0	0.5	0.9	8.3	28.9	40.1	54.6	87.5
Peak Inflow Q (cfs) =	4.9	8.6	6.1	9.2	19.2	46.5	63.4	85.2	136.7
Peak Outflow Q (cfs) =	0.2	0.3	0.2	0.3	6.8	30.4	38.7	44.5	105.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	0.8	1.1	1.0	0.8	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.6	2.1	2.4	2.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	55	47	56	56	44	40	35	26
Time to Drain 99% of Inflow Volume (hours) =	45	58	50	60	62	58	55	52	45
Maximum Ponding Depth (ft) =	1.49	2.04	1.66	2.13	2.84	3.65	4.23	5.40	6.38
Area at Maximum Ponding Depth (acres) =	0.46	0.50	0.47	0.51	0.55	0.61	0.65	0.74	0.82
Maximum Volume Stored (acre-ft) =	0.339	0.608	0.423	0.653	1.030	1.501	1.861	2.685	3.448

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



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

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

Project Summary	
Title	Flying Horse North Filing No.1
Engineer	MAW
Company	CCES
Date	11/20/2017

Notes	2 Year
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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
Area to HFR Pond 16	Post-Development 2 YR	2	4.331	12.250	20.25
Area to Pond 1	Post-Development 2 YR	2	0.379	12.100	3.10
BS-10	Post-Development 2 YR	2	0.416	12.050	5.95
BS-11	Post-Development 2 YR	2	0.083	12.000	1.45
BS-12	Post-Development 2 YR	2	0.104	12.100	0.78
BS-13	Post-Development 2 YR	2	0.511	12.100	4.88
BS-14	Post-Development 2 YR	2	0.263	12.100	2.48
BS-15	Post-Development 2 YR	2	0.127	12.050	1.58
BS-16	Post-Development 2 YR	2	0.445	12.150	3.42
BS-17	Post-Development 2 YR	2	0.278	12.100	3.02
BS-18	Post-Development 2 YR	2	0.499	12.100	3.50
BS-19	Post-Development 2 YR	2	0.161	12.050	2.08
BS-1A	Post-Development 2 YR	2	0.047	12.100	0.36
BS-1B	Post-Development 2 YR	2	0.093	12.100	0.43
BS-2	Post-Development 2 YR	2	0.176	12.000	2.90
BS-20	Post-Development 2 YR	2	1.164	12.150	7.43
BS-21	Post-Development 2 YR	2	1.202	12.200	7.78
BS-22	Post-Development 2 YR	2	0.372	12.100	3.72
BS-23	Post-Development 2 YR	2	0.657	12.150	4.49
BS-23A	Post-Development 2 YR	2	0.463	12.050	5.48
BS-24	Post-Development 2 YR	2	0.114	12.100	0.59
BS-25	Post-Development 2 YR	2	0.115	12.150	0.36
BS-26	Post-Development 2 YR	2	0.016	14.250	0.04
BS-27	Post-Development 2 YR	2	0.315	12.100	2.10

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-28	Post-Development 2 YR	2	0.462	12.200	2.21
BS-29	Post-Development 2 YR	2	0.329	12.200	1.43
BS-2A	Post-Development 2 YR	2	0.074	12.000	1.22
BS-2B	Post-Development 2 YR	2	0.083	12.000	1.40
BS-3	Post-Development 2 YR	2	0.084	12.100	0.60
BS-30	Post-Development 2 YR	2	0.091	12.100	0.65
BS-31	Post-Development 2 YR	2	0.082	12.150	0.31
BS-32	Post-Development 2 YR	2	0.061	12.100	0.25
BS-33	Post-Development 2 YR	2	0.116	12.100	0.81
BS-4	Post-Development 2 YR	2	0.222	12.100	1.86
BS-5	Post-Development 2 YR	2	0.152	12.100	1.13
BS-6	Post-Development 2 YR	2	0.111	12.000	1.93
BS-7	Post-Development 2 YR	2	0.268	12.000	4.43
BS-8	Post-Development 2 YR	2	0.093	12.000	1.55
BS-9	Post-Development 2 YR	2	0.139	12.000	2.29
CC-10	Post-Development 2 YR	2	0.839	12.350	2.56
CC-11	Post-Development 2 YR	2	0.197	12.100	0.90
CC-12	Post-Development 2 YR	2	0.165	12.150	0.98
CC-13A	Post-Development 2 YR	2	0.261	12.200	1.39
CC-13B	Post-Development 2 YR	2	0.344	12.200	1.84
CC-13C	Post-Development 2 YR	2	0.134	12.100	0.89
CC-13D	Post-Development 2 YR	2	0.254	12.150	1.54
CC-14	Post-Development 2 YR	2	0.062	12.100	0.43
CC-15	Post-Development 2 YR	2	0.173	12.100	1.08

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-16	Post-Development 2 YR	2	0.220	12.150	1.19
CC-17	Post-Development 2 YR	2	0.337	12.200	1.66
CC-18	Post-Development 2 YR	2	0.078	12.150	0.42
CC-19	Post-Development 2 YR	2	0.050	12.150	0.30
CC-1A	Post-Development 2 YR	2	0.133	12.100	0.84
CC-1B	Post-Development 2 YR	2	0.166	12.150	0.98
CC-20	Post-Development 2 YR	2	0.532	12.150	3.23
CC-21	Post-Development 2 YR	2	0.048	12.300	0.12
CC-22	Post-Development 2 YR	2	0.187	12.150	1.13
CC-23	Post-Development 2 YR	2	0.074	12.200	0.37
CC-24	Post-Development 2 YR	2	0.536	12.150	3.25
CC-25	Post-Development 2 YR	2	0.047	12.100	0.30
CC-26	Post-Development 2 YR	2	0.226	12.150	1.35
CC-27	Post-Development 2 YR	2	0.237	12.200	1.15
CC-28	Post-Development 2 YR	2	1.917	12.500	6.47
CC-2A	Post-Development 2 YR	2	0.149	12.100	0.99
CC-2B	Post-Development 2 YR	2	0.282	12.100	1.87
CC-2C	Post-Development 2 YR	2	0.087	12.100	0.65
CC-3	Post-Development 2 YR	2	0.551	12.350	1.80
CC-4A	Post-Development 2 YR	2	2.341	12.200	15.39
CC-4B	Post-Development 2 YR	2	0.316	12.100	3.95
CC-4C (Pre-Development)	Post-Development 2 YR	2	0.057	12.100	0.15
CC-5	Post-Development 2 YR	2	0.303	12.150	1.81
CC-6	Post-Development 2 YR	2	0.376	12.150	2.28

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-7	Post-Development 2 YR	2	0.249	12.150	1.38
CC-8	Post-Development 2 YR	2	0.104	12.150	0.63
CC-9	Post-Development 2 YR	2	0.076	12.100	0.55
EX-24	Post-Development 2 YR	2	0.086	14.250	0.21
EX-DP-3 (Pre-Dev.)	Post-Development 2 YR	2	0.235	14.300	0.54
OS-10	Post-Development 2 YR	2	0.072	12.050	0.73
OS-11	Post-Development 2 YR	2	0.420	12.200	2.36
OS-12	Post-Development 2 YR	2	0.678	12.300	2.17
OS-13	Post-Development 2 YR	2	0.384	12.250	1.37
OS-14	Post-Development 2 YR	2	0.238	12.250	0.68
OS-15	Post-Development 2 YR	2	0.829	12.250	3.30
OS-16	Post-Development 2 YR	2	0.061	12.100	0.38
OS-17	Post-Development 2 YR	2	0.214	12.100	1.56
OS-18	Post-Development 2 YR	2	0.176	12.100	1.26
OS-1A	Post-Development 2 YR	2	0.060	12.100	0.43
OS-1B	Post-Development 2 YR	2	0.076	12.100	0.52
OS-2	Post-Development 2 YR	2	0.022	12.300	0.05
OS-3	Post-Development 2 YR	2	0.138	12.100	1.01
OS-4	Post-Development 2 YR	2	0.445	12.100	2.84
OS-5	Post-Development 2 YR	2	0.400	12.250	1.87
OS-6	Post-Development 2 YR	2	0.125	12.100	0.86
OS-7	Post-Development 2 YR	2	0.068	12.100	0.51
OS-8	Post-Development 2 YR	2	0.264	12.100	2.12
OS-9	Post-Development 2 YR	2	0.064	14.350	0.13

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-1	Post-Development 2 YR	2	0.143	12.050	1.61
DP-10	Post-Development 2 YR	2	1.530	12.100	11.95
DP-11	Post-Development 2 YR	2	0.445	12.150	3.42
DP-12	Post-Development 2 YR	2	0.572	12.150	4.24
DP-13	Post-Development 2 YR	2	1.520	14.500	3.35
DP-16	Post-Development 2 YR	2	4.050	12.200	24.96
DP-17	Post-Development 2 YR	2	2.080	16.550	3.36
DP-18	Post-Development 2 YR	2	1.058	12.150	5.03
DP-19	Post-Development 2 YR	2	1.520	12.100	3.82
DP-2	Post-Development 2 YR	2	0.365	12.100	3.23
DP-20	Post-Development 2 YR	2	0.810	12.300	2.70
DP-21	Post-Development 2 YR	2	0.532	12.150	2.10
DP-22	Post-Development 2 YR	2	0.814	12.150	3.73
DP-23	Post-Development 2 YR	2	0.789	12.350	2.47
DP-24	Post-Development 2 YR	2	0.360	12.150	1.94
DP-25	Post-Development 2 YR	2	0.313	23.950	0.35
DP-26	Post-Development 2 YR	2	0.943	12.300	2.98
DP-27	Post-Development 2 YR	2	0.705	12.150	4.29
DP-28	Post-Development 2 YR	2	1.090	12.250	4.59
DP-29	Post-Development 2 YR	2	1.552	12.350	5.78
DP-3	Post-Development 2 YR	2	0.572	12.150	1.43
DP-30	Post-Development 2 YR	2	0.078	12.150	0.42
DP-31	Post-Development 2 YR	2	0.128	12.150	0.70
DP-32	Post-Development 2 YR	2	0.398	12.200	1.99

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-33	Post-Development 2 YR	2	0.610	12.150	3.60
DP-34	Post-Development 2 YR	2	2.819	13.250	5.98
DP-4	Post-Development 2 YR	2	0.176	12.000	2.90
DP-5	Post-Development 2 YR	2	0.150	12.050	1.54
DP-6	Post-Development 2 YR	2	0.106	12.100	0.64
DP-7	Post-Development 2 YR	2	0.290	12.100	2.14
DP-8	Post-Development 2 YR	2	5.527	12.350	20.94
DP-9	Post-Development 2 YR	2	0.172	12.100	1.29
J-75	Post-Development 2 YR	2	2.535	12.450	8.58
O-100	Post-Development 2 YR	2	0.197	12.100	0.90
O-101	Post-Development 2 YR	2	0.254	12.150	1.54
O-102	Post-Development 2 YR	2	0.062	12.100	0.43
O-108	Post-Development 2 YR	2	0.235	12.150	1.24
O-110	Post-Development 2 YR	2	0.047	12.100	0.30
O-122	Post-Development 2 YR	2	0.047	12.100	0.36
O-125	Post-Development 2 YR	2	0.165	12.150	0.98
O-126	Post-Development 2 YR	2	2.733	12.200	18.53
O-127	Post-Development 2 YR	2	0.426	12.000	7.22
O-129	Post-Development 2 YR	2	0.400	12.250	1.87
O-137	Post-Development 2 YR	2	0.086	14.250	0.21
O-138	Post-Development 2 YR	2	0.235	14.300	0.54
O-73	Post-Development 2 YR	2	0.114	12.100	0.59
O-74	Post-Development 2 YR	2	0.115	12.150	0.36
O-75	Post-Development 2 YR	2	0.016	14.250	0.04

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
O-80	Post-Development 2 YR	2	0.082	12.150	0.31
O-81	Post-Development 2 YR	2	0.061	12.100	0.25
O-82	Post-Development 2 YR	2	0.116	12.100	0.81
O-86	Post-Development 2 YR	2	0.166	12.150	0.98
O-96	Post-Development 2 YR	2	0.087	12.100	0.65
O-98	Post-Development 2 YR	2	0.249	12.150	1.38

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Exist. HFR Pond 16 (IN)	Post-Development 2 YR	2	4.331	12.250	20.25	(N/A)	(N/A)
Exist. HFR Pond 16 (OUT)	Post-Development 2 YR	2	4.273	12.400	17.00	7,455.39	0.222
FH North Pond 1 (IN)	Post-Development 2 YR	2	0.379	12.100	3.10	(N/A)	(N/A)
FH North Pond 1 (OUT)	Post-Development 2 YR	2	0.373	13.350	0.62	7,391.48	0.086
FH North Pond 12 (IN)	Post-Development 2 YR	2	0.736	12.150	4.19	(N/A)	(N/A)
FH North Pond 12 (OUT)	Post-Development 2 YR	2	0.313	23.950	0.35	7,546.37	0.421
FH North Pond 4 (IN)	Post-Development 2 YR	2	2.442	12.150	18.30	(N/A)	(N/A)
FH North Pond 4 (OUT)	Post-Development 2 YR	2	1.520	14.500	3.35	7,425.62	1.002
FH North Pond 8 (IN)	Post-Development 2 YR	2	4.509	12.200	27.90	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (OUT)	Post-Development 2 YR	2	2.080	16.550	3.36	7,374.84	2.484
Golf Course Pond 6 (IN)	Post-Development 2 YR	2	2.366	12.200	15.07	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 2 YR	2	2.363	12.200	14.50	7,436.08	2.505
Golf Course Pond 7 (IN)	Post-Development 2 YR	2	2.896	12.200	17.89	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 2 YR	2	2.896	12.200	17.64	7,424.09	1.477

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.2	0.2	0.2
6.250	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.3	0.3	0.3
8.750	0.3	0.3	0.3	0.3	0.4
10.000	0.4	0.4	0.4	0.5	0.5
11.250	0.5	0.6	0.8	1.4	1.5
12.500	1.5	1.6	1.6	1.7	1.7
13.750	1.7	1.7	1.8	1.8	1.8
15.000	1.8	1.8	1.8	1.9	1.9
16.250	1.9	1.9	1.9	1.9	1.9
17.500	1.9	1.9	1.9	1.9	2.0
18.750	2.0	2.0	2.0	2.0	2.0
20.000	2.0	2.0	2.0	2.0	2.0
21.250	2.0	2.0	2.0	2.1	2.1
22.500	2.1	2.1	2.1	2.1	2.1
23.750	2.1	2.1	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 1

Return Event: 2 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,390.00	0.0000	0.004	0.000	0.000	0.000
7,392.00	0.0000	0.242	0.277	0.185	0.185
7,394.00	0.0000	0.311	0.827	0.552	0.736
7,396.00	0.0000	0.387	1.045	0.697	1.433

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 12

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,544.50	0.0000	0.002	0.000	0.000	0.000
7,546.00	0.0000	0.462	0.494	0.247	0.247
7,548.00	0.0000	0.600	1.588	1.059	1.306
7,550.00	0.0000	0.749	2.019	1.346	2.652
7,552.00	0.0000	0.905	2.477	1.652	4.304

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 4

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,421.50	0.0000	0.004	0.000	0.000	0.000
7,422.00	0.0000	0.004	0.012	0.002	0.002
7,424.00	0.0000	0.248	0.283	0.189	0.191
7,426.00	0.0000	0.981	1.722	1.148	1.339
7,428.00	0.0000	1.226	3.304	2.202	3.542
7,430.00	0.0000	1.432	3.983	2.655	6.197
7,432.00	0.0000	1.651	4.621	3.080	9.277

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1 + A2 + sq (A1 * A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.00	0.0000	0.009	0.000	0.000	0.000
7,370.00	0.0000	0.009	0.027	0.009	0.009
7,372.00	0.0000	0.415	0.485	0.323	0.332
7,374.00	0.0000	0.918	1.950	1.300	1.633
7,376.00	0.0000	1.411	3.467	2.311	3.944
7,378.00	0.0000	1.594	4.505	3.003	6.947
7,380.00	0.0000	1.788	5.070	3.380	10.327
7,382.00	0.0000	2.032	5.726	3.817	14.145

Subsection: Composite Rating Curve
Label: FH North Pond 1

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,390.00	0.00	(N/A)	0.00
7,390.50	0.21	(N/A)	0.00
7,391.00	0.42	(N/A)	0.00
7,391.50	0.63	(N/A)	0.00
7,392.00	0.84	(N/A)	0.00
7,392.50	1.05	(N/A)	0.00
7,392.75	1.15	(N/A)	0.00
7,393.00	2.70	(N/A)	0.00
7,393.50	9.09	(N/A)	0.00
7,394.00	18.16	(N/A)	0.00
7,394.50	29.05	(N/A)	0.00
7,395.00	41.22	(N/A)	0.00
7,395.50	47.14	(N/A)	0.00
7,396.00	48.76	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 12

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,544.50	0.00	(N/A)	0.00
7,545.00	0.09	(N/A)	0.00
7,545.50	0.19	(N/A)	0.00
7,546.00	0.28	(N/A)	0.00
7,546.50	0.37	(N/A)	0.00
7,546.75	0.42	(N/A)	0.00
7,547.00	1.93	(N/A)	0.00
7,547.50	8.19	(N/A)	0.00
7,548.00	17.12	(N/A)	0.00
7,548.50	27.99	(N/A)	0.00
7,549.00	33.62	(N/A)	0.00
7,549.50	35.86	(N/A)	0.00
7,550.00	37.97	(N/A)	0.00
7,550.50	39.96	(N/A)	0.00
7,551.00	41.87	(N/A)	0.00
7,551.50	43.69	(N/A)	0.00
7,552.00	45.43	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 4

