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Flying Horse North – Phase 2 PUD Parcels 1-6
Preliminary Drainage Report

February 2024

Prepared For:

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Engineer's Statement

This report and plan for the drainage design of the development, Flying Horse North, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the *El Paso County Drainage Criteria* Manual and is in conformity with the master plan of the drainage basin. I understand that El Paso County does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

_____

Richie Lyon, PE Date

State of Colorado No. 53921

For and on behalf of HR Green Development, LLC

Developer's Statement

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

Flying Horse Development, LLC

_____

Drew Balsick Date

Vice President / Project Manager

Flying Horse Development, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

El Paso County:

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

_____ _____

Joshua Palmer, P.E. Date

County Engineer/ECM Administrator

I. General Purpose, Location and Description

Purpose and Scope

The Purpose of this Preliminary Drainage Report (PDR) is to identify specific solutions to drainage concerns on site and off-site resulting from the development of the subdivision to be platted as well as any drainage issues that exist prior to development. The PDR is to describe the onsite and offsite drainage patterns, quantify stormwater runoff and detention volumes, assess existing and proposed storm infrastructure as it relates to preliminary water quality and stormwater detention, describe areas tributary to the site and the planned storm water management for the Flying Horse North Parcels 1-6 development. Flying Horse North, (F.H.N.) Filing No. 1 combined Preliminary Drainage Report (PDR) and Final Drainage Report (FDR) was previously developed by Classic Consulting Engineers and Surveyors and included in Appendix F and a more recent Master Development Drainage Plan (MDDP) was prepared by HR Green Development, LLC. and was approved by the County in September of 2022, entitled *Flying Horse North Master Development Drainage Plan* latest revision date of September 9, 2022. A Final Drainage Report for Flying Horse North Filing No. 3 developed by HR Green Development, LLC. is currently in process with the County for a final plat application for Filing No. 3.

The items discussed in this report are preliminary in nature and final drainage calculations and design will be required in a future Final Drainage Report (FDR) as design development proceeds including delineation of sub-basins per roadway plan and profiles and overlot grading, design of public and private storm systems and outfalls, and final permanent control measure design. This PDR provides the drainage concept and guidance for future development of Flying Horse North Parcels 1-6 by analyzing the major basins, off-site stormwater runoff, water quality and full spectrum extended detention basins, and outfall locations to demonstrate compliance with drainage criteria and the Master Plan for the Flying Horse North subdivision. The extent of hydraulic analysis for this PDR is described further in its own section.

Project Location and Description

The Flying Horse North subdivision is in El Paso County. The larger subdivision development is bordered by Highway 83 to the west, Black Forest Road to the east, Cathedral Pines to the south, and High Forest Ranch to the north. The area contains approximately 1,473.6 acres within the whole Section 36, Township 11 South, Range 66 West of the Sixth Principal Meridian, and a portion of Section 30 and 31, Township 11 South, and Range 65 West of the Sixth Principal Meridian.

The Flying Horse North Parcels 1-6 area is the proposed PUD within the greater Flying Horse North subdivision that is approximately 747.27 acres that are currently unplatted parcels within the greater Flying Horse North subdivision. The subdivision is surrounded by the Flying Horse North Golf Course, the Cathedral Pines and Palmer Divide subdivisions to the south, residential subdivisions north of Hodgen Road such as Lesley Subdivision and High Plains Subdivision, and unplatted RR-5 zoned residential parcels to the northwest and east.

There are no areas of development of disturbance within FEMA floodplain. There is a Zone AE located at the northwest corner of Parcel 4, in the area of Hodgen Road. There is no proposed development within the flood zone.

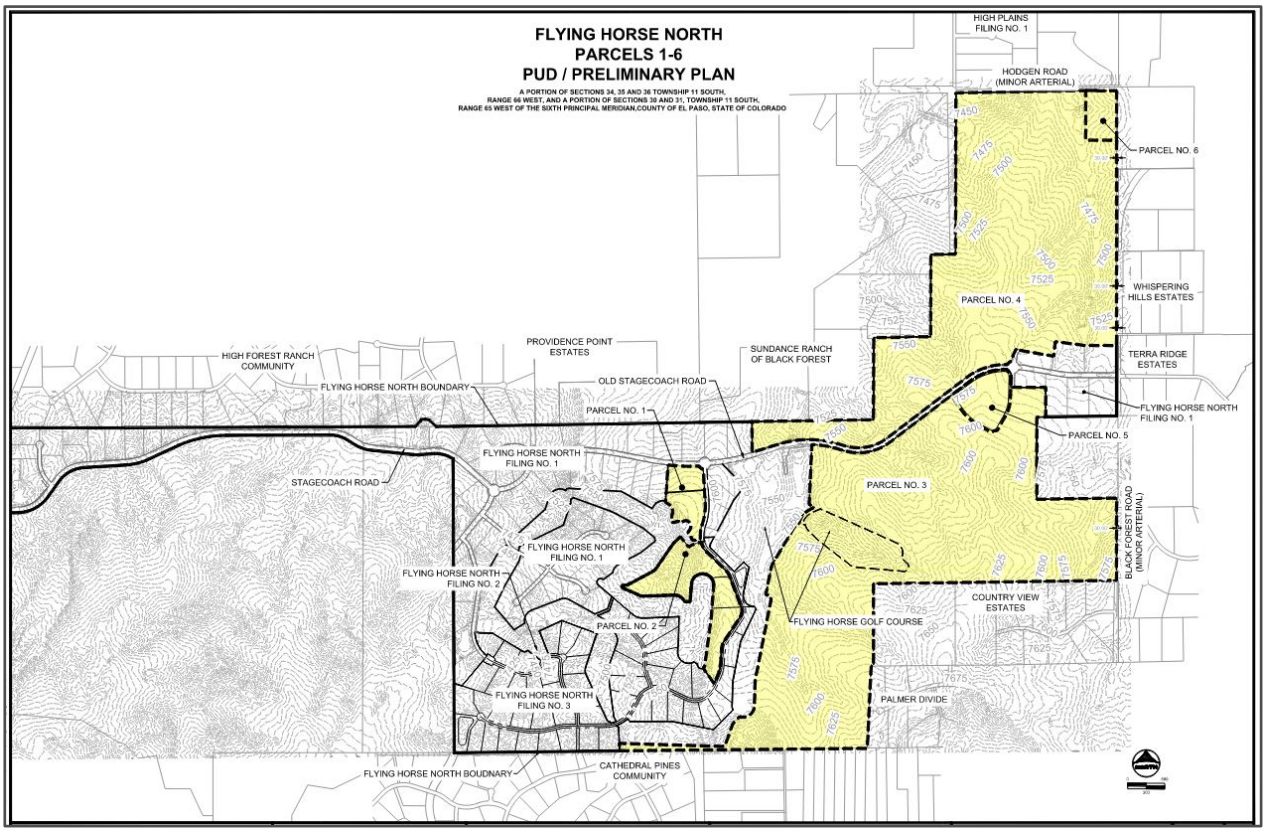


Figure 1: Site Map

A full sheet vicinity map is provided in Appendix A for a clear visual of Parcels 1 though 6 and adjacent developments.

This PDR will assess the drainage conditions for the 747.3 acres of onsite proposed PUD development, additional Flying Horse North acreage from other tributary filings and off-site tributary areas. The proposed PUD Preliminary Plan includes 796 proposed single-family residential units of various lot sizes. The PUD includes rural single-family estate lots of 2.5 and 5.0 acres, more dense single-family residential lots from 1/8-acre to 1/4-acre in size, commercial development, an 18-acre hotel and resort site with residential casitas, a 15-acre multifamily Flats area, open space and park areas, fitness center and a clubhouse.

The following table is a breakdown of the proposed land uses for the PUD Preliminary Plan Parcels 1-6, by Parcel.

Table 1: Land Use by Parcel Number

Parcel No.	Land Use(s)	PROPOSED DU/AC
1	Commercial Golf Course Clubhouse	N/A
2	Commercial Hotel & Resort, Residential Casitas, Multi-Family Residential Flats	8.62
3	Single-Family Residential	1.24

4	Single-Family Residential	1.08
5	Community Recreation Center & Park	N/A
6	Commercial	N/A

The following table is a breakdown of the various proposed lot sizes for the single-family parcels within the PUD Preliminary Plan Parcels 1-6, by lot size:

Table 2: Single-Family Lot Size Summary

Lot Size	Typical Minimum Dimensions	No. of Proposed Parcels	Total Area (ac.)
1/8-acre	75'x130'	123	45.2
1/4-acre	85'x130' ; 100'x130'	432 ; 94	130.33
1/3-acre	140'x130'	74	36.6
1/2-acre	160'x145'	43	51.4
1-acre	-	0	0.0
2.5-acre Rural	-	6	20.22
5.0-acre Rural	-	24	121.36
TOTALS		**796**	**405.11**

Parcel 2 consists of the Commercial Hotel & Resort as well as the Casitas and multi-family Flats development areas. The anticipated number of hotel and casitas keys (units) is 225, and the preliminarily sited number of Flats is 50 units (6 units per building), totaling 275 units. This brings the total number of units for the entire PUD Preliminary Plan to 1,024. Excluding the hotel keys, the total amount of dwelling units comes out to 896, with 100 of those being responsible for the casitas and flats. The total weighted imperviousness of the PUD is approximately 27% for the fully developed conditions of all parcels.

Existing Conditions Description

The existing ground cover consists of native grass and shrubbery with areas of barren pervious soil. The parcel 1 and 2 areas to the west where the proposed hotel resort, casitas, and flats are to be developed consist of the same native grass with areas of dense tree cover with pinyon pines, mostly in the areas adjacent to the golf course property. Slopes within this area generally range from 2 to 20 percent and flow west to east within East Cherry Creek Basin and east to west within Black Squirrel Creek Basin. These parcels are split by the Black Squirrel Creek and East Cherry Creek basin delineation line, with a majority of parcel 1 flowing east into East Cherry Creek. A majority of the area defined by parcel 2 flows west into Black Squirrel Creek. The remaining portion of parcel 2 that flows east into East Cherry Creek Basin is captured in an adjacent section of Allen Ranch Road that will be developed as F.H.N. Filing No. 3 is concurrently in review. The captured run-off is detained in F.H.N. Filing 3 pond A and ultimately released into an existing tertiary drainage swale located in a tract of the Flying Horse Golf Course. The natural vegetation has been documented by survey and aerial photography.

Parcels 3 through 6 are separated from the first two parcels by a stretch of golf course that runs south to north from the southern property border up to the existing Old Stagecoach Road. These parcels also consist of native grasses and shrubbery with areas of barren pervious soil. Slopes within this area generally range from 1 to 15 percent and generally flow from south to north. The natural vegetation has been documented by survey and aerial photography. Adjacent subdivisions in Palmer Divide and Country View Estates consist of 5 acre lots and make up a majority of the off-site flows. Flows from these off-site basins drain directly into existing drainage swales located in parcel no. 3. Black Forest Road which runs North to South along

the eastern edge of parcels 3, 4, and 6, has 3 corrugated metal pipe culvert crossings that allow runoff to flow from east to west into parcel 4. Additionally, parcel no. 4 has 3 concrete culverts of varying size that allow flows from parcel 3 to drain north into parcel 4, past the existing stretch of Old Stagecoach Road that separates the two aforementioned parcels.

All existing sub-basins within the site as well as existing off-site basins have associated design points, all of which are described in a further section. An existing drainage conditions map can be found within the appendix.

There are no existing major drainageways such as formal channels or water ways. There are existing natural tertiary swales and channels throughout the parcels that convey stormwater and are addressed in this PDR for the developed conditions. There are no existing stormwater facilities within the proposed PUD parcels. Adjacent filings that are developed such as the golf course, Filing No. 1, and the concurrent review of Filing No. 3 have public and private storm infrastructure such as storm sewer main, inlets, and detention basins. There are no existing irrigation facilities within the PUD parcels. There are existing irrigation facilities within the adjacent existing golf course property. Existing minor drainage channels within the site are planned to be maintained to the maximum extent possible as a part of parkways and greenways with the development. These will continue to be used for conveyance of storm drainage flows.

The Franktown Parker Dam (080130) is located near the northwest corner of site. The dam is designated as a jurisdictional dam and has a low hazard class. It is located along East Cherry Creek. See Appendix A for characteristics and location of dam.

Drainageways of note including grass-lined swales and emergency overflow Tracts are described within this report with preliminary parameters to demonstrate compliance with swale design criteria and capacities.

The soils that existing within the PUD boundaries include the following:

- Brussett loam – hydrologic soils group B.
- Elbeth sandy loam – hydrologic soils group B.
- Kettle gravelly loamy sand – hydrologic soils group B.
- Peyton sandy loam – hydrologic soils group B.
- Peyton-Pring complex – hydrologic soils group B.
- Pring coarse sandy loam – hydrologic soils group B.

Per the NRCS web soil survey, the site is made up entirely of Type B soils. The ridge line between the Arkansas River and South Platte River Basins creates different soil environments for each. The portion of site that is within the Black Squirrel Drainage Basin, which includes Flying Horse Norse Filing No. 2 and No. 3, are predominately Elbeth sandy loam. The remaining filings are within the East Cherry Creek Basin which consists of Peyton sandy loam and Peyton-Pring complex. See Appendix A for the NRCS soil map.

The property for the PUD Parcels 1-6 do not consist of any existing utilities such as potable water main, wastewater main, natural gas facilities, or electric facilities. There are no encumbrances by utilities including platted easements that contain facilities for removal or relocation. Platted easements and other legal items are shown on the PUD Preliminary Plan set drawings.

II. Drainage Basins and Sub-Basins

Drainage Basin Information

Flying Horse North is located within both the Black Squirrel Drainage Basin and East Cherry Creek Basin. Predominantly, the existing Filing No.1 and part of the proposed Filing No. 2 is located within the Black Squirrel Drainage Basin. This drainage basin encompasses 10.9 square miles of mostly forested area and generally slopes from east to west and outfalls into Monument Creek. Black Squirrel is a sub-basin of the Arkansas River. The remaining filings and part of Filing No. 2 is located within the East Cherry Creek Basin. There is not a current planning study of the drainage basin, but generally it slopes from southwest to northeast. The basin eventually flows into the South Platte River.

As the site generally lies at the top of each of the respective basins, minimal offsite flows are conveyed onto the site. The Black Squirrel Creek Drainage basin has no offsite flow come onto the site sans those flows generated as part of Filing 1 of F.H.N.. The development which is within the Black Squirrel Creek Drainage Basin is unchanged from the FDR shown in Filing 1.

DBPS Investigations

Flying Horse North is split by the Arkansas River Basin and South Platte Basin. Within each of those river basins, the site stretches across the Black Squirrel Basin and East Cherry Creek Drainage Basins.

The Black Squirrel Drainage Basin Planning Study (DBPS) Preliminary Design Report prepared by URS Corporation was reviewed to determine existing plans and constraints that would influence the design of the F.H.N. Development. The proposed plans for F.H.N. are in general conformance with the DBPS.

Flying Horse North Parcels 1-6 is located within a major portion of the East Cherry Creek Drainage Basin to the east of the larger F.H.N. subdivision and the west portion of the site is within the Black Squirrel Creek Drainage Basin. A MDDP developed by HR Green Development, LLC. that includes the proposed Parcels 1-6 area was approved by the County in September of 2022 and it is the intent of this PDR to follow the general drainage approach for this area where densities for the development will remain similar to the report.

For the portion of F.H.N. which lies within the East Cherry Creek Drainage Basin, a DBPS does not currently exist and the MDDP will comply with standard El Paso County regulations regarding drainage within this corridor.

Compliance with DBPS

This PDR is in general conformance with the guidelines outlined in the Black Squirrel DBPS and current drainage flows of the East Cherry Creek Basin. Flying Horse North will construct multiple full spectrum detention facilities to limit the effects of development and mimic natural flow patterns.

Existing downstream infrastructure is currently limited to the historic drainage channels and minimal downstream improvements exist. As such, the site follows the DBPS and restricts offsite flow rates to not exceed historic flow rates. The site's ultimate outfalls will generally be along the same historic tributaries. Although outfall rates will be at or below historic, the cumulative volume of runoff will increase and therefore downstream facilities may see an increase in the duration of flows. This may provide a net benefit to the downstream facilities by providing more water to assist with the sustenance of vegetation. However, it should be noted that increased volume may expedite potential erosion or channel movement.

III. Hydrologic Analysis

Existing Major Basin Descriptions

Design Point 1 (Q_5=4.3 CFS, Q_{100}=24.9 CFS) represents flows from existing sub basin EX1. This basin is located within parcel 1 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within a roadside ditch section on the west side of Allen Ranch Road. The swale flows from south to north to the round-about that intersects Allen Ranch Road and Old Stagecoach Road. From there the flows continue east within a roadside ditch section on the south side of Old Stagecoach Road where a 36" RCP culvert diverts flow north to detention pond 12 that has been developed as part of F.H.N. Filing No. 1.

Design Point 2 (Q_5=0.3 CFS, Q_{100}=2.2 CFS) represents flows from existing sub basin EX2. This basin is located within parcel 1 and is part of the Black Squirrel Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that flow directly offsite into a tract within the F.H.N. Golf Course.

Design Point 3 (Q_5=0.6 CFS, Q_{100}=4.3 CFS) represents flows from existing sub basin EX3. This basin is located within parcel 1 and is part of the Black Squirrel Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that drain directly west offsite into a tract within the F.H.N. Golf Course.

Design Point 4 (Q_5=4.3 CFS, Q_{100}=31.4 CFS) represents flows from existing sub basin EX4. This basin is located within parcel 2 and is part of the Black Squirrel Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows east to west to the associated design point where the run-off drains directly off-site into tract K of the F.H.N. Golf Course.

Design Point 5 (Q_5=2.0 CFS, Q_{100}=14.6 CFS) represents flows from existing sub basin EX5. This basin is located within parcel 2 and is part of the Black Squirrel Creek Basin. Run-off from this sub-basin consist of sheet flows that drain west directly off-site into tract K of F.H.N. Golf Course.

Design Point 5.1 (Q_5=1.8 CFS, Q_{100}=13.0 CFS) represents flows from existing sub basin EX5.1. This basin is located within parcel 2 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drain east. Under the current conditions as of the date of this report, stormwater from this basin continues to drain east into the undeveloped portion of land that is a part of F.H.N. Filing No. 3 and eventually is captured within the irrigation pond located within tract L of the adjacent golf course. Under future conditions, once F.H.N. filing no. 3 has been constructed, flows from this basin will be collected within the EPC type A curb and gutter along Allen Ranch Road within F.H.N. Filing No. 3, of which is concurrently being reviewed. Flows collected within the existing curb and gutter are collected within 2 CDOT type R on-grade inlets sized 15' and 10'. Runoff not collected within the on-grade inlets are captured within a 15' Type R sump inlet. The captured flows are then directed to F.H.N. Filing 3 pond A to be detained and released at historic rates into an existing tertiary drainage swale located within tract L of the Flying Horse Golf Course.

Design Point 6 (Q_5=3.9 CFS, Q_{100}=28.8 CFS) represents flows from existing sub basin EX6. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that drain south off-site into Edmonds Subdivision.

Design Point 7 (Q_5=22.7 CFS, Q_{100}=150.9 CFS) represents flows from existing sub basin EX7 and off-site basin OS1. Basin OS1 flows into EX7 from the east at design point 26. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from east to west to the associated design point. This design point continues into off-site basin OS6, tract L of the Flying Horse Golf Course.

Design Point 8 (Q_5=23.2 CFS, Q_{100}=144.5 CFS) represents flows from existing sub basin EX8 and off-site basin OS2. Basin OS2 flows into EX8 from the east at design point 27. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south-east to north-west, into off-site basin OS6, which represents tract L of the F.H.N. Golf Course.

Design Point 9 (Q_5=6.0 CFS, Q_{100}=44.2 CFS) represents flows from existing sub basin EX9. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drain north-west into off-site basin OS7 which represents tract M of the F.H.N. Golf Course.

Design Point 10 (Q_5=10.5 CFS, Q_{100}=70.3 CFS) represents flows from existing sub basin EX10 and off-site basin OS3. Basin OS3 flows into EX10 from the south at design point 28. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south-east to north-west, into off-site basin OS7, which represents tract M of the F.H.N. Golf Course.

Design Point 11 (Q_5=42.5 CFS, Q_{100}=235.3 CFS) represents flows from existing sub basin EX11 and off-site basin OS4. Basin OS4 flows into EX11 from the south at design point 29. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north-east to the associated design point.

Design Point 12 (Q_5=6.8 CFS, Q_{100}=49.6 CFS) represents flows from existing sub basin EX12. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drains east directly off site to the associated design point.

Design Point 13 (Q_5=5.4 CFS, Q_{100}=39.8 CFS) represents flows from existing sub basin EX13. This basin is located within a portion of parcel 3 and parcel 4 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect at an existing public storm culvert that runs from south to north through Old Stagecoach Road. Flows continue north into basin EX23.

Design Point 14 (Q_5=12.4 CFS, Q_{100}=41.0 CFS) represents flows from existing sub basin EX14 and a third of the runoff from basin OS9. This basin is located within a portion of parcel 3 and parcel 5 and is part of the East Cherry Creek Basin. Run-off from sub-basin EX14 consists of sheet flows that collect at an existing public storm culvert that runs from south to north through Old Stagecoach Road. Run-off from OS9 is led to the DP via roadside swales on Old Stagecoach Road. Flows continue north into basin EX21.

Design Point 15 (Q_5=30.7 CFS, Q_{100}=175.3 CFS) represents flows from existing sub basin EX15. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from sub-basin EX15 consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point where an existing public storm culvert that runs from south to

north through Old Stagecoach Road carries flows to basin EX20. Run-off from basin OS9 is led to the DP via roadside swales on Old Stagecoach Road.

Design Point 16 (Q_5=2.3 CFS, Q_{100}=16.6 CFS) represents flows from existing sub basin EX16. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drain directly west into off-site basin OS7 which represents tract M of the F.H.N. Golf Course where an existing tertiary swale conveys flows north-west.

Design Point 17 (Q_5=4.4 CFS, Q_{100}=32.3 CFS) represents flows from existing sub basin EX17. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drain west directly into off-site basin OS6. Drainage from basin EX17 making its way into OS6 goes directly into the existing retention pond/water feature within off-site basin OS6.

Design Point 18 (Q_5=23.5 CFS, Q_{100}=165.9 CFS) represents run-off from off-site sub-basin OS7 in addition to run-off entering basin OS7 at design points 9, 10, and 16. This basin is located within parcel 3 and is part of the East Cherry Creek Basin. The associated sub-basin, OS7, is representative of tract M within the F.H.N. Golf Course and is actively in use. Within the tract there are several golf course features including fairways, greens, golf cart paths, a cart bridge over an existing natural drainage swale, and a retention pond. The retention pond has been designed with an overflow spillway at the west side of the pond/tract that releases water into the larger golf course water feature/retention pond that is in off-site sub-basin OS6 (tract L of F.H.N. Golf course). All drainage entering the tract will make its way down to the existing golf course retention pond via the existing tertiary drainage swale and will be released once the water surface elevation reaches a height that allows spillage to occur into the downstream pond in basin OS6.

Design Point 19 (Q_5=7.0 CFS, Q_{100}=203.7 CFS) represents flows from existing sub basins EX18 & EX19 as well as the release flow from the jurisdictional irrigation reservoir at design point 31. These basins are located within parcel 5 and are a part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that are directed south-north and collect within an existing tertiary drainage swale. The minor (Q5=4.0 cfs) and major (182.0 cfs) flows that are released from the upstream irrigation reservoir are done so via a set of twin concrete box culverts (4'x10') that spill out into a 20' wide rock chute that leads down to a 2' deep plunge pool. Released flows are then directed into the existing natural drainage swale that flows off-site to the north.

Design Point 20 (Q_5=34.9 CFS, Q_{100}=205.9 CFS) represents flows from existing sub basin EX20 and design point 15. Design point 15 enters basin EX20 from the culvert outlet on the north side of Old Stagecoach Road. This basin is located within parcel 5 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point which continues north off-site.

Design Point 21 (Q_5=26.6 CFS, Q_{100}=144.9 CFS) represents flows from existing sub basin EX21 and design point 14. Design point 14 enters basin EX21 from the culvert outlet on the north side of Old Stagecoach Road. This basin is located within parcel 5 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point where the flows will continue north off-site.

Design Point 22 (Q_5=6.7 CFS, Q_{100}=49.3 CFS) represents flows from existing sub basin EX22. This basin is located within parcel 4 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists of sheet flows that drain north-west directly off-site.