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,421.50	0.00	(N/A)	0.00
7,422.00	0.09	(N/A)	0.00
7,422.50	0.19	(N/A)	0.00
7,423.00	0.29	(N/A)	0.00
7,423.50	0.38	(N/A)	0.00
7,424.00	0.48	(N/A)	0.00
7,424.50	0.57	(N/A)	0.00
7,425.00	0.67	(N/A)	0.00
7,425.50	0.77	(N/A)	0.00
7,426.00	11.42	(N/A)	0.00
7,426.50	30.84	(N/A)	0.00
7,427.00	55.96	(N/A)	0.00
7,427.50	85.67	(N/A)	0.00
7,428.00	119.35	(N/A)	0.00
7,428.50	156.50	(N/A)	0.00
7,429.00	196.62	(N/A)	0.00
7,429.50	205.78	(N/A)	0.00
7,430.00	211.74	(N/A)	0.00
7,430.50	217.53	(N/A)	0.00
7,431.00	223.18	(N/A)	0.00
7,431.50	228.71	(N/A)	0.00
7,432.00	234.08	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 4

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.00	0.00	(N/A)	0.00
7,369.25	0.00	(N/A)	0.00
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 1

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,390.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,390.00	0.00	0.000	0.004	0.00	0.00	0.00
7,390.50	0.21	0.007	0.029	0.00	0.21	3.74
7,391.00	0.42	0.033	0.077	0.00	0.42	16.33
7,391.50	0.63	0.088	0.148	0.00	0.63	43.31
7,392.00	0.84	0.185	0.242	0.00	0.84	90.25
7,392.50	1.05	0.310	0.258	0.00	1.05	151.00
7,392.75	1.15	0.375	0.267	0.00	1.15	182.89
7,393.00	2.70	0.443	0.275	0.00	2.70	217.24
7,393.50	9.09	0.585	0.293	0.00	9.09	292.39
7,394.00	18.16	0.736	0.311	0.00	18.16	374.53
7,394.50	29.05	0.896	0.329	0.00	29.05	462.88
7,395.00	41.22	1.066	0.348	0.00	41.22	556.98
7,395.50	47.14	1.244	0.367	0.00	47.14	649.42
7,396.00	48.76	1.433	0.387	0.00	48.76	742.29

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 12

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,544.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,544.50	0.00	0.000	0.002	0.00	0.00	0.00
7,545.00	0.09	0.013	0.066	0.00	0.09	6.48
7,545.50	0.19	0.081	0.219	0.00	0.19	39.23
7,546.00	0.28	0.247	0.462	0.00	0.28	119.92
7,546.50	0.37	0.486	0.495	0.00	0.37	235.77
7,546.75	0.42	0.612	0.512	0.00	0.42	296.70
7,547.00	1.93	0.742	0.529	0.00	1.93	361.15
7,547.50	8.19	1.015	0.564	0.00	8.19	499.59
7,548.00	17.12	1.306	0.600	0.00	17.12	649.32
7,548.50	27.99	1.615	0.636	0.00	27.99	809.69
7,549.00	33.62	1.942	0.672	0.00	33.62	973.58
7,549.50	35.86	2.288	0.710	0.00	35.86	1,143.10
7,550.00	37.97	2.652	0.749	0.00	37.97	1,321.75
7,550.50	39.96	3.036	0.787	0.00	39.96	1,509.54
7,551.00	41.87	3.439	0.825	0.00	41.87	1,706.45
7,551.50	43.69	3.862	0.865	0.00	43.69	1,912.72
7,552.00	45.43	4.304	0.905	0.00	45.43	2,128.56

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 4

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,421.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,421.50	0.00	0.000	0.004	0.00	0.00	0.00
7,422.00	0.09	0.002	0.004	0.00	0.09	1.06
7,422.50	0.19	0.009	0.030	0.00	0.19	4.74
7,423.00	0.29	0.035	0.079	0.00	0.29	17.47
7,423.50	0.38	0.092	0.152	0.00	0.38	44.96
7,424.00	0.48	0.191	0.248	0.00	0.48	92.92
7,424.50	0.57	0.348	0.386	0.00	0.57	169.09
7,425.00	0.67	0.582	0.554	0.00	0.67	282.28
7,425.50	0.77	0.907	0.752	0.00	0.77	439.80
7,426.00	11.42	1.339	0.981	0.00	11.42	659.57
7,426.50	30.84	1.844	1.040	0.00	30.84	923.46
7,427.00	55.96	2.379	1.100	0.00	55.96	1,207.47
7,427.50	85.67	2.945	1.162	0.00	85.67	1,510.87
7,428.00	119.35	3.542	1.226	0.00	119.35	1,833.49
7,428.50	156.50	4.167	1.276	0.00	156.50	2,173.36
7,429.00	196.62	4.818	1.327	0.00	196.62	2,528.43
7,429.50	205.78	5.494	1.379	0.00	205.78	2,864.99
7,430.00	211.74	6.197	1.432	0.00	211.74	3,211.06
7,430.50	217.53	6.926	1.485	0.00	217.53	3,569.83
7,431.00	223.18	7.682	1.540	0.00	223.18	3,941.46
7,431.50	228.71	8.466	1.595	0.00	228.71	4,326.23
7,432.00	234.08	9.277	1.651	0.00	234.08	4,724.32

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.00	0.00	0.000	0.009	0.00	0.00	0.00
7,369.25	0.00	0.002	0.009	0.00	0.00	1.09
7,369.50	0.00	0.004	0.009	0.00	0.00	2.18
7,370.00	0.12	0.009	0.009	0.00	0.12	4.47
7,370.50	0.23	0.023	0.054	0.00	0.23	11.44
7,371.00	0.35	0.069	0.137	0.00	0.35	33.85
7,371.50	0.47	0.166	0.257	0.00	0.47	80.81
7,372.00	0.58	0.332	0.415	0.00	0.58	161.47
7,372.50	0.69	0.566	0.522	0.00	0.69	274.74
7,373.00	0.81	0.857	0.642	0.00	0.81	415.47
7,373.50	0.92	1.210	0.774	0.00	0.92	586.62
7,374.00	1.04	1.633	0.918	0.00	1.04	791.20
7,374.50	1.15	2.120	1.031	0.00	1.15	1,027.05
7,374.75	1.21	2.385	1.091	0.00	1.21	1,155.47
7,375.00	7.17	2.665	1.151	0.00	7.17	1,297.03
7,375.50	32.24	3.272	1.278	0.00	32.24	1,615.90
7,376.00	68.01	3.944	1.411	0.00	68.01	1,976.89
7,376.50	112.00	4.661	1.456	0.00	112.00	2,367.74
7,377.00	162.75	5.400	1.501	0.00	162.75	2,776.25
7,377.50	219.40	6.162	1.547	0.00	219.40	3,201.72
7,378.00	254.44	6.947	1.594	0.00	254.44	3,616.84
7,378.50	266.12	7.756	1.641	0.00	266.12	4,020.00
7,379.00	277.33	8.589	1.690	0.00	277.33	4,434.25
7,379.50	288.06	9.446	1.738	0.00	288.06	4,859.76
7,380.00	298.45	10.327	1.788	0.00	298.45	5,296.84
7,380.50	308.47	11.236	1.848	0.00	308.47	5,746.74
7,381.00	318.15	12.175	1.908	0.00	318.15	6,210.82
7,381.50	327.59	13.144	1.970	0.00	327.59	6,689.43
7,382.00	336.74	14.145	2.032	0.00	336.74	7,182.75

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Project Summary	
Title	Flying Horse North Filing No.1
Engineer	MAW
Company	CCES
Date	11/20/2017

Notes	5 Year
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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
Area to HFR Pond 16	Post-Development 5 YR	5	9.990	12.200	77.31
Area to Pond 1	Post-Development 5 YR	5	0.813	12.100	9.36
BS-10	Post-Development 5 YR	5	0.610	12.050	8.66
BS-11	Post-Development 5 YR	5	0.122	12.000	2.08
BS-12	Post-Development 5 YR	5	0.240	12.050	3.01
BS-13	Post-Development 5 YR	5	1.054	12.050	12.78
BS-14	Post-Development 5 YR	5	0.545	12.050	6.57
BS-15	Post-Development 5 YR	5	0.250	12.050	3.66
BS-16	Post-Development 5 YR	5	0.912	12.150	9.19
BS-17	Post-Development 5 YR	5	0.553	12.050	7.36
BS-18	Post-Development 5 YR	5	1.121	12.100	12.38
BS-19	Post-Development 5 YR	5	0.312	12.050	4.62
BS-1A	Post-Development 5 YR	5	0.109	12.050	1.39
BS-1B	Post-Development 5 YR	5	0.232	12.050	2.37
BS-2	Post-Development 5 YR	5	0.258	12.000	4.20
BS-20	Post-Development 5 YR	5	2.565	12.150	24.57
BS-21	Post-Development 5 YR	5	2.579	12.150	23.92
BS-22	Post-Development 5 YR	5	0.762	12.050	9.63
BS-23	Post-Development 5 YR	5	1.401	12.150	13.59
BS-23A	Post-Development 5 YR	5	0.874	12.050	11.98
BS-24	Post-Development 5 YR	5	0.285	12.050	3.25
BS-25	Post-Development 5 YR	5	0.301	12.100	2.68
BS-26	Post-Development 5 YR	5	0.048	12.100	0.40
BS-27	Post-Development 5 YR	5	0.727	12.100	7.95

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-28	Post-Development 5 YR	5	1.090	12.150	9.31
BS-29	Post-Development 5 YR	5	0.790	12.150	6.49
BS-2A	Post-Development 5 YR	5	0.109	12.000	1.77
BS-2B	Post-Development 5 YR	5	0.122	12.000	2.02
BS-3	Post-Development 5 YR	5	0.194	12.050	2.25
BS-30	Post-Development 5 YR	5	0.209	12.050	2.43
BS-31	Post-Development 5 YR	5	0.209	12.100	1.94
BS-32	Post-Development 5 YR	5	0.156	12.100	1.55
BS-33	Post-Development 5 YR	5	0.271	12.050	3.18
BS-4	Post-Development 5 YR	5	0.478	12.100	5.54
BS-5	Post-Development 5 YR	5	0.350	12.050	4.38
BS-6	Post-Development 5 YR	5	0.163	12.000	2.76
BS-7	Post-Development 5 YR	5	0.394	12.000	6.40
BS-8	Post-Development 5 YR	5	0.136	12.000	2.24
BS-9	Post-Development 5 YR	5	0.204	12.000	3.31
CC-10	Post-Development 5 YR	5	2.140	12.200	14.13
CC-11	Post-Development 5 YR	5	0.490	12.100	4.95
CC-12	Post-Development 5 YR	5	0.380	12.100	3.88
CC-13A	Post-Development 5 YR	5	0.601	12.150	5.42
CC-13B	Post-Development 5 YR	5	0.794	12.150	7.17
CC-13C	Post-Development 5 YR	5	0.309	12.100	3.38
CC-13D	Post-Development 5 YR	5	0.586	12.100	6.17
CC-14	Post-Development 5 YR	5	0.144	12.100	1.59
CC-15	Post-Development 5 YR	5	0.399	12.100	4.27

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-16	Post-Development 5 YR	5	0.507	12.150	4.64
CC-17	Post-Development 5 YR	5	0.777	12.150	6.47
CC-18	Post-Development 5 YR	5	0.181	12.150	1.65
CC-19	Post-Development 5 YR	5	0.115	12.100	1.21
CC-1A	Post-Development 5 YR	5	0.306	12.100	3.28
CC-1B	Post-Development 5 YR	5	0.386	12.100	4.02
CC-20	Post-Development 5 YR	5	1.225	12.100	12.89
CC-21	Post-Development 5 YR	5	0.133	12.100	1.17
CC-22	Post-Development 5 YR	5	0.430	12.100	4.53
CC-23	Post-Development 5 YR	5	0.173	12.150	1.48
CC-24	Post-Development 5 YR	5	1.235	12.100	12.99
CC-25	Post-Development 5 YR	5	0.109	12.100	1.17
CC-26	Post-Development 5 YR	5	0.521	12.100	5.31
CC-27	Post-Development 5 YR	5	0.558	12.150	4.88
CC-28	Post-Development 5 YR	5	4.534	12.350	24.70
CC-2A	Post-Development 5 YR	5	0.343	12.100	3.76
CC-2B	Post-Development 5 YR	5	0.649	12.100	7.10
CC-2C	Post-Development 5 YR	5	0.200	12.050	2.50
CC-3	Post-Development 5 YR	5	1.375	12.250	8.79
CC-4A	Post-Development 5 YR	5	4.709	12.200	38.97
CC-4B	Post-Development 5 YR	5	0.554	12.100	7.31
CC-4C (Pre-Development)	Post-Development 5 YR	5	0.159	12.050	1.81
CC-5	Post-Development 5 YR	5	0.698	12.100	7.13
CC-6	Post-Development 5 YR	5	0.867	12.100	9.12

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-7	Post-Development 5 YR	5	0.573	12.100	5.35
CC-8	Post-Development 5 YR	5	0.240	12.100	2.53
CC-9	Post-Development 5 YR	5	0.175	12.050	2.08
EX-24	Post-Development 5 YR	5	0.255	12.050	2.17
EX-DP-3 (Pre-Dev.)	Post-Development 5 YR	5	0.693	12.100	4.76
OS-10	Post-Development 5 YR	5	0.154	12.050	2.13
OS-11	Post-Development 5 YR	5	0.938	12.150	8.20
OS-12	Post-Development 5 YR	5	1.720	12.200	11.85
OS-13	Post-Development 5 YR	5	0.961	12.150	7.35
OS-14	Post-Development 5 YR	5	0.624	12.150	4.61
OS-15	Post-Development 5 YR	5	1.997	12.200	14.76
OS-16	Post-Development 5 YR	5	0.140	12.100	1.50
OS-17	Post-Development 5 YR	5	0.493	12.050	5.88
OS-18	Post-Development 5 YR	5	0.406	12.050	4.72
OS-1A	Post-Development 5 YR	5	0.137	12.050	1.60
OS-1B	Post-Development 5 YR	5	0.175	12.100	1.94
OS-2	Post-Development 5 YR	5	0.062	12.100	0.55
OS-3	Post-Development 5 YR	5	0.318	12.050	3.80
OS-4	Post-Development 5 YR	5	1.026	12.100	11.02
OS-5	Post-Development 5 YR	5	0.922	12.200	7.14
OS-6	Post-Development 5 YR	5	0.287	12.100	3.18
OS-7	Post-Development 5 YR	5	0.156	12.050	1.96
OS-8	Post-Development 5 YR	5	0.556	12.100	6.22
OS-9	Post-Development 5 YR	5	0.188	12.200	0.99

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-1	Post-Development 5 YR	5	0.260	12.050	3.37
DP-10	Post-Development 5 YR	5	3.247	12.100	34.85
DP-11	Post-Development 5 YR	5	0.912	12.150	9.19
DP-12	Post-Development 5 YR	5	1.161	12.100	11.23
DP-13	Post-Development 5 YR	5	4.192	12.600	15.02
DP-16	Post-Development 5 YR	5	8.729	12.150	78.46
DP-17	Post-Development 5 YR	5	7.095	12.800	23.12
DP-18	Post-Development 5 YR	5	2.495	12.100	21.62
DP-19	Post-Development 5 YR	5	3.616	12.100	16.76
DP-2	Post-Development 5 YR	5	0.737	12.050	8.76
DP-20	Post-Development 5 YR	5	2.026	12.150	14.26
DP-21	Post-Development 5 YR	5	1.304	12.150	10.47
DP-22	Post-Development 5 YR	5	1.951	12.100	16.60
DP-23	Post-Development 5 YR	5	1.999	12.200	13.04
DP-24	Post-Development 5 YR	5	0.857	12.100	8.41
DP-25	Post-Development 5 YR	5	1.084	14.200	1.85
DP-26	Post-Development 5 YR	5	2.380	12.200	15.93
DP-27	Post-Development 5 YR	5	1.624	12.100	17.16
DP-28	Post-Development 5 YR	5	2.598	12.150	19.79
DP-29	Post-Development 5 YR	5	3.678	12.200	26.59
DP-3	Post-Development 5 YR	5	1.262	12.100	5.77
DP-30	Post-Development 5 YR	5	0.181	12.150	1.65
DP-31	Post-Development 5 YR	5	0.296	12.150	2.72
DP-32	Post-Development 5 YR	5	0.917	12.150	7.77

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-33	Post-Development 5 YR	5	1.407	12.100	14.38
DP-34	Post-Development 5 YR	5	6.776	12.650	23.53
DP-4	Post-Development 5 YR	5	0.258	12.000	4.20
DP-5	Post-Development 5 YR	5	0.283	12.050	3.52
DP-6	Post-Development 5 YR	5	0.256	12.050	2.77
DP-7	Post-Development 5 YR	5	0.668	12.050	8.18
DP-8	Post-Development 5 YR	5	12.227	12.300	70.39
DP-9	Post-Development 5 YR	5	0.397	12.050	4.97
J-75	Post-Development 5 YR	5	5.958	12.300	32.44
O-100	Post-Development 5 YR	5	0.490	12.100	4.95
O-101	Post-Development 5 YR	5	0.586	12.100	6.17
O-102	Post-Development 5 YR	5	0.144	12.100	1.59
O-108	Post-Development 5 YR	5	0.563	12.100	5.70
O-110	Post-Development 5 YR	5	0.109	12.100	1.17
O-122	Post-Development 5 YR	5	0.109	12.050	1.39
O-125	Post-Development 5 YR	5	0.380	12.100	3.88
O-126	Post-Development 5 YR	5	5.438	12.150	44.99
O-127	Post-Development 5 YR	5	0.625	12.000	10.39
O-129	Post-Development 5 YR	5	0.922	12.200	7.14
O-137	Post-Development 5 YR	5	0.255	12.050	2.17
O-138	Post-Development 5 YR	5	0.693	12.100	4.76
O-73	Post-Development 5 YR	5	0.285	12.050	3.25
O-74	Post-Development 5 YR	5	0.301	12.100	2.68
O-75	Post-Development 5 YR	5	0.048	12.100	0.40

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
O-80	Post-Development 5 YR	5	0.209	12.100	1.94
O-81	Post-Development 5 YR	5	0.156	12.100	1.55
O-82	Post-Development 5 YR	5	0.271	12.050	3.18
O-86	Post-Development 5 YR	5	0.386	12.100	4.02
O-96	Post-Development 5 YR	5	0.200	12.050	2.50
O-98	Post-Development 5 YR	5	0.573	12.100	5.35

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Exist. HFR Pond 16 (IN)	Post-Development 5 YR	5	9.990	12.200	77.31	(N/A)	(N/A)
Exist. HFR Pond 16 (OUT)	Post-Development 5 YR	5	9.910	12.350	60.95	7,456.98	0.761
FH North Pond 1 (IN)	Post-Development 5 YR	5	0.813	12.100	9.36	(N/A)	(N/A)
FH North Pond 1 (OUT)	Post-Development 5 YR	5	0.774	13.700	1.01	7,392.43	0.291
FH North Pond 12 (IN)	Post-Development 5 YR	5	1.723	12.100	17.34	(N/A)	(N/A)
FH North Pond 12 (OUT)	Post-Development 5 YR	5	1.084	14.200	1.85	7,546.99	0.735
FH North Pond 4 (IN)	Post-Development 5 YR	5	5.146	12.100	52.30	(N/A)	(N/A)
FH North Pond 4 (OUT)	Post-Development 5 YR	5	4.192	12.600	15.02	7,426.09	1.431
FH North Pond 8 (IN)	Post-Development 5 YR	5	9.596	12.150	84.97	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (OUT)	Post-Development 5 YR	5	7.095	12.800	23.12	7,375.32	3.044
Golf Course Pond 6 (IN)	Post-Development 5 YR	5	5.144	12.150	48.48	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 5 YR	5	5.138	12.200	46.40	7,436.24	2.611
Golf Course Pond 7 (IN)	Post-Development 5 YR	5	6.211	12.150	55.75	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 5 YR	5	6.211	12.200	54.75	7,424.29	1.551

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
6.250	0.2	0.2	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.4
8.750	0.4	0.4	0.4	0.4	0.5
10.000	0.5	0.5	0.5	0.6	0.6
11.250	0.7	0.8	1.0	1.8	1.9
12.500	2.0	2.0	2.1	2.1	2.2
13.750	2.2	2.2	2.3	2.3	2.3
15.000	2.3	2.3	2.3	2.4	2.4
16.250	2.4	2.4	2.4	2.4	2.5
17.500	2.5	2.5	2.5	2.5	2.5
18.750	2.5	2.5	2.5	2.6	2.6
20.000	2.6	2.6	2.6	2.6	2.6
21.250	2.6	2.6	2.6	2.6	2.6
22.500	2.7	2.7	2.7	2.7	2.7
23.750	2.7	2.7	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 1

Return Event: 5 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,390.00	0.0000	0.004	0.000	0.000	0.000
7,392.00	0.0000	0.242	0.277	0.185	0.185
7,394.00	0.0000	0.311	0.827	0.552	0.736
7,396.00	0.0000	0.387	1.045	0.697	1.433

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 12

Return Event: 5 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,544.50	0.0000	0.002	0.000	0.000	0.000
7,546.00	0.0000	0.462	0.494	0.247	0.247
7,548.00	0.0000	0.600	1.588	1.059	1.306
7,550.00	0.0000	0.749	2.019	1.346	2.652
7,552.00	0.0000	0.905	2.477	1.652	4.304

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 4

Return Event: 5 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,421.50	0.0000	0.004	0.000	0.000	0.000
7,422.00	0.0000	0.004	0.012	0.002	0.002
7,424.00	0.0000	0.248	0.283	0.189	0.191
7,426.00	0.0000	0.981	1.722	1.148	1.339
7,428.00	0.0000	1.226	3.304	2.202	3.542
7,430.00	0.0000	1.432	3.983	2.655	6.197
7,432.00	0.0000	1.651	4.621	3.080	9.277

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.00	0.0000	0.009	0.000	0.000	0.000
7,370.00	0.0000	0.009	0.027	0.009	0.009
7,372.00	0.0000	0.415	0.485	0.323	0.332
7,374.00	0.0000	0.918	1.950	1.300	1.633
7,376.00	0.0000	1.411	3.467	2.311	3.944
7,378.00	0.0000	1.594	4.505	3.003	6.947
7,380.00	0.0000	1.788	5.070	3.380	10.327
7,382.00	0.0000	2.032	5.726	3.817	14.145

Subsection: Composite Rating Curve
Label: FH North Pond 1

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,390.00	0.00	(N/A)	0.00
7,390.50	0.21	(N/A)	0.00
7,391.00	0.42	(N/A)	0.00
7,391.50	0.63	(N/A)	0.00
7,392.00	0.84	(N/A)	0.00
7,392.50	1.05	(N/A)	0.00
7,392.75	1.15	(N/A)	0.00
7,393.00	2.70	(N/A)	0.00
7,393.50	9.09	(N/A)	0.00
7,394.00	18.16	(N/A)	0.00
7,394.50	29.05	(N/A)	0.00
7,395.00	41.22	(N/A)	0.00
7,395.50	47.14	(N/A)	0.00
7,396.00	48.76	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 12

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,544.50	0.00	(N/A)	0.00
7,545.00	0.09	(N/A)	0.00
7,545.50	0.19	(N/A)	0.00
7,546.00	0.28	(N/A)	0.00
7,546.50	0.37	(N/A)	0.00
7,546.75	0.42	(N/A)	0.00
7,547.00	1.93	(N/A)	0.00
7,547.50	8.19	(N/A)	0.00
7,548.00	17.12	(N/A)	0.00
7,548.50	27.99	(N/A)	0.00
7,549.00	33.62	(N/A)	0.00
7,549.50	35.86	(N/A)	0.00
7,550.00	37.97	(N/A)	0.00
7,550.50	39.96	(N/A)	0.00
7,551.00	41.87	(N/A)	0.00
7,551.50	43.69	(N/A)	0.00
7,552.00	45.43	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 4

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,421.50	0.00	(N/A)	0.00
7,422.00	0.09	(N/A)	0.00
7,422.50	0.19	(N/A)	0.00
7,423.00	0.29	(N/A)	0.00
7,423.50	0.38	(N/A)	0.00
7,424.00	0.48	(N/A)	0.00
7,424.50	0.57	(N/A)	0.00
7,425.00	0.67	(N/A)	0.00
7,425.50	0.77	(N/A)	0.00
7,426.00	11.42	(N/A)	0.00
7,426.50	30.84	(N/A)	0.00
7,427.00	55.96	(N/A)	0.00
7,427.50	85.67	(N/A)	0.00
7,428.00	119.35	(N/A)	0.00
7,428.50	156.50	(N/A)	0.00
7,429.00	196.62	(N/A)	0.00
7,429.50	205.78	(N/A)	0.00
7,430.00	211.74	(N/A)	0.00
7,430.50	217.53	(N/A)	0.00
7,431.00	223.18	(N/A)	0.00
7,431.50	228.71	(N/A)	0.00
7,432.00	234.08	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1, Orifice - 1, Culvert - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Culvert - 1 (no Q: Orifice - 1)
 Riser - 1, Culvert - 1 (no Q: Orifice - 1)
 Riser - 1, Culvert - 1 (no Q: Orifice - 1)
 Riser - 1, Culvert - 1 (no Q: Orifice - 1)
 Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 4

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.00	0.00	(N/A)	0.00
7,369.25	0.00	(N/A)	0.00
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
 (no Q: Riser - 1,Orifice - 1,Culvert - 1)
 (no Q: Riser - 1,Orifice - 1,Culvert - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 1

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,390.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,390.00	0.00	0.000	0.004	0.00	0.00	0.00
7,390.50	0.21	0.007	0.029	0.00	0.21	3.74
7,391.00	0.42	0.033	0.077	0.00	0.42	16.33
7,391.50	0.63	0.088	0.148	0.00	0.63	43.31
7,392.00	0.84	0.185	0.242	0.00	0.84	90.25
7,392.50	1.05	0.310	0.258	0.00	1.05	151.00
7,392.75	1.15	0.375	0.267	0.00	1.15	182.89
7,393.00	2.70	0.443	0.275	0.00	2.70	217.24
7,393.50	9.09	0.585	0.293	0.00	9.09	292.39
7,394.00	18.16	0.736	0.311	0.00	18.16	374.53
7,394.50	29.05	0.896	0.329	0.00	29.05	462.88
7,395.00	41.22	1.066	0.348	0.00	41.22	556.98
7,395.50	47.14	1.244	0.367	0.00	47.14	649.42
7,396.00	48.76	1.433	0.387	0.00	48.76	742.29

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 12

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,544.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,544.50	0.00	0.000	0.002	0.00	0.00	0.00
7,545.00	0.09	0.013	0.066	0.00	0.09	6.48
7,545.50	0.19	0.081	0.219	0.00	0.19	39.23
7,546.00	0.28	0.247	0.462	0.00	0.28	119.92
7,546.50	0.37	0.486	0.495	0.00	0.37	235.77
7,546.75	0.42	0.612	0.512	0.00	0.42	296.70
7,547.00	1.93	0.742	0.529	0.00	1.93	361.15
7,547.50	8.19	1.015	0.564	0.00	8.19	499.59
7,548.00	17.12	1.306	0.600	0.00	17.12	649.32
7,548.50	27.99	1.615	0.636	0.00	27.99	809.69
7,549.00	33.62	1.942	0.672	0.00	33.62	973.58
7,549.50	35.86	2.288	0.710	0.00	35.86	1,143.10
7,550.00	37.97	2.652	0.749	0.00	37.97	1,321.75
7,550.50	39.96	3.036	0.787	0.00	39.96	1,509.54
7,551.00	41.87	3.439	0.825	0.00	41.87	1,706.45
7,551.50	43.69	3.862	0.865	0.00	43.69	1,912.72
7,552.00	45.43	4.304	0.905	0.00	45.43	2,128.56

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 4

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,421.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,421.50	0.00	0.000	0.004	0.00	0.00	0.00
7,422.00	0.09	0.002	0.004	0.00	0.09	1.06
7,422.50	0.19	0.009	0.030	0.00	0.19	4.74
7,423.00	0.29	0.035	0.079	0.00	0.29	17.47
7,423.50	0.38	0.092	0.152	0.00	0.38	44.96
7,424.00	0.48	0.191	0.248	0.00	0.48	92.92
7,424.50	0.57	0.348	0.386	0.00	0.57	169.09
7,425.00	0.67	0.582	0.554	0.00	0.67	282.28
7,425.50	0.77	0.907	0.752	0.00	0.77	439.80
7,426.00	11.42	1.339	0.981	0.00	11.42	659.57
7,426.50	30.84	1.844	1.040	0.00	30.84	923.46
7,427.00	55.96	2.379	1.100	0.00	55.96	1,207.47
7,427.50	85.67	2.945	1.162	0.00	85.67	1,510.87
7,428.00	119.35	3.542	1.226	0.00	119.35	1,833.49
7,428.50	156.50	4.167	1.276	0.00	156.50	2,173.36
7,429.00	196.62	4.818	1.327	0.00	196.62	2,528.43
7,429.50	205.78	5.494	1.379	0.00	205.78	2,864.99
7,430.00	211.74	6.197	1.432	0.00	211.74	3,211.06
7,430.50	217.53	6.926	1.485	0.00	217.53	3,569.83
7,431.00	223.18	7.682	1.540	0.00	223.18	3,941.46
7,431.50	228.71	8.466	1.595	0.00	228.71	4,326.23
7,432.00	234.08	9.277	1.651	0.00	234.08	4,724.32

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.00	0.00	0.000	0.009	0.00	0.00	0.00
7,369.25	0.00	0.002	0.009	0.00	0.00	1.09
7,369.50	0.00	0.004	0.009	0.00	0.00	2.18
7,370.00	0.12	0.009	0.009	0.00	0.12	4.47
7,370.50	0.23	0.023	0.054	0.00	0.23	11.44
7,371.00	0.35	0.069	0.137	0.00	0.35	33.85
7,371.50	0.47	0.166	0.257	0.00	0.47	80.81
7,372.00	0.58	0.332	0.415	0.00	0.58	161.47
7,372.50	0.69	0.566	0.522	0.00	0.69	274.74
7,373.00	0.81	0.857	0.642	0.00	0.81	415.47
7,373.50	0.92	1.210	0.774	0.00	0.92	586.62
7,374.00	1.04	1.633	0.918	0.00	1.04	791.20
7,374.50	1.15	2.120	1.031	0.00	1.15	1,027.05
7,374.75	1.21	2.385	1.091	0.00	1.21	1,155.47
7,375.00	7.17	2.665	1.151	0.00	7.17	1,297.03
7,375.50	32.24	3.272	1.278	0.00	32.24	1,615.90
7,376.00	68.01	3.944	1.411	0.00	68.01	1,976.89
7,376.50	112.00	4.661	1.456	0.00	112.00	2,367.74
7,377.00	162.75	5.400	1.501	0.00	162.75	2,776.25
7,377.50	219.40	6.162	1.547	0.00	219.40	3,201.72
7,378.00	254.44	6.947	1.594	0.00	254.44	3,616.84
7,378.50	266.12	7.756	1.641	0.00	266.12	4,020.00
7,379.00	277.33	8.589	1.690	0.00	277.33	4,434.25
7,379.50	288.06	9.446	1.738	0.00	288.06	4,859.76
7,380.00	298.45	10.327	1.788	0.00	298.45	5,296.84
7,380.50	308.47	11.236	1.848	0.00	308.47	5,746.74
7,381.00	318.15	12.175	1.908	0.00	318.15	6,210.82
7,381.50	327.59	13.144	1.970	0.00	327.59	6,689.43
7,382.00	336.74	14.145	2.032	0.00	336.74	7,182.75

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Project Summary	
Title	Flying Horse North Filing No.1
Engineer	MAW
Company	CCES
Date	11/20/2017
Notes	
100 Year	

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
Area to HFR Pond 16	Post-Development 100 YR	100	37.106	12.150	400.62
Area to Pond 1	Post-Development 100 YR	100	2.793	12.050	38.16
BS-10	Post-Development 100 YR	100	1.269	12.050	17.46
BS-11	Post-Development 100 YR	100	0.254	12.000	4.09
BS-12	Post-Development 100 YR	100	0.892	12.050	13.83
BS-13	Post-Development 100 YR	100	3.477	12.050	49.97
BS-14	Post-Development 100 YR	100	1.807	12.050	25.95
BS-15	Post-Development 100 YR	100	0.781	12.050	12.22
BS-16	Post-Development 100 YR	100	2.975	12.100	35.70
BS-17	Post-Development 100 YR	100	1.747	12.050	25.96
BS-18	Post-Development 100 YR	100	4.050	12.050	56.04
BS-19	Post-Development 100 YR	100	0.955	12.050	14.95
BS-1A	Post-Development 100 YR	100	0.405	12.050	6.29
BS-1B	Post-Development 100 YR	100	0.933	12.050	13.83
BS-2	Post-Development 100 YR	100	0.536	12.000	8.36
BS-20	Post-Development 100 YR	100	9.086	12.100	112.39
BS-21	Post-Development 100 YR	100	8.877	12.100	103.01
BS-22	Post-Development 100 YR	100	2.489	12.050	36.51
BS-23	Post-Development 100 YR	100	4.789	12.100	58.24
BS-23A	Post-Development 100 YR	100	2.590	12.050	38.30
BS-24	Post-Development 100 YR	100	1.143	12.050	17.59
BS-25	Post-Development 100 YR	100	1.263	12.050	17.27
BS-26	Post-Development 100 YR	100	0.223	12.050	3.35
BS-27	Post-Development 100 YR	100	2.696	12.050	38.80

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-28	Post-Development 100 YR	100	4.139	12.100	49.40
BS-29	Post-Development 100 YR	100	3.050	12.100	35.94
BS-2A	Post-Development 100 YR	100	0.226	12.000	3.52
BS-2B	Post-Development 100 YR	100	0.254	12.000	4.00
BS-3	Post-Development 100 YR	100	0.718	12.050	10.78
BS-30	Post-Development 100 YR	100	0.776	12.050	11.65
BS-31	Post-Development 100 YR	100	0.858	12.050	11.80
BS-32	Post-Development 100 YR	100	0.637	12.050	9.41
BS-33	Post-Development 100 YR	100	1.016	12.050	15.33
BS-4	Post-Development 100 YR	100	1.652	12.050	23.58
BS-5	Post-Development 100 YR	100	1.298	12.050	20.12
BS-6	Post-Development 100 YR	100	0.339	12.000	5.44
BS-7	Post-Development 100 YR	100	0.818	12.000	12.76
BS-8	Post-Development 100 YR	100	0.282	12.000	4.45
BS-9	Post-Development 100 YR	100	0.423	12.000	6.60
CC-10	Post-Development 100 YR	100	8.756	12.150	91.86
CC-11	Post-Development 100 YR	100	1.960	12.050	28.14
CC-12	Post-Development 100 YR	100	1.411	12.100	18.67
CC-13A	Post-Development 100 YR	100	2.230	12.100	27.30
CC-13B	Post-Development 100 YR	100	2.947	12.100	36.07
CC-13C	Post-Development 100 YR	100	1.146	12.050	16.49
CC-13D	Post-Development 100 YR	100	2.175	12.050	29.20
CC-14	Post-Development 100 YR	100	0.532	12.050	7.76
CC-15	Post-Development 100 YR	100	1.481	12.050	20.37