Design Point 23 (Q_5=65.9 CFS, Q_{100}=443.4 CFS) represents flows from existing sub basin EX23 and design points 13 and 32. Design point 13 represents flows from basin EX13 and makes its way into basin EX23 via a culvert that runs under the eastern most round-about on Old Stagecoach Road. Design point 32 represent basin OS5 which enters the basin EX23 via a natural drainage swale from the south of basin EX23. Basin EX23 is located within parcel 4, contains the entirety of parcel 6, and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within multiple existing tertiary drainage swales. The swales flow from south to north to the associated design point and continue off-site.

Design Point 24 (Q_5=3.3 CFS, Q_{100}=24.0 CFS) represents flows from existing sub basin EX24. This basin is located within parcel 4 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point where the flows exit the site.

Design Point 25 (Q_5=11.2 CFS, Q_{100}=82.1 CFS) represents flows from existing sub basin EX25. This basin is located within parcel 4 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that drain north-west directly off-site towards Hodgen Road. The swale flows from south to north to the associated design point.

Design Point 26 (Q_5=7.9 CFS, Q_{100}=42.7 CFS) represents flows from existing sub basin OS1. This basin is located just east of basin EX7 and is part of the East Cherry Creek Basin. Run-off from this sub-basin consists mostly of sheet flows that drain west towards the associated design point and enter the site via basin EX7. Flows that enter the site are then naturally collected within an existing tertiary drainage swale and continue to flow west.

Design Point 27 (Q_5=13.5 CFS, Q_{100}=73.4 CFS) represents flows from existing sub basin OS2. This basin is located just east of existing sub-basins EX7 and EX8 and is part of the East Cherry Creek Basin. This off-site basin contains a part of the Palmer Divide subdivision which is a cul-de-sac containing 5 acre lots. Run-off from this sub-basin consists mostly of sheet flows that flow west and collect within an existing tertiary drainage swale that begins at the associated design point. The flows continue west, combining with run-off from basin EX8.

Design Point 28 (Q_5=8.2 CFS, Q_{100}=53.9 CFS) represents flows from existing sub basin OS3. This basin is located east of basin EX9 and south of EX10 and is part of the East Cherry Creek Basin. Part of this basin lies within the Country View Estates subdivisions which consists of 5 acre lots. Run-off from this sub-basin consists of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point where it then enters the proposed site.

Design Point 29 (Q_5=28.8 CFS, Q_{100}=134.6 CFS) represents flows from existing sub basin OS4. This basin is located directly south of basin EX11 and is part of the East Cherry Creek Basin. The off-site basin is comprised entirely of the Country View Estates Subdivision which contains 5 acre lots. Run-off from this sub-basin consists mostly of sheet flows that collect within an existing tertiary drainage swale. The swale flows from south to north to the associated design point where is enters the site through basin EX11.

Design Point 30 (Q_5=3.8 CFS, Q_{100}=4.4 CFS) represents flows from existing off-site sub-basin OS8. This basin is located directly east of basin EX5.1 and is part of the East Cherry Creek Basin. This basin contains existing storm infrastructure that had been constructed during the F.H.N. Filing 3 development. Infrastructure includes 2 on-grade storm inlets, 2 sump inlets, and a full spectrum detention pond. The detention pond releases flows at historic rates which are reflected in the design points flow rates. Detained stormwater is released from the pond into the existing tertiary drainage swale located in off-site basin OS7.

Design Point 31 (Q_5=102.7 CFS, Q_{100}=624.8 CFS) represents flows from existing sub basin OS6 as well as run-off from design points 7, 8, 17, 18, and 30. Basin OS6 is representative of a majority of tract L within F.H.N. Golf Course and is part of the East Cherry Creek Basin. This tract contains several golf course features as well as the irrigation reservoir. Flows entering this reservoir are retained and released at historic rates as shown with the flows associated with this design point. Stormwater exiting the reservoir does so through a small jurisdictional dam where twin concrete box culverts sized 4' x 10' allow water to pass under the roadway (Old Stagecoach Road) and into a 20' wide rock chute. The rock chute then releases water into an existing natural drainage swale that continues north, off-site. Calculated flows for this design point have been overridden by design flows from Classic Consulting's approved JD design report to provide a more accurate depiction of existing flows exiting the reservoir.

Design Point 32 (Q_5=16.2 CFS, Q_{100}=78.3 CFS) represents flows from existing off-site sub-basin OS5. This basin is located directly east of basin EX13 and is part of the East Cherry Creek Basin. This basin contains a portion of F.H.N. Filing 1 development which includes several lots and a culvert that allows flows to pass underneath Old Stagecoach Road. Flows exiting the subbasin do so at the northern end of the subbasin which enter an existing natural drainage swale and flow into basin EX23.

There are offsite drainage basins that are conveyed onto or through the site on the southwestern portion. There are also offsite basins shown that are central to the greater PUD that represent the existing F.H.N. Golf Course areas. These basins are generally conveyed through the development via natural drainage ways or overland sheet flow. The proposed PUD is to either continue conveyance of these offsite basins or capture and convey them for onsite detention prior to release to downstream areas. The specific basins are described below in detail for comparison to developed conditions in a later section.

- **Basin OS1** is approximately 19.0 acres and is located offsite to the south of parcel no. 3, adjacent and upstream to Basin EX7. The offsite basin was analyzed in the MDDP as Basin A and categorized as all open space with native weeds/grasses. In this report, basin OS1 has been analyzed as majority existing 5-acre residential lots with a portion of the basin remaining as open space. Existing developments within this basin are from the Edmonds Subdivision and Palmer Divide subdivision. Both subdivisions consist largely of 5 acre lots that did not require detention at their time of approval. Flows entering the proposed site are routed via overland sheet flow and eventually collect within existing drainage swales located on-site. The basin has a composite imperviousness of 5.2% and the 5-year minor storm event and the 100-year major storm event are 7.7 cfs and 40.8 cfs, respectively.
- **Basin OS2** is approximately 36.4 acres and is located offsite to the southeast of parcel no. 3, adjacent and upstream to Basin EX8. The offsite basin was analyzed in the MDDP as Basin C and categorized as all open space with native weeds/grasses. In this report, basin OS2 has been analyzed as majority existing 5 acre residential with a portion of the basin remaining as open space. Existing developments within this basin are a part of the adjacent Palmer Divide subdivision. Run-

off coming from the mentioned subdivision did not require any detention at the time of approval. This off-site stormwater makes it way on-site via overland sheet flow that collects within an existing drainage swale, beginning at the property line. The basin has a composite imperviousness of 5.1% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 13.1 cfs and 69.9 cfs, respectively.

- **Basin OS3** is approximately 25.25 acres and is located offsite to the southeast of parcel no. 3, adjacent and upstream to Basin EX10. The offsite basin was analyzed in the MDDP as Basin F and categorized as all open space with native weeds/grasses. In this report, basin OS3 has been analyzed as majority existing open space with native weeds/grasses and a portion of the basin now categorized as existing 5 acre residential. Existing developments within this basin are a part of the adjacent Country View Estates subdivision. Run-off entering the proposed site from the mentioned subdivision did not require any detention at the time of approval. This off-site stormwater makes it way on-site via overland sheet flow that collects within an existing drainage swale, beginning at the property line. The basin has a composite imperviousness of 3.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 8.2 cfs and 53.9 cfs, respectively.
- **Basin OS4** is approximately 72.3 acres and is located offsite to the southeast of parcel no. 3, adjacent and upstream to Basin EX11. The offsite basin was analyzed in the MDDP as Basin Q and categorized as all open space with native weeds/grasses. In this report, basin OS4 has been analyzed as entirely existing 5 acre residential. Existing developments within this basin are a part of the adjacent Country View Estates subdivision. Run-off entering the proposed site from the mentioned subdivision did not require any detention at the time of approval. This off-site stormwater makes it way on-site via overland sheet flow that collects within an existing 18” HDPE culvert to cross under a gravel driveway that borders the north side of Country View Estates. The flows exit the culvert and enter an existing natural drainage swale that travels into parcel no. 3 of the proposed site. The basin has a composite imperviousness of 7.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 28.8 cfs and 134.6 cfs, respectively.
- **Basin OS5** is approximately 41.2 acres and is located offsite to the east of parcel no. 3 and south of parcel no. 4, adjacent and upstream to basin EX23. The offsite basin was analyzed in the MDDP as Basin V and categorized as mostly 5-acre residential with the rest of the area as open space, and this categorization remains in this report. Existing developments within this basin are 5-acre residential that have been developed as a part of F.H.N. Filing No. 1. Flows from the south of this subbasin are sheet flows that pass through a culvert that runs underneath Old Stagecoach Road and continue north into an existing drainage swale. This swale continues north and enters parcel no. 4, basin EX23, from the southern edge. The basin has a composite imperviousness of 6.5% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 16.2 cfs and 78.3 cfs, respectively.
- **Basin OS6** is approximately 83.6 acres and is located west of parcel no. 3. The offsite basin was analyzed in the MDDP as part of Basin E and categorized as all open space which remains as the categorization within this report. Existing developments within this basin are a part of the adjacent F.H.N. North Golf Course and consist of golf course infrastructure/features. Run-off coming from and making its way into the golf course tract collect within the existing irrigation reservoir. Water released from the reservoir is done so through the small jurisdiction dam via twin 4’x10’ concrete box culverts that allows the released waters to pass underneath Old Stagecoach Road, into a rock

chute, and finally into an existing natural drainage swale that flows north off-site. The basin has a composite imperviousness of 2.0% and the discharge rates, from the reservoir, for the 5-year minor storm event and the 100-year major storm event are 12.0 cfs and 124.0 cfs, respectively.

- **Basin OS7** is approximately 20.1 acres and is located within the western half of parcel no. 3, adjacent and downstream to Basins EX9, EX10, and EX16. The offsite basin was analyzed in the MDDP as Basin G and categorized as all open space with native weeds/grasses and remains as this categorization within this report. Existing developments within this basin are a part of the adjacent F.H.N. Golf Course and consist of golf course infrastructure/features. Run-off coming from and making its way into the golf course tract collect within a retention pond/water feature. Water released from the pond is directed into the downstream irrigation reservoir. The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 4.7 cfs and 34.9 cfs, respectively.
- **Basin OS8** is approximately 8.0 acres and is located east of parcel no. 2, adjacent and downstream to Basin EX5.1. The offsite basin was analyzed in the MDDP as a part of Basin E and categorized as all open space with native weeds/grasses. This basin is a part of F.H.N. Filing No. 3 and contains a part of Allen Ranch Road as well as an existing full spectrum detention pond. Run-off coming from and making its way into this basin, from basin EX5.1, is collected with the 4 type-R inlets along Allen Ranch Road that direct the stormwater into the detention pond which is then released at historic rates into the existing adjacent F.H.N. Golf Course tract. The basin has a composite imperviousness of 58.1% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 3.8 cfs and 4.4 cfs, respectively.
- **Basin OS9** is approximately 9.4 acres and is located in between parcels 3 and 4. The offsite basin was analyzed in the MDDP as a part of several basins, but now represents the area of Old Stagecoach Road that splits F.H.N. parcels 3 and 4. Because of this, this basin is categorized as mostly paved surface. This was developed as a part of F.H.N. Filing No. 1 and several pieces of stormwater infrastructure, all of which are culverts, allow flow from the south to cross underneath the road and continue north. Runoff from Old Stagecoach Road is captured in roadside swales and discharged into the culverts at design points 14 and 15, with the remaining flows discharging into the irrigation reservoir in offsite basin OS6. The basin has a composite imperviousness of 90.2% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 27.4 cfs and 50.6 cfs, respectively.

Proposed Major Basin Descriptions

This PDR discusses the hydrology of the larger basins that contain downstream design points representing the water quality and full spectrum detention ponds for the developed and disturbed basin areas. Any basin areas that drain directly offsite will consist of grass buffers that provide 100 percent runoff reduction and are eligible as large lot exemptions as these areas are perimeter estate lots of 2.5 acres or greater. Any areas that drain directly offsite that result in an increase of stormwater runoff to offsite downstream areas are mitigated by use of over-detention in the proposed on-site ponds to account for the runoff from these basins. As a result, the overall downstream minor and major storm runoff is at or below existing flows. An exhibit showing what areas throughout all parcels of the development that will be exempt from detention requirements will be shown in appendix F. All basins that are stated to have 100% run-off reduction from water quality are supported with UDBMP spreadsheet calculations that can be found in appendix D. These calculations represent “worst case

scenarios" for percent imperviousness of 2.5 acres lots and larger and ensure that these large lots still receive runoff reduction. The major basins yield overall minor and major storm event runoff rates calculated by the Rational Method that are to be captured in the public roadways with public storm sewer inlets and routed to their respective detention facility via public and private storm pipes. A combination of inlet sump locations, on-grade inlets, and grass lined swales are to be utilized for capture and conveyance. Design details such as specified inlet types and sizes, pipe sizing and hydraulic grade line analysis, and roadway capacities are to be presented in a future FDR in which sub-basins are delineated and additional design points where runoff is captured within major basins are presented. The PDR delineates the major basin throughout the development and provides preliminary sizing for proposed permanent control measures only.

Below are the major basins within the PUD Preliminary Plan Parcels 1-6 and their description including tributary area size, location, land use makeup, downstream design point and permanent control measure, as well as minor and major storm runoff totals. Basin descriptions are used as a PUD and PDR level of design is more clearly explained by describing land uses within a basin. Design Points are mentioned for each basin. Emergency overflow pathways are described for each detention pond in a further section of the report.

- **Basin A** is approximately 74.1 acres located to the south of the PUD within Parcel No. 3 and is east of the existing F.H.N. Golf Course. The basin consists of ½-acre sized single-family residential lots with a network of paved roadways within the 60' local urban rights-of-way. The basin contains a large area of open space tract including Detention Pond A, **Design Point 3**. The basin has a composite imperviousness of 15.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 38.9 cfs and 161.6 cfs, respectively.
- **Basin A1** is approximately 12.6 acres located to the south of the PUD within Parcel No. 3 and the east onsite area downstream of offsite basin OS1. The basin consists of 5.0-acre estate single-family residential lots that include mostly pervious lawn area, and the basin includes an existing tertiary channel that is intended to be undisturbed and flow through the PUD via a public culvert pipe crossing at **Design Point 4.** This design point will also convey the upstream Basin OS2, and ultimately drain to the existing Golf Course Irrigation Pond, **Design Point 6,** where the stormwater from this basin is detained and water quality is provided. Refer to table 4 in section 6.d of this report for supporting calculations that prove that the irrigation pond will not receive more major event stormwater flow than historical conditions. The basin has a composite imperviousness of 7.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 6.0 cfs and 29.0 cfs, respectively.
- **Basin A2** is approximately 6.5 acres located to the south of the PUD within Parcel No. 3 and is east of the existing Flying Horse North Golf Course. The basin consists of the rear of ½-acre sized single-family residential lots that include mostly pervious lawn area and the majority of the basin includes an existing tertiary channel that is intended to be undisturbed and flow through the PUD via a public culvert pipe crossing at **Design Point 5** conveying the upstream Basin OS2, ultimately to the existing F.H.N. Golf Course Irrigation Pond, **Design Point 6,** where basin A2 will receive storage detention. Refer to table 4 in section 6.d of this report for supporting calculations that prove that the irrigation pond will not receive more major stormwater flow than historical conditions. The basin has a composite imperviousness of 13.1% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 3.4 cfs and 15.3 cfs, respectively.

- **Basin B** is approximately 32.7 acres and is located north of Basin A, within the south half of the PUD in Parcel No. 3 and is east of the existing golf course. The basin consists of 1/2-acre and 1/3-acre sized single-family residential lots with a network of paved roadways within the 60' local urban rights-of-way. The basin contains an area of open space tract to its south and tract area to the north for Detention Pond B, **Design Point 7**. The basin has a composite imperviousness of 24.1% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 24.6 cfs and 86.1 cfs, respectively.
- **Basin C** is approximately 121.0 acres and is located northeast of Basin OS7 and west of Basin D, within the south half and central areas of the PUD in Parcel No. 3. The basin consists of a mix of land uses consisting of ½-acre and ¼ -acre sized single-family residential lots with paved roadways within the 60' local urban rights-of-way and the extension of Old Stagecoach Road. The basin contains a large area of open space tract central to the basin including designated Park Space. This open space area consists of existing tertiary swales to remain undisturbed. These swales convey stormwater runoff to an existing public 48" RCP culvert pipe (**Design Point 10**) that crosses Old Stagecoach Road that will now outfall to Detention Pond C, **Design Point 11**. Proposed flows leading to the existing RCP culvert will be analyzed further in the FDR. The basin has a composite imperviousness of 31.6% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 81.4 cfs and 251.4 cfs, respectively.
- **Basin D** is approximately 86.2 acres and is located east of Basin C within the southeast of the PUD in Parcel No. 3. The basin consists of ¼ -acre, 1/8-acre (0.2-acres), and 5-acre estate single-family residential lots with paved roadways within the 60' local urban rights-of-way. The basin contains open space at the filing boundary to the east which includes Detention Pond D, **Design Point 13**. The basin has a composite imperviousness of 26.8% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 54.8 cfs and 177.1 cfs, respectively.
- **Basin E** is approximately 52.4 acres and is located northeast of Basin C and north of Basin D and is within the central north half of the of the PUD and is a part of Parcel No. 3 and No. 5 which is the dedicated future amenities and recreation/gym facility parcel. The basin consists of ¼ -acre single-family residential lots with paved roadways within the 60' local urban rights-of-way and the extension of Old Stagecoach Road. Parcel No. 5 is assumed at 75% future commercial land use area. The basin drains due northwest and is tributary to Detention Pond E, **Design Point 15**. Within the basin is a culvert pipe that is to cross Old Stagecoach Road, **Design Point 14**. Sub-basins within Basin E are to be delineated in a future FDR to size the culvert pipe crossing. The future commercial amenities center area within Parcel No. 5 is assumed to drain directly to the public storm system that outfalls to Detention Pond E. The basin has a composite imperviousness of 43.7% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 67.7 cfs and 171.0 cfs, respectively.
- **Basin F** is a large area of the northern portion of the PUD totaling approximately 197.5 acres and is located northeast of Basin E and east of Basin G and extends to the north and northeast filing boundary within Parcel No. 4 and Parcel No. 6 which is the commercial lot at the northeast of the PUD. The basin consists of a mix of 1/8-acre, ¼ -acre and 2.5-acre single-family residential lots with paved roadways within the 60' local urban rights-of-way and a short extension of Old Stagecoach Road to a roundabout connection to the local and collector roadways. The basin contains a large area of open space tract area to the east of the filing as a buffer from surrounding

subdivision. This tract consists of existing natural tertiary channels and swales that drain due north. Portions of these tertiary swales will be re-graded to ensure proper bury depth of public sanitary sewer crossings from the Parcel's south residential blocks to the north area. There are interior tract areas of open space and a designated Park Area to the north central portion of the basin. The very northeast corner of the basin and filing contains a future commercial development parcel of approximately 9.2 acres. The basin drains due northwest and is tributary to Detention Pond F, **Design Point 17**. The basin has a composite imperviousness of 15.7% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 95.9 cfs and 366.3 cfs, respectively.

- **Basin G** is approximately 27.3 acres and is located to the north boundary of the filing, west of Basin F and is adjacent to Basin H within Parcel No. 4. The basin consists of ¼ -acre single-family residential lots with paved roadways within the 60' local urban rights-of-way and the connection to Hodgen Road. The basin contains a large area of open space tract at the north boundary of the site which contains Detention Pond G, **Design Point 18**. Additionally, the tract provides an emergency spillway overland path to the pond. The basin drains due north and northwest to the proposed pond. The basin has a composite imperviousness of 16.4% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 16.4 cfs and 68.4 cfs, respectively.

- **Basin H** is approximately 74.0 acres and is located onsite at the east filing boundary on the north half of the filing, adjacent to Basins C, E, F and G within Parcel No. 4. The basin consists of 5-acre rural single-family residential estate lots to act as buffers to the urban areas of the development. The developed areas within this basin are large estate lots that have sufficient undeveloped open space downstream for grass buffers that provide 100 percent runoff reduction and therefore do not be captured and detained onsite, as per the PBMP applicability item part II.E, which s lots greater than 2.5 acres with less than 10% imperviousness. Additionally, run-off reduction supporting calculations can be found in appendix D and an exhibit can be found in appendix F showing areas that do not require detention. The basin has a composite imperviousness of 7.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 37.6 cfs and 180.4 cfs, respectively. **Design Point 19** represents the respective downstream outfall areas at the filing border with offsite adjacent properties for the rural lots that drain directly offsite. See section 6.c of this report for more information about the effect on stormwater release points. The basins that experience development ccounted for in the proposed on-site ponds that over-detain to mitigate ese basins so that the overall outflow to downstream offsite areas is ng conditions. There are no existing or proposed offsite drainage ccomplished with over-detention onsite.

  acres and is in the northwest portion of Parcel No. 3, adjacent to Filing l north of Basin OS7. The basin consists of ½-acre and 1/3-acre t the northern cul-de-sac. The basin drains to a sump inlet (**Design** cul-de-sac which is to outfall to the existing golf course Irrigation Pond/Reservoir (**Design Point 6**) matching the historical drainage pattern of this basin. Historical flows from this basin are lower than the proposed flows to the irrigation pond. However, total overall flowrates leading to the irrigation pond are to be reduced in proposed conditions. Because the total flows leading the existing irrigation pond will be lower for the proposed conditions as compared to

revise to "do not provide detention.

DP 19 is not representative of the entirety of Basin H as only the southerly portion of basin H is conveyed to DP 19. Basin H should be broken up an additional basin (or 2) to accurately reflect the outfalls/Design Points that are increasing flows to the offsite. Please give me a call to discuss this.

historical values, the flows exiting basin I can be discharged into the existing irrigation pond. Refer to section 6.d of this report for supporting calculations. The basin has a composite imperviousness of 26.4% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 6.1 cfs and 20.7 cfs, respectively.

- **Basin J** is approximately 15.8 acres and is in the west area of the PUD in Parcel No. 1, adjacent to F.H.N. Filing No. 1. The basin consists of the proposed permanent golf course clubhouse development with parking lot. The basin drains due north toward Old Stagecoach Road and west into Pond J, **Design Point 21**. The basin has a composite imperviousness of 86.1% which conservatively includes an assumed 95% imperviousness for most of the developed commercial parcel and 1.5 acre of pond open space. The runoff rates for the 5-year minor storm event and the 100-year major storm event are 59.8 cfs and 112.4 cfs, respectively.
- **Basin K** is approximately 18.0 acres and is in the west commercial and flats area of Parcel No. 2, adjacent to Filing Nos. 1 and 3. The basin consists of the hotel and resort complex with paved parking areas and various amenities buildings in addition to the main hotel and event center building as well as a casitas residential development with paved access roadways. The basin drains due west to proposed Detention Pond K, **Design Point 22** which outfalls due west through the existing golf course and F.H.N. Filing No. 1. The basin has a composite imperviousness of 86.0% which conservatively includes an assumed 95% imperviousness for most of the developed commercial and residential parcel and 1.75 acre of pond open space area. The runoff rates for the 5-year minor storm event and the 100-year major storm event are 64.4 cfs and 121.2 cfs, respectively.
- **Basin L** is approximately 7.1 acres and is in the west commercial and flats area in Parcel No. 2, adjacent to Filing Nos. 1 and 3. The basin consists of the Flats which includes the buildings, access drives, and landscaping that are conceptual at this point. Assumed imperviousness for this basin is 40% open space landscaped area and 60% roof and pavement. The basin drains due west through the existing F.H.N. Golf Course and is tributary to existing Pond 8 in Filing No. 1. In the final design of this basin, it will be demonstrated that Pond 8 has sufficient capacity for the contributing flow and that the pond will continue to function as intended and without maintenance deficiencies. This tributary basin was discussed in the 2018 Classic Consulting PDR/FDR and the 2023 F.H.N. Filing No. 3 FDR by HR Green Development, LLC. The basin has a composite imperviousness of 57.8% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 19.0 cfs and 41.1 cfs, respectively. **Design Point 23** represents the basin's west outfall location at the golf course from the flats area. The adjacent development to the east is a part of Filing No. 3 and is described in the Filing No. 3 FDR to be detained in Pond A of Filing No. 3 located adjacent to the golf course.
- **Basin M** is approximately 5.0 acres and is in the west commercial and flats area in Parcel No. 2, adjacent to Filing Nos. 1 and 3. The basin consists of the Flats which includes the buildings, access drives, and landscaping that are conceptual at this point. Assumed imperviousness for this basin is 40% open space landscaped area and 60% roof and pavement. The basin has a composite imperviousness of 57.8% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 9.9 cfs and 21.3 cfs, respectively. The basin drains due east to F.H.N. Filing No. 3, which is being reviewed concurrently, into a section of Allen Ranch Road that contains several pieces of drainage infrastructure including 4 CDOT Type-R inlets. Stormwater that exits the

basin is captured within those inlets and then piped down to full spectrum detention pond A, a part of F.H.N. Filing No. 3, which will release flows at historic rates. Flows released from the pond eventually end up in the irrigation reservoir that has been developed as part of F.H.N. Filing No. 1. This portion of Allen Ranch Road and the detention pond have been assessed for fully developed conditions of the Flats area as part of the F.H.N. Filing No. 3 FDR.

The following are the Offsite Basins that the upstream tributary areas that drain to and through the proposed PUD that will require collection and conveyance to downstream permanent control measures or routing around or through the development. The offsite basins are described as undeveloped open space consisting of their native grasses and weeds with sparse areas of barren pervious soils per the NRCS Soils Maps included in the Appendix. Any future development of these upstream adjacent properties are to require onsite water quality and detention and any stormwater release to and through the Flying Horse North subdivision will be restricted to be at or less than historical rates and via overland sheet flow. There are also offsite basins that represent the existing F.H.N. Golf Course areas, as relevant to this PUD.

- **Basin OS1** is approximately 19.0 acres and is located offsite to the southeast of the filing, adjacent and upstream to Basin A. The offsite basin was analyzed in the MDDP as Basin A and remains as its existing undeveloped open space with native grasses and weeds. There are no developments within this major offsite basin and any future development of the area will require onsite water quality and detention. The offsite basin is tributary to onsite Detention Pond A / **Design Point 3**. Detention Pond A outfalls to the existing golf course at or below historical stormwater runoff rates and drains to the existing Golf Course Irrigation Pond (**Design Point 6**). The offsite basin is routed via overland sheet flow to the roadway in the PUD and is to cross and outfall into undisturbed open space in Basin A via public culvert pipes sited at **Design Points 1 and 2**. The basin is to be split into two sub-basins to assess each culvert pipe design in a future FDR. The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 5.6 cfs and 41.3 cfs, respectively.
- **Basin OS2** is approximately 36.4 acres and is adjacent and upstream of Basin A1. The offsite basin was analyzed in the MDDP as Basin B and remains as its existing undeveloped open space with native grasses and weeds. There are no developments within this major offsite portion of the basin and there is a small area of 5-acre development within the Site where the existing tertiary channel crossing through the development. Any future development of the off-site area will require onsite water quality and detention to release at historical rates as it passes through the F.H.N. PUD. The offsite basin is tributary to the existing Irrigation Pond (**Design Point 6**) that was built as a part of the F.H.N. Golf Course development. The offsite basin is routed via overland sheet flow and is conveyed through the PUD via public culvert pipes (**Design Point 4**) through the PUD roadways and through the existing tertiary channel in Basin A2. The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 9.2 cfs and 67.9 cfs, respectively.
- **Basin OS3** is approximately 25.3 acres and is located offsite to the southeast of the filing, adjacent and upstream to Basin BB. The offsite basin was analyzed in the MDDP as Basin C and remains as its existing undeveloped open space with native grasses and weeds. There are no developments within this major offsite basin and any future development of the area will require onsite water quality and detention. The offsite basin overland sheet flows to the roadway at the south portion of Basin BB and C and is conveyed directly to the open space existing F.H.N. Golf Course area in

Basin BB via a public culvert pipe (**Design Point 8**) and is directed offsite, ultimately to the existing Irrigation Pond at the Golf Course (**Design Point 6**). The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 6.8 cfs and 49.9 cfs, respectively.

- **Basin OS4** is approximately 72.3 acres and is located offsite to the southeast of the filing, adjacent and upstream to Basin D. The offsite basin was analyzed in the MDDP as Basin D and remains as its existing undeveloped open space with native grasses and weeds. There are no developments within this major offsite basin and any future development of the area will require onsite water quality and detention. The basin drains onto the PUD site via overland flow until it is channelized in a tertiary swale at **Design Point** 12. The offsite basin is tributary to onsite Detention Pond D / **Design Point 13**. The offsite basin is routed via overland sheet flow and is channelized through onsite Basin F via existing natural channels. The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 18.3 cfs and 134.5 cfs, respectively.
- **Basin OS5** is approximately 41.2 acres and is located offsite central east boundary of the filing, adjacent to Basin E and upstream to Basin F. The offsite basin was analyzed in the MDDP as Basins V2, U, W, and X3 and remains as existing 2.5 acre lots and partion open space with native weeds and grasses. The existing developments within this site will receive detention as a part of the development of parcel no. 4 of this PUD. The offsite basin is tributary to onsite Detention Pond F / **Design Point 17**. The offsite basin is routed via overland sheet flow and is channelized through onsite Basin F via existing natural channels on the east side of parcel no. 4, entering the Site at **Design Point 16** where proposed estate lots are sited. It is expected that driveway culvert pipes for these estate lots will be required to convey the upstream off-site stormwater runoff. The basin has a composite imperviousness of 2.0% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 15.9 cfs and 78.8 cfs, respectively.
- **Basin OS6** is approximately 95.0 acres and represents the existing F.H.N. Golf Course area between the west Parcels 1 and 2, Filing No. 1, and Filing No. 3 and the east PUD residential areas for Parcels 3-6. The existing golf course area includes areas of pervious grassed surfaces for the golf course, and rear of residential lots of various lot sizes that drain through the course. This basin includes the existing Irrigation Pond/Reservoir, **Design Point 6** that is the ultimate drainage control measure for many basins and pond outfalls within the PUD. The offsite basin was analyzed in the MDDP as Basin E and most of the basin remains as the existing golf course development with the addition of some rear of developed PUD lots adjacent to Basins A, B, I, and Filing No. 1 and 3 estate lots. The basin has been reduced in size from the MDDP as the PUD development of Basins A, B, and I will capture stormwater runoff where historic conditions have areas within these basins that flow directly to the Irrigation Reservoir. In cases where the back half of a proposed lot will be directed to flow into basin OS6, the lot will be provided detention via the irrigation pond within basin OS6. The offsite basin is routed via overland sheet flow and is channelized through grass-lined swales along its east edge adjacent to Basins A and B. The basin has a composite imperviousness of 4.6% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 23.0 cfs and 143.5 cfs, respectively.
- **Basin OS7** is approximately 28.2 acres and is located north of Basin B and southwest of Basin C, within the south half of the PUD in Parcel No. 3 and is comprised of existing golf course area that

is not to be disturbed. The basin includes some onsite area (7.6 ac.) of developed single-family residential lots which are the rear half of the lots backing up to the existing golf course. The basin flows directly offsite at **Design Point 9** and has 100 percent runoff reduction via the grass buffer in the existing Golf Course and ultimately drains to the existing Irrigation Pond/Reservoir (**Design Point 6**). The basin has a composite imperviousness of 8.2% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 10.6 cfs and 57.7 cfs, respectively. The basin is all open space and has 100 percent water quality runoff reduction via a grass buffer and is directed offsite. Final analysis of this area will be required with a future Final Drainage Report.

- **Basin OS8** is approximately 8.0 acres and is located east of parcel no. 2, adjacent and downstream to Basin M. The offsite basin was analyzed in the MDDP as a part of Basin E and categorized as all open space with native weeds/grasses. This basin is a part of F.H.N. Filing No. 3 and contains a part of Allen Ranch Road as well as an existing full spectrum detention pond. Run-off coming from and making its way into this basin, from basin M, is collected with the 4 type-R inlets along Allen Ranch Road that direct the stormwater into the detention pond which is then released at historic rates into the existing adjacent F.H.N. Golf Course tract. The basin has a composite imperviousness of 58.1% and the runoff rates for the 5-year minor storm event and the 100-year major storm event are 3.8 cfs and 4.4 cfs, respectively.

The above-mentioned basins are large planning area basins and as the Final Drainage Report is developed for the filing, additional analysis and calculations will be required to assess proposed storm sewer conveyance, roadway and inlet capacities, capacities and routing of natural and proposed channels and swales, and detention pond infrastructure.

The Final Drainage Report for respective future filings are to include final pond outlet structure designs that will determine the outflows for the minor and major storm events to ensure that developed conditions have downstream outflow runoff quantities at or below existing undeveloped conditions for respective major basins and outfall points. The pond calculations within this report include basins that drain directly offsite in their tributary areas so that over-detention is provided to mitigate the increase in runoff in these areas.

IV. Drainage Design Criteria

a. Development Criteria Reference

The following criteria manuals and reports were used as reference material for the preparation of this PDR and its hydrologic and hydraulic design parameters.

- NOAA Atlas 14
- NRCS Soil Survey for El Paso County Area, Colorado
- El Paso County Assessor Property Records
- El Paso County – Drainage Criteria Manual, 2014
- City of Colorado Springs – Drainage Criteria Manual, May 2014
- Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

The following reports were used as reference documents for surrounding developments and the major drainage basin that the proposed PUD lies within.

- Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1, Classic Consulting Engineers and Surveyors, November 2017

- Flying Horse North Filing No. 3 Final Drainage Report prepared by HR Green Development, LLC. – latest revision August 2023
- Flying Horse North Master Development Drainage Plan, HR Green Development, LLC., September 2022
- Flying Horse North Irrigation Reservoir Embankment Design Report, Classic Consulting Engineers and Surveyors, August 2018
- Black Squirrel Drainage Basin Planning Study (DBPS), URS Consultants, January 1989

b. Hydrologic Criteria

Design rainfall was determined utilizing Table 6-2 from the City of Colorado Springs Drainage Criteria Manual to determine the 5-year and 100-year rainfall values for the 1-hour events. The 1-hour rainfall depths are 1.5 and 2.52 in/hr respectively. The Rational Method is used for stormwater runoff calculations.

Composite percent impervious calculations were completed for each subbasin based on the density of lots and can be found in Appendix B. The El Paso County Drainage Criteria Manual Table 5-1 was used for reference when correlating land use to percent impervious values and located in Appendix F. Impervious values for 5-Acre Rural Lots, 2.5-Acre Rural Lots, 1/2-acre, 1/3-acre, 1/4-acre, 1/8-acre single family residential lots and Commercial Lots have impervious values of 7%, 11%, 25%, 30%, 40%, 65%, 95%, respectively. Open space, lawn, and golf course areas have 2% impervious values. Rainfall intensity and peak runoff calculations are provided in Appendix B.

Basins are routed to their respective design points and detention ponds as shown on the Hydrology Maps in Appendix F. Calculations performed in the Mile High Flood District BMP and Detention spreadsheets are used to determine pond storage sizing and detention discharge release rates at the preliminary design level.

c. Applicable Criteria and Standards

Per the DBPS and El Paso County Criteria Manual, flows from the proposed site will be limited to historic flows to maintain the stability of the existing channels within the drainage basins. The master plan follows the Drainage Criteria Manual for El Paso County which refers to the City of Colorado Springs Drainage Criteria Manuals as amended. Criteria within the County and City manuals refer to the Mile High Flood District manuals, particularly for extended detention basin design and runoff reduction calculations which are utilized in this report.

V. Hydraulic Analysis

Major Drainageways

There are no major drainage ways that exist within the PUD development; however, natural tertiary tributaries are within the site currently and function to convey flows to unnamed tributaries of the East Cherry Creek and Black Squirrel Creek. Open spaces including tracts and park areas have natural drainageways that will remain undisturbed and are assessed within this report for capacity and stabilization. This PDR does not include hydraulic analysis for the storm systems to be designed as a part a future FDR, however, there are preliminary design points with storm pipes such as culvert crossings, tract drainageways, and other conveyances that are included in the hydraulic analysis of this PDR.

Hydraulic analysis is provided in this PDR for the following:

- Locations where upstream off-site basins will cross roadways in the development and culverts are sited.
- Natural channels both onsite and offsite that will either be undisturbed or graded into an engineered channel.
- Locations where existing culvert storm infrastructure will be used to convey newly proposed flows underneath Old Stagecoach Road.

VI. Drainage Facility Design

a. General Concept

For the PUD Preliminary Plan to be in compliance with off-site runoff requirements, the developed conditions require conveyance of upstream off-site areas through or around the developed areas. The off-site tributary basins are to be captured and conveyed within the major basins of the developed PUD parcels and routed to downstream design points that are full spectrum detention basins. This PDR includes preliminary hydraulic design for the conveyance of off-site stormwater runoff but does not include detailed analysis of proposed storm systems within the major basins. It is anticipated that developed rights-of-way will include public stormwater infrastructure including inlets that will capture stormwater runoff and convey the runoff downstream via storm main to their respective detention basins. Off-site areas that drain directly onto the developed areas are to be captured either by culvert pipes or drainage swales and conveyed to storm sewer systems that ultimately outfall to detention basins.

The content included in this PDR to demonstrate drainage facility design at the preliminary level include hydrology design calculations including the Rational Method tabulations for determining major basin composite coefficients, imperviousness, time of concentration, rainfall intensity, and peak runoff rates for minor and major storm events; MHFD Detention and BMP tabulations for basin stage-storage and detention discharge rates; tables and figures from the El Paso County Drainage Criteria Manual for Land Use Coefficients and Percent Imperviousness; tables and figures from the City of Colorado Springs Drainage Criteria Manuals Volumes 1 and 2 for roadway stormwater capacity; and hydrology maps for the pre-development and developed conditions of the PUD to show major basin delineations, acreage of tributary areas, and design point routing.

b. Specific Details

This PDR includes Appendix F hydrology/drainage maps showing the major basin tributary areas associated with the PUD development for both the pre-developed and developed conditions. The appendix calculations and drainage maps include tables summarizing the stormwater peak runoff rates fo the minor (5-year) and major (100-year) events. The maps and calculations include off-site tributary areas entering the PUD parcels and the outfall locations for pond outlet pipes and any basins with direct runoff exiting the PUD parcels to off-site downstream locations.

The approach to accommodate drainage impacts on existing or proposed improvements includes the delineation of major basins at the PDR level to determine the required location and sizing of full spectrum detention basins to provide water quality and detention and release stormwater downstream at or below historical rates. The general concept for future delineated sub-basins and a storm system design to be presented in a future FDR includes public and private storm inlets and pipes that will collect and convey off-site and on-site stormwater runoff within roadways that ultimately outfall to detention ponds. A future FDR will include storm system design based on roadway capacity, inlet capacity, and hydraulic grade lines.

The PDR summarizes the major basin areas and provides preliminary calculations for each major basin and their downstream control measures.

The proposed water quality and full spectrum detention basins are preliminarily sized in this PDR for the purpose of siting, and the outlet structures and orifice plate design are to be designed for release rates at or below historical rates in a future FDR. Pond designs are also preliminarily shown on the developed conditions drainage map including the required stormwater infrastructure for extended detention basins including concrete forebays, concrete trickle channels, concrete micropools and outlet structures with orifice plates and/or outlet pipe restrictor plates, emergency spillways with weirs, maintenance pathways, outlet pipes.

The drainage impact of site constraints such as streets, utilities, existing and proposed structures are mitigated by following typical sections for right-of-way improvements per the County Engineering Criteria Manual. The majority of the PUD parcels include urban local and urban collector roadways with standard alignments for storm sewer, water main, and sanitary sewer. A future FDR is to include sited storm sewer alignments and inlet locations with consideration for vertical clearances of utility crossings. There are no existing structures or utilities currently in conflict with the preliminary storm design.

There are no known environmental features or issues applicable to the drainage facility design of the PUD.

Maintenance access is required by the County for the perpetual access and maintenance of stormwater facilities. The PDR level of design presented in this report and its maps shows that each detention facility will require a standard maintenance pathway from the public rights-of-way to access all pond infrastructure including forebays and outlet structures. Access to drainage facilities are to include a pathway from the public rights-of-way or a pathway within an access easement.

c. Detention Pond Preliminary Design Summary

The following table summarizes the full spectrum detention ponds sited for the PUD Preliminary Plan. The ponds are designed for WQCV, EURV, and 100-year storage volumes. Preliminary design has been done for the outlet structures to release at or below historical rates.

Table 3: Preliminary Pond Design Information

Pond Name	Preliminary Bottom Elev. (ft)	Preliminary Top of Pond Elev. (ft)	WQCV (ac-ft)	EURV (ac-ft)	100-Year (ac-ft)	Total Required Volume (ac-ft)	Total Preliminary Design Volume * (ac-ft)
Pond A	7562.00	7572.00	0.618	0.476	2.699	3.793	10.504
Pond B	7552.00	7558.00	0.359	0.436	1.110	1.904	2.780
Pond C	7526.00	7534.00	1.577	2.364	4.361	8.302	12.062
Pond D	7530.00	7538.00	1.264	1.127	4.863	7.254	9.082
Pond E	7550.00	7557.00	0.828	1.594	2.032	4.454	6.316
Pond F	7438.00	7446.00	1.768	1.484	7.158	10.409	15.680
Pond G	7442.00	7447.00	0.227	0.210	0.849	1.287	3.045
Pond J	7583.00	7591.00	0.487	1.031	0.751	2.270	2.985
Pond K	7501.00	7511.00	0.554	1.174	0.856	2.584	3.436

***** Total basin volumes include the required 1' of freeboard to top of pond.

The following descriptions of each detention pond are provided to describe outfall locations, emergency spillway routing, and ultimate outfall locations downstream. All pond embankments have been designed to be no greater than 10 feet in height, therefore there are no proposed jurisdictional dams.

Pond outlet locations have been strategically selected and designed to reduce the impact on downstream properties/conditions. Additionally, pond outfalls will have rip-rap to provide energy dissipation which will be analyzed in the future FDR. In the subsequent pond descriptions, pond outfall locations will be described and reasoning for outfall locations will be explained.

Pond A (Design Point 3) provides water quality and full-spectrum detention for tributary basins A and OS1. This extended detention basin outfalls due west into Basin OS8, the existing F.H.N. Golf Course, under the adjacent western roadway. The golf course has an existing grass-lined swale that drains due north to its existing Irrigation Pond/Reservoir that was designed and constructed as a part of Filing No. 1. Analysis of this existing pond is included in this report to demonstrate compliance for upstream stormwater detention and ponds in-series. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed west toward the Tract located across the street so that emergency stormwater overflow is ultimately directed toward the golf course. Detained stormwater is released in Tract E which then allows flows to enter into an existing swale located in tract L of the Flying Horse Golf Course. Flows travel to the existing irrigation pond and ultimately travel north to be captured in a roadside swale along Hodgen Road.

Pond B (Design Point 7) provides water quality and full-spectrum detention for tributary basin B. This extended detention basin outfalls due north into Basin OS6, the existing F.H.N. Golf Course, under the existing maintenance and golf car path to its north. The golf course has an existing grass-lined swale that drains due north to its existing Irrigation Pond/Reservoir that was designed and constructed as a part of Filing No. 1. Analysis of this existing pond is included in this report to demonstrate compliance for upstream stormwater detention and ponds in-series. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed northwest toward the existing golf course swale. Detained stormwater is released in Tract M of the Flying Horse Golf Course and enters an existing swale which travels to Tract L of the golf course. Flows travel to the existing irrigation pond and ultimately travel north to be captured in a roadside swale along Hodgen Road.

Pond C (Design Point 11) provides water quality and full-spectrum detention for tributary basin C. This extended detention basin outfalls due north directly offsite. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed northwest, directly offsite. Detained stormwater is released into the headwaters of an existing swale directly north-west of the pond. Flows travel north, off-site, and ultimately are captured in a roadside swale along Hodgen Road.

Pond D (Design Point 13) provides water quality and full-spectrum detention for tributary basin D. This extended detention basin outfalls due north directly offsite. The emergency spillway of this pond consists of a rip-rap weir designed for the peak inflow to the pond and is to be directed northwest, directly offsite. Detained stormwater is released east into a roadside swale along Black Forest Road. Flows ultimately travel north to an unnamed tributary.

Pond E (Design Point 15) provides water quality and full-spectrum detention for tributary basin E which includes the future amenities center with gym/recreation building(s) that has assumed imperviousness described in the proposed basins section. This extended detention basin outfalls due northwest directly offsite into an existing swale that travels north and ultimately is collected in a roadside swale along Hodgen

Dp18 per drainage map

Road. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed northwest, directly offsite.

Pond F (Design Point 17) provides water quality and full-spectrum detention for tributary basin F and OS5. This extended detention basin outfalls due north toward Hodgens Road where an existing culvert pipe crosses to the north side of the roadway and is directed offsite. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed north, following the same drainage pattern as the outlet pipe.

Pond G (Design Point 15) provides water quality and full-spectrum detention for tributary basin G. This extended detention basin outfalls due north toward Hodgens Road where an existing culvert pipe crosses to the north side of the roadway and is directed offsite. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed north, following the same drainage pattern as the outlet pipe.

DP21 per drainage map

Pond J (Design Point 18) provides water quality and full-spectrum detention for tributary basin J which is Parcel No. 1, the future commercial golf course club house with parking. Assumed imperviousness and land uses for the parcel are described in the proposed basins section. This extended detention basin outfalls due north to the roadside swale of Old Stagecoach Road which drains due west to an existing culvert pipe crosses to the north side of the roadway and is directed to an existing detention pond that was constructed as a part of Filing No. 1. This pond was designed to detain the runoff from this Parcel as 2.5 acre lots. On-site detention of the commercial development will reduce the runoff from this area to historic rates. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed northwest, following the same drainage pattern as the outlet pipe.

Pond K (Design Point 19) provides water quality and full-spectrum detention for tributary basin K which is part of Parcel No. 2 area that is for the future commercial hotel and resort with parking and residential casitas development. Assumed imperviousness and land uses for the parcel are described in the proposed basins section. This extended detention basin outfalls due west directly to Filing No. 1. The downstream existing Pond 8, which was constructed as a part of Filing No. 1, accounted for runoff from this basin as existing undeveloped area. In the final design of this pond, it will be demonstrated that Pond 8 has sufficient capacity for the contributing flow being released from this pond, and that Pond 8 will continue to function as intended and without maintenance deficiencies. On-site detention of the commercial development will reduce the runoff from this area to historic rates, matching that of the assumed runoff rates for Filing No. 1. The emergency spillway of this pond is to consist of a rip-rap weir designed for the peak inflow to the pond and is to be directed west, following the same drainage pattern as the outlet pipe.

revise to DP22 per the drainage map

d. Existing Tract L Irrigation Pond & Reservoir, Filing No. 1

Per the Flying Horse North Irrigation Reservoir Embankment Design Report, the Existing Tract L Irrigation Pond and Reservoir acts as an irrigation reservoir and detention pond for the golf course and surrounding tributary area as seen in Figure 2.

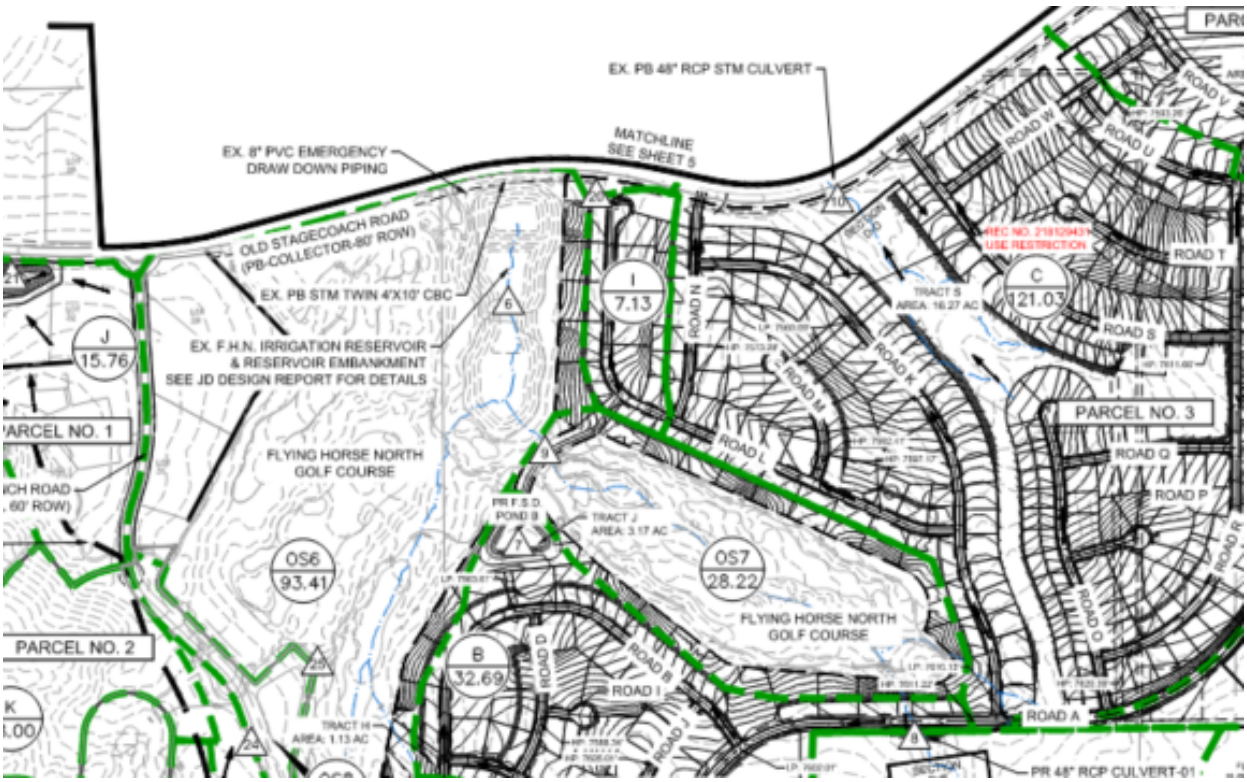


Figure 2: Existing Tract L Irrigation Pond and Reservoir

The full proposed drainage map is provided in Appendix F. The Flying Horse North Irrigation Design Report can be found in Appendix E.