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-16	Post-Development 100 YR	100	1.884	12.100	23.58
CC-17	Post-Development 100 YR	100	2.885	12.100	32.77
CC-18	Post-Development 100 YR	100	0.670	12.100	8.39
CC-19	Post-Development 100 YR	100	0.428	12.050	5.75
CC-1A	Post-Development 100 YR	100	1.134	12.050	15.97
CC-1B	Post-Development 100 YR	100	1.444	12.050	19.35
CC-20	Post-Development 100 YR	100	4.547	12.050	61.04
CC-21	Post-Development 100 YR	100	0.585	12.050	8.51
CC-22	Post-Development 100 YR	100	1.597	12.050	21.44
CC-23	Post-Development 100 YR	100	0.650	12.100	7.71
CC-24	Post-Development 100 YR	100	4.581	12.050	61.51
CC-25	Post-Development 100 YR	100	0.405	12.050	5.70
CC-26	Post-Development 100 YR	100	1.932	12.100	25.56
CC-27	Post-Development 100 YR	100	2.121	12.100	25.82
CC-28	Post-Development 100 YR	100	17.270	12.300	136.30
CC-2A	Post-Development 100 YR	100	1.273	12.050	18.32
CC-2B	Post-Development 100 YR	100	2.407	12.050	34.64
CC-2C	Post-Development 100 YR	100	0.742	12.050	11.50
CC-3	Post-Development 100 YR	100	5.511	12.150	54.50
CC-4A	Post-Development 100 YR	100	15.367	12.150	155.93
CC-4B	Post-Development 100 YR	100	1.493	12.050	20.60
CC-4C (Pre- Development)	Post-Development 100 YR	100	0.699	12.000	11.16
CC-5	Post-Development 100 YR	100	2.591	12.100	34.28
CC-6	Post-Development 100 YR	100	3.216	12.050	43.18

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
CC-7	Post-Development 100 YR	100	2.127	12.100	27.04
CC-8	Post-Development 100 YR	100	0.891	12.050	11.96
CC-9	Post-Development 100 YR	100	0.648	12.050	9.80
EX-24	Post-Development 100 YR	100	1.178	12.050	17.75
EX-DP-3 (Pre-Dev.)	Post-Development 100 YR	100	3.210	12.100	41.28
OS-10	Post-Development 100 YR	100	0.528	12.050	8.23
OS-11	Post-Development 100 YR	100	3.372	12.100	38.66
OS-12	Post-Development 100 YR	100	7.008	12.150	75.81
OS-13	Post-Development 100 YR	100	3.863	12.100	44.96
OS-14	Post-Development 100 YR	100	2.622	12.100	31.03
OS-15	Post-Development 100 YR	100	7.742	12.150	84.16
OS-16	Post-Development 100 YR	100	0.521	12.050	7.16
OS-17	Post-Development 100 YR	100	1.829	12.050	27.65
OS-18	Post-Development 100 YR	100	1.506	12.050	22.60
OS-1A	Post-Development 100 YR	100	0.510	12.050	7.65
OS-1B	Post-Development 100 YR	100	0.648	12.050	9.44
OS-2	Post-Development 100 YR	100	0.274	12.050	3.98
OS-3	Post-Development 100 YR	100	1.181	12.050	17.85
OS-4	Post-Development 100 YR	100	3.807	12.050	53.61
OS-5	Post-Development 100 YR	100	3.426	12.150	36.99
OS-6	Post-Development 100 YR	100	1.065	12.050	15.51
OS-7	Post-Development 100 YR	100	0.579	12.050	8.98
OS-8	Post-Development 100 YR	100	1.872	12.100	24.73
OS-9	Post-Development 100 YR	100	0.871	12.150	9.05

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-1	Post-Development 100 YR	100	0.764	12.050	11.13
DP-10	Post-Development 100 YR	100	11.054	12.050	143.30
DP-11	Post-Development 100 YR	100	2.975	12.100	35.70
DP-12	Post-Development 100 YR	100	3.754	12.100	44.11
DP-13	Post-Development 100 YR	100	16.350	12.250	139.15
DP-16	Post-Development 100 YR	100	30.220	12.100	361.52
DP-17	Post-Development 100 YR	100	30.083	12.300	255.78
DP-18	Post-Development 100 YR	100	9.471	12.100	115.49
DP-19	Post-Development 100 YR	100	13.817	12.100	125.58
DP-2	Post-Development 100 YR	100	2.416	12.050	34.63
DP-20	Post-Development 100 YR	100	8.142	12.100	88.44
DP-21	Post-Development 100 YR	100	5.136	12.100	61.96
DP-22	Post-Development 100 YR	100	7.540	12.100	92.42
DP-23	Post-Development 100 YR	100	8.133	12.150	84.40
DP-24	Post-Development 100 YR	100	3.290	12.050	44.82
DP-25	Post-Development 100 YR	100	5.764	12.300	32.88
DP-26	Post-Development 100 YR	100	9.647	12.150	101.89
DP-27	Post-Development 100 YR	100	6.028	12.050	81.42
DP-28	Post-Development 100 YR	100	9.972	12.150	110.17
DP-29	Post-Development 100 YR	100	14.023	12.150	154.97
DP-3	Post-Development 100 YR	100	4.441	12.100	38.98
DP-30	Post-Development 100 YR	100	0.670	12.100	8.39
DP-31	Post-Development 100 YR	100	1.098	12.100	13.88
DP-32	Post-Development 100 YR	100	3.406	12.100	39.76

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-33	Post-Development 100 YR	100	5.231	12.100	69.08
DP-34	Post-Development 100 YR	100	26.136	12.400	167.92
DP-4	Post-Development 100 YR	100	0.536	12.000	8.36
DP-5	Post-Development 100 YR	100	0.874	12.050	12.59
DP-6	Post-Development 100 YR	100	0.992	12.050	14.76
DP-7	Post-Development 100 YR	100	2.479	12.050	37.97
DP-8	Post-Development 100 YR	100	43.909	12.350	284.14
DP-9	Post-Development 100 YR	100	1.472	12.050	22.81
J-75	Post-Development 100 YR	100	22.558	12.250	180.87
O-100	Post-Development 100 YR	100	1.960	12.050	28.14
O-101	Post-Development 100 YR	100	2.175	12.050	29.20
O-102	Post-Development 100 YR	100	0.532	12.050	7.76
O-108	Post-Development 100 YR	100	2.182	12.050	29.95
O-110	Post-Development 100 YR	100	0.405	12.050	5.70
O-122	Post-Development 100 YR	100	0.405	12.050	6.29
O-125	Post-Development 100 YR	100	1.411	12.100	18.67
O-126	Post-Development 100 YR	100	17.508	12.150	178.97
O-127	Post-Development 100 YR	100	1.298	12.000	20.57
O-129	Post-Development 100 YR	100	3.426	12.150	36.99
O-137	Post-Development 100 YR	100	1.178	12.050	17.75
O-138	Post-Development 100 YR	100	3.210	12.100	41.28
O-73	Post-Development 100 YR	100	1.143	12.050	17.59
O-74	Post-Development 100 YR	100	1.263	12.050	17.27
O-75	Post-Development 100 YR	100	0.223	12.050	3.35

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
O-80	Post-Development 100 YR	100	0.858	12.050	11.80
O-81	Post-Development 100 YR	100	0.637	12.050	9.41
O-82	Post-Development 100 YR	100	1.016	12.050	15.33
O-86	Post-Development 100 YR	100	1.444	12.050	19.35
O-96	Post-Development 100 YR	100	0.742	12.050	11.50
O-98	Post-Development 100 YR	100	2.127	12.100	27.04

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Exist. HFR Pond 16 (IN)	Post-Development 100 YR	100	37.106	12.150	400.62	(N/A)	(N/A)
Exist. HFR Pond 16 (OUT)	Post-Development 100 YR	100	36.950	12.350	258.25	7,462.42	6.804
FH North Pond 1 (IN)	Post-Development 100 YR	100	2.793	12.050	38.16	(N/A)	(N/A)
FH North Pond 1 (OUT)	Post-Development 100 YR	100	2.517	12.250	20.41	7,394.10	0.769
FH North Pond 12 (IN)	Post-Development 100 YR	100	6.505	12.100	86.17	(N/A)	(N/A)
FH North Pond 12 (OUT)	Post-Development 100 YR	100	5.764	12.300	32.88	7,548.93	1.898
FH North Pond 4 (IN)	Post-Development 100 YR	100	17.420	12.100	217.23	(N/A)	(N/A)
FH North Pond 4 (OUT)	Post-Development 100 YR	100	16.350	12.250	139.15	7,428.27	3.872
FH North Pond 8 (IN)	Post-Development 100 YR	100	32.794	12.150	383.43	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (OUT)	Post-Development 100 YR	100	30.083	12.300	255.78	7,378.06	7.039
Golf Course Pond 6 (IN)	Post-Development 100 YR	100	17.962	12.100	215.40	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 100 YR	100	17.947	12.150	212.28	7,436.83	3.002
Golf Course Pond 7 (IN)	Post-Development 100 YR	100	21.391	12.100	253.17	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 100 YR	100	21.391	12.150	250.27	7,424.94	1.819

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
1.250	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.2	0.2	0.2
3.750	0.2	0.2	0.2	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.4
6.250	0.4	0.4	0.4	0.5	0.5
7.500	0.5	0.5	0.6	0.6	0.6
8.750	0.6	0.7	0.7	0.7	0.8
10.000	0.8	0.9	0.9	1.0	1.1
11.250	1.2	1.3	1.8	3.0	3.3
12.500	3.4	3.5	3.6	3.6	3.7
13.750	3.7	3.8	3.8	3.9	3.9
15.000	3.9	4.0	4.0	4.0	4.1
16.250	4.1	4.1	4.1	4.2	4.2
17.500	4.2	4.2	4.2	4.3	4.3
18.750	4.3	4.3	4.3	4.4	4.4
20.000	4.4	4.4	4.4	4.4	4.4
21.250	4.5	4.5	4.5	4.5	4.5
22.500	4.5	4.5	4.5	4.6	4.6
23.750	4.6	4.6	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 1

Return Event: 100 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,390.00	0.0000	0.004	0.000	0.000	0.000
7,392.00	0.0000	0.242	0.277	0.185	0.185
7,394.00	0.0000	0.311	0.827	0.552	0.736
7,396.00	0.0000	0.387	1.045	0.697	1.433

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 12

Return Event: 100 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,544.50	0.0000	0.002	0.000	0.000	0.000
7,546.00	0.0000	0.462	0.494	0.247	0.247
7,548.00	0.0000	0.600	1.588	1.059	1.306
7,550.00	0.0000	0.749	2.019	1.346	2.652
7,552.00	0.0000	0.905	2.477	1.652	4.304

Subsection: Elevation-Area Volume Curve
 Label: FH North Pond 4

Return Event: 100 years
 Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,421.50	0.0000	0.004	0.000	0.000	0.000
7,422.00	0.0000	0.004	0.012	0.002	0.002
7,424.00	0.0000	0.248	0.283	0.189	0.191
7,426.00	0.0000	0.981	1.722	1.148	1.339
7,428.00	0.0000	1.226	3.304	2.202	3.542
7,430.00	0.0000	1.432	3.983	2.655	6.197
7,432.00	0.0000	1.651	4.621	3.080	9.277

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.00	0.0000	0.009	0.000	0.000	0.000
7,370.00	0.0000	0.009	0.027	0.009	0.009
7,372.00	0.0000	0.415	0.485	0.323	0.332
7,374.00	0.0000	0.918	1.950	1.300	1.633
7,376.00	0.0000	1.411	3.467	2.311	3.944
7,378.00	0.0000	1.594	4.505	3.003	6.947
7,380.00	0.0000	1.788	5.070	3.380	10.327
7,382.00	0.0000	2.032	5.726	3.817	14.145

Subsection: Composite Rating Curve
Label: FH North Pond 1

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,390.00	0.00	(N/A)	0.00
7,390.50	0.21	(N/A)	0.00
7,391.00	0.42	(N/A)	0.00
7,391.50	0.63	(N/A)	0.00
7,392.00	0.84	(N/A)	0.00
7,392.50	1.05	(N/A)	0.00
7,392.75	1.15	(N/A)	0.00
7,393.00	2.70	(N/A)	0.00
7,393.50	9.09	(N/A)	0.00
7,394.00	18.16	(N/A)	0.00
7,394.50	29.05	(N/A)	0.00
7,395.00	41.22	(N/A)	0.00
7,395.50	47.14	(N/A)	0.00
7,396.00	48.76	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 12

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,544.50	0.00	(N/A)	0.00
7,545.00	0.09	(N/A)	0.00
7,545.50	0.19	(N/A)	0.00
7,546.00	0.28	(N/A)	0.00
7,546.50	0.37	(N/A)	0.00
7,546.75	0.42	(N/A)	0.00
7,547.00	1.93	(N/A)	0.00
7,547.50	8.19	(N/A)	0.00
7,548.00	17.12	(N/A)	0.00
7,548.50	27.99	(N/A)	0.00
7,549.00	33.62	(N/A)	0.00
7,549.50	35.86	(N/A)	0.00
7,550.00	37.97	(N/A)	0.00
7,550.50	39.96	(N/A)	0.00
7,551.00	41.87	(N/A)	0.00
7,551.50	43.69	(N/A)	0.00
7,552.00	45.43	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
 Label: FH North Pond 4

Return Event: 100 years
 Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,421.50	0.00	(N/A)	0.00
7,422.00	0.09	(N/A)	0.00
7,422.50	0.19	(N/A)	0.00
7,423.00	0.29	(N/A)	0.00
7,423.50	0.38	(N/A)	0.00
7,424.00	0.48	(N/A)	0.00
7,424.50	0.57	(N/A)	0.00
7,425.00	0.67	(N/A)	0.00
7,425.50	0.77	(N/A)	0.00
7,426.00	11.42	(N/A)	0.00
7,426.50	30.84	(N/A)	0.00
7,427.00	55.96	(N/A)	0.00
7,427.50	85.67	(N/A)	0.00
7,428.00	119.35	(N/A)	0.00
7,428.50	156.50	(N/A)	0.00
7,429.00	196.62	(N/A)	0.00
7,429.50	205.78	(N/A)	0.00
7,430.00	211.74	(N/A)	0.00
7,430.50	217.53	(N/A)	0.00
7,431.00	223.18	(N/A)	0.00
7,431.50	228.71	(N/A)	0.00
7,432.00	234.08	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Orifice - 1,Culvert - 1 (no Q: Riser - 1)
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Orifice - 1,Culvert - 1
 Riser - 1,Culvert - 1 (no Q: Orifice - 1)
 Riser - 1,Culvert - 1 (no Q: Orifice - 1)
 Riser - 1,Culvert - 1 (no Q: Orifice - 1)
 Riser - 1,Culvert - 1 (no Q: Orifice - 1)
 Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 4

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.00	0.00	(N/A)	0.00
7,369.25	0.00	(N/A)	0.00
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1,Orifice - 1,Culvert - 1)
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
(no Q: Riser - 1,Orifice - 1,Culvert - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)
Orifice - 1,Culvert - 1 (no Q: Riser - 1)

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 1

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,390.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,390.00	0.00	0.000	0.004	0.00	0.00	0.00
7,390.50	0.21	0.007	0.029	0.00	0.21	3.74
7,391.00	0.42	0.033	0.077	0.00	0.42	16.33
7,391.50	0.63	0.088	0.148	0.00	0.63	43.31
7,392.00	0.84	0.185	0.242	0.00	0.84	90.25
7,392.50	1.05	0.310	0.258	0.00	1.05	151.00
7,392.75	1.15	0.375	0.267	0.00	1.15	182.89
7,393.00	2.70	0.443	0.275	0.00	2.70	217.24
7,393.50	9.09	0.585	0.293	0.00	9.09	292.39
7,394.00	18.16	0.736	0.311	0.00	18.16	374.53
7,394.50	29.05	0.896	0.329	0.00	29.05	462.88
7,395.00	41.22	1.066	0.348	0.00	41.22	556.98
7,395.50	47.14	1.244	0.367	0.00	47.14	649.42
7,396.00	48.76	1.433	0.387	0.00	48.76	742.29