The development of Parcels 1-6 results in an increase in land density from 2 acre lots to ½ acre residential lots upstream of the irrigation pond. To reduce runoff to historic rates, detention ponds will be added upstream of the reservoir. The table below shows the existing and proposed runoff rates of each basin tributary to the irrigation pond through Tract L.

Table 4: Preliminary Existing and Proposed Runoff Rates

Existing Conditions			Proposed Conditions[1]		
Design Point	**Contributing Basins**	**100 Year Runoff Rate (cfs)**	**Design Point**	**Contributing Basins**	**100 Year Runoff Rate (cfs)**
17	EX17	32.3	25[1]	OS8	23.95
18	OS5, DP9, 16, 10	165.9	3[2]	A, OS1	43.1
8	EX8 & DP27	144.5	5	A2, A1, OS2	117.4
7	EX7 & DP26	150.9	7[3]	B	22.8
30	OS8	4.4	9	OS7, OS3	124.7
	OS6	110.0	20	I	15.7
				OS6	161.12
Total		608	Total[4]		478.02

1. All proposed runoff rates are from the CUHP model
2. DP 25 100-year runoff rate is FHN Filing No. 3 Pond A's peak discharge rate
2. DP3 100-year runoff rate is proposed Pond A's peak discharge rate
3. DP7 100-year runoff rate is proposed Pond B's discharge rate
4. Value derived from total inflow into irrigation pond per SWMM and accounts for timing of peak runoff rates from basins.

The proposed conditions were modeled in EPA SWMM to ensure the ponds in series meet compliance with Senate Bill 15-212 for drain times and evaluate the storage capacity and outlet structure of the existing irrigation pond. Per the Flying Horse North Irrigation Reservoir Embankment Report, the existing irrigation pond was designed to hold an inflow runoff rate of 609 cfs. The peak has been reduced to 460 cfs. The table below shows the existing and proposed parameters of the irrigation pond.

Table 5: Irrigation Pond Design Value Comparison

Flying Horse North Irrigation Reservoir Embankment Design Report Design Values		Proposed Irrigation Pond Design Values
Total Design Inflows (cfs)	609	478
100-Year WSE (ft)	7534.23	7535.07
Peak Discharge (ft)	182	216

Please note that different hydrologic and hydraulic methods were used when modeling the pond. The FHN Irrigation Reservoir Embankment Design Report uses the SCS Curve Number Method and Pond Pack to design the pond. This differs from the CUHP/ EPA SWMM Modeling approach and will result in different values. CUHP utilizes 1-hr rainfall depths whereas Pond Pack uses 24-hr rainfall depths.

Per discussions with El Paso County, EPA SWMM is an acceptable method to model the pond. The lower peak but higher volume of runoff is a result of the use of the different rainfall depths and methodology. There is no actual increase in stormwater runoff to the irrigation reservoir and therefore no downstream mitigation or retrofitting of the basin and infrastructure is proposed.

Per the model, all pond drain times do not exceed 120 hours and are within compliance for events greater than the 5-year storms outlined in Senate Bill 15-212.

All SWMM results and supporting information is located in Appendix C.

VII. 4-Step Process

In accordance with the Engineering Criteria Manual I.7.2.A and DCM V2, this site has implemented the four-step process to minimize adverse impacts of urbanization. The four-step process includes reducing runoff volumes, stabilizing drainageways, treating the water quality capture volume, and considering the need for Industrial Commercial BMPs. The PDR stage of design for the 4-step process is conceptual in nature and is to be more specifically described within a future FDR when storm system routing at the sub-basin level is available.

Step 1 – Reducing Runoff Volumes: The development of the project site includes a variety of land uses including open and vegetated areas interspersed to help disconnect imperious areas and reduce runoff volumes. Single-family residential lots are standardized to include side yard swales that roof runoff drain to via downspouts. Runoff reduction is provided within side yard swales for each lot.

Step 2 – Stabilize Drainageways: Altered drainage ways will be designed in a manner that provides water quality benefits through infiltration and the removal of pollutants via phytoremediation. Vegetation will also be selected to stabilize the drainage ways by reducing the velocity of flows and decreasing any scour. Should the final drainage ways require, grade control structures may be implemented to further reduce flow velocities and protect against erosion. These improvements will help stabilize drainageways.

Step 3 – Provide WQCV: Runoff from this development is treated through capture and slow release of the WQCV via detention ponds that are designed per current El Paso County DCM V2.

Step 4 – Consider the need for Industrial and Commercial BMP's: A site specific storm water quality and erosion control plan and narrative will be prepared with subsequent land use approvals prepared in conjunction with the report prior to any construction. Site specific temporary source control BMPs as well as permanent BMPs are detailed in this plan and narrative. Guidelines detailed in the El Paso DCM V2 4.2 pertaining to the covering and storage handline and spill containment and control shall be followed as necessary.

VIII. Drawings

Please refer to the appendices for vicinity maps and drainage basin maps.

The drainage maps identify drainage flows entering and leaving the development and general drainage patterns. The maps identify any major construction such as existing and proposed detention facilities, culverts, and preliminarily sited storm sewer infrastructure. The Drainage plans delineate all subbasins and proposed initial and major facilities as well as a provide a summary of all initial and major flow rates at design points. All floodplains effecting the site are shown.

IX. Summary

Flying Horse North is a large master planned community consisting of various densities of dwelling units to include single family homes, multifamily homes, parks, institutional sites, and commercial areas. Due to development, increased runoff will occur. To mitigate downstream impacts, full spectrum detention facilities will be built to reduce the runoff rate to be at or below historic levels. These detention facilities will provide water quality enhancements to account for the increased urbanization of the upstream catchment areas. These basins also include detention for non-tributary areas that drain directly offsite so that the overall downstream runoff from the development is equal to or less than existing undeveloped conditions. The

ponds are preliminarily sized to ensure that the 5-year and 100-year release rates are equal to or less than the historic rates.

There are no proposed development or disturbance areas within the FEMA flood zones on the property. There is a Zone AE located at the northwest corner of Parcel 3 but no development is to take place within this floodplain.

Additional analysis will be required and completed to review the hydraulics of the proposed major drainage channels and sub-basins to be included in a future submittal of an FDR. The proposed design, as described in this report, is not anticipated to cause any adverse impact to downstream properties. Implementation of the four-step process above and any additional measures that are within reason to disconnect impervious areas and increase infiltration should be pursued within a future FDR. The Final Drainage Report for respective future filings are to include final pond outlet structure designs that will determine the outflows for the minor and major storm events to ensure that developed conditions have downstream outflow runoff quantities at or below existing undeveloped conditions for respective major basins and outfall points. The pond calculations within this report include basins that drain directly offsite in their tributary areas so that over-detention is provided to mitigate the increase in runoff in these areas.

This PDR includes major basin analysis and provides descriptions and calculations for best management practices for stormwater collection and conveyance at the preliminary design stage.

X. References

Mile High Flood District Urban Drainage Criteria Manuals, Volumes 1-3

NOAA Atlas 14

NRCS Soil Survey for El Paso County Area, Colorado

FEMA FIRM 08041C0305G and FIRM 08041C0315G (eff. 12/7/2018)

El Paso County Assessor Property Records

El Paso County – Drainage Criteria Manual, 2014

City of Colorado Springs – Drainage Criteria Manual, May 2014

Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2018

Preliminary Drainage Report for Flying Horse North Preliminary Plan and Final Drainage Report for Flying Horse North Filing No. 1, Classic Consulting Engineers and Surveyors, November 2017

Flying Horse North Filing No. 3 Final Drainage Report prepared by HR Green Development, LLC. – latest revision August 2023

Flying Horse North Master Development Drainage Plan, HR Green Development, LLC., September 2022

Flying Horse North Irrigation Reservoir Embankment Design Report, Classic Consulting Engineers and Surveyors, August 2018

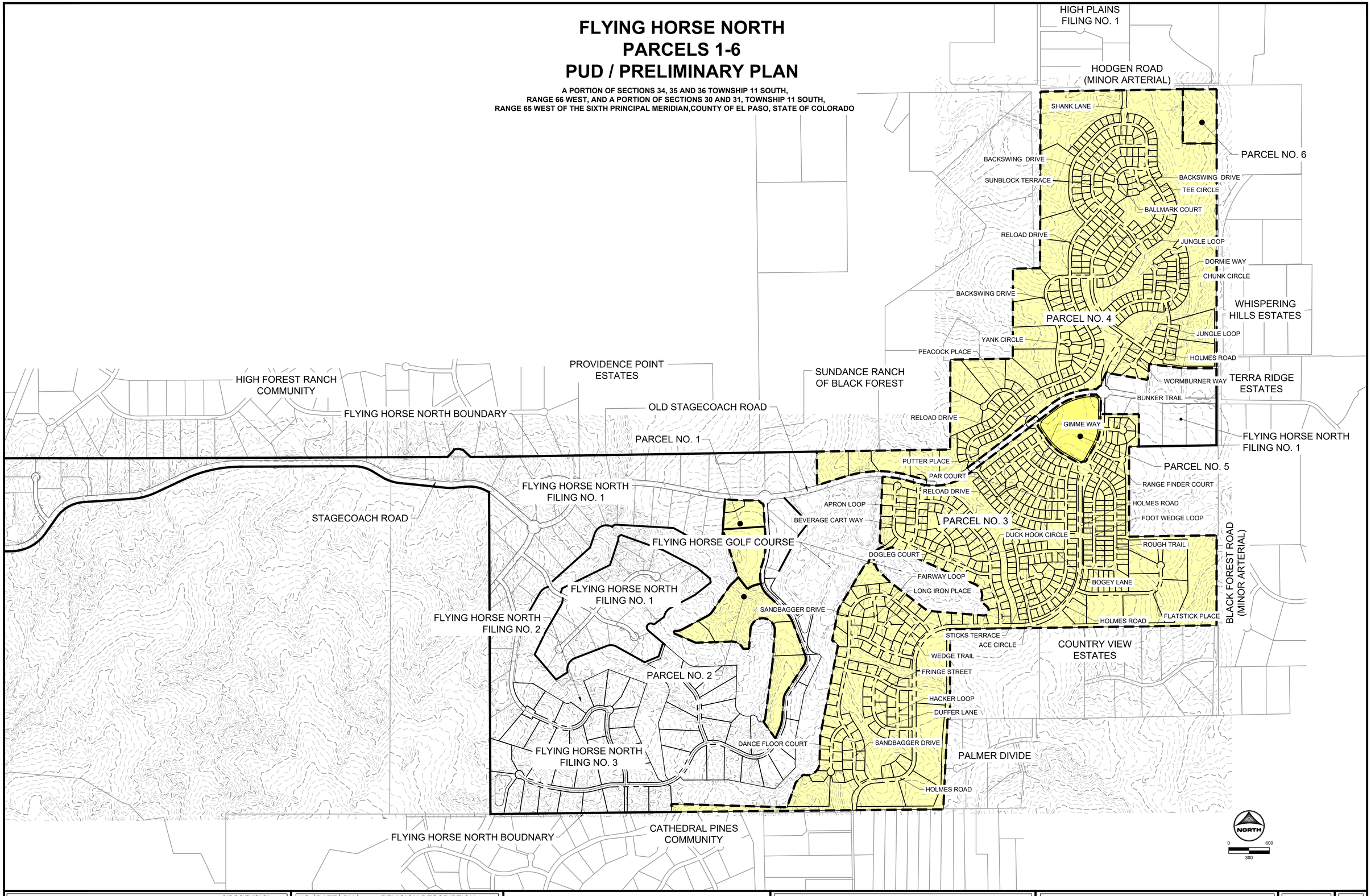
Black Squirrel Drainage Basin Planning Study (DBPS), URS Consultants, January 1989

Appendix A:

Vicinity Map, NRCS Soils Map, and FEMA Floodplain Map

FLYING HORSE NORTH
PARCELS 1-6
PUD / PRELIMINARY PLAN

**A PORTION OF SECTIONS 34, 35 AND 36 TOWNSHIP 11 SOUTH,
RANGE 66 WEST, AND A PORTION OF SECTIONS 30 AND 31, TOWNSHIP 11 SOUTH,
RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN,COUNTY OF EL PASO, STATE OF COLORADO**



DRAWN BY:	DLH	JOB DATE:	PUD PRELIMINARY PLAN
APPROVED:	KMH	JOB NUMBER:	211030
CAD DATE:	10/12/2023		
CAD FILE:	J:\2021\211030\CAD\Dwgs\C\PUD-PP\Exhibits\Parcel_Exhibit		

BAR IS ONE INCH ON OFFICIAL DRAWINGS.
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

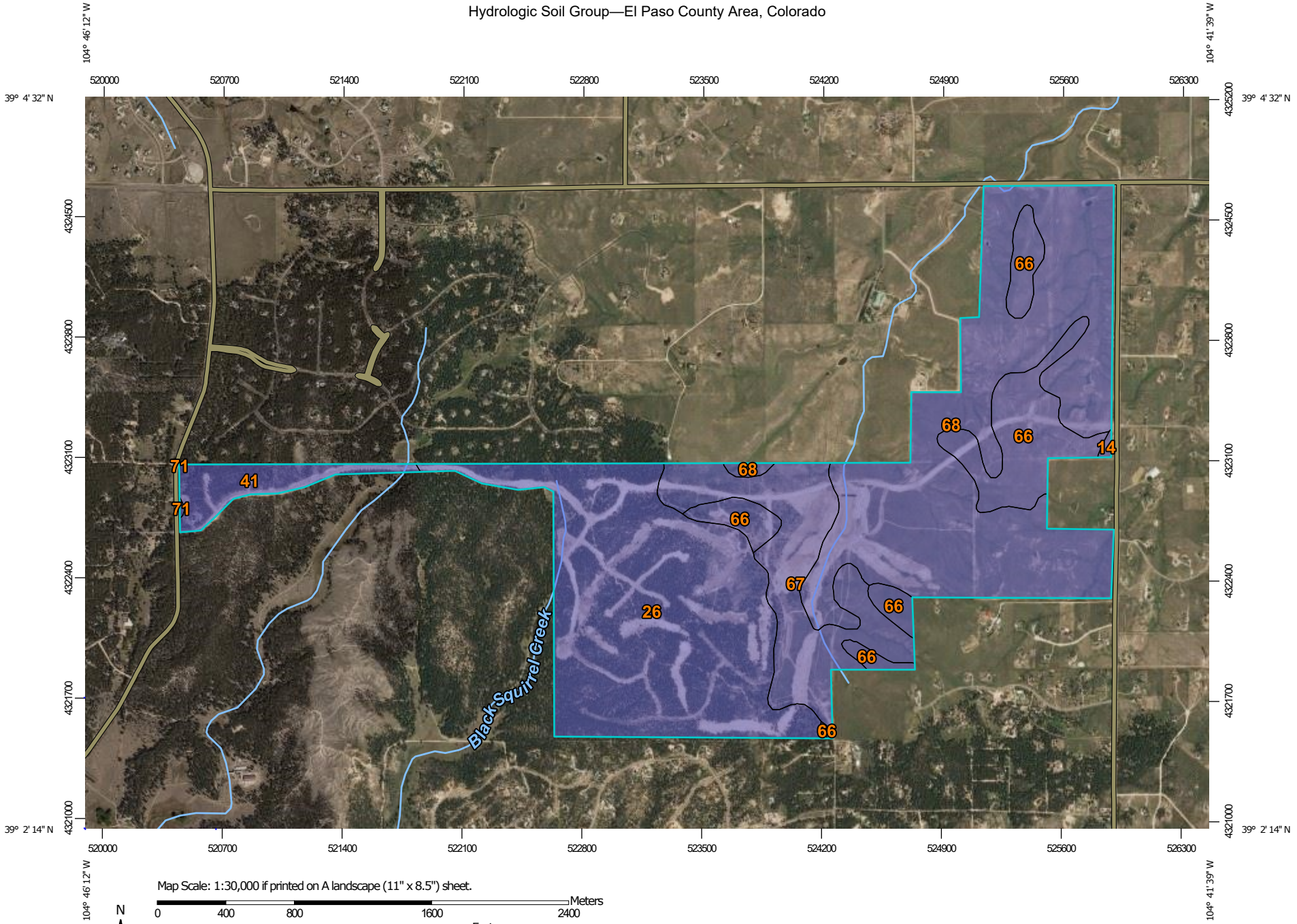
NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH PUD PARCELS 1-6
PRI #2, LLC.
EL PASO COUNTY, CO

PARCEL PLAN

SHEET


104° 46' 12" W
104° 41' 39" W
39° 4' 32" N
39° 2' 14" N
520000
520700
521400
522100
522800
523500
524200
524900
525600
526300
4325200
4324500
4323800
4323100
4322400
4321700
4321000
66
68
66
14
71
41
71
68
66
67
66
26
66
66
Black Squirrel Creek
Map Scale: 1:30,000 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 400 800 1600 2400
Feet
0 1000 2000 4000 6000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 19, 2018—May 26, 2019

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	B	1.9	0.1%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	474.2	33.7%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	53.4	3.8%
66	Peyton sandy loam, 1 to 5 percent slopes	B	160.9	11.4%
67	Peyton sandy loam, 5 to 9 percent slopes	B	182.8	13.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	533.4	37.9%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	0.6	0.0%
Totals for Area of Interest			**1,407.3**	**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

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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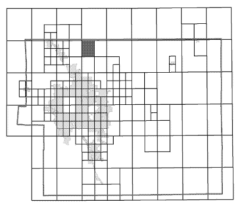
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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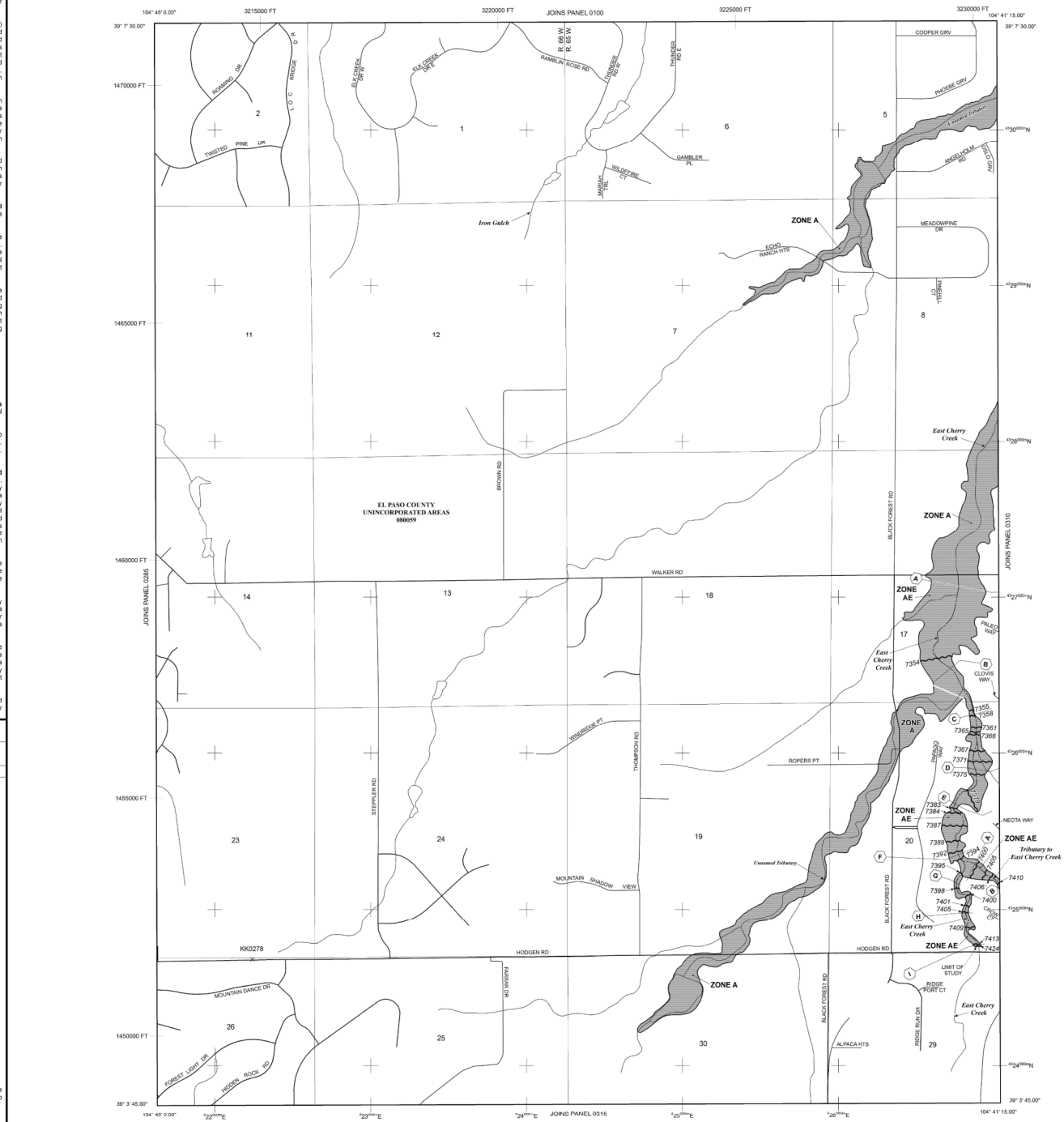

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
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- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0305G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 305 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0305	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0305G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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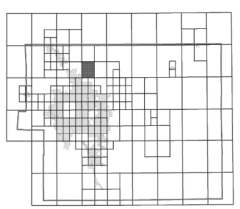

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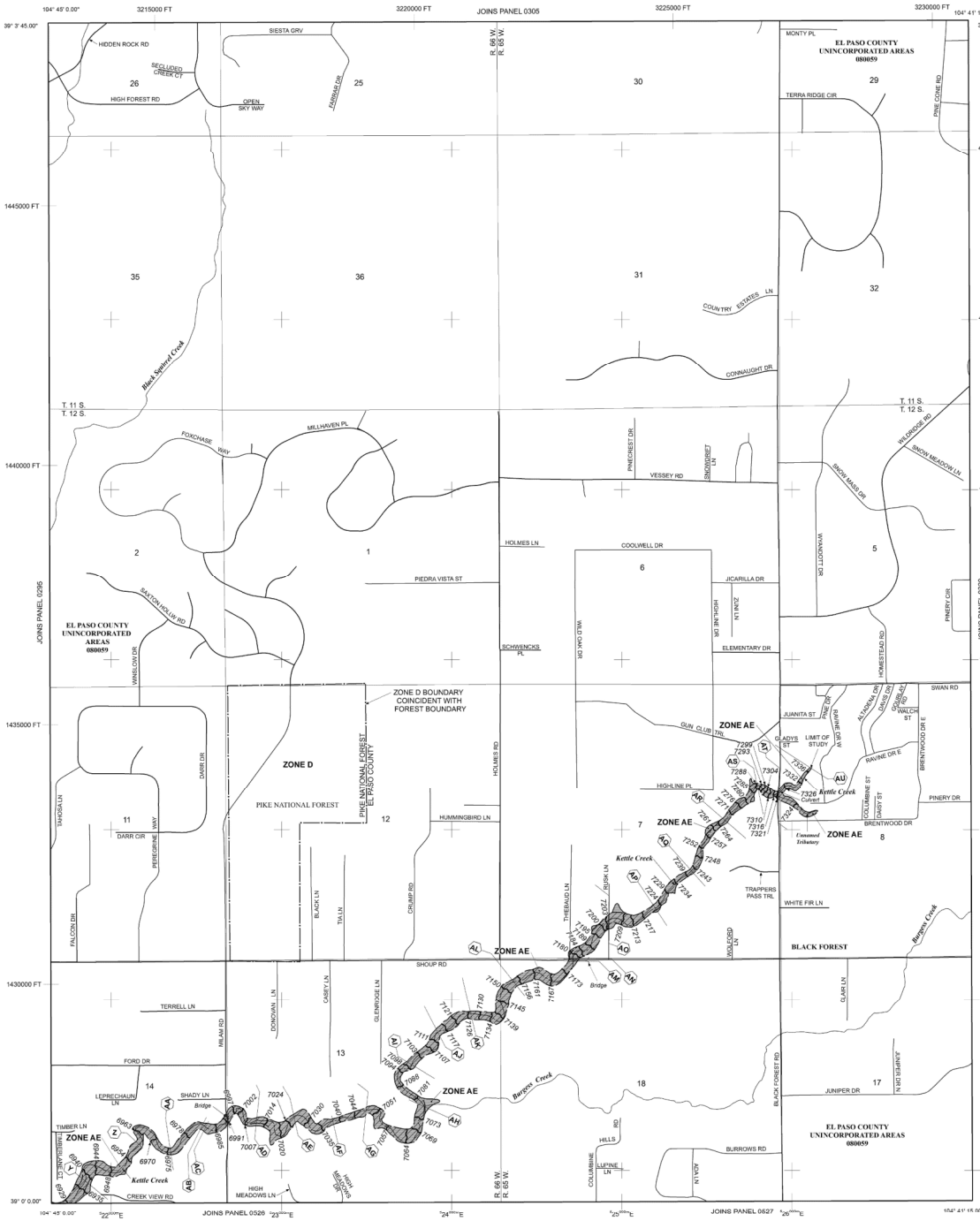

LEGEND

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FLOODWAY AREAS IN ZONE AE

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Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
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(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

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M1.5 — River Mile

MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0315G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 315 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0315	G

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MAP NUMBER 08041C0315G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

Appendix B:

Hydrologic Calculations

HRGreen

FLYING HORSE NORTH - PARCELS 1-6
EXISTING CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	DLH
Checked by:	RDL
Date:	3/6/2024

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
EX1	12.4	4.2	0.11	0.37	4.3	24.9
EX2	0.8	2.0	0.08	0.35	0.3	2.2
EX3	1.5	2.0	0.08	0.35	0.6	4.3
EX4	16.5	2.0	0.08	0.35	4.3	31.4
EX5	6.4	2.0	0.08	0.35	2.0	14.6
EX5.1	3.3	2.0	0.08	0.35	0.8	5.7
EX6	13.7	2.0	0.08	0.35	3.9	28.8
EX7	64.7	2.0	0.08	0.35	14.7	108.1
EX8	41.6	2.0	0.08	0.35	9.7	71.1
EX9	21.7	2.0	0.08	0.35	6.0	44.2
EX10	7.6	2.0	0.08	0.35	2.2	16.4
EX11	55.3	2.0	0.08	0.35	13.7	100.7
EX12	27.5	2.0	0.08	0.35	6.8	49.6
EX13	20.0	2.0	0.08	0.35	5.4	39.8
EX14	12.2	2.0	0.08	0.35	3.3	24.2
EX15	90.1	2.0	0.08	0.35	21.6	158.5
EX16	8.0	2.0	0.08	0.35	2.3	16.6
EX17	15.6	2.0	0.08	0.35	4.4	32.3
EX18	5.4	2.0	0.08	0.35	1.4	10.4
EX19	5.4	2.0	0.08	0.35	1.5	11.3
EX20	14.9	2.0	0.08	0.35	4.2	30.5
EX21	48.4	2.0	0.08	0.35	14.1	103.8
EX22	24.6	2.0	0.08	0.35	6.7	49.3
EX23	164.4	2.0	0.08	0.35	44.3	325.4
EX24	17.3	2.0	0.08	0.35	3.3	24.0
EX25	42.7	2.0	0.08	0.35	11.2	82.1
OS1	19.0	5.1	0.12	0.37	7.9	42.7
OS2	36.4	5.0	0.12	0.37	13.5	73.4
OS3	25.3	3.0	0.09	0.36	8.2	53.9
OS4	72.3	7.0	0.14	0.39	28.8	134.6
OS5	41.2	6.5	0.13	0.39	16.2	78.3
OS6	77.4	2.6	0.09	0.35	14.9	102.0
OS7	20.1	2.0	0.08	0.35	4.7	34.9
OS8	19.1	25.5	0.28	0.50	3.8	4.4
OS9	9.4	90.2	0.82	0.90	27.4	50.6
TOTAL ONSITE	741.8	2.04%	0.08	0.35	192.9	1410.0
TOTAL OFFSITE	320.1	8.44%	0.14	0.39	125.5	574.7
TOTAL	1062.0	3.97%	0.10	0.36	318.5	1984.7

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	EX1	4.3	24.9	12.4	4.23
2	EX2	0.3	2.2	0.8	2.00
3	EX3	0.6	4.3	1.5	2.00
4	EX4	4.3	31.4	16.5	2.00
5	EX5	2.0	14.6	6.4	2.00
5.1	EX5.1	0.8	5.7	3.3	2.00
6	EX6	3.9	28.8	13.7	2.00
7	EX7 & DP26	22.7	150.9	83.6	2.70
8	EX8 & DP27	23.2	144.5	78.0	3.39
9	EX9	6.0	44.2	21.7	2.00
10	EX10 & DP28	10.5	70.3	32.9	2.76
11	EX11 & DP29	42.5	235.3	127.6	4.83
12	EX12	6.8	49.6	27.5	2.00
13	EX13	5.4	39.8	20.0	2.00
14	EX14 & 1/3RD OS9	12.4	41.0	15.3	20.02
15	EX15 & 1/3RD OS9	30.7	175.3	93.3	4.96
16	EX16	2.3	16.6	8.0	2.00
17	EX17	4.4	32.3	15.6	2.00
18	OS5, DP9, 16, 10	23.5	165.9	82.6	1.39
19	EX18, EX19, DP31	7.0	203.7	368.0	3.65
20	EX20 & DP15	34.9	205.9	108.2	1.94
21	EX21 & DP14	26.6	144.9	63.8	1.90
22	EX22	6.7	49.3	24.6	2.00
23	EX23, DP13 &32	65.9	443.4	184.4	2.00
24	EX24	3.3	24.0	17.3	2.00
25	EX25	11.2	82.1	42.7	2.00
26	OS1	7.9	42.7	19.0	5.06
27	OS2	13.5	73.4	36.4	4.99
28	OS3	8.2	53.9	25.3	2.99
29	OS4	28.8	134.6	72.3	7.00
30	OS8	3.8	4.4	20.1	2.00
31	OS6, DP7, 8, 17, 18, 30	101.6	616.8	357.3	3.70
32	OS5	16.2	78.3	41.2	6.47
TOTAL		318.5	1984.7	1062.0	3.97%

HRGreen	FLYING HORSE NORTH - PARCELS 1-6	Calc'd by:	DLH
	EXISTING CONDITIONS	Checked by:	RDL
	EL PASO COUNTY, COLORADO	Date	3/6/2024

COMPOSITE 'C' FACTORS

BASIN	OPEN SPACE / LAWN	RESIDENTIAL (5 AC LOT)	ROADWAY / PAVEMENT	TOTAL	SOIL TYPE	OPEN SPACE / LAWN			RESIDENTIAL (5 AC LOT)			ROADWAY / PAVEMENT			COMPOSITE IMPERVIOUSNESS & C		
	ACRES					%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
EX1	6.84	5.52	0.00	12.36	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	4.2	0.11	0.37
EX2	0.80	0.00	0.00	0.80	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX3	1.48	0.00	0.00	1.48	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX4	16.53	0.00	0.00	16.53	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX5	6.36	0.00	0.00	6.36	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX5.1	3.25	0.00	0.00	3.25	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX6	13.74	0.00	0.00	13.74	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX7	64.65	0.00	0.00	64.65	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX8	41.56	0.00	0.00	41.56	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX9	21.68	0.00	0.00	21.68	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX10	7.62	0.00	0.00	7.62	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX11	55.34	0.00	0.00	55.34	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX12	27.47	0.00	0.00	27.47	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX13	19.98	0.00	0.00	19.98	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX14	12.20	0.00	0.00	12.20	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX15	90.14	0.00	0.00	90.14	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX16	8.02	0.00	0.00	8.02	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX17	15.59	0.00	0.00	15.59	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX18	5.35	0.00	0.00	5.35	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX19	5.35	0.00	0.00	5.35	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX20	14.89	0.00	0.00	14.89	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX21	48.43	0.00	0.00	48.43	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX22	24.63	0.00	0.00	24.63	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX23	164.44	0.00	0.00	164.44	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX24	17.27	0.00	0.00	17.27	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
EX25	42.71	0.00	0.00	42.71	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
OS1	7.36	11.63	0.00	18.99	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	5.1	0.12	0.37
OS2	14.65	21.74	0.00	36.39	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	5.0	0.12	0.37
OS3	20.25	5.00	0.00	25.25	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	3.0	0.09	0.36
OS4	0.00	72.29	0.00	72.29	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	7.0	0.14	0.39
OS5	4.37	36.87	0.00	41.24	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	6.5	0.13	0.39
OS7	20.07	0.00	0.00	20.07	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.0	0.08	0.35
OS8	14.54	0.00	4.58	19.12	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	25.5	0.28	0.50
OS6	68.37	9.00	0.00	77.37	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.6	0.09	0.35
OS9	0.94	0.00	8.46	9.40	B	2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	90.2	0.82	0.90
TOTAL ONSITE	**736.32**	**5.52**	**0.00**	**741.84**		2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	2.04	0.08	0.35
TOTAL OFFSITE	**150.55**	**156.53**	**13.04**	**320.12**		2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	8.44	0.14	0.39
GRAND TOTAL	**886.87**	**162.05**	**13.04**	**1061.96**		2	0.08	0.35	7	0.14	0.39	100	0.90	0.96	3.97	0.10	0.36

FLYING HORSE NORTH - PARCELS 1-6
EXISTING CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	DLH
Checked by:	RDL
Date:	3/6/2024

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	tc=(L/180)+10	Design tc
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)	tc max	tc design (min)
EX1	0.11	12.36	300	2.2	24.3	7	1100	2.3	1.1	17.3	41.5	17.8	17.8
EX2	0.08	0.80	100	21.0	6.8	7	100	20.0	3.1	0.5	7.3	11.1	7.3
EX3	0.08	1.48	25	5.0	5.5	7	25	5.0	1.6	0.3	5.7	10.3	5.7
EX4	0.08	16.53	300	10.3	14.9	7	1180	5.9	1.7	11.6	26.5	18.2	18.2
EX5	0.08	6.36	200	16.0	10.5	7	200	16.0	2.8	1.2	11.7	12.2	11.7
EX5.1	0.08	3.25	270	6.7	16.3	7	1770	2.0	1.0	29.8	46.1	21.3	21.3
EX6	0.08	13.74	300	13.8	13.5	7	510	7.8	2.0	4.3	17.9	14.5	14.5
EX7	0.08	64.65	300	5.0	18.9	7	2130	2.0	1.0	35.9	54.8	23.5	23.5
EX8	0.08	41.56	300	8.0	16.2	7	1950	2.5	1.1	29.4	45.6	22.5	22.5
EX9	0.08	21.68	300	3.0	22.5	7	700	4.0	1.4	8.3	30.8	15.6	15.6
EX10	0.08	7.62	300	6.4	17.4	7	370	3.6	1.3	4.6	22.1	13.7	13.7
EX11	0.08	55.34	300	6.6	17.3	7	1480	2.2	1.0	23.8	41.0	19.9	19.9
EX12	0.08	27.47	300	7.1	16.9	7	1540	4.9	1.5	16.6	33.4	20.2	20.2
EX13	0.08	19.98	300	3.4	21.5	7	850	3.3	1.3	11.1	32.7	16.4	16.4
EX14	0.08	12.20	300	5.1	18.8	7	880	4.9	1.5	9.5	28.3	16.6	16.6
EX15	0.08	90.14	300	11.1	14.5	7	1740	5.5	1.6	17.7	32.2	21.3	21.3
EX16	0.08	8.02	300	5.7	18.1	7	600	5.3	1.6	6.2	24.3	15.0	15.0
EX17	0.08	15.59	300	6.9	17.0	7	980	5.7	1.6	6.2	23.2	15.0	15.0
EX18	0.08	5.35	300	7.0	16.9	7	480	4.7	1.7	9.8	26.7	17.1	17.1
EX19	0.08	5.35	300	5.0	18.9	7	660	5.3	1.5	5.3	24.2	14.3	14.3
EX20	0.08	14.89	300	6.1	17.7	7	380	3.9	1.6	6.8	24.6	15.3	15.3
EX21	0.08	48.43	300	7.0	16.9	7	820	4.6	1.4	4.6	21.5	13.8	13.8
EX22	0.08	24.63	300	8.3	16.0	7	890	4.0	1.5	9.1	25.1	16.2	16.2
EX23	0.08	164.44	300	4.5	19.6	7	3730	3.0	1.4	10.6	30.2	16.6	16.6
EX24	0.08	17.27	300	9.2	15.5	7	1090	3.8	1.2	51.3	66.7	32.4	32.4
EX25	0.08	42.71	300	9.2	15.5	7	1200	3.9	1.4	13.3	28.8	17.7	17.7
OS1	0.12	18.99	300	5.5	17.7	7	500	6.6	1.8	4.6	22.3	14.4	14.4
OS2	0.12	36.39	300	5.8	17.4	7	1213	4.9	1.5	13.0	30.4	18.4	18.4
OS3	0.09	25.25	300	5.7	17.9	7	540	7.3	1.9	4.8	22.7	14.7	14.7
OS4	0.14	72.29	300	6.1	16.7	7	2140	4.0	1.4	25.5	42.2	23.6	23.6
OS5	0.13	41.24	300	5.0	17.9	7	1900	5.0	1.6	20.2	38.2	22.2	22.2
OS7	0.08	20.07	280	9.0	15.0	15	1850	2.8	2.5	12.3	27.3	21.8	21.8
OS8	0.28	19.12	OVERRIDDEN			20	OVERRIDDEN		0.0				
OS6	0.09	77.37	300	7.0	16.8	15	4350	3.0	2.6	27.9	44.7	35.8	35.8
OS9	0.82	9.40	15	2	1.6	15	1650	2	2.1	13.0	14.6	19.3	14.6

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

FLYING HORSE NORTH - PARCELS 1-6

EXISTING CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by:	**DLH**
Checked by:	**RDL**
Date:	**3/6/2024**

3.266076143

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	1	EX1	12.36	0.11	17.8	1.32	3.27	4.3															DRAINS EAST INTO ALLEN RANCH ROAD
	2	EX2	0.80	0.08	7.3	0.06	4.60	0.3															DRAINS WEST OFF INTO GOLF COURSE TRACT
	3	EX3	1.48	0.08	5.7	0.12	4.96	0.6															DRAINS SOUTH WEST INTO EX4
	4	EX4	16.53	0.08	18.2	1.32	3.23	4.3															DRAINS SOUTH WEST INTO FLYING HORSE GOLF COURSE TRACT
	5	EX5	6.36	0.08	11.7	0.51	3.90	2.0															DRAINS WEST INTO FLYING HORSE GOLF COURSE
	5.1	EX5.1	3.25	0.08	21.3	0.26	2.99	0.8															BASIN DRAINS EAST INTO ALLEN RANCH ROAD
	6	EX6	13.74	0.08	14.5	1.10	3.57	3.9															DRAINS SOUTH WEST OFFSITE INTO EDMONDS SUBDIVISION
	7	EX7	64.65	0.08	23.5	5.17	2.85	14.7		7.39		22.7											BASIN & OS1 COLLECT INTO EX. TERTIARY DRAINAGE SWALE, FLOWS TO NORTHWEST TO DP7
	8	EX8	41.56	0.08	22.5	3.32	2.91	9.7		7.54		23.2											BASIN & OS2 COLLECT INTO EX. TERTIARY DRAINAGE SWALE, FLOWS TO NORTHWEST TO DP8
	9	EX9	21.68	0.08	15.6	1.73	3.47	6.0															DRAINS NORTH WEST INTO OS7
	10	EX10	7.62	0.08	13.7	0.61	3.65	2.2		2.93		10.5											EX10 & OS3 COLLECT INTO EX NATURAL DRAINAGE SWALE AND INTO OS7
	11	EX11	55.34	0.08	19.9	4.43	3.10	13.7		14.55		42.5											SHEET FLOWS EAST INTO BLACK FOREST ROAD
	12	EX12	27.47	0.08	20.2	2.20	3.07	6.8															SHEET FLOWS EAST OFFSITE
	13	EX13	19.98	0.08	16.4	1.60	3.39	5.4															SHEET FLOWS NORTH-EAST INTO CULVERT AT DP13
	14	EX14	12.20	0.08	16.6	0.98	3.37	3.3		3.54		12.4											SHEET FLOWS NORTH INTO CULVERT AT DP14 + ONE THIRD OF FLOWS FROM OS9
	15	EX15	90.14	0.08	21.3	7.21	2.99	21.6		9.77		30.7											SHEET FLOWS AND COLLECTS INTO NATURAL DRAINAGE SWALE, FLOWS NORTH TO CULVERT @ DP15 + ONE THRID OF FLOWS FROM OS9

HRGreen

FLYING HORSE NORTH - PARCELS 1-6

EXISTING CONDITIONS

DESIGN STORM: 5-YEAR

Calc'd by:	**DLH**
Checked by:	**RDL**
Date:	**3/6/2024**

3.266076143

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN POINT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min	
	16	EX16	8.02	0.08	15.0	0.64	3.52	2.3															SHEET FLOWS SOUTH-WEST INTO OS7
	17	EX17	15.59	0.08	15.0	1.25	3.52	4.4															SHEET FLOWS WEST INTO OS6
	18									6.91		23.5											DP IS CUMULATIVE OF DP9, 16, 10 AND OS7
		EX18	5.35	0.08	17.1	0.43	3.32	1.4															SHEET FLOWS EAST INTO EX NATURAL DRAINAGE SWALE THAT FLOWS NORTH OFF-SITE
		EX19	5.35	0.08	14.3	0.43	3.59	1.5															SHEET FLOWS WEST INTO EX NATURAL DRAINAGE SWALE THAT FLOWS NORTH OFF-SITE
	19									35.96		7.0											DP19 HAS BEEN OVERRIDDEN TO SHOW RELEASE FLOWS FROM THE JD DESIGN + EX18 AND EX19
	20	EX20	14.89	0.08	15.3	1.19	3.49	4.2		10.97		34.9											SHEEET FLOWS COLLECT INTO NATURAL DRAINAGE SWALE AT DP20
	21	EX21	48.43	0.08	13.8	3.87	3.65	14.1		7.41		26.6											SHEET FLOWS COLLECT INTO NATURAL DRAINAGE SWALE , FLOWS NORTH OFF-SITE
	22	EX22	24.63	0.08	16.2	1.97	3.40	6.7															SHEET FLOWS NORTH WEST OFF-SITE
	23	EX23	164.44	0.08	16.6	13.16	3.37	44.3		20.27		65.9											SHEET FLOWS COLLECT INTO MULTIPLE NATURAL SWALES THAT FLOW NORTH TO HODGEN ROAD
	24	EX24	17.27	0.08	32.4	1.38	2.37	3.3															FLOWS NORTH TO HODGEN ROAD
	25	EX25	42.71	0.08	17.7	3.42	3.27	11.2															FLOWS NORTH-WEST OFF-SITE TO HODGEN ROAD
	26	OS1	18.99	0.12	14.4	2.22	3.58	7.9															FLOWS NORTH-WEST INTO SITE AT DP26 INTO EX7
	27	OS2	36.39	0.12	18.4	4.22	3.21	13.5															FLOWS NORTH-WEST INTO SITE AT DP27 INTO EX8
	28	OS3	25.25	0.09	14.7	2.32	3.55	8.2															FLOWS NORTH INTO SITE AT DP28 INTO EX10
	29	OS4	72.29	0.14	23.6	10.12	2.84	28.8															FLOWS NORTH-EAST TO DP29 AND INTO EX11
	32	OS5	41.24	0.13	22.2	5.51	2.93	16.2															FLOWS NORTH, THROUGH EX CULVERT UNDER O.S.R. INTO EX23
		OS7	20.07	0.08	21.8	1.61	2.96	4.7															SHEET FLOWS INTO EX SWALE THROUGH GOLF COURSE. COMBINED FLOWS IN DP18
	30	OS8	19.12	0.28		5.29						3.8											OS6 IS ENTIRELY CAPTURED WITHIN AN EXISTING POND IN FHN FILING 3 RELEASED AT HISTORIC RATES AS CALCULATED IN F.H.N. FILING 3
		OS6	77.37	0.09	35.8	6.73	2.21	14.9		9.29		24.0											SHEET FLOWS INTO MULTIPLE EX SWALES IN GOLF COURSE, LEADS DOWN TO IRRIGATION RESERVOIR
	31									35.10		101.6											DP31 REPRESENTS RELEASE FROM IRRIGATIONAL RESERVIOR (OVERRIDDEN BY DESIGN RELEASE) CUMULATIVE OF BASIN OS6, OS9, AND DP7, 8, 17, 18, 30
		OS9	9.40	0.82	14.6	7.69	3.57	27.4															RUNOFF FROM OLD STAGECOACH ROAD HAS BEEN SPLIT INTO THIRDS FOR SIMPLICITY ENTERING DP14, DP15, AND OS6

HRGreen

FLYING HORSE NORTH - PARCELS 1-6

EXISTING CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	DLH
Checked by:	RDL
Date:	3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN PONT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	1	EX1	12.36	0.37	17.8	4.55	5.48	24.9															DRAINS EAST INTO ALLEN RANCH ROAD
	2	EX2	0.80	0.35	7.3	0.28	7.72	2.2															DRAINS WEST OFF INTO GOLF COURSE TRACT
	3	EX3	1.48	0.35	5.7	0.52	8.33	4.3															DRAINS SOUTH WEST INTO EX4
	4	EX4	16.53	0.35	18.2	5.79	5.42	31.4															DRAINS SOUTH WEST INTO FLYING HORSE GOLF COURSE TRACT
	5	EX5	6.36	0.35	11.7	2.23	6.54	14.6															DRAINS WEST INTO FLYING HORSE GOLF COURSE
	5.1	EX5.1	3.25	0.35	21.3	1.14	5.02	5.7															BASIN DRAINS EAST INTO ALLEN RANCH ROAD
	6	EX6	13.74	0.35	14.5	4.81	6.00	28.8															DRAINS SOUTH WEST OFFSITE INTO EDMONDS SUBDIVISION
	7	EX7	64.65	0.35	23.5	22.63	4.78	108.1		29.74		150.9											BASIN & OS1 COLLECT INTO EX. TERTIARY DRAINAGE SWALE, FLOWS TO NORTHWEST TO DP7
	8	EX8	41.56	0.35	22.5	14.55	4.89	71.1		28.15		144.5											BASIN & OS2 COLLECT INTO EX. TERTIARY DRAINAGE SWALE, FLOWS TO NORTHWEST TO DP8
	9	EX9	21.68	0.35	15.6	7.59	5.82	44.2															DRAINS NORTH WEST INTO OS7
	10	EX10	7.62	0.35	13.7	2.67	6.14	16.4		11.70		70.3											EX10 & OS3 COLLECT INTO EX NATURAL DRAINAGE SWALE AND INTO OS7
	11	EX11	55.34	0.35	19.9	19.37	5.20	100.7		47.56		235.3											SHEET FLOWS EAST INTO BLACK FOREST ROAD
	12	EX12	27.47	0.35	20.2	9.61	5.16	49.6															SHEET FLOWS EAST OFFSITE
	13	EX13	19.98	0.35	16.4	6.99	5.69	39.8															SHEET FLOWS NORTH-EAST INTO CULVERT AT DP13
	14	EX14	12.20	0.35	16.6	4.27	5.66	24.2		7.09		41.0											SHEET FLOWS NORTH INTO CULVERT AT DP14 + ONE THIRD OF FLOWS FROM OS9
	15	EX15	90.14	0.35	21.3	31.55	5.02	158.5		34.37		175.3											SHEET FLOWS AND COLLECTS INTO NATURAL DRAINAGE SWALE, FLOWS NORTH TO CULVERT @ DP15 + ONE THRID OF FLOWS FROM OS9
	16	EX16	8.02	0.35	15.0	2.81	5.91	16.6															SHEET FLOWS SOUTH-WEST INTO OS7