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 12

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,544.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,544.50	0.00	0.000	0.002	0.00	0.00	0.00
7,545.00	0.09	0.013	0.066	0.00	0.09	6.48
7,545.50	0.19	0.081	0.219	0.00	0.19	39.23
7,546.00	0.28	0.247	0.462	0.00	0.28	119.92
7,546.50	0.37	0.486	0.495	0.00	0.37	235.77
7,546.75	0.42	0.612	0.512	0.00	0.42	296.70
7,547.00	1.93	0.742	0.529	0.00	1.93	361.15
7,547.50	8.19	1.015	0.564	0.00	8.19	499.59
7,548.00	17.12	1.306	0.600	0.00	17.12	649.32
7,548.50	27.99	1.615	0.636	0.00	27.99	809.69
7,549.00	33.62	1.942	0.672	0.00	33.62	973.58
7,549.50	35.86	2.288	0.710	0.00	35.86	1,143.10
7,550.00	37.97	2.652	0.749	0.00	37.97	1,321.75
7,550.50	39.96	3.036	0.787	0.00	39.96	1,509.54
7,551.00	41.87	3.439	0.825	0.00	41.87	1,706.45
7,551.50	43.69	3.862	0.865	0.00	43.69	1,912.72
7,552.00	45.43	4.304	0.905	0.00	45.43	2,128.56

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 4

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,421.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,421.50	0.00	0.000	0.004	0.00	0.00	0.00
7,422.00	0.09	0.002	0.004	0.00	0.09	1.06
7,422.50	0.19	0.009	0.030	0.00	0.19	4.74
7,423.00	0.29	0.035	0.079	0.00	0.29	17.47
7,423.50	0.38	0.092	0.152	0.00	0.38	44.96
7,424.00	0.48	0.191	0.248	0.00	0.48	92.92
7,424.50	0.57	0.348	0.386	0.00	0.57	169.09
7,425.00	0.67	0.582	0.554	0.00	0.67	282.28
7,425.50	0.77	0.907	0.752	0.00	0.77	439.80
7,426.00	11.42	1.339	0.981	0.00	11.42	659.57
7,426.50	30.84	1.844	1.040	0.00	30.84	923.46
7,427.00	55.96	2.379	1.100	0.00	55.96	1,207.47
7,427.50	85.67	2.945	1.162	0.00	85.67	1,510.87
7,428.00	119.35	3.542	1.226	0.00	119.35	1,833.49
7,428.50	156.50	4.167	1.276	0.00	156.50	2,173.36
7,429.00	196.62	4.818	1.327	0.00	196.62	2,528.43
7,429.50	205.78	5.494	1.379	0.00	205.78	2,864.99
7,430.00	211.74	6.197	1.432	0.00	211.74	3,211.06
7,430.50	217.53	6.926	1.485	0.00	217.53	3,569.83
7,431.00	223.18	7.682	1.540	0.00	223.18	3,941.46
7,431.50	228.71	8.466	1.595	0.00	228.71	4,326.23
7,432.00	234.08	9.277	1.651	0.00	234.08	4,724.32

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.00	0.00	0.000	0.009	0.00	0.00	0.00
7,369.25	0.00	0.002	0.009	0.00	0.00	1.09
7,369.50	0.00	0.004	0.009	0.00	0.00	2.18
7,370.00	0.12	0.009	0.009	0.00	0.12	4.47
7,370.50	0.23	0.023	0.054	0.00	0.23	11.44
7,371.00	0.35	0.069	0.137	0.00	0.35	33.85
7,371.50	0.47	0.166	0.257	0.00	0.47	80.81
7,372.00	0.58	0.332	0.415	0.00	0.58	161.47
7,372.50	0.69	0.566	0.522	0.00	0.69	274.74
7,373.00	0.81	0.857	0.642	0.00	0.81	415.47
7,373.50	0.92	1.210	0.774	0.00	0.92	586.62
7,374.00	1.04	1.633	0.918	0.00	1.04	791.20
7,374.50	1.15	2.120	1.031	0.00	1.15	1,027.05
7,374.75	1.21	2.385	1.091	0.00	1.21	1,155.47
7,375.00	7.17	2.665	1.151	0.00	7.17	1,297.03
7,375.50	32.24	3.272	1.278	0.00	32.24	1,615.90
7,376.00	68.01	3.944	1.411	0.00	68.01	1,976.89
7,376.50	112.00	4.661	1.456	0.00	112.00	2,367.74
7,377.00	162.75	5.400	1.501	0.00	162.75	2,776.25
7,377.50	219.40	6.162	1.547	0.00	219.40	3,201.72
7,378.00	254.44	6.947	1.594	0.00	254.44	3,616.84
7,378.50	266.12	7.756	1.641	0.00	266.12	4,020.00
7,379.00	277.33	8.589	1.690	0.00	277.33	4,434.25
7,379.50	288.06	9.446	1.738	0.00	288.06	4,859.76
7,380.00	298.45	10.327	1.788	0.00	298.45	5,296.84
7,380.50	308.47	11.236	1.848	0.00	308.47	5,746.74
7,381.00	318.15	12.175	1.908	0.00	318.15	6,210.82
7,381.50	327.59	13.144	1.970	0.00	327.59	6,689.43
7,382.00	336.74	14.145	2.032	0.00	336.74	7,182.75

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Project Summary

Title	Flying Horse North Filing No.1
Engineer	MAW
Company	CCES
Date	11/20/2017

Notes	2 Year (Filing 1 Only)
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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-18	Post-Development 2 YR (Filing 1 Only)	2	0.494	12.100	3.42
BS-19	Post-Development 2 YR (Filing 1 Only)	2	0.161	12.050	2.08
BS-20	Post-Development 2 YR (Filing 1 Only)	2	0.532	14.350	1.14
BS-21	Post-Development 2 YR (Filing 1 Only)	2	0.840	12.300	3.20
BS-22	Post-Development 2 YR (Filing 1 Only)	2	0.207	12.100	1.05
BS-23	Post-Development 2 YR (Filing 1 Only)	2	0.626	12.200	4.08
BS-23A	Post-Development 2 YR (Filing 1 Only)	2	0.174	12.250	0.64

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-16	Post-Development 2 YR (Filing 1 Only)	2	2.856	12.150	11.61
DP-17	Post-Development 2 YR (Filing 1 Only)	2	0.989	24.000	1.13

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (IN)	Post-Development 2 YR (Filing 1 Only)	2	3.026	12.200	12.12	(N/A)	(N/A)
FH North Pond 8 (OUT)	Post-Development 2 YR (Filing 1 Only)	2	0.989	24.000	1.13	7,374.42	2.034
Golf Course Pond 6 (IN)	Post-Development 2 YR (Filing 1 Only)	2	1.372	12.350	4.24	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 2 YR (Filing 1 Only)	2	1.370	12.400	4.18	7,436.02	2.471

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Golf Course Pond 7 (IN)	Post-Development 2 YR (Filing 1 Only)	2	1.738	12.350	5.39	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 2 YR (Filing 1 Only)	2	1.738	12.350	5.35	7,424.03	1.453

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.0	0.0	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.1	0.1
5.000	0.1	0.1	0.2	0.2	0.2
6.250	0.2	0.2	0.2	0.2	0.2
7.500	0.2	0.2	0.3	0.3	0.3
8.750	0.3	0.3	0.3	0.3	0.4
10.000	0.4	0.4	0.4	0.5	0.5
11.250	0.5	0.6	0.8	1.4	1.5
12.500	1.5	1.6	1.6	1.7	1.7
13.750	1.7	1.7	1.8	1.8	1.8
15.000	1.8	1.8	1.8	1.9	1.9
16.250	1.9	1.9	1.9	1.9	1.9
17.500	1.9	1.9	1.9	1.9	2.0
18.750	2.0	2.0	2.0	2.0	2.0
20.000	2.0	2.0	2.0	2.0	2.0
21.250	2.0	2.0	2.0	2.1	2.1
22.500	2.1	2.1	2.1	2.1	2.1
23.750	2.1	2.1	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1+A2+sqr (A1*A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.50	0.000	0.009	0.000	0.000	0.000
7,370.00	0.000	0.009	0.027	0.004	0.004
7,372.00	0.000	0.415	0.485	0.323	0.328
7,374.00	0.000	0.918	1.950	1.300	1.628
7,376.00	0.000	1.411	3.467	2.311	3.939
7,378.00	0.000	1.594	4.505	3.003	6.943
7,380.00	0.000	1.788	5.070	3.380	10.323
7,382.00	0.000	2.032	5.726	3.817	14.140

Subsection: Composite Rating Curve
 Label: FH North Pond 8

Return Event: 2 years
 Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1, Orifice - 1, Culvert - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Orifice - 1, Culvert - 1 (no Q: Riser - 1)
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1
 Riser - 1, Orifice - 1, Culvert - 1

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Orifice - 1,Culvert - 1
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)
Riser - 1,Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 2 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.50	0.00	0.000	0.009	0.00	0.00	0.00
7,370.00	0.12	0.004	0.009	0.00	0.12	2.30
7,370.50	0.23	0.019	0.054	0.00	0.23	9.26
7,371.00	0.35	0.065	0.137	0.00	0.35	31.67
7,371.50	0.47	0.162	0.257	0.00	0.47	78.63
7,372.00	0.58	0.328	0.415	0.00	0.58	159.29
7,372.50	0.69	0.562	0.522	0.00	0.69	272.56
7,373.00	0.81	0.852	0.642	0.00	0.81	413.29
7,373.50	0.92	1.206	0.774	0.00	0.92	584.45
7,374.00	1.04	1.628	0.918	0.00	1.04	789.02
7,374.50	1.15	2.115	1.031	0.00	1.15	1,024.87
7,374.75	1.21	2.380	1.091	0.00	1.21	1,153.29
7,375.00	7.17	2.661	1.151	0.00	7.17	1,294.86
7,375.50	32.24	3.268	1.278	0.00	32.24	1,613.72
7,376.00	68.01	3.939	1.411	0.00	68.01	1,974.71
7,376.50	112.00	4.656	1.456	0.00	112.00	2,365.56
7,377.00	162.75	5.395	1.501	0.00	162.75	2,774.07
7,377.50	219.40	6.157	1.547	0.00	219.40	3,199.55
7,378.00	254.44	6.943	1.594	0.00	254.44	3,614.66
7,378.50	266.12	7.751	1.641	0.00	266.12	4,017.82
7,379.00	277.33	8.584	1.690	0.00	277.33	4,432.07
7,379.50	288.06	9.441	1.738	0.00	288.06	4,857.58
7,380.00	298.45	10.323	1.788	0.00	298.45	5,294.67
7,380.50	308.47	11.232	1.848	0.00	308.47	5,744.56
7,381.00	318.15	12.170	1.908	0.00	318.15	6,208.65
7,381.50	327.59	13.140	1.970	0.00	327.59	6,687.26
7,382.00	336.74	14.140	2.032	0.00	336.74	7,180.58

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Project Summary

Title	Flying Horse North Filing No.1
Engineer	MAW
Company	CCES
Date	11/20/2017

Notes	5 Year (Filing 1 Only)
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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-18	Post-Development 5 YR (Filing 1 Only)	5	1.112	12.100	12.24
BS-19	Post-Development 5 YR (Filing 1 Only)	5	0.312	12.050	4.62
BS-20	Post-Development 5 YR (Filing 1 Only)	5	1.513	12.150	9.35
BS-21	Post-Development 5 YR (Filing 1 Only)	5	2.002	12.250	13.46
BS-22	Post-Development 5 YR (Filing 1 Only)	5	0.502	12.100	5.15
BS-23	Post-Development 5 YR (Filing 1 Only)	5	1.353	12.150	12.91
BS-23A	Post-Development 5 YR (Filing 1 Only)	5	0.432	12.150	3.28

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-16	Post-Development 5 YR (Filing 1 Only)	5	6.787	12.150	47.28
DP-17	Post-Development 5 YR (Filing 1 Only)	5	4.742	13.600	10.89

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (IN)	Post-Development 5 YR (Filing 1 Only)	5	7.213	12.200	49.73	(N/A)	(N/A)
FH North Pond 8 (OUT)	Post-Development 5 YR (Filing 1 Only)	5	4.742	13.600	10.89	7,375.07	2.747
Golf Course Pond 6 (IN)	Post-Development 5 YR (Filing 1 Only)	5	3.515	12.200	22.52	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 5 YR (Filing 1 Only)	5	3.510	12.250	21.92	7,436.11	2.529

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Golf Course Pond 7 (IN)	Post-Development 5 YR (Filing 1 Only)	5	4.324	12.200	26.09	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 5 YR (Filing 1 Only)	5	4.325	12.250	26.02	7,424.14	1.493

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	5 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
1.250	0.0	0.0	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.750	0.1	0.1	0.1	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
6.250	0.2	0.2	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.4
8.750	0.4	0.4	0.4	0.4	0.5
10.000	0.5	0.5	0.5	0.6	0.6
11.250	0.7	0.8	1.0	1.8	1.9
12.500	2.0	2.0	2.1	2.1	2.2
13.750	2.2	2.2	2.3	2.3	2.3
15.000	2.3	2.3	2.3	2.4	2.4
16.250	2.4	2.4	2.4	2.4	2.5
17.500	2.5	2.5	2.5	2.5	2.5
18.750	2.5	2.5	2.5	2.6	2.6
20.000	2.6	2.6	2.6	2.6	2.6
21.250	2.6	2.6	2.6	2.6	2.6
22.500	2.7	2.7	2.7	2.7	2.7
23.750	2.7	2.7	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1 + A2 + sq (A1 * A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.50	0.000	0.009	0.000	0.000	0.000
7,370.00	0.000	0.009	0.027	0.004	0.004
7,372.00	0.000	0.415	0.485	0.323	0.328
7,374.00	0.000	0.918	1.950	1.300	1.628
7,376.00	0.000	1.411	3.467	2.311	3.939
7,378.00	0.000	1.594	4.505	3.003	6.943
7,380.00	0.000	1.788	5.070	3.380	10.323
7,382.00	0.000	2.032	5.726	3.817	14.140

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1, Orifice - 1, Culvert - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 5 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.50	0.00	0.000	0.009	0.00	0.00	0.00
7,370.00	0.12	0.004	0.009	0.00	0.12	2.30
7,370.50	0.23	0.019	0.054	0.00	0.23	9.26
7,371.00	0.35	0.065	0.137	0.00	0.35	31.67
7,371.50	0.47	0.162	0.257	0.00	0.47	78.63
7,372.00	0.58	0.328	0.415	0.00	0.58	159.29
7,372.50	0.69	0.562	0.522	0.00	0.69	272.56
7,373.00	0.81	0.852	0.642	0.00	0.81	413.29
7,373.50	0.92	1.206	0.774	0.00	0.92	584.45
7,374.00	1.04	1.628	0.918	0.00	1.04	789.02
7,374.50	1.15	2.115	1.031	0.00	1.15	1,024.87
7,374.75	1.21	2.380	1.091	0.00	1.21	1,153.29
7,375.00	7.17	2.661	1.151	0.00	7.17	1,294.86
7,375.50	32.24	3.268	1.278	0.00	32.24	1,613.72
7,376.00	68.01	3.939	1.411	0.00	68.01	1,974.71
7,376.50	112.00	4.656	1.456	0.00	112.00	2,365.56
7,377.00	162.75	5.395	1.501	0.00	162.75	2,774.07
7,377.50	219.40	6.157	1.547	0.00	219.40	3,199.55
7,378.00	254.44	6.943	1.594	0.00	254.44	3,614.66
7,378.50	266.12	7.751	1.641	0.00	266.12	4,017.82
7,379.00	277.33	8.584	1.690	0.00	277.33	4,432.07
7,379.50	288.06	9.441	1.738	0.00	288.06	4,857.58
7,380.00	298.45	10.323	1.788	0.00	298.45	5,294.67
7,380.50	308.47	11.232	1.848	0.00	308.47	5,744.56
7,381.00	318.15	12.170	1.908	0.00	318.15	6,208.65
7,381.50	327.59	13.140	1.970	0.00	327.59	6,687.26
7,382.00	336.74	14.140	2.032	0.00	336.74	7,180.58

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FH North Pond 8 (Elevation-Volume-Flow Table (Pond), 5 years)...8

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Master Network Summary...2, 3

Project Summary

Title	Flying Horse North Filing No. 1
Engineer	MAW
Company	CCES
Date	11/20/2017

Notes	100 Year (Filing 1 Only)
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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
BS-18	Post-Development 100 YR (Filing 1 Only)	100	4.033	12.050	55.75
BS-19	Post-Development 100 YR (Filing 1 Only)	100	0.955	12.050	14.95
BS-20	Post-Development 100 YR (Filing 1 Only)	100	6.797	12.100	76.94
BS-21	Post-Development 100 YR (Filing 1 Only)	100	7.687	12.200	75.52
BS-22	Post-Development 100 YR (Filing 1 Only)	100	1.962	12.050	27.95
BS-23	Post-Development 100 YR (Filing 1 Only)	100	4.695	12.100	56.90
BS-23A	Post-Development 100 YR (Filing 1 Only)	100	1.722	12.100	19.56

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)
DP-16	Post-Development 100 YR (Filing 1 Only)	100	26.105	12.100	278.35
DP-17	Post-Development 100 YR (Filing 1 Only)	100	25.124	12.350	197.59

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
FH North Pond 8 (IN)	Post-Development 100 YR (Filing 1 Only)	100	27.812	12.150	297.19	(N/A)	(N/A)
FH North Pond 8 (OUT)	Post-Development 100 YR (Filing 1 Only)	100	25.124	12.350	197.59	7,377.31	5.861

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft ³ /s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Golf Course Pond 6 (IN)	Post-Development 100 YR (Filing 1 Only)	100	14.484	12.150	149.77	(N/A)	(N/A)
Golf Course Pond 6 (OUT)	Post-Development 100 YR (Filing 1 Only)	100	14.470	12.150	147.51	7,436.65	2.876
Golf Course Pond 7 (IN)	Post-Development 100 YR (Filing 1 Only)	100	17.387	12.150	176.39	(N/A)	(N/A)
Golf Course Pond 7 (OUT)	Post-Development 100 YR (Filing 1 Only)	100	17.388	12.150	177.48	7,424.73	1.731

Subsection: Time-Depth Curve
Label: Colo Springs 2015

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Time-Depth Curve: TYPE II 24 HOUR

Label	TYPE II 24 HOUR
Start Time	0.000 hours
Increment	0.250 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)

Output Time Increment = 0.250 hours

Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.1
1.250	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.2	0.2	0.2
3.750	0.2	0.2	0.2	0.3	0.3
5.000	0.3	0.3	0.3	0.3	0.4
6.250	0.4	0.4	0.4	0.5	0.5
7.500	0.5	0.5	0.6	0.6	0.6
8.750	0.6	0.7	0.7	0.7	0.8
10.000	0.8	0.9	0.9	1.0	1.1
11.250	1.2	1.3	1.8	3.0	3.3
12.500	3.4	3.5	3.6	3.6	3.7
13.750	3.7	3.8	3.8	3.9	3.9
15.000	3.9	4.0	4.0	4.0	4.1
16.250	4.1	4.1	4.1	4.2	4.2
17.500	4.2	4.2	4.2	4.3	4.3
18.750	4.3	4.3	4.3	4.4	4.4
20.000	4.4	4.4	4.4	4.4	4.4
21.250	4.5	4.5	4.5	4.5	4.5
22.500	4.5	4.5	4.5	4.6	4.6
23.750	4.6	4.6	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Area Volume Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Elevation (ft)	Planimeter (ft ²)	Area (acres)	A1 + A2 + sq (A1 * A2) (acres)	Volume (ac-ft)	Volume (Total) (ac-ft)
7,369.50	0.000	0.009	0.000	0.000	0.000
7,370.00	0.000	0.009	0.027	0.004	0.004
7,372.00	0.000	0.415	0.485	0.323	0.328
7,374.00	0.000	0.918	1.950	1.300	1.628
7,376.00	0.000	1.411	3.467	2.311	3.939
7,378.00	0.000	1.594	4.505	3.003	6.943
7,380.00	0.000	1.788	5.070	3.380	10.323
7,382.00	0.000	2.032	5.726	3.817	14.140

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft ³ /s)	Tailwater Elevation (ft)	Convergence Error (ft)
7,369.50	0.00	(N/A)	0.00
7,370.00	0.12	(N/A)	0.00
7,370.50	0.23	(N/A)	0.00
7,371.00	0.35	(N/A)	0.00
7,371.50	0.47	(N/A)	0.00
7,372.00	0.58	(N/A)	0.00
7,372.50	0.69	(N/A)	0.00
7,373.00	0.81	(N/A)	0.00
7,373.50	0.92	(N/A)	0.00
7,374.00	1.04	(N/A)	0.00
7,374.50	1.15	(N/A)	0.00
7,374.75	1.21	(N/A)	0.00
7,375.00	7.17	(N/A)	0.00
7,375.50	32.24	(N/A)	0.00
7,376.00	68.01	(N/A)	0.00
7,376.50	112.00	(N/A)	0.00
7,377.00	162.75	(N/A)	0.00
7,377.50	219.40	(N/A)	0.00
7,378.00	254.44	(N/A)	0.00
7,378.50	266.12	(N/A)	0.00
7,379.00	277.33	(N/A)	0.00
7,379.50	288.06	(N/A)	0.00
7,380.00	298.45	(N/A)	0.00
7,380.50	308.47	(N/A)	0.00
7,381.00	318.15	(N/A)	0.00
7,381.50	327.59	(N/A)	0.00
7,382.00	336.74	(N/A)	0.00

Contributing Structures

(no Q: Riser - 1, Orifice - 1, Culvert - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Orifice - 1, Culvert - 1 (no Q: Riser - 1)
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1

Subsection: Composite Rating Curve
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Composite Outflow Summary

Contributing Structures
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Orifice - 1, Culvert - 1
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)
Riser - 1, Culvert - 1 (no Q: Orifice - 1)

Subsection: Elevation-Volume-Flow Table (Pond)
Label: FH North Pond 8

Return Event: 100 years
Storm Event: TYPE II 24 HOUR

Infiltration	
Infiltration Method (Computed)	No Infiltration
Initial Conditions	
Elevation (Water Surface, Initial)	7,369.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft ³ /s
Flow (Initial Infiltration)	0.00 ft ³ /s
Flow (Initial, Total)	0.00 ft ³ /s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft ³ /s)	Storage (ac-ft)	Area (acres)	Infiltration (ft ³ /s)	Flow (Total) (ft ³ /s)	2S/t + O (ft ³ /s)
7,369.50	0.00	0.000	0.009	0.00	0.00	0.00
7,370.00	0.12	0.004	0.009	0.00	0.12	2.30
7,370.50	0.23	0.019	0.054	0.00	0.23	9.26
7,371.00	0.35	0.065	0.137	0.00	0.35	31.67
7,371.50	0.47	0.162	0.257	0.00	0.47	78.63
7,372.00	0.58	0.328	0.415	0.00	0.58	159.29
7,372.50	0.69	0.562	0.522	0.00	0.69	272.56
7,373.00	0.81	0.852	0.642	0.00	0.81	413.29
7,373.50	0.92	1.206	0.774	0.00	0.92	584.45
7,374.00	1.04	1.628	0.918	0.00	1.04	789.02
7,374.50	1.15	2.115	1.031	0.00	1.15	1,024.87
7,374.75	1.21	2.380	1.091	0.00	1.21	1,153.29
7,375.00	7.17	2.661	1.151	0.00	7.17	1,294.86
7,375.50	32.24	3.268	1.278	0.00	32.24	1,613.72
7,376.00	68.01	3.939	1.411	0.00	68.01	1,974.71
7,376.50	112.00	4.656	1.456	0.00	112.00	2,365.56
7,377.00	162.75	5.395	1.501	0.00	162.75	2,774.07
7,377.50	219.40	6.157	1.547	0.00	219.40	3,199.55
7,378.00	254.44	6.943	1.594	0.00	254.44	3,614.66
7,378.50	266.12	7.751	1.641	0.00	266.12	4,017.82
7,379.00	277.33	8.584	1.690	0.00	277.33	4,432.07
7,379.50	288.06	9.441	1.738	0.00	288.06	4,857.58
7,380.00	298.45	10.323	1.788	0.00	298.45	5,294.67
7,380.50	308.47	11.232	1.848	0.00	308.47	5,744.56
7,381.00	318.15	12.170	1.908	0.00	318.15	6,208.65
7,381.50	327.59	13.140	1.970	0.00	327.59	6,687.26
7,382.00	336.74	14.140	2.032	0.00	336.74	7,180.58

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FH North Pond 8 (Composite Rating Curve, 100 years)...6, 7

FH North Pond 8 (Elevation-Area Volume Curve, 100 years)...5

FH North Pond 8 (Elevation-Volume-Flow Table (Pond), 100 years)...8

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Master Network Summary...2, 3

DRAINAGE MAP

Runoff is now concentrated flow. Analyze and discuss the results/recommendations in the narrative. It seems that erosion will occur, a swale may be required within a drainage easement. For this particular location the swale would connect to the pond with a rundown and a trickle channel to the outlet structure.

Review all other culvert locations regarding the above comment.

Show the 100yr spread from DP3. Is the natural swale sufficient to keep the runoff from draining into Pond 1?

Q2(IN) = 3 CFS
Q2(OUT) = 0.1 CFS
Q5(IN) = 9 CFS
Q5(OUT) = 0.2 CFS
Q100(IN) = 38 CFS
Q100(OUT) = 25 CFS
VOLUME = 0.99 AC.-FT.
SITE RELEASE AT DP-3
Q2(DEV) = 1 CFS
Q2(EX) = 0.5 CFS
Q5(DEV) = 6 CFS
Q5(EX) = 5 CFS
Q100(DEV) = 39 CFS
Q100(EX) = 41 CFS
EXIST. 48" CMP CULVERT
EXIST. DUAL 18" ERCP CULVERTS TO BE RELOCATED WITH HWY. 83 IMP.

Is this an existing culvert?

Same label

Is this supposed to be BS-2 per pg 4?

SHAMROCK RANCH UNPLATTED NO DEVELOPMENT PLANNED AT THIS TIME

BASIN SUMMARY - DEVELOPED CONDITIONS

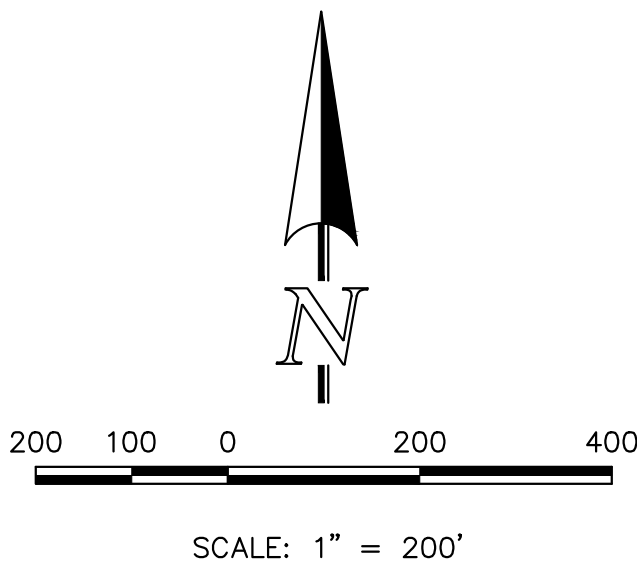
BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-1A	4.40	61.0	0.20	0.4	1.6	7.7
OS-1B	5.60	61.0	0.21	0.5	1.9	9.4
EX-DP-3 (Pre-Dev.)	36.00	60.0	0.25	0.5	4.8	41.3
OS-2	2.90	61.0	0.20	0.1	0.6	4.0
OS-3	10.20	65.0	0.19	1.0	3.8	17.9
OS-4	32.90	65.0	0.23	2.8	11.2	53.6
OS-5	29.70	65.0	0.39	1.9	7.1	37.0
OS-6	9.20	65.0	0.21	0.9	3.2	15.5
OS-7	5.00	65.0	0.18	0.5	2.0	9.0
BS-1A	3.50	65.0	0.17	0.4	1.4	6.3
BS-1B	8.90	65.0	0.20	0.4	2.4	13.8
BS-2	1.90	89.0	0.35	2.9	4.2	8.4
BS-2A	0.80	89.0	0.13	1.2	1.8	3.5
BS-2B	0.90	89.0	0.12	1.4	2.0	4.0
BS-3	6.20	65.0	0.20	0.6	2.3	10.8
BS-4	13.00	67.0	0.23	1.9	5.5	23.6
BS-5	11.20	65.0	0.18	1.1	4.4	20.1
BS-6	1.20	89.0	0.09	1.9	2.8	5.4
BS-7	2.90	65.0	0.13	4.4	6.4	12.8
BS-8	1.00	89.0	0.12	1.6	2.2	4.5
BS-9	1.50	89.0	0.13	2.3	3.3	6.6
BS-10	4.50	65.0	0.24	6.0	8.7	17.5
BS-11	0.90	89.0	0.08	1.5	2.1	4.1
BS-12	7.70	65.0	0.19	0.8	3.0	13.8

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-1 DEV	OS-1A, BS-2B	1.6	3.4	11
DP-2 DEV	DP-1, BS-4	3.2	8.8	35
TOTAL INFLOW TO FHN POND 1	DP-1, DP-2, BS-1A	3	9	38
DP-3 DEV	OS-2, BS-3, BS-1B, Release from FHN Pond 1	1	6	39
DP-4 DEV	BS-2	2.9	4.2	8
DP-5 DEV	OS-1B, BS-2A	1.5	3.5	13
DP-6 DEV	OS-2, BS-3	0.6	2.8	15
DP-7 DEV	OS-3, BS-5	2.1	8.2	38
DP-8 DEV	OS-4, OS-5, OS-6, BS-7, BS-10, Release from Exist. HFR Pond 16	20.9	70.4	284
DP-9 DEV	OS-7, BS-12	1.3	5.0	23

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY BLACK SQUIRREL	---
DESIGN POINT	3
BASIN IDENTIFIER	BB 10.0
AREA IN ACRES	→
EXISTING DIRECTION OF FLOW	→
PROPOSED DIRECTION OF FLOW	→
STORM SEWER	---
FILING NO. 1 PLAT AREA	---



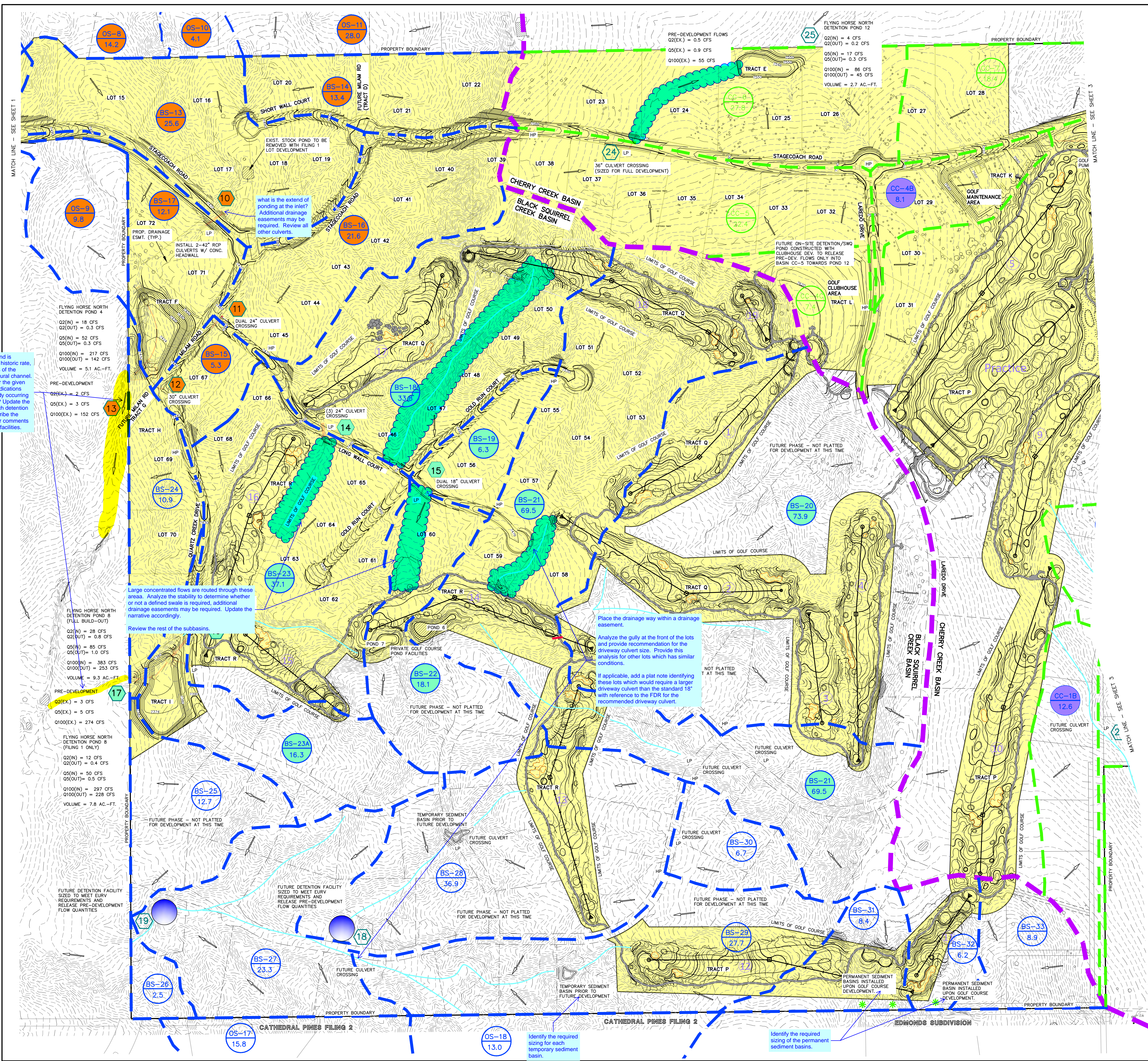
618 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903

(719) 785-0790
(719) 785-0799 (Fax)

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FILING NO. 1 DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	10-20-17
DRAWN BY	MAW	(H) 1" = 200'	SHEET	1 OF 4
CHECKED BY	(V) 1" = N/A	JOB NO.	1096.11	