HRGreen

FLYING HORSE NORTH - PARCELS 1-6

EXISTING CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by:	DLH
Checked by:	RDL
Date:	3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
STREET	DESIGN PONT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
	17	EX17	15.59	0.35	15.0	5.46	5.91	32.3															SHEET FLOWS WEST INTO OS6
	18									29.12		165.9											DP IS CUMULATIVE OF DP9, 16, 10 AND OS7
		EX18	5.35	0.35	17.1	1.87	5.58	10.4															SHEET FLOWS EAST INTO EX NATURAL DRAINAGE SWALE THAT FLOWS NORTH OFF-SITE
		EX19	5.35	0.35	14.3	1.87	6.03	11.3															SHEET FLOWS WEST INTO EX NATURAL DRAINAGE SWALE THAT FLOWS NORTH OFF-SITE
	19									133.14		203.7											DP19 HAS BEEN OVERRIDDEN TO SHOW RELEASE FLOWS FROM THE JD DESIGN + EX18 AND EX19
	20	EX20	14.89	0.35	15.3	5.21	5.86	30.5		39.58		205.9											SHEEET FLOWS COLLECT INTO NATURAL DRAINAGE SWALE AT DP20
	21	EX21	48.43	0.35	13.8	16.95	6.12	103.8		24.04		144.9											SHEET FLOWS COLLECT INTO NATURAL DRAINAGE SWALE , FLOWS NORTH OFF-SITE
	22	EX22	24.63	0.35	16.2	8.62	5.71	49.3															SHEET FLOWS NORTH WEST OFF-SITE
	23	EX23	164.44	0.35	16.6	57.55	5.65	325.4		80.46		443.4											SHEET FLOWS COLLECT INTO MULTIPLE NATURAL SWALES THAT FLOW NORTH TO HODGEN ROAD
	24	EX24	17.27	0.35	32.4	6.04	3.97	24.0															FLOWS NORTH TO HODGEN ROAD
	25	EX25	42.71	0.35	17.7	14.95	5.49	82.1															FLOWS NORTH-WEST OFF-SITE TO HODGEN ROAD
	26	OS1	18.99	0.37	14.4	7.11	6.01	42.7															FLOWS NORTH-WEST INTO SITE AT DP26 INTO EX7
	27	OS2	36.39	0.37	18.4	13.61	5.40	73.4															FLOWS NORTH-WEST INTO SITE AT DP27 INTO EX8
	28	OS3	25.25	0.36	14.7	9.04	5.97	53.9															FLOWS NORTH INTO SITE AT DP28 INTO EX10
	29	OS4	72.29	0.39	23.6	28.19	4.77	134.6															FLOWS NORTH-EAST TO DP29 AND INTO EX11
	32	OS5	41.24	0.39	22.2	15.91	4.92	78.3															FLOWS NORTH, THROUGH EX CULVERT UNDER O.S.R. INTO EX23
		OS7	20.07	0.35	21.8	7.02	4.96	34.9															SHEET FLOWS INTO EX SWALE THROUGH GOLF COURSE. COMBINED FLOWS IN DP18
	30	OS8	19.12	0.50		9.49						4.4											OS6 IS ENTIRELY CAPTURED WITHIN AN EXISTING POND IN FHN FILING 3 RELEASED AT HISTORIC RATES AS CALCULATED IN F.H.N. FILING 3
		OS6	77.37	0.35	35.8	27.44	3.72	102.0		30.26		118.8											SHEET FLOWS INTO MULTIPLE EX SWALES IN GOLF COURSE, LEADS DOWN TO IRRIGATION RESERVOIR
	31									129.40		616.8											DP31 REPRESENTS RELEASE FROM IRRIGATIONAL RESERVIOR (OVERRIDDEN BY DESIGN RELEASE) CUMULATIVE OF BASIN OS6, OS9, AND DP7, 8, 17, 18, 30
		OS9	9.40	0.90	14.6	8.45	5.99	50.6															RUNOFF FROM OLD STAGECOACH ROAD HAS BEEN SPLIT INTO THIRDS FOR SIMPLICITY ENTERING DP14, DP15, AND OS6

FLYING HORSE NORTH PARCELS 1-6
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by:	DLH
Checked by:	RDL
Date:	3/6/2024

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
A	74.1	15.0	0.17	0.42	38.9	161.6
A1	12.6	7.0	0.14	0.39	6.0	29.0
A2	6.5	13.1	0.15	0.40	3.4	15.3
B	32.7	24.1	0.22	0.45	24.6	86.1
C	121.0	31.6	0.26	0.47	81.4	251.4
D	86.2	26.8	0.23	0.45	54.8	177.1
E	52.4	43.7	0.37	0.55	67.7	171.0
F	197.5	15.7	0.19	0.43	95.9	366.3
G	27.3	16.4	0.16	0.41	16.4	68.4
H	74.0	7.0	0.14	0.39	37.6	180.4
I	7.1	26.4	0.23	0.46	6.1	20.7
J	15.8	86.1	0.74	0.83	59.8	112.4
K	18.0	86.0	0.74	0.83	64.4	121.2
L	7.1	57.8	0.52	0.67	19.0	41.1
M	1.3	57.8	0.52	0.67	2.5	5.5
OS1	19.0	2.0	0.08	0.35	5.6	41.3
OS2	36.4	2.0	0.08	0.35	9.2	67.9
OS3	25.3	2.0	0.08	0.35	6.8	49.9
OS4	72.3	2.0	0.08	0.35	18.3	134.5
OS5	41.2	6.5	0.13	0.39	15.9	78.8
OS6	87.4	4.0	0.09	0.36	20.3	132.5
OS7	28.2	8.2	0.12	0.38	10.6	57.7
OS8	18.0	23.1	0.24	0.47	3.8	4.4
TOTAL ONSITE	747.3	24.5%	0.24	0.46	578.5	1807.6
TOTAL OFFSITE	317.7	4.9%	0.10	0.38	90.6	566.8
TOTAL	1061.3	18.6%	0.20	0.43	669.0	2374.4

*Includes some on-site area that are rear of B, G, or W/O lot types

CUMULATIVE DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	A, OS1 (portions)	14.5	69.1	31.7	11.1%
2	A, OS1 (portions)	14.5	69.1	31.7	11.1%
3	A, OS1	44.5	202.8	93.1	12.3%
4	A1, OS2	15.3	96.9	49.0	3.3%
5	A1, A2, OS2	18.7	112.2	55.5	4.4%
6	A1, A2, I, OS2, OS3, OS6, OS7 + Outlet Q's of A, B, Pond A (Fil. 3)	69.4	448.3	221.5	5.2%
7	B	24.6	86.1	32.7	24.1%
8	OS3	6.8	49.9	25.3	2.0%
9	OS3, OS7	17.4	107.6	53.5	4.7%
10	C	81.4	251.4	121.0	31.6%
11	C	81.4	251.4	121.0	31.6%
12	OS4	18.3	134.5	72.3	2.0%
13	D, OS4	73.1	311.6	158.5	15.5%
14	E (portion)	33.8	85.5	26.2	43.7%
15	E	67.7	171.0	52.4	43.7%
16	OS5	15.9	78.8	41.2	6.5%
17	F, OS5	111.8	445.1	238.7	14.1%
18	G	16.4	68.4	27.3	16.4%
19	H	37.6	180.4	74.0	7.0%
20	I	6.1	20.7	7.1	26.4%
21	J	59.8	112.4	15.8	86.1%
22	K	64.4	121.2	18.0	86.0%
23	L	19.0	41.1	7.1	57.8%
24	M	2.5	5.5	1.3	57.8%
25	OS8	3.8	4.4	17.96	23.1%

*FINAL Q5 AND 100 OF DESIGN POINT 6 WILL REQUIRE DETERMINATION OF OUTLET PEAK FLOWS AS DESIGNED IN FUTURE FDR

*PRELIMINARY OUTLET STRUCTURE CALCS AND RELEASE RATES ARE INCLUDED IN THIS REPORT, SEE POND A AND POND B CALCS

HRGreen

FLYING HORSE NORTH PARCELS 1-6
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by: DLH
Checked by: RDL
Date: 3/6/2024

COMPOSITE 'C' FACTORS

BASIN	OPEN SPACE / LAWN	COMMERCIAL	ROADWAY / PAVEMENT	RESIDENTIAL (5 AC LOT)	RESIDENTIAL (2.5 AC LOT)	RESIDENTIAL (1/2-AC LOT)	RESIDENTIAL (1/3-AC LOT)	RESIDENTIAL (1/4-AC LOT)	RESIDENTIAL (1/8-AC LOT)	TOTAL	SOIL TYPE	OPEN SPACE / LAWN			COMMERCIAL			ROADWAY / PAVEMENT			RESIDENTIAL (5 AC LOT)			RESIDENTIAL (2.5 AC LOT)			RESIDENTIA L (1/2-AC			RESIDENTIAL (1/3-AC LOT)			RESIDENTIAL (1/4-AC LOT)			RESIDENTIAL (1/8-AC LOT)			COMPOSITE IMPERVIOUSNESS & C		
	ACRES											%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5*	C_{100}*	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}	%I	C_5	C_{100}
A	12.50			27.35		27.15	7.11			74.11	B	2	0.08	0.35	95	0.81	0.88	100	0.90	0.96	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	15.0	0.17	0.42
A1				12.58						12.58	B	2	0.08	0.35	95	0.81	0.88	100	0.90	0.96	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	7.0	0.14	0.39
A2	3.95						2.58			6.53	B	2	0.08	0.35	95	0.81	0.88	100	0.90	0.96	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	13.1	0.15	0.40
B	1.70			3.25		14.20	13.54			32.69	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	24.1	0.22	0.45
C	29.76		3.56			6.47		81.24		121.03	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	31.6	0.26	0.47
D	24.04			29.10				3.58	29.44	86.16	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	26.8	0.23	0.45
E	14.30	11.04	2.15					24.87		52.36	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	43.7	0.37	0.55
F	76.45	9.18			96.02				15.80	197.45	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	15.7	0.19	0.43
G	16.98							10.32		27.30	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	16.4	0.16	0.41
H				74.02						74.02	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	7.0	0.14	0.39
I	0.56					2.06	4.51			7.13	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	26.4	0.23	0.46
J	1.50	14.26								15.76	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	86.1	0.74	0.83
K	1.75	16.25								18.00	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	86.0	0.74	0.83
L	2.84	4.25								7.09	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	12	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	57.8	0.52	0.67
M	0.51	0.76								1.27	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	13	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	57.8	0.52	0.67
OS1	18.99									18.99	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	2.0	0.08	0.35
OS2	36.39									36.39	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	2.0	0.08	0.35
OS3	25.25									25.25	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	2.0	0.08	0.35
OS4	72.29									72.29	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	2.0	0.08	0.35
OS5	4.37			36.87						41.24	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	6.5	0.13	0.39
OS6	79.68					7.76				87.44	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	4.0	0.09	0.36
OS7	20.65					7.57				28.22	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	8.2	0.12	0.38
OS8	7.21		3.08		7.67					17.96	B	2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	12	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	23.1	0.24	0.47
TOTAL ONSITE	**194.40**	**55.75**	**5.71**	**146.30**	**96.02**	**57.45**	**27.74**	**120.01**	**45.24**	**741.05**		2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	24.8	0.24	0.47
TOTAL OFFSITE	**257.26**	**0.00**	**3.08**	**36.87**	**0.00**	**7.76**	**0.00**	**0.00**	**0.00**	**320.21**		2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	4.0	0.09	0.35
GRAND TOTAL	**451.66**	**55.75**	**8.79**	**183.17**	**96.02**	**65.21**	**27.74**	**120.01**	**45.24**	**1061.26**		2	0.08	0.35	95	0.81	0.88	100	0.81	0.88	7	0.14	0.39	11	0.17	0.42	25	0.22	0.46	30	0.25	0.47	40	0.30	0.50	65	0.45	0.59	18.5	0.20	0.43

NOTES:
* The areas highlighted in OS6 & OS7 is on-site tributary area. These figures are included in the on-site area total and excluded from the offsite area total.

FLYING HORSE NORTH PARCELS 1-6
PROPOSED CONDITIONS
EL PASO COUNTY, COLORADO

Calc'd by: DLH
Checked by: RDL
Date: 3/6/2024

TIME OF CONCENTRATION

BASIN DATA			OVERLAND TIME (T_i)			TRAVEL TIME (T_t)					TOTAL	tc=(L/180)+10	Design tc
DESIGNATION	C_5	AREA (ac)	LENGTH (ft)	SLOPE %	t_i (min)	C_V	LENGTH (ft)	SLOPE %	V (ft/s)	t_t (min)	t_c (min)	tc max	tc design (min)
A	0.17	74.11	100	4.0	10.8	20	1650	2.0	2.8	9.7	20.5	19.7	19.7
A1	0.14	12.58	100	3.0	12.2	7	850	3.0	1.2	11.7	23.9	15.3	15.3
A2	0.15	6.53	100	3.0	12.1	7	800	3.0	1.2	11.0	23.1	15.0	15.0
B	0.22	32.69	100	4.0	10.2	20	1265	4.0	4.0	5.3	15.5	17.6	15.5
C	0.26	121.03	100	1.0	15.5	20	3020	1.0	2.0	25.2	40.6	27.3	27.3
D	0.23	86.16	100	2.0	12.6	20	2750	2.5	3.2	14.5	27.1	25.8	25.8
E	0.37	52.36	100	5.0	7.8	20	1750	4.0	4.0	7.3	15.1	20.3	15.1
F	0.19	197.45	100	4.0	10.5	20	3600	3.0	3.5	17.3	27.9	30.6	27.9
G	0.16	27.30	100	25.0	5.9	20	1600	3.0	3.5	7.7	13.6	19.4	13.6
H	0.14	74.02	100	5.0	10.3	7	500	5.0	1.6	5.3	15.6	13.3	13.3
I	0.23	7.13	100	5.0	9.3	20	900	5.0	4.5	3.4	12.7	15.6	12.7
J	0.74	15.76	100	5.0	3.9	20	350	5.0	4.5	1.3	5.2	12.5	5.2
K	0.74	18.00	100	10.0	3.1	20	1000	7.0	5.3	3.1	6.2	16.1	6.2
L	0.52	7.09	100	25.0	3.6	20	250	12.0	6.9	0.6	5.0	11.9	5.0
M	0.52	1.27	100	5.5	6.0	20	1050	2.0	2.8	6.2	12.2	16.4	12.2
OS1	0.08	18.99	300	7.0	16.9	10	300	7.0	2.6	1.9	18.8	13.3	13.3
OS2	0.08	36.39	300	4.0	20.4	10	1300	4.0	2.0	10.8	31.2	18.9	18.9
OS3	0.08	25.25	300	6.0	17.8	10	900	6.0	2.4	6.1	23.9	16.7	16.7
OS4	0.08	72.29	300	7.0	16.9	10	1320	6.0	2.4	9.0	25.9	19.0	19.0
OS5	0.13	41.24	300	5.0	18.0	10	1900	5.0	2.2	14.2	32.2	22.2	22.2
OS6	0.09	87.44	100	2.5	13.6	15	3400	2.5	2.4	23.9	37.5	29.4	29.4
OS7	0.12	28.22	100	5.0	10.5	15	1600	5.0	3.4	8.0	18.5	19.4	18.5
OS8	0.24	17.96	OVERRIDEN		#VALUE!	20	OVERRIDEN		0.0	######	#VALUE!	#VALUE!	#VALUE!

FORMULAS:

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

$$V = C_v S_w^{0.5}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

HRGreen

FLYING HORSE NORTH PARCELS 1-6
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: DLH
Checked by: RDL
Date: 3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT(S)	ULTIMATEDESIGN PONT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
1, 2, 3	3	A	74.11	0.17	19.7	12.51	3.11	38.9															DETENTION IN POND A, OUTLETS TO EX. FIL. NO. 1 POND 13
4	6	A1	12.58	0.14	15.3	1.73	3.49	6.0															DIRECTLY DRAINS OFFSITE, CONVEYS OFFSITE FLOW THROUGH THE DEVELOPMENT. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
5, 6	6	A2	6.53	0.15	15.0	0.96	3.52	3.4															DIRECTLY DRAINS OFFSITE, CONVEYS OFFSITE FLOW THROUGH THE DEVELOPMENT. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
7	7	B	32.69	0.22	15.5	7.09	3.47	24.6															DETENTION IN POND B, OUTLETS TO EX. FIL. NO. 1 POND 13
10, 11	11	C	121.03	0.26	27.3	31.06	2.62	81.4															DETENTION IN POND C. OUTLETS OFFSITE DUE NORTH.
13	13	D	86.16	0.23	25.8	20.24	2.71	54.8															DETENTION IN POND D. OUTLETS OFFSITE DUE NORTHWEST.
14, 15	15	E	52.36	0.37	15.1	19.29	3.51	67.7															DETENTION IN POND E. OUTLETS OFFSITE DUE NORTH.
17	17	F	197.45	0.19	27.9	37.00	2.59	95.9															DETENTION IN POND F. OUTLETS ONSITE DUE NORTH.
18	18	G	27.30	0.16	13.6	4.45	3.67	16.4															DETENTION IN POND G. OUTLETS ONSITE DUE NORTH.
19	19	H	74.02	0.14	13.3	10.17	3.70	37.6															DIRECTLY DRAINS OFFSITE. RUNOFF REDUCTION VIA GRASS BUFFERS.
6, 20	6	I	7.13	0.23	12.7	1.63	3.77	6.1															DIRECTLY DRAINS OFFSITE TO EX. FIL. NO. 1 POND 13

HRGreen

FLYING HORSE NORTH PARCELS 1-6
PROPOSED CONDITIONS
DESIGN STORM: 5-YEAR

Calc'd by: DLH
Checked by: RDL
Date: 3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT(S)	ULTIMATEDESIGN PONT	BASIN ID	AREA (ac)	C_5	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_5*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_5*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_5*A (ac)	SLOPE %	PIPE SIZE (FT)	LENGTH (FT)	VEL. (FPS)	TRAVEL TIME (min)	
21	21	J	15.76	0.74	5.2	11.67	5.12	59.8															DETENTION IN POND J. OUTLETS OFFSITE DUE WEST.
22, Pond 8 (Fil. 1)	22	K	18.00	0.74	6.2	13.30	4.84	64.4															DETENTION IN POND K. OUTLETS OFFSITE DUE WEST. ULTIMATELY DRAINS TO EX. FIL. NO. 1 POND 8.
23, Pond 8 (Fil. 1)	23	L	7.09	0.52	5.0	3.67	5.17	19.0															DRAINS OFFSITE TO GOLF COURSE AND ULTIMATLEY TO EX. FIL. NO. 1 POND 8.
24	6	M	1.27	0.52	12.2	0.66	3.83	2.5															DRAINS INTO ADJACENT ALLEN RANCH ROAD AND INTO F.H.N. FILING NO. 3 POND
1, 2, 3	3	OS1	18.99	0.08	13.3	1.52	3.70	5.6															DRAINS THROUGH TO BASIN A. TWO CULVERT PIPE LOCATIONS TO CROSS ROADWAYS.
4, 5, 6	6	OS2	36.39	0.08	18.9	2.91	3.18	9.2															DRAINS THROUGH TO BASINS A1 AND A2. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
6, 8, 9	6	OS3	25.25	0.08	16.7	2.02	3.36	6.8															DRAINS THROUGH TO BASIN OS7. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
12, 13	13	OS4	72.29	0.08	19.0	5.78	3.17	18.3															DRAINS THROUGH TO BASIN D. DETENTION IN POND D.
16, 17	17	OS5	41.24	0.13	22.2	5.42	2.93	15.9															DRAINS THROUGH TO BASIN F. DETENTION IN POND F.
6	6	OS6	87.44	0.09	29.4	8.08	2.51	20.3															DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13
6, 9	6	OS7	28.22	0.12	18.5	3.32	3.21	10.6															DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13
25	6	OS8	17.96	0.24		4.38						3.8											F.H.N. FILING NO. 3 POND DRAINS DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13

HRGreen

FLYING HORSE NORTH PARCELS 1-6

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by: DLH

Checked by: RDL

Date: 3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT(S)	ULTIMATEDESIGN PONT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
1, 2, 3	3	A	74.11	0.42	19.7	30.95	5.22	161.6															DETENTION IN POND A, OUTLETS TO EX. FIL. NO. 1 POND 13
4	6	A1	12.58	0.39	15.3	4.94	5.86	29.0															DIRECTLY DRAINS OFFSITE, CONVEYS OFFSITE FLOW THROUGH THE DEVELOPMENT. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
5, 6	6	A2	6.53	0.40	15.0	2.60	5.91	15.3															DIRECTLY DRAINS OFFSITE, CONVEYS OFFSITE FLOW THROUGH THE DEVELOPMENT. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
7	7	B	32.69	0.45	15.5	14.77	5.83	86.1															DETENTION IN POND B, OUTLETS TO EX. FIL. NO. 1 POND 13
10, 11	11	C	121.03	0.47	27.3	57.15	4.40	251.4															DETENTION IN POND C. OUTLETS OFFSITE DUE NORTH.
13	13	D	86.16	0.45	25.8	39.00	4.54	177.1															DETENTION IN POND D. OUTLETS OFFSITE DUE NORTHWEST.
14, 15	15	E	52.36	0.55	15.1	29.05	5.89	171.0															DETENTION IN POND E. OUTLETS OFFSITE DUE NORTH.
17	17	F	197.45	0.43	27.9	84.21	4.35	366.3															DETENTION IN POND F. OUTLETS ONSITE DUE NORTH.
18	18	G	27.30	0.41	13.6	11.10	6.16	68.4															DETENTION IN POND G. OUTLETS ONSITE DUE NORTH.
19	19	H	74.02	0.39	13.3	29.07	6.21	180.4															DIRECTLY DRAINS OFFSITE. RUNOFF REDUCTION VIA GRASS BUFFERS.
6, 20	6	I	7.13	0.46	12.7	3.26	6.33	20.7															DIRECTLY DRAINS OFFSITE TO EX. FIL. NO. 1 POND 13

HRGreen

FLYING HORSE NORTH PARCELS 1-6

PROPOSED CONDITIONS

DESIGN STORM: 100-YEAR

Calc'd by: DLH

Checked by: RDL

Date: 3/6/2024

			DIRECT RUNOFF						TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
DESIGN POINT(S)	ULTIMATEDESIGN PONT	BASIN ID	AREA (ac)	C_{100}	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	t_c (min)	C_{100}*A (ac)	I (in./ hr.)	Q (cfs)	Q_{street} (cfs)	C_{100}*A (ac)	SLOPE %	Q_{PIPE} (cfs)	C_{100}*A (ac)	SLOPE %	PIPE SIZE (ft)	LENGTH (ft)	VEL. (ft/s)	TRAVEL TIME (min)	
21	21	J	15.76	0.83	5.2	13.07	8.60	112.4															DETENTION IN POND J. OUTLETS OFFSITE DUE WEST.
22, Pond 8 (Fil. 1)	22	K	18.00	0.83	6.2	14.91	8.13	121.2															DETENTION IN POND K. OUTLETS OFFSITE DUE WEST. ULTIMATELY DRAINS TO EX. FIL. NO. 1 POND 8.
23, Pond 8 (Fil. 1)	23	L	7.09	0.67	5.0	4.74	8.68	41.1															DRAINS OFFSITE TO GOLF COURSE AND ULTIMATLEY TO EX. FIL. NO. 1 POND 8.
24	6	M	1.27	0.67	12.2	0.85	6.42	5.5															DRAINS INTO ADJACENT ALLEN RANCH ROAD AND INTO F.H.N. FILING NO. 3 POND
1, 2, 3	3	OS1	18.99	0.35	13.3	6.65	6.21	41.3															DRAINS THROUGH TO BASIN A. TWO CULVERT PIPE LOCATIONS TO CROSS ROADWAYS.
4, 5, 6	6	OS2	36.39	0.35	18.9	12.74	5.33	67.9															DRAINS THROUGH TO BASINS A1 AND A2. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
6, 8, 9	6	OS3	25.25	0.35	16.7	8.84	5.65	49.9															DRAINS THROUGH TO BASIN OS7. ULTIMATELY OUTFALLS TO EX. FIL. NO. 1 POND 13.
12, 13	13	OS4	72.29	0.35	19.0	25.30	5.32	134.5															DRAINS THROUGH TO BASIN D. DETENTION IN POND D.
16, 17	17	OS5	41.24	0.39	22.2	16.01	4.92	78.8															DRAINS THROUGH TO BASIN F. DETENTION IN POND F.
6	6	OS6	87.44	0.36	29.4	31.46	4.21	132.5															DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13
6, 9	6	OS7	28.22	0.38	18.5	10.71	5.38	57.7															DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13
25	6	OS8	17.96	0.47		8.43						4.4											F.H.N. FILING NO. 3 POND DRAINS DIRECTLY DRAINS TO EX. FIL. NO. 1 POND 13

Appendix C:

Hydraulic Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section A-A OFF-SITE CHANNEL: 5-YR

Trapezoidal

Bottom Width (ft)	= 50.00
Side Slopes (z:1)	= 89.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.70
N-Value	= 0.035