BASIN SUMMARY - DEVELOPED CONDITIONS

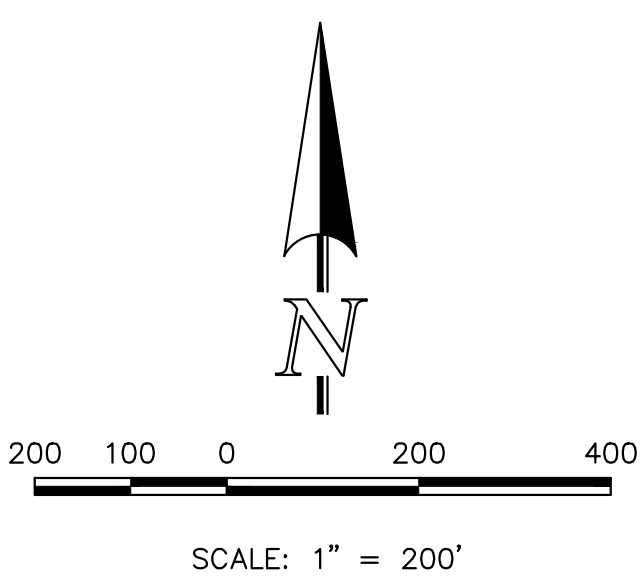
BASIN	AREA	COMPOSITE	TOTAL	Q	Q	Q
(Name)	(Acres)	CN	LAG TIME	2 Yr.	5 Yr.	100 Yr.
			(Hours)	(cfs)	(cfs)	(cfs)
OS-8	14.20	65.0	0.27	2.1	8.2	24.7
OS-9	9.80	60.0	0.37	0.1	1.0	9.1
OS-10	4.10	65.0	0.17	0.7	2.1	8.2
OS-11	28.00	65.0	0.35	2.4	8.2	38.7
OS-12	68.10	62.7	0.37	2.3	11.9	75.8
OS-13	36.90	63.0	0.33	1.4	7.4	45.0
OS-14	26.40	62.0	0.31	0.7	4.5	31.0
OS-15	70.80	63.9	0.38	3.3	14.8	84.2
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6
BS-13	25.50	65.0	0.23	3.7	10.2	40.7
BS-14	13.40	65.0	0.23	2.8	8.8	26.5
BS-15	5.30	65.0	0.18	1.6	3.7	12.2
BS-16	21.60	65.0	0.34	4.6	11.8	44.1
BS-17	12.10	65.0	0.21	3.1	7.7	28.7
BS-18	33.80	63.6	0.41	3.5	12.4	56.0
BS-19	4.30	65.0	0.18	2.1	4.6	15.0
BS-20	73.90	63.4	0.31	7.4	24.6	112.4
BS-21	69.50	64.3	0.35	7.8	23.9	103.0
BS-22	18.10	64.4	0.22	3.7	9.6	36.5
BS-23	37.10	63.3	0.33	4.5	13.6	58.2
BS-23A	16.30	64.4	0.29	5.5	12.0	38.3
BS-24	10.90	63.0	0.17	0.6	3.3	17.6
EX-24 (Pre-Dev.)	13.20	60.0	0.17	0.2	2.2	17.8
BS-25	12.70	63.0	0.23	0.4	2.7	17.3
BS-26	2.50	60.0	0.18	0.0	0.4	3.4
BS-27	23.30	65.0	0.22	2.1	8.0	38.8
BS-28	36.90	64.4	0.32	2.2	9.3	49.4
BS-29	27.70	64.0	0.33	1.4	6.5	35.9
BS-30	4.70	65.0	0.20	0.7	2.4	11.7
BS-31	8.40	62.5	0.23	0.3	1.9	11.8
BS-32	6.20	62.6	0.20	0.3	1.6	9.4
BS-33	8.90	64.7	0.19	0.8	3.2	15.3
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6
CC-2C	4.40	65.0	0.18	0.7	2.5	11.5
CC-3	52.50	63.1	0.43	1.8	8.8	54.5
CC-4A	108.70	62.6	0.44	15.4	38.0	156.0
CC-4B	8.10	78.1	0.26	4.0	7.3	20.6
CC-4C (Pre-Dev.)	7.40	61.0	0.13	0.2	1.8	11.2
CC-5	22.40	65.0	0.28	1.8	7.1	34.3
CC-6	27.80	65.0	0.25	2.3	9.1	43.2
CC-7	16.40	65.0	0.29	1.4	5.4	27.0

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point	Contributing Basins	Q	Q	Q
(Label)		2 Yr.	5 Yr.	100 Yr.
		Q (cfs)	Q (cfs)	Q (cfs)
DP-10 DEV	OS-8, OS-10, OS-11, BS-13, BS-14	10.7	32.0	143
DP-11 DEV	BS-16	4.6	11.8	36
DP-12 DEV	DP-11, BS-15	4.0	11.0	44
TOTAL INFLOW TO FHN POND 4	DP-10, DP-12, BS-17, OS-9	18	52	217
DP-13 DEV	Release from FHN Pond 4	0.3	0.3	142
DP-14 DEV	BS-18	3.5	12.4	56
DP-15 DEV	BS-19	2.1	4.6	15
DP-16 DEV	DP-14, DP-15, BS-20, BS-21, BS-22, BS-23	25.0	78.0	362
TOTAL INFLOW TO FHN POND 8 (Full Build-out)	DP-10, DP-12, BS-17, OS-9	28	85	383
DP-17 DEV (Full Build-out)	Release from FHN Pond 8	0.8	1.0	253
TOTAL INFLOW TO FHN POND 8 (Filling 1 Only)	DP-10, DP-12, BS-17, OS-9	12	50	297
DP-17 DEV (Filling 1 Only)	Release from FHN Pond 8	0.4	0.5	228
DP-18 DEV	BS-28, BS-29, BS-30, OS-18	5.0	21.6	115
DP-19 DEV	BS-27, OS-17, Release from DP-18	3.8	16.8	126
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev.), CC-5	1.9	8.4	45
TOTAL INFLOW TO FHN POND 12	CC-4C, CC-5, CC-6	4	17	86
DP-25 DEV	Release from FHN Pond 12	0.2	0.3	45

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY EAST CHERRY CREEK	---
MAJOR BASIN BOUNDARY	---
BASIN BOUNDARY BLACK SQUIRREL	---
DESIGN POINT	3
BASIN IDENTIFIER	BB
AREA IN ACRES	10.0
EXISTING DIRECTION OF FLOW	→
PROPOSED DIRECTION OF FLOW	→
STORM SEWER	---
FILING NO. 1 PLAT AREA	---



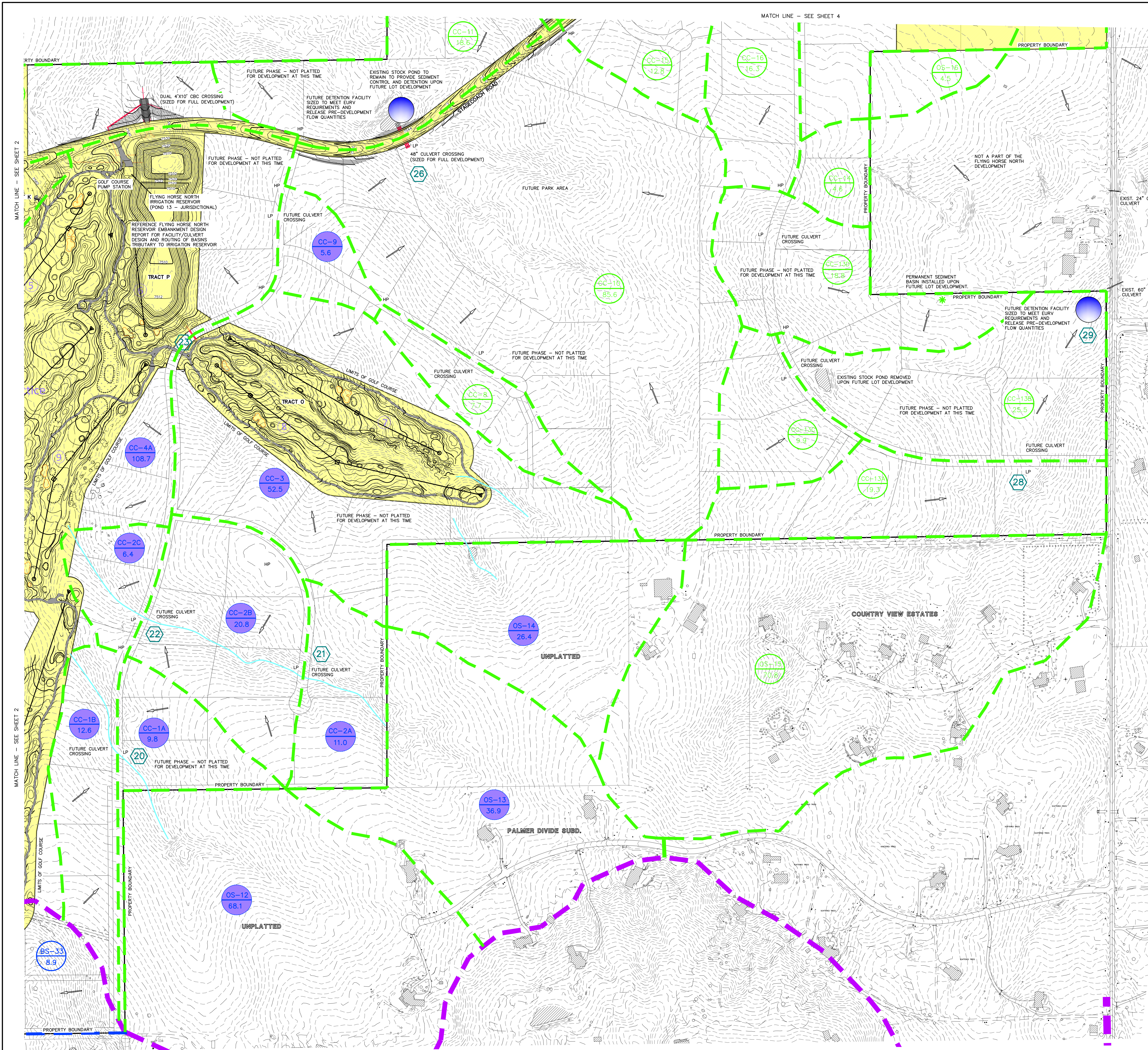
619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FILING NO. 1 DRAINAGE MAP

DESIGNED BY: MAW
DRAWN BY: MAW
CHECKED BY:

SCALE: (H) 1" = 200'
(V) 1" = N/A

DATE: 10-25-17
SHEET: 2 OF 4
JOB NO.: 1096.11



BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-8	14.20	65.0	0.27	2.1	6.2	24.7
OS-9	9.80	60.0	0.37	0.1	1.0	9.1
OS-10	4.10	65.0	0.17	0.7	2.1	8.2
OS-11	28.00	65.0	0.35	2.4	8.2	38.7
OS-12	68.10	62.7	0.37	2.2	11.9	75.8
OS-13	36.90	63.0	0.33	1.4	7.4	45.0
OS-14	26.40	62.0	0.31	0.7	4.6	31.0
OS-15	70.80	63.9	0.38	3.3	14.8	84.2
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6
CC-1A	9.80	65.0	0.23	0.8	3.3	16.0
CC-1B	12.60	64.8	0.25	1.0	4.0	19.4
CC-2A	11.00	65.0	0.22	1.0	3.8	18.3
CC-2B	20.80	65.0	0.22	1.9	7.1	34.6
CC-2C	6.40	65.0	0.18	0.7	2.5	11.5
CC-3	52.50	63.1	0.43	1.8	8.8	54.5
CC-4A	108.70	62.6	0.44	15.4	39.0	156.0
CC-4B	8.10	76.1	0.26	4.0	7.3	20.6
CC-4C (Pre-Dev.)	7.40	61.0	0.13	0.2	1.8	11.2
CC-5	22.40	65.0	0.26	1.8	7.1	34.3
CC-6	27.80	65.0	0.25	2.3	9.1	43.2
CC-7	18.40	65.0	0.29	1.4	5.4	27.0
CC-8	7.70	65.0	0.25	0.6	2.5	12.0
CC-9	5.60	65.0	0.19	0.6	2.1	9.8
CC-10	85.60	62.6	0.39	2.6	14.1	91.9
CC-11	18.60	63.1	0.21	0.9	5.0	28.1
CC-12	12.20	65.0	0.26	1.0	3.9	18.7
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1
CC-13C	9.90	65.0	0.32	0.9	3.4	16.5
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2
CC-14	4.60	65.0	0.21	0.4	1.6	7.8
CC-15	12.80	65.0	0.24	1.1	4.3	20.4
CC-16	16.30	65.0	0.30	1.2	4.6	23.6
CC-17	25.00	65.0	0.35	1.7	6.5	32.9
CC-18	5.80	65.0	0.30	0.4	1.7	8.4
CC-19	3.70	65.0	0.25	0.3	1.2	5.8
CC-20	39.30	65.0	0.25	3.2	12.9	61.0
CC-21	6.20	61.0	0.20	0.1	1.2	8.5
CC-22	13.80	65.0	0.25	1.1	4.5	21.4
CC-23	5.70	64.7	0.33	0.4	1.5	7.7
CC-24	39.60	65.0	0.25	3.3	13.0	61.5
CC-25	3.50	65.0	0.23	0.3	1.2	5.7
CC-26	16.70	65.0	0.26	1.4	5.3	25.6
CC-27	18.90	64.4	0.31	1.2	4.9	25.8
CC-28	154.80	64.4	0.63	6.5	24.7	136.3

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-20 DEV	CC-1A, OS-12	3.2	14.3	88
DP-21 DEV	CC-2A, OS-13	2.1	10.5	62
DP-22 DEV	CC-2B, Release from DP-21	3.7	16.6	92
DP-23 DEV	CC-3, OS-14	2.5	13.0	84
DP-24 DEV	CC-4C (Pre-Dev.), CC-5	1.9	8.4	45
TOTAL INFLOW TO FHN POND 12	CC-4C, CC-5, CC-6	4	17	86
DP-25 DEV	Release from FHN Pond 12	0.2	0.3	45
DP-26 DEV	CC-8, CC-10	3.0	15.9	102
DP-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.4	1.7	8
DP-31 DEV	CC-19, Release from DP-30	0.7	2.7	14
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-16, CC-26, CC-27, CC-28, Release from DP-32	6.0	23.5	188

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY EAST CHERRY CREEK	---
MAJOR BASIN BOUNDARY	---
DESIGN POINT	3
BASIN IDENTIFIER	BB 10.0
EXISTING DIRECTION OF FLOW	→
PROPOSED DIRECTION OF FLOW	→
STORM SEWER	---
FILING NO. 1 PLAT AREA	---

SCALE: 1" = 200'

200 100 0 200 400

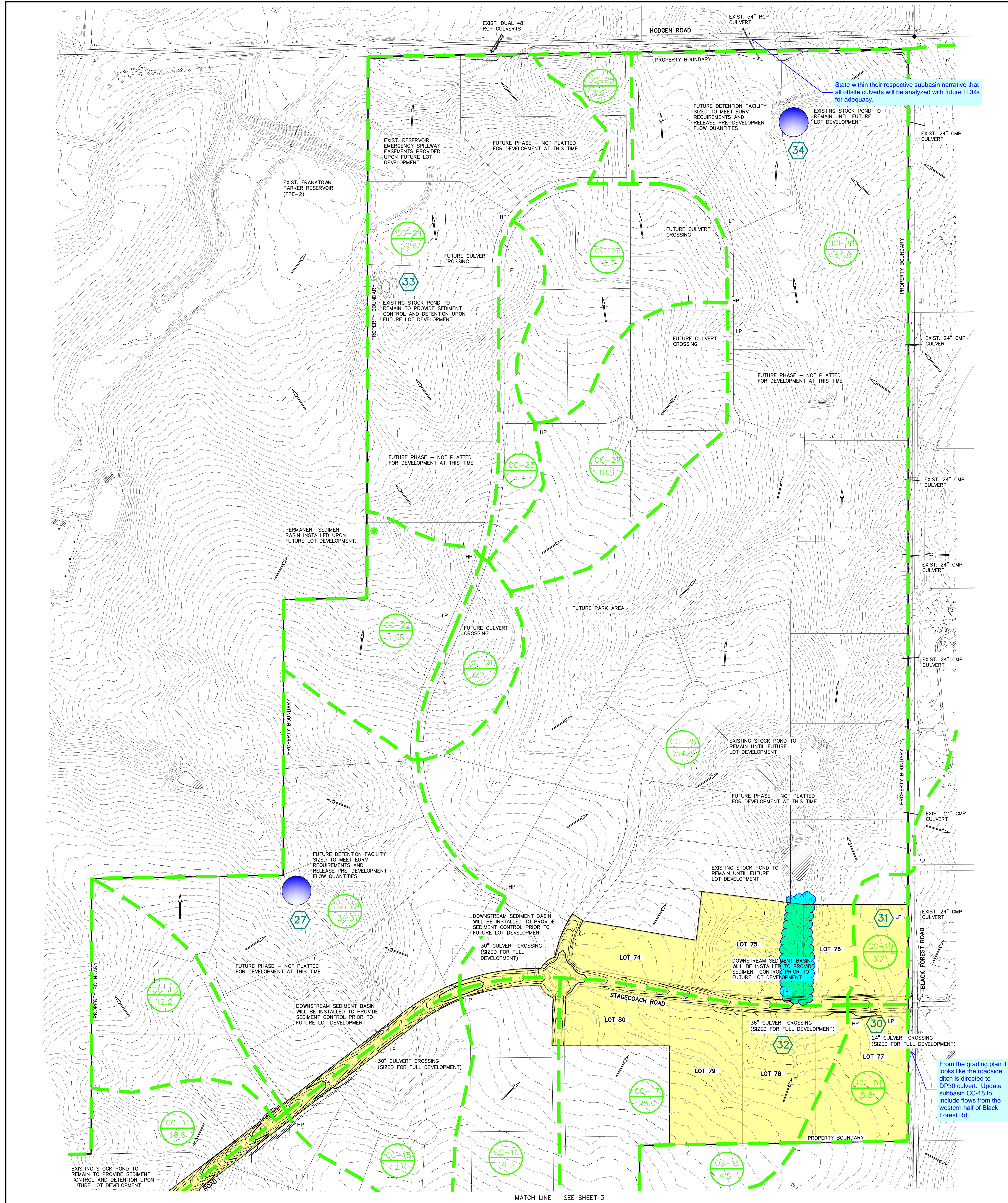
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FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FILING NO. 1 AND
PRELIMINARY PLAN DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	10-25-17
DRAWN BY	MAW	(H) 1" = 200'	SHEET	3 OF 4
CHECKED BY	(V) 1" = N/A	JOB NO.	1096.11	

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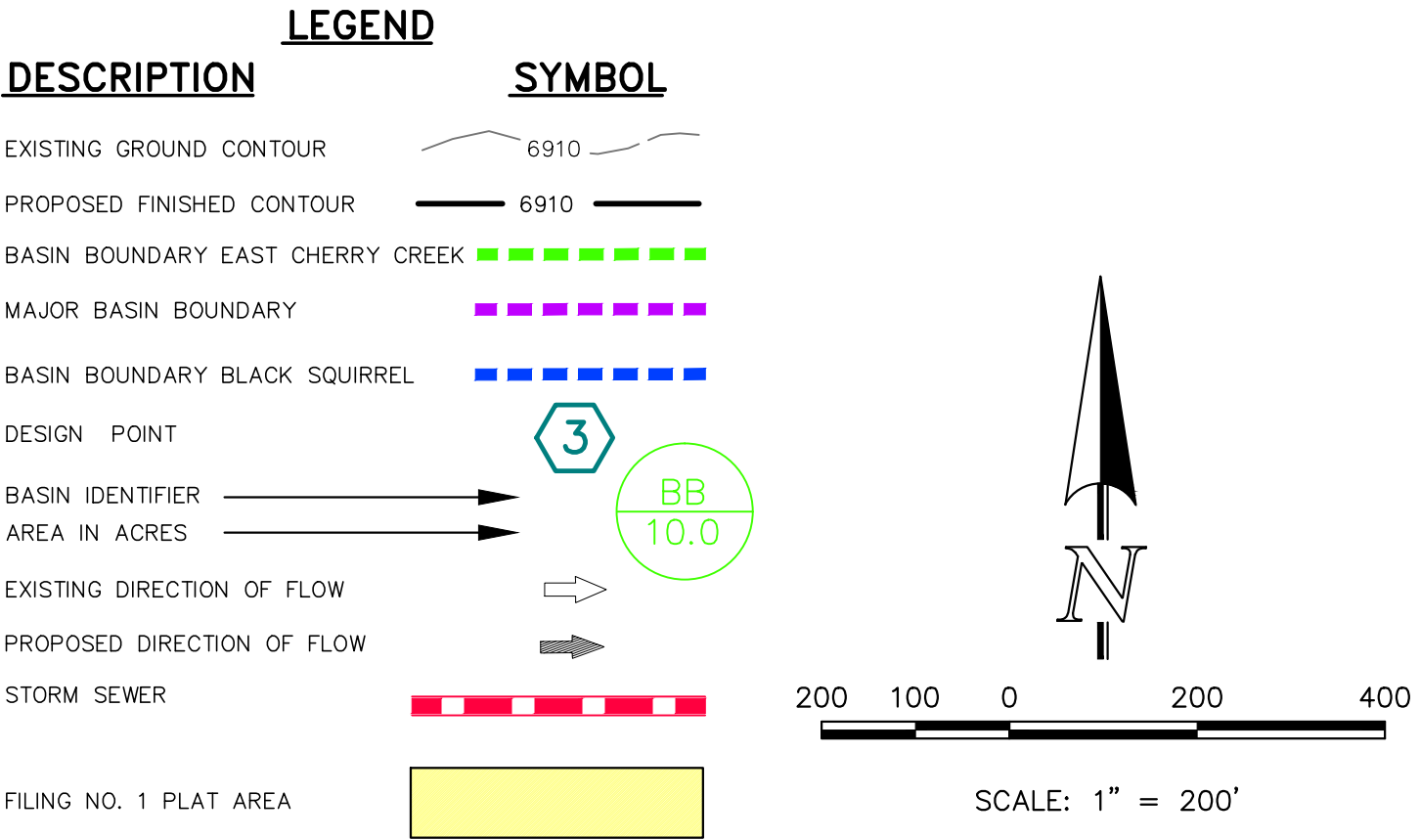


BASIN SUMMARY - DEVELOPED CONDITIONS

BASIN (label)	AREA (acres)	COMPOSITE CN	TOTAL LAG TIME (hours)	Q 2 Yr. (cfs)	Q 5 Yr. (cfs)	Q 100 Yr. (cfs)
OS-16	4.50	65.0	0.24	0.4	1.5	7.2
OS-17	15.80	65.0	0.19	1.6	5.9	27.7
OS-18	13.00	65.0	0.20	1.3	4.7	22.6
CC-11	18.60	63.1	0.21	0.9	5.0	28.1
CC-12	12.20	65.0	0.26	1.0	3.9	18.7
CC-13A	19.30	65.0	0.31	1.4	5.4	27.3
CC-13B	25.50	65.0	0.31	1.8	7.2	36.1
CC-13C	9.90	65.0	0.22	0.9	3.4	16.5
CC-13D	18.80	65.0	0.25	1.5	6.2	29.2
CC-14	4.60	65.0	0.21	0.4	1.6	7.8
CC-15	12.80	65.0	0.24	1.1	4.3	20.4
CC-16	16.30	65.0	0.30	1.2	4.6	23.6
CC-17	25.00	65.0	0.35	1.7	6.5	32.8
CC-18	5.80	65.0	0.30	0.4	1.7	8.4
CC-19	3.70	65.0	0.25	0.3	1.2	5.8
CC-20	39.30	65.0	0.25	3.2	12.9	61.0
CC-21	6.20	61.0	0.20	0.1	1.2	8.5
CC-22	13.80	65.0	0.25	1.1	4.5	21.4
CC-23	5.70	64.7	0.33	0.4	1.5	7.7
CC-24	39.60	65.0	0.25	3.3	13.0	61.5
CC-25	3.50	65.0	0.23	0.3	1.2	5.7
CC-26	16.70	65.0	0.26	1.4	5.3	25.6
CC-27	18.90	64.4	0.31	1.2	4.9	25.8
CC-28	154.80	64.4	0.63	6.5	24.7	136.3

DESIGN POINTS SURFACE ROUTING SUMMARY - DEVELOPED CONDITIONS

Design Point (label)	Contributing Basins	Q 2 Yr. Q (cfs)	Q 5 Yr. Q (cfs)	Q 100 Yr. Q (cfs)
DP-27 DEV	CC-15, CC-20	4.3	17.2	81
DP-28 DEV	CC-13A, OS-15	4.6	19.8	110
DP-29 DEV	CC-13B, CC-13C, Release from DP-28	5.8	26.6	155
DP-30 DEV	CC-18	0.4	1.7	8
DP-31 DEV	CC-19, Release from DP-30	0.7	2.7	14
DP-32 DEV	CC-17, OS-16	2.0	7.8	40
DP-33 DEV	CC-23, CC-24	3.6	14.4	69
DP-34 DEV	CC-16, CC-26, CC-27, CC-28, Release from DP-32	6.0	23.5	168



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(719)785-0799 (Fax)

FLYING HORSE NORTH
PRELIMINARY/FINAL DRAINAGE REPORT
FILING NO. 1 AND
PRELIMINARY PLAN DRAINAGE MAP

DESIGNED BY	MAW	SCALE	DATE	10-17-17
DRAWN BY	MAW	(H) 1"= 200'	SHEET	4 OF 4
CHECKED BY	(V) 1"= N/A	JOB NO.	1096.11	

dsdlaforce (43)

Colorado Springs, CO 80903 (719) 785-0790

Add PCD File No. SP-17-012 and SF-18-001

CITATIONS

Subject: Callout
Page Label: 3
Lock: Unlocked
Author: dsdlaforce

1. Provide road side ditch analysis with recommendations for ditch lining. Given the steep slopes on sections of the proposed road network, additional erosion protection.

2. Provide riprap sizing calculations for the proposed outlet protections.

- SOILS MAP (SUB SOIL SURVEY)
- F.E.M.A. MAP
- HYDROLOGY/HYDRAULIC CALCULATIONS
- DETENTION FACILITY CALCULATIONS
- DRAINAGE MAPS

Subject: Callout
Page Label: 3
Lock: Unlocked
Author: dsdlaforce

Include an existing drainage map and provide the narrative for the sub-basin

mit folgenden: $Q_1 = 0.2 \text{ m}^3/\text{s}$, $Q_2 = 0.4 \text{ m}^3/\text{s}$, $Q_3 = 0.2 \text{ m}^3/\text{s}$

Table 2b \rightarrow Table 2a, $Q_{200} \rightarrow$ H 200) represents existing and developed flows from Route 200 towards Rd. These flows will travel in a side road track towards Hwy 83. A size will be needed during construction of this portion of the roadway. The goal is to provide improvements to this intersection and Hwy 83 per the site multi-modal plan (2020). These improvements will be constructed along with final design section which will include the relocation of the dual 16' BICP sublots.

Subject: Callout
Page Label: 8
Lock: Unlocked
Author: dsdlaforce

Identify the trigger for removal of the TSB.

Design Point 4 ($Q_1 = 3$ cfs, $Q_2 = 4$ cfs, $Q_{eq} = 7$ cfs) (North side of Stagecoach Rd.) These flow rates are based on the temporary sediment basin will be installed during the development will be required to provide improved drainage. Upon review/approval from CDOT, the design of drainage at this intersection which will include

Subject: Callout
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Author: dsdlaforce

BS-2B

of this highly (See Appendix for U/D Definition)

6.6 per UD Detention Worksheet

storm relief

$Q_5 = 9 \text{ cfs}, Q_{100} = 38 \text{ cfs}$
 $Q_5 = 0.2 \text{ cfs}, Q_{100} = 25 \text{ cfs}$

Subject: Callout
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Lock: Unlocked
Author: dsdlaforce

6.6 per UD Detention Worksheet

line 5 ($Q_2 = 2 \text{ cfs}$, $Q_3 = 4 \text{ cfs}$, $Q_{\text{out}} = 13 \text{ cfs}$) represents existing and developed BS-2A (south side of Stagecoach Rd). These flows will travel in a side road until a sediment basin will be installed during construction of this portion of rural farm (CDOE, these improvements will be constructed along with the first section).

line 6 ($Q_6 = 1 \text{ cfs}$, $Q_5 = 3 \text{ cfs}$, $Q_{4m} = 15 \text{ cfs}$) represents flows from Basin CE. Flows are collected at a low point where proposed dual 18" RCP culverts temporarily sediment basin installed with early grading. (See Appendix for cross-sections with Basin RS-1B and tunnel in the existing natural channel to a 40" CMP culvert. **Duction Point 3 (D) = 1 cfs**, $Q_3 = 6 \text{ cfs}$, $Q_2 = 38 \text{ cfs}$.)

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Author: dsdlaforce

Identify the trigger for removal of the TSB.

(**Q = 36 cfs**) represents developed flow from Basin B location where dual 24" RCP culverts will be installed for design)

Explain why the construction plans show a bend & manhole. Is there a future extension of the storm system?

Subject: Callout
Page Label: 10
Lock: Unlocked
Author: dsdlaforce

Explain why the construction plans show a bend & manhole. Is there a future extension of the storm system?

Facility 4, including Basins OS-9 and BS-17 equal (Q_4)

As seen again – an energy requirement that increases exponentially with distance is well suited to the layout at this location where a 30° RCP culvert section (Panel 4) at the point end. (See Appendix for culvert design)

Upstream the Fly and Fly to the south the sub-station workshop

3 major flows enter the facility at the north end through a rock sluiceway. (The following describes the design of these facility sub design sheets)

stream – use multiple stream culverts (see below)

with 0.5 m slopes

$Q_{10} = 18 \text{ cfs}$, $Q_{11} = 82 \text{ cfs}$, $Q_{12} = 217 \text{ cfs}$
 $Q_{13} = 8.3 \text{ cfs}$, $Q_{14} = 6.3 \text{ cfs}$, $Q_{15} = 142 \text{ cfs}$

Subject: Callout
Page Label: 10
Lock: Unlocked
Author: dsdlaforce

Update the 2yr and 5yr to match the ud-detention worksheet.

RE: TOWN OF FLEMING No. 1
Subject: Callout
Page Label: 13
Lock: Unlocked
Author: dsdlaforce

If the concentrated flow from the future pond is directed to the residential lots, there will likely be drainage impacts.

Provide additional guidance in the narrative regarding the release location (consider the 100yr and emergency overflow path). Specific drainage easements may be required if draining through residential lots.

Subject: Callout
Page Label: 15
Lock: Unlocked
Author: dsdlaforce

Missing. Include the culvert design in the Appendix and the construction plans.

Subject: Callout
Page Label: 15
Lock: Unlocked
Author: dsdlaforce

Elaborate on where this drains to. From the drainage map it seems to drain into the future detention facility at DP 19. If this is the case then identify that ponds DP18 and DP19 must be designed/analyzed as ponds in a series.

Identify and discuss the emergency overflow path for Pond 18. It appears that it would cross over residential lots and into Pond DP19

Subject: Callout
Page Label: 15
Lock: Unlocked
Author: dsdlaforce

Include the supporting calculation. Verify there is sufficient drainage easement that covers the natural swale.

Subject: Callout
Page Label: 21
Lock: Unlocked
Author: dsdlaforce

Update the calculation based on the 2018 rates since the application was submitted in 2018.

Subject: Text Box
Page Label: 21
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Author: dsdlaforce

Add a section listing the 4 step process (ECM Appendix I Section 1.7.2) with narrative on how each step was considered and/or incorporated in the drainage design.

Subject: Callout
Page Label: 50
Lock: Unlocked
Author: dsdlaforce

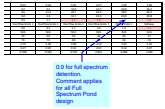
Hw/D must be less than 1.5

Subject: Callout
Page Label: 54
Lock: Unlocked
Author: dsdlaforce

Hw/D must be 1.5 or less.

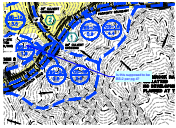
Subject: Text Box
Page Label: 54
Lock: Unlocked
Author: dsdlaforce

is the bend and manhole modeled?



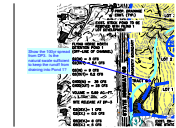
Subject: Callout
Page Label: 85
Lock: Unlocked
Author: dsdlaforce

0.9 for full spectrum detention. Comment applies for all Full Spectrum Pond design



Subject: Callout
Page Label: 222
Lock: Unlocked
Author: dsdlaforce

Is this supposed to be BS-2 per pg 4?



Subject: Callout
Page Label: 222
Lock: Unlocked
Author: dsdlaforce

Show the 100yr spread from DP3. Is the natural swale sufficient to keep the runoff from draining into Pond 1?



Subject: Highlight
Page Label: 222
Lock: Unlocked
Author: dsdlaforce



Subject: Callout
Page Label: 222
Lock: Unlocked
Author: dsdlaforce

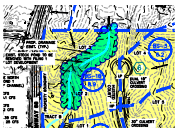
Is this an existing culvert?



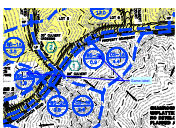
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Page Label: 222
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Author: dsdlaforce

Runoff is now concentrated flow. Analyze and discuss the results/recommendations in the narrative. It seems that erosion will occur, a swale may be required within a drainage easement. For this particular location the swale would connect to the pond with a rundown and a trickle channel to the outlet structure.

Review all other culvert locations regarding the above comment.

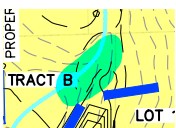


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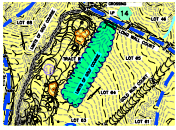


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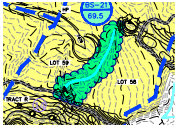
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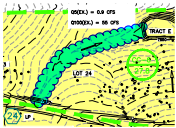
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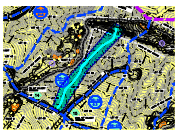
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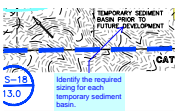
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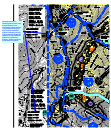


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Identify the required sizing for each temporary sediment basin.



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Although the pond is releasing below historic rate, provide analysis of the downstream natural channel. Is this stable for the given flow? Is there indications erosion is already occurring on this channel? Update the narrative for each detention facilities to describe the findings. Similar comments for all detention facilities.



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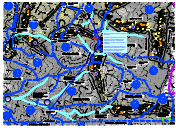
Large concentrated flows are routed through these areaa. Analyze the stability to determine whether or not a defined swale is required, additional drainage easements may be required. Update the narrative accordingly.

Review the rest of the subbasins.



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what is the extend of ponding at the inlet?
Additional drainage easements may be required.
Review all other culverts.

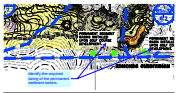


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Place the drainage way within a drainage easement.

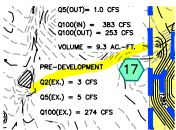
Analyze the gully at the front of the lots and provide recommendation for the driveway culvert size. Provide this analysis for other lots which has similar conditions.

If applicable, add a plat note identifying these lots which would require a larger driveway culvert than the standard 18" with reference to the FDR for the recommended driveway culvert.

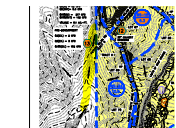


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Identify the required sizing of the permanent sediment basins.



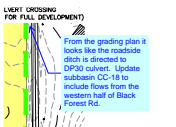
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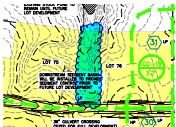


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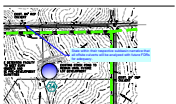


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From the grading plan it looks like the roadside ditch is directed to DP30 culvert. Update subbasin CC-18 to include flows from the western half of Black Forest Rd.



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State within their respective subbasin narrative that all offsite culverts will be analyzed with future FDRs for adequacy.

MWhorton (2)

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