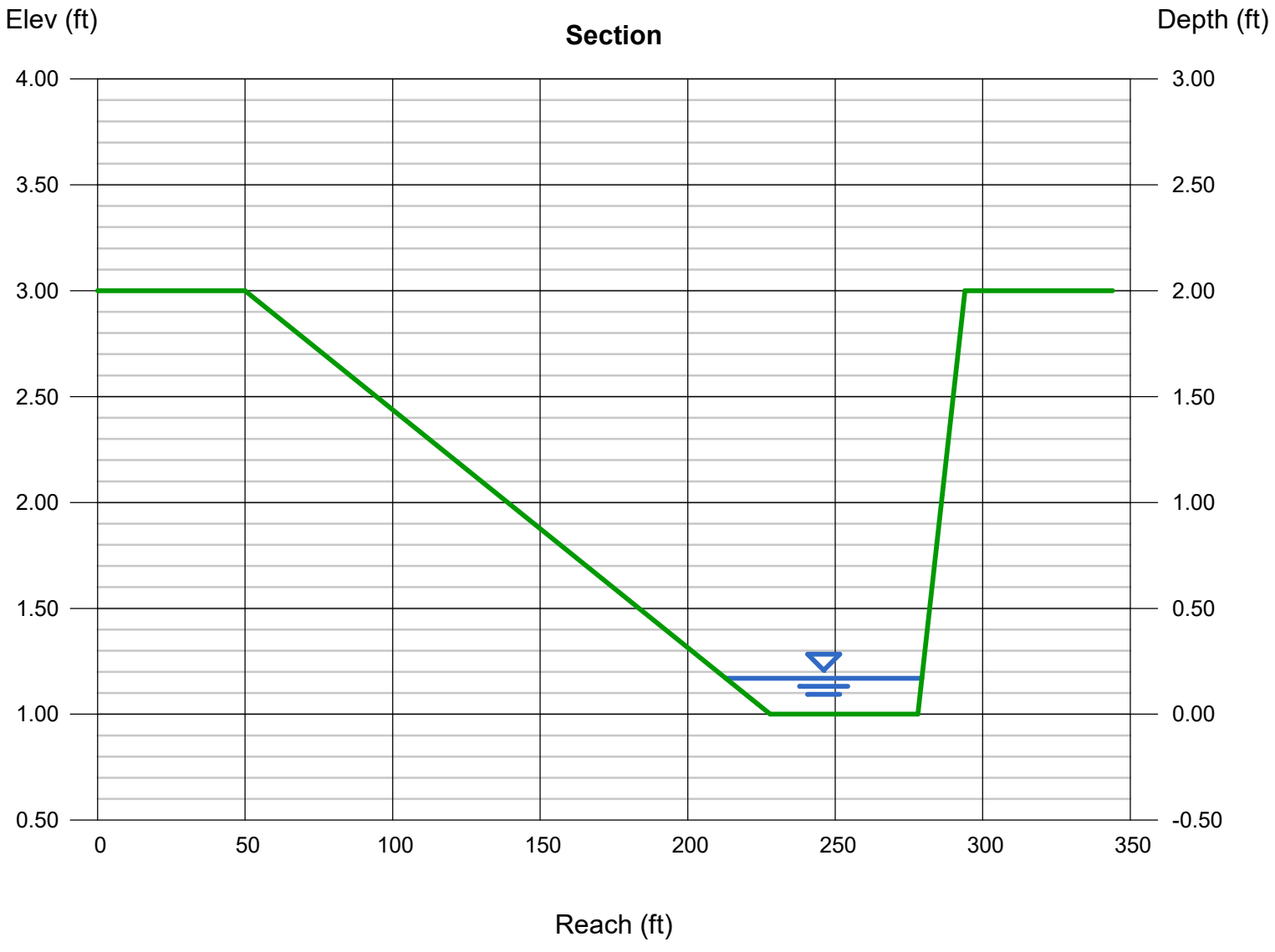
Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.30

Highlighted

Depth (ft)	= 0.17
Q (cfs)	= 18.30
Area (sqft)	= 9.90
Velocity (ft/s)	= 1.85
Wetted Perim (ft)	= 66.50
Crit Depth, Yc (ft)	= 0.16
Top Width (ft)	= 66.49
EGL (ft)	= 0.22

CHANNEL LOCATION:
WITHIN BASIN OS4



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section A-A OFF-SITE CHANNEL: 100-YR

Trapezoidal

Bottom Width (ft)	= 50.00
Side Slopes (z:1)	= 89.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.70
N-Value	= 0.035

Calculations

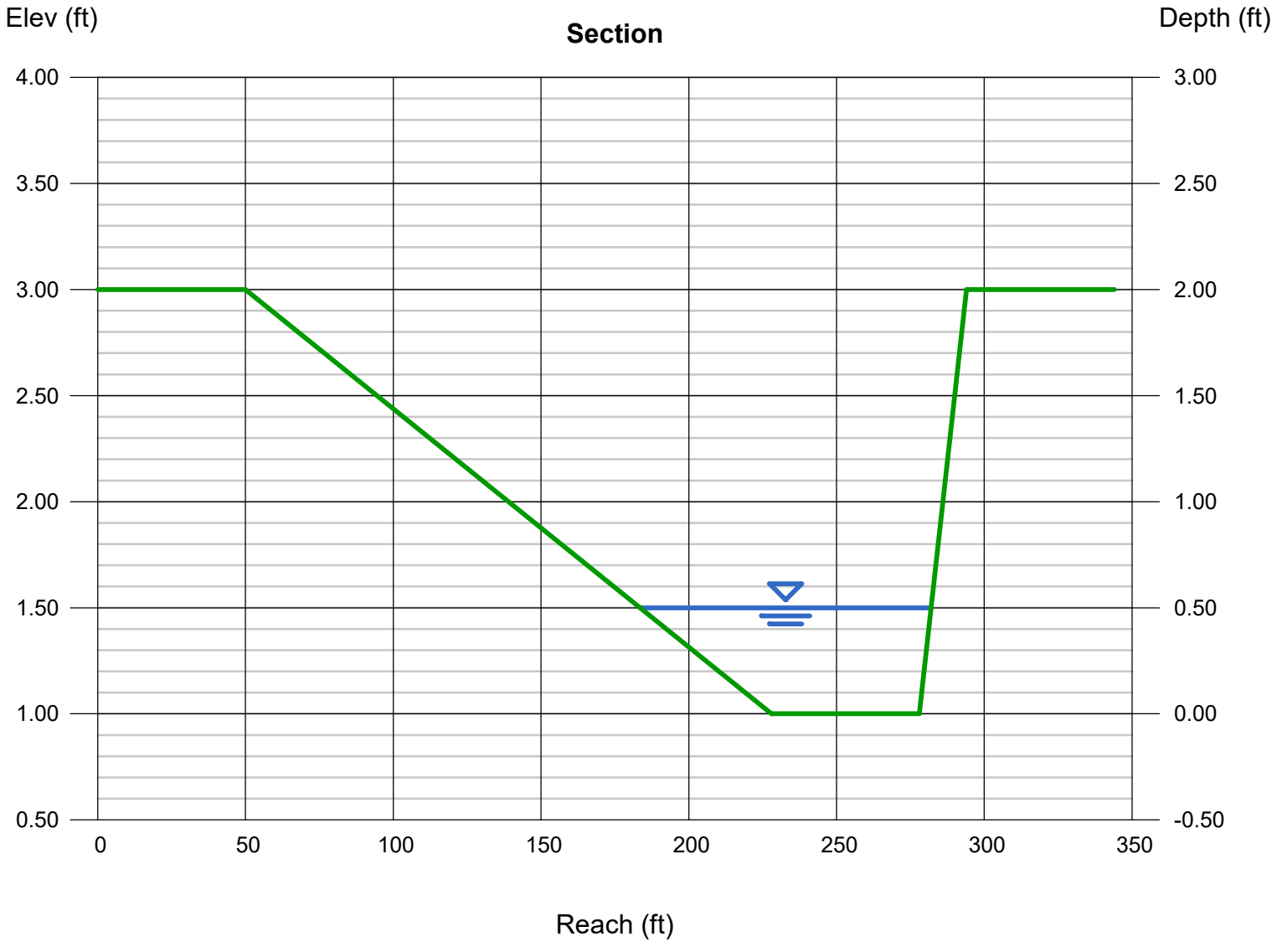
Compute by:	Known Q
Known Q (cfs)	= 134.50

CHANNEL LOCATION:
WITHIN BASIN OS4

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 134.50
Area (sqft)	= 37.12
Velocity (ft/s)	= 3.62
Wetted Perim (ft)	= 98.53
Crit Depth, Yc (ft)	= 0.52
Top Width (ft)	= 98.50
EGL (ft)	= 0.70

Recommended BMP:
North American Green
Rollmax Permanent Turf Reinforcement Mat
P300 (or equiv.)
Permissible Velocity (ft/s) = 9.0
Permissible Shear Stress (lb/ft^2) = 3.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 9 2023

Section B-B OFF-SITE CHANNEL: 5-YR

Triangular

Side Slopes (z:1)	= 6.00, 10.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 1.00
Slope (%)	= 5.70
N-Value	= 0.035

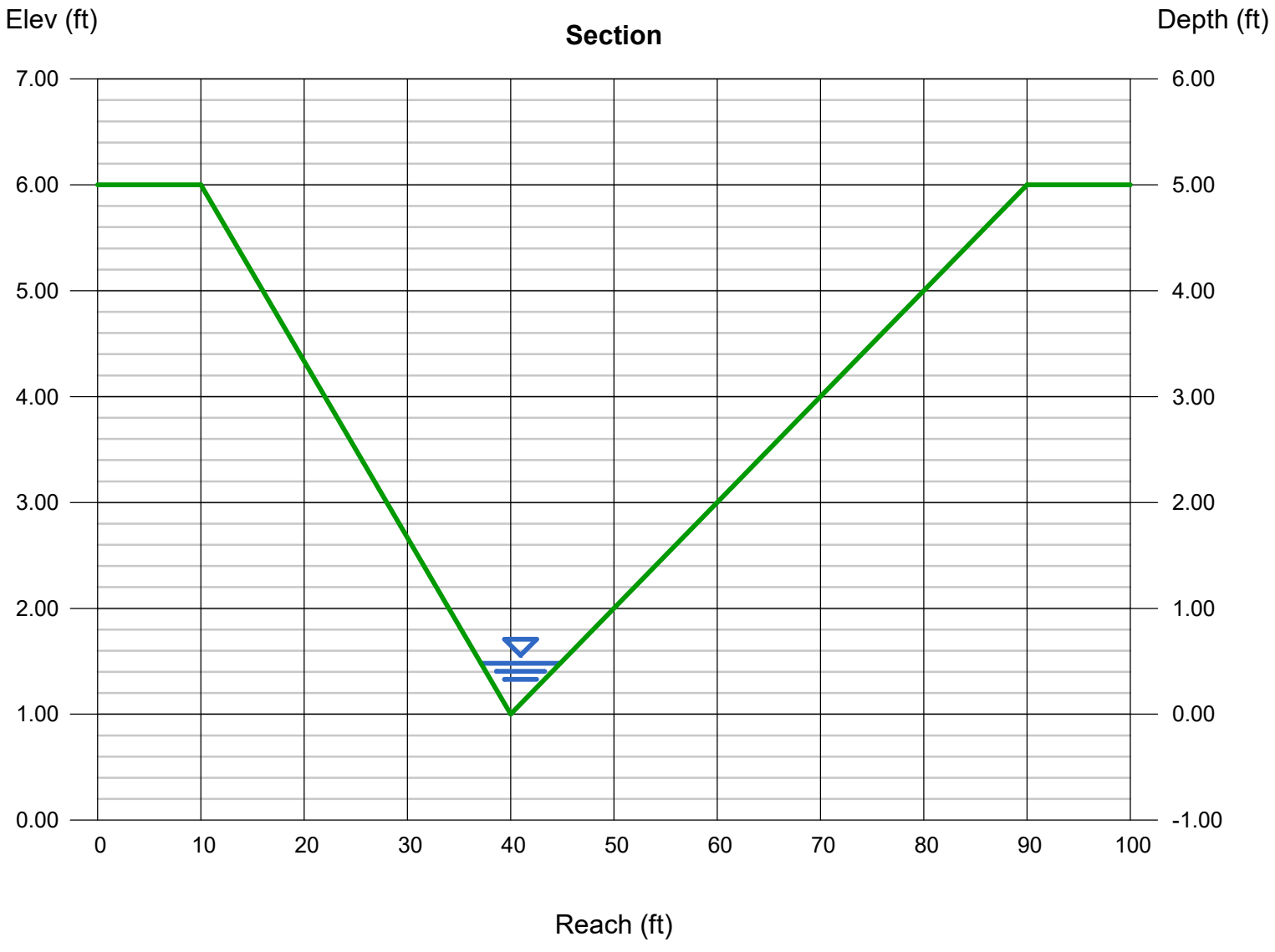
Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.80

Highlighted

Depth (ft)	= 0.48
Q (cfs)	= 6.800
Area (sqft)	= 1.84
Velocity (ft/s)	= 3.69
Wetted Perim (ft)	= 7.74
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 7.68
EGL (ft)	= 0.69

CHANNEL LOCATION:
WITHIN BASIN OS3



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 9 2023

Section B-B OFF-SITE CHANNEL: 100-YR

Triangular

Side Slopes (z:1)	= 6.00, 10.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 1.00
Slope (%)	= 5.70
N-Value	= 0.035

Calculations

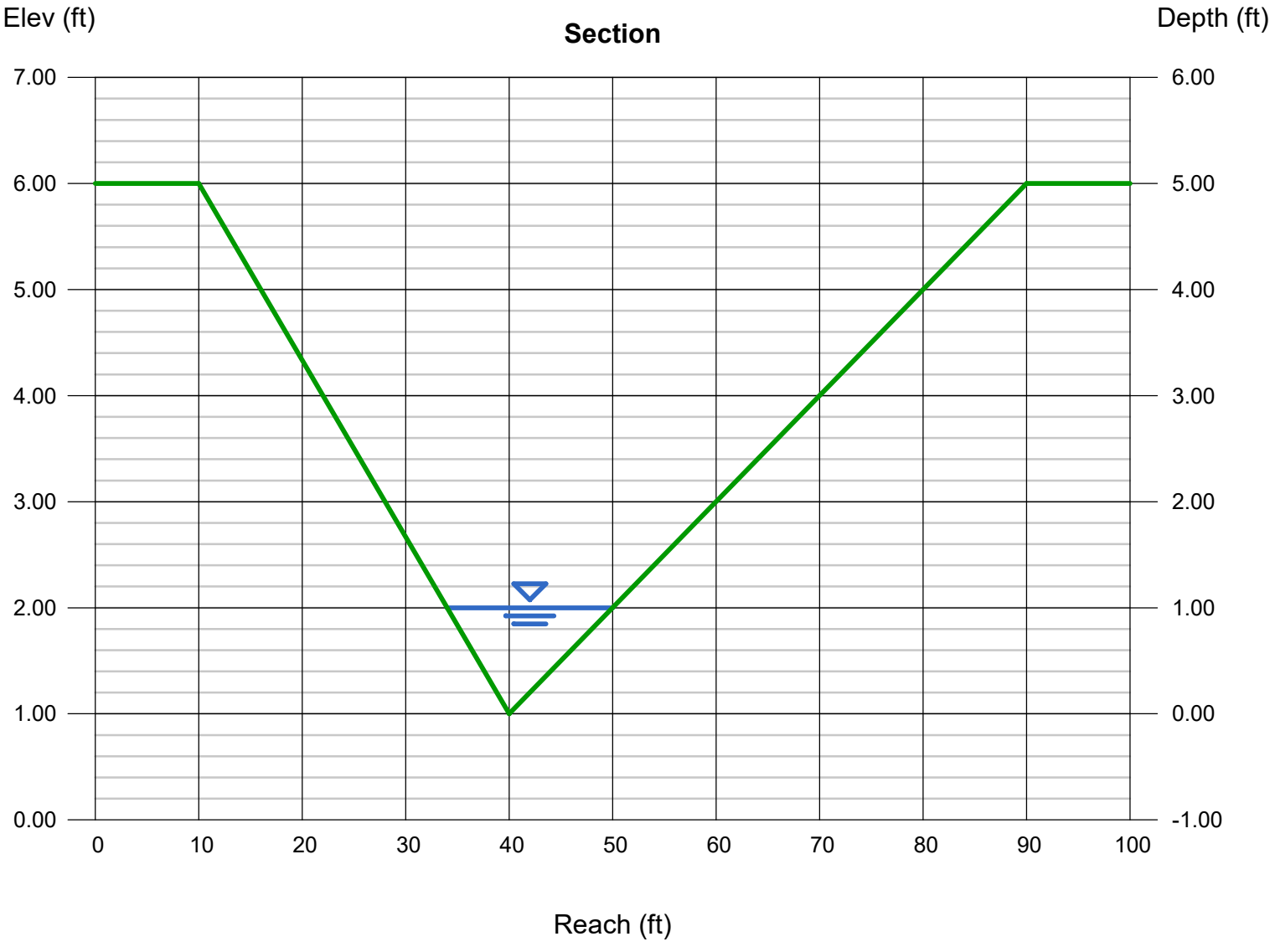
Compute by:	Known Q
Known Q (cfs)	= 49.90

CHANNEL LOCATION:
WITHIN BASIN OS3

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 49.90
Area (sqft)	= 8.00
Velocity (ft/s)	= 6.24
Wetted Perim (ft)	= 16.13
Crit Depth, Yc (ft)	= 1.20
Top Width (ft)	= 16.00
EGL (ft)	= 1.60

Recommended BMP:
Rollmax Permanent Turf Reinforcement Mat TMAX (or equiv.)
Permissible Velocity (ft/s) = 25.0
Permissible Shear Stress (lb/ft^2) = 15.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section C-C OFF-SITE CHANNEL: 5-YR

Trapezoidal

Bottom Width (ft)	= 23.00
Side Slopes (z:1)	= 39.00, 10.00
Total Depth (ft)	= 1.20
Invert Elev (ft)	= 1.00
Slope (%)	= 6.60
N-Value	= 0.035

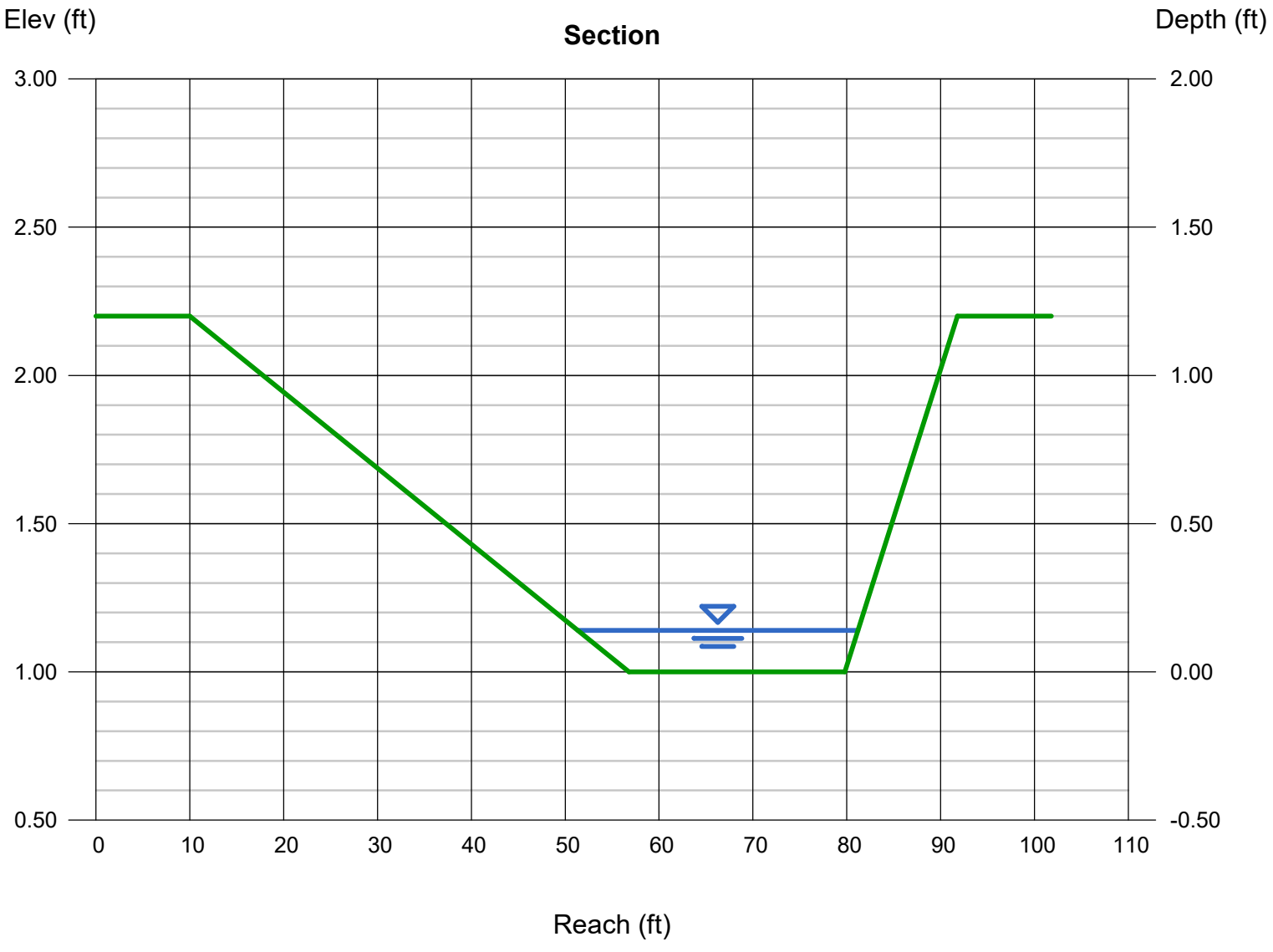
Highlighted

Depth (ft)	= 0.14
Q (cfs)	= 9.200
Area (sqft)	= 3.70
Velocity (ft/s)	= 2.49
Wetted Perim (ft)	= 29.87
Crit Depth, Yc (ft)	= 0.17
Top Width (ft)	= 29.86
EGL (ft)	= 0.24

Calculations

Compute by:	Known Q
Known Q (cfs)	= 9.20

CHANNEL LOCATION:
WITHIN BASIN OS2



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section C-C OFF-SITE CHANNEL: 100-YR

Trapezoidal

Bottom Width (ft)	= 23.00
Side Slopes (z:1)	= 39.00, 10.00
Total Depth (ft)	= 1.20
Invert Elev (ft)	= 1.00
Slope (%)	= 6.60
N-Value	= 0.035

Calculations

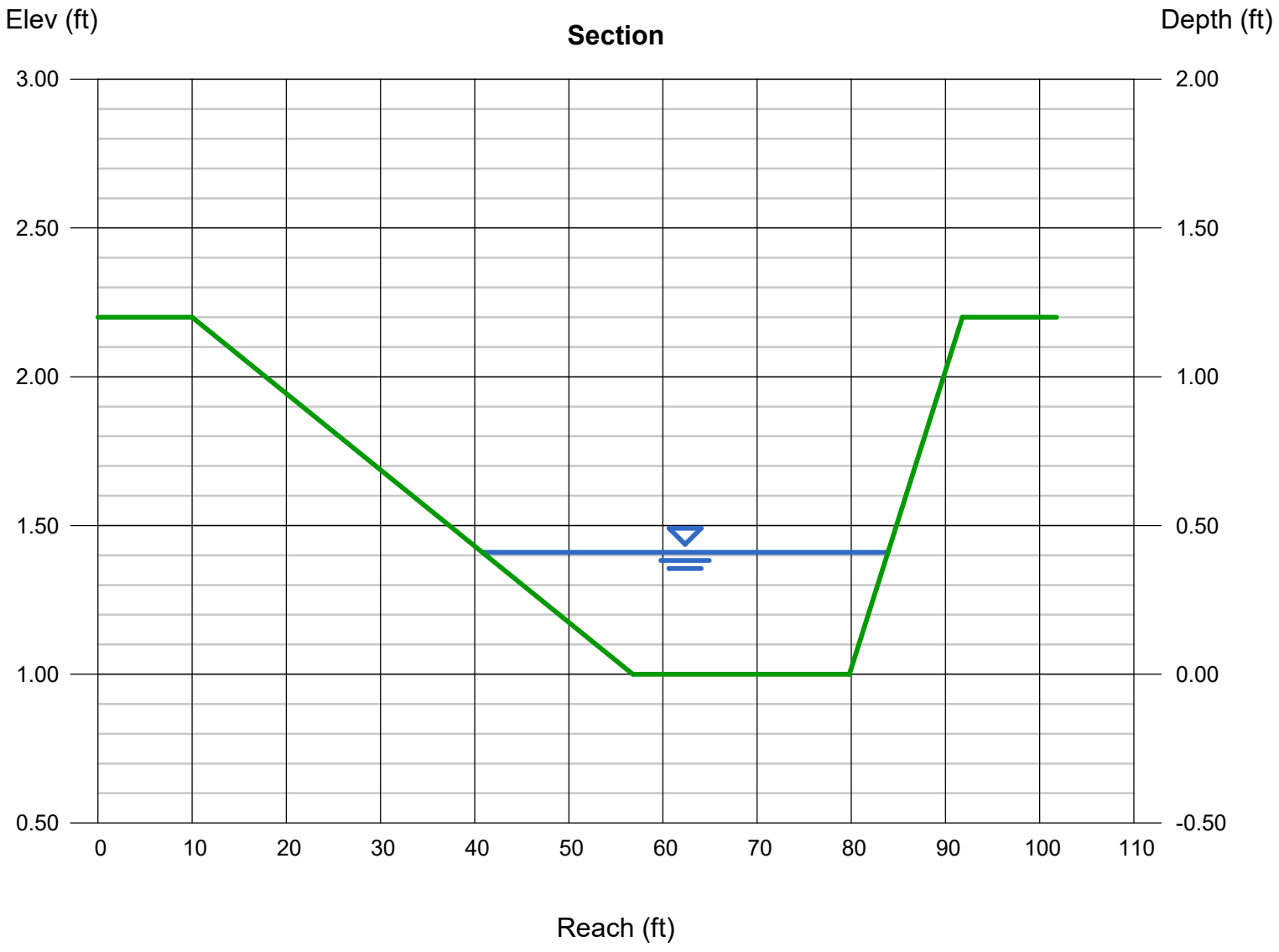
Compute by:	Known Q
Known Q (cfs)	= 67.90

CHANNEL LOCATION:
WITHIN BASIN OS2

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 67.90
Area (sqft)	= 13.55
Velocity (ft/s)	= 5.01
Wetted Perim (ft)	= 43.12
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 43.09
EGL (ft)	= 0.80

Recommended BMP:
North American Green
Rollmax Permanent Turf Reinforcement Mat
P300 (or equiv.)
Permissible Velocity (ft/s) = 9.0
Permissible Shear Stress (lb/ft^2) = 3.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section D-D ON-SITE CHANNEL: 5-YR

Trapezoidal

Bottom Width (ft)	= 40.00
Side Slopes (z:1)	= 44.00, 14.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.50
N-Value	= 0.035

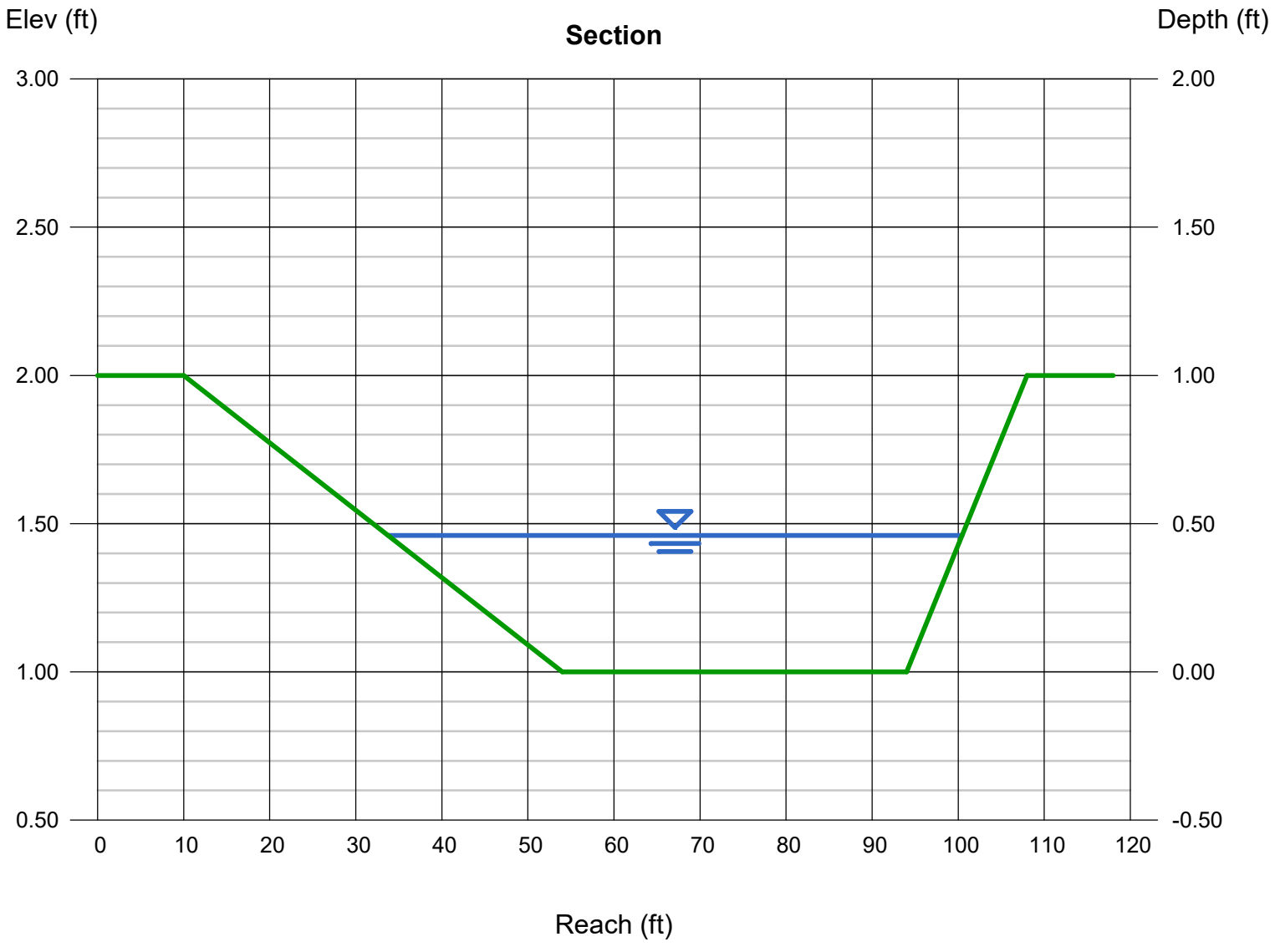
Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 81.40
Area (sqft)	= 24.54
Velocity (ft/s)	= 3.32
Wetted Perim (ft)	= 66.70
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 66.68
EGL (ft)	= 0.63

Calculations

Compute by:	Known Q
Known Q (cfs)	= 81.40

CHANNEL LOCATION:
WITHIN BASIN C



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section D-D ON-SITE CHANNEL: 100-YR

Trapezoidal

Bottom Width (ft)	= 40.00
Side Slopes (z:1)	= 44.00, 14.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.50
N-Value	= 0.035

Calculations

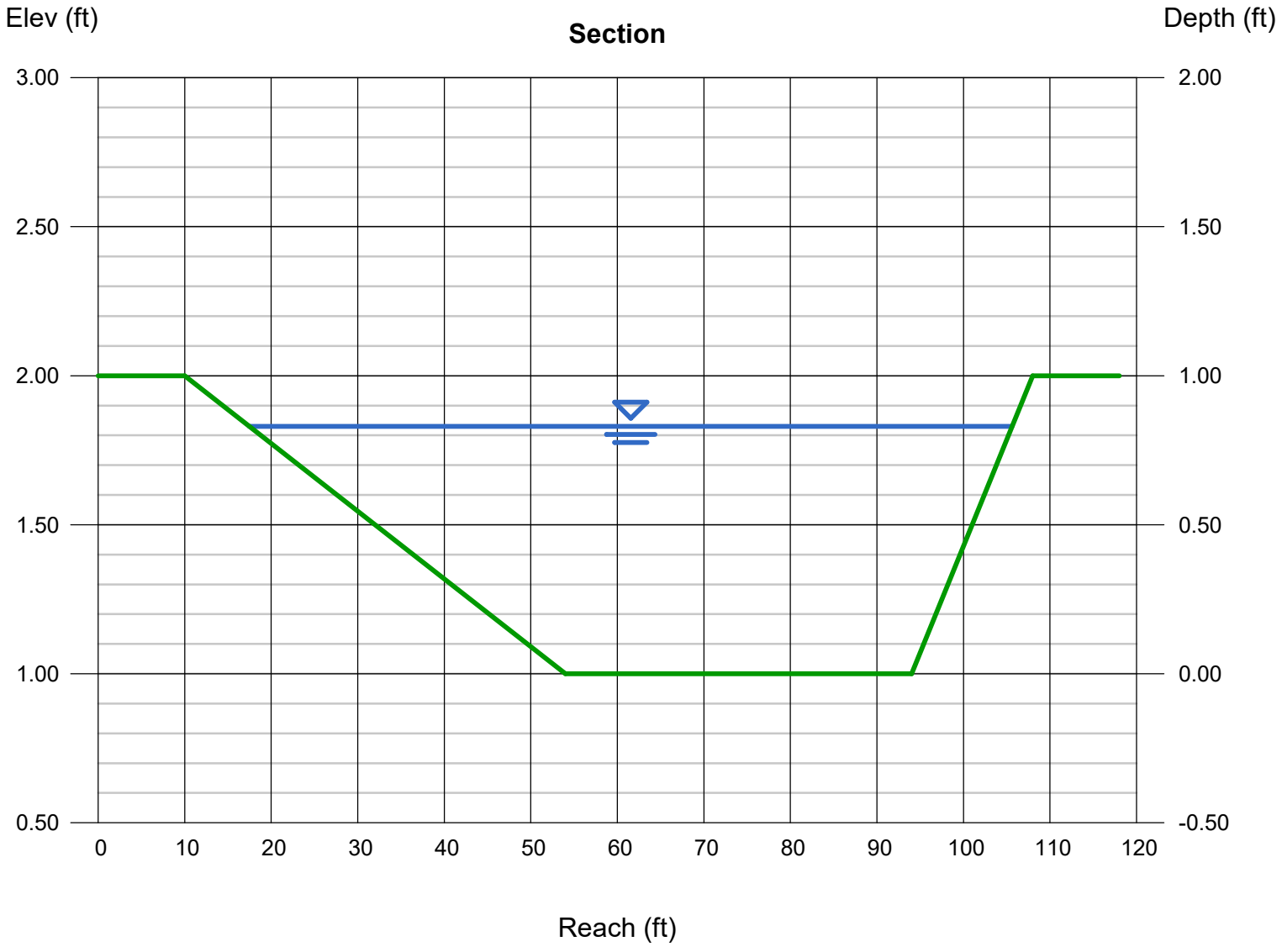
Compute by:	Known Q
Known Q (cfs)	= 251.40

CHANNEL LOCATION:
WITHIN BASIN C

Highlighted

Depth (ft)	= 0.83
Q (cfs)	= 251.40
Area (sqft)	= 53.18
Velocity (ft/s)	= 4.73
Wetted Perim (ft)	= 88.18
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 88.14
EGL (ft)	= 1.18

Recommended BMP:
North American Green
Rollmax Permanent Turf Reinforcement Mat
P300 (or equiv.)
Permissible Velocity (ft/s) = 9.0
Permissible Shear Stress (lb/ft^2) = 3.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section E-E ON-SITE CHANNEL: 5-YR

Trapezoidal

Bottom Width (ft)	= 22.50
Side Slopes (z:1)	= 7.00, 8.00
Total Depth (ft)	= 3.90
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

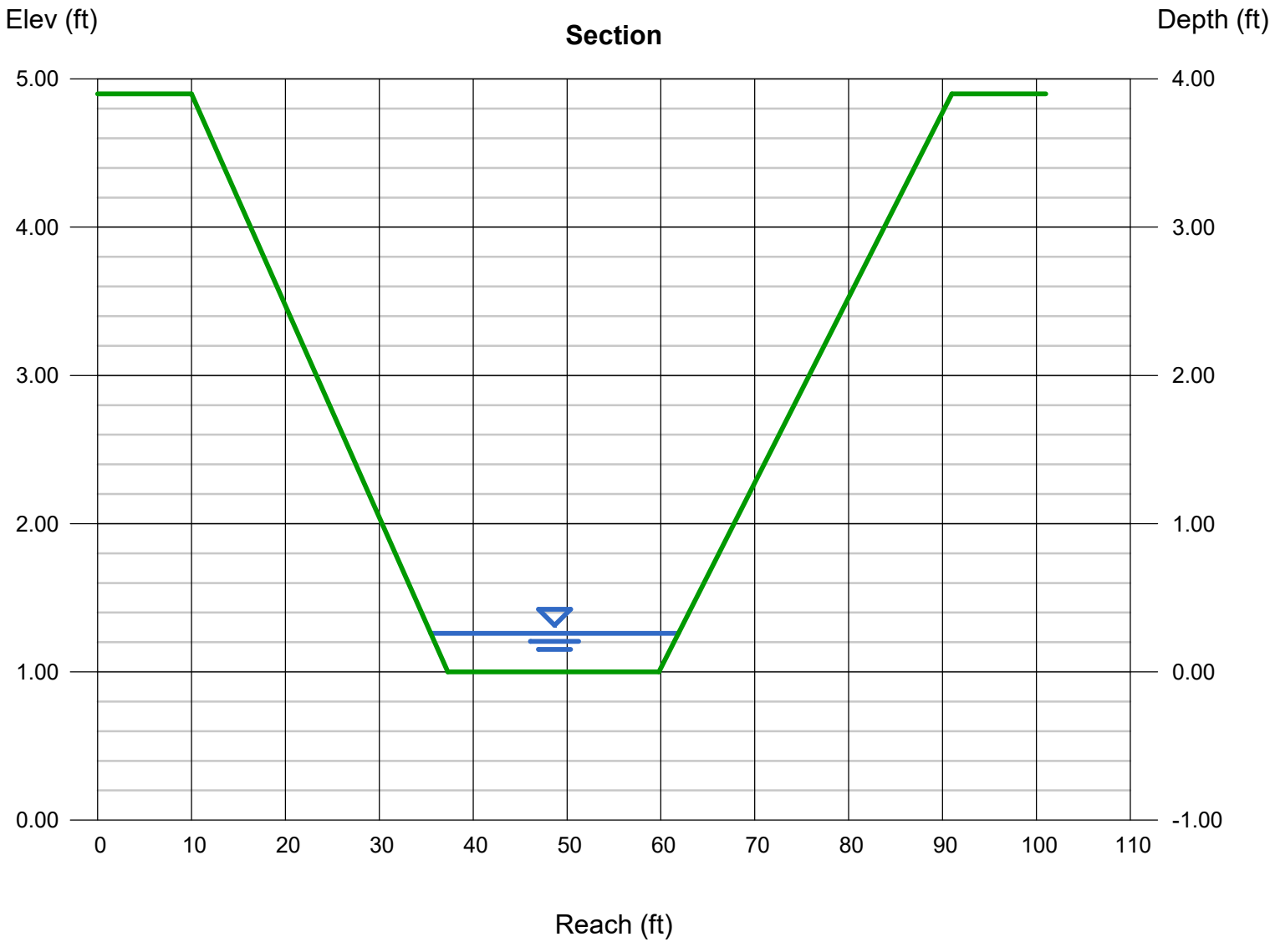
Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.50

Highlighted

Depth (ft)	= 0.26
Q (cfs)	= 14.50
Area (sqft)	= 6.36
Velocity (ft/s)	= 2.28
Wetted Perim (ft)	= 26.43
Crit Depth, Yc (ft)	= 0.23
Top Width (ft)	= 26.40
EGL (ft)	= 0.34

CHANNEL LOCATION:
WITHIN BASIN A



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section E-E ON-SITE CHANNEL: 100-YR

Trapezoidal

Bottom Width (ft)	= 22.50
Side Slopes (z:1)	= 7.00, 8.00
Total Depth (ft)	= 3.90
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

Calculations

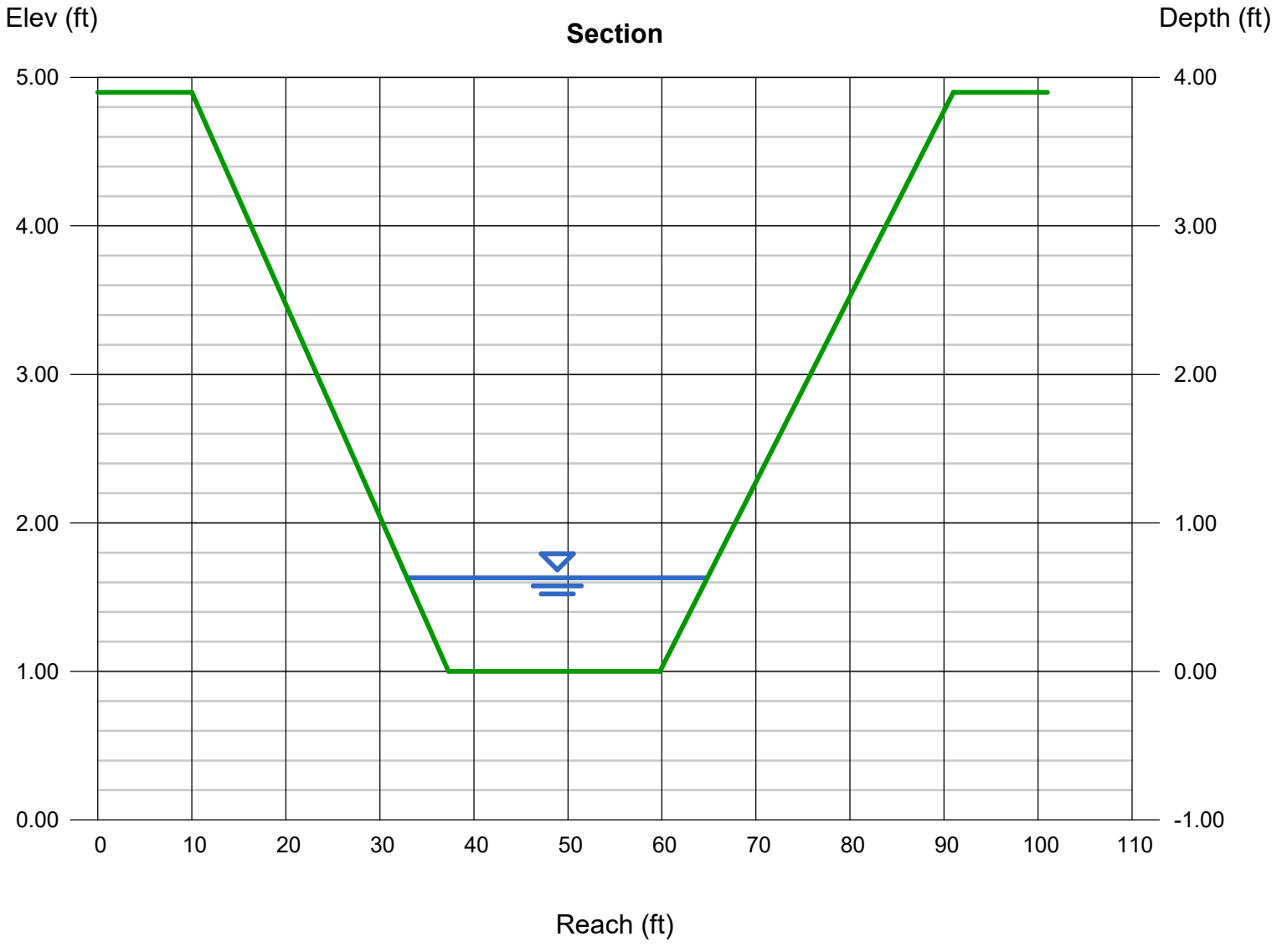
Compute by:	Known Q
Known Q (cfs)	= 69.10

CHANNEL LOCATION:
WITHIN BASIN A

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 69.10
Area (sqft)	= 17.15
Velocity (ft/s)	= 4.03
Wetted Perim (ft)	= 32.03
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 31.95
EGL (ft)	= 0.88

Recommended BMP:
North American Green
Rollmax Permanent Turf Reinforcement Mat
P300 (or equiv.)
Permissible Velocity (ft/s) = 9.0
Permissible Shear Stress (lb/ft^2) = 3.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section F-F ON-SITE CHANNEL: 5-YR

Triangular

Side Slopes (z:1)	= 8.00, 14.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

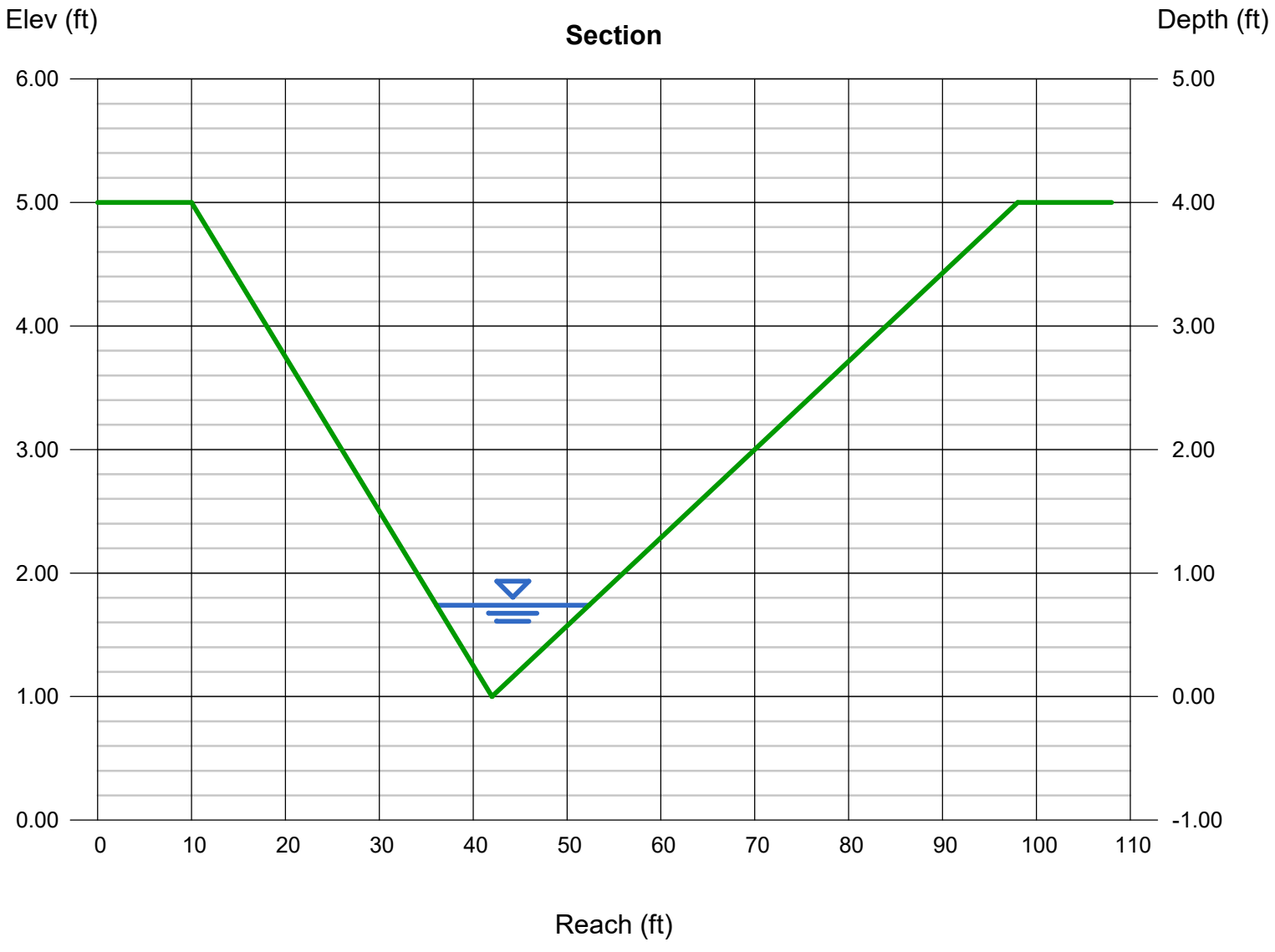
Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.70

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 18.70
Area (sqft)	= 6.02
Velocity (ft/s)	= 3.10
Wetted Perim (ft)	= 16.35
Crit Depth, Yc (ft)	= 0.71
Top Width (ft)	= 16.28
EGL (ft)	= 0.89

CHANNEL LOCATION:
WITHIN BASIN A2



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section F-F ON-SITE CHANNEL: 100-YR

Triangular

Side Slopes (z:1)	= 8.00, 14.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.035

Calculations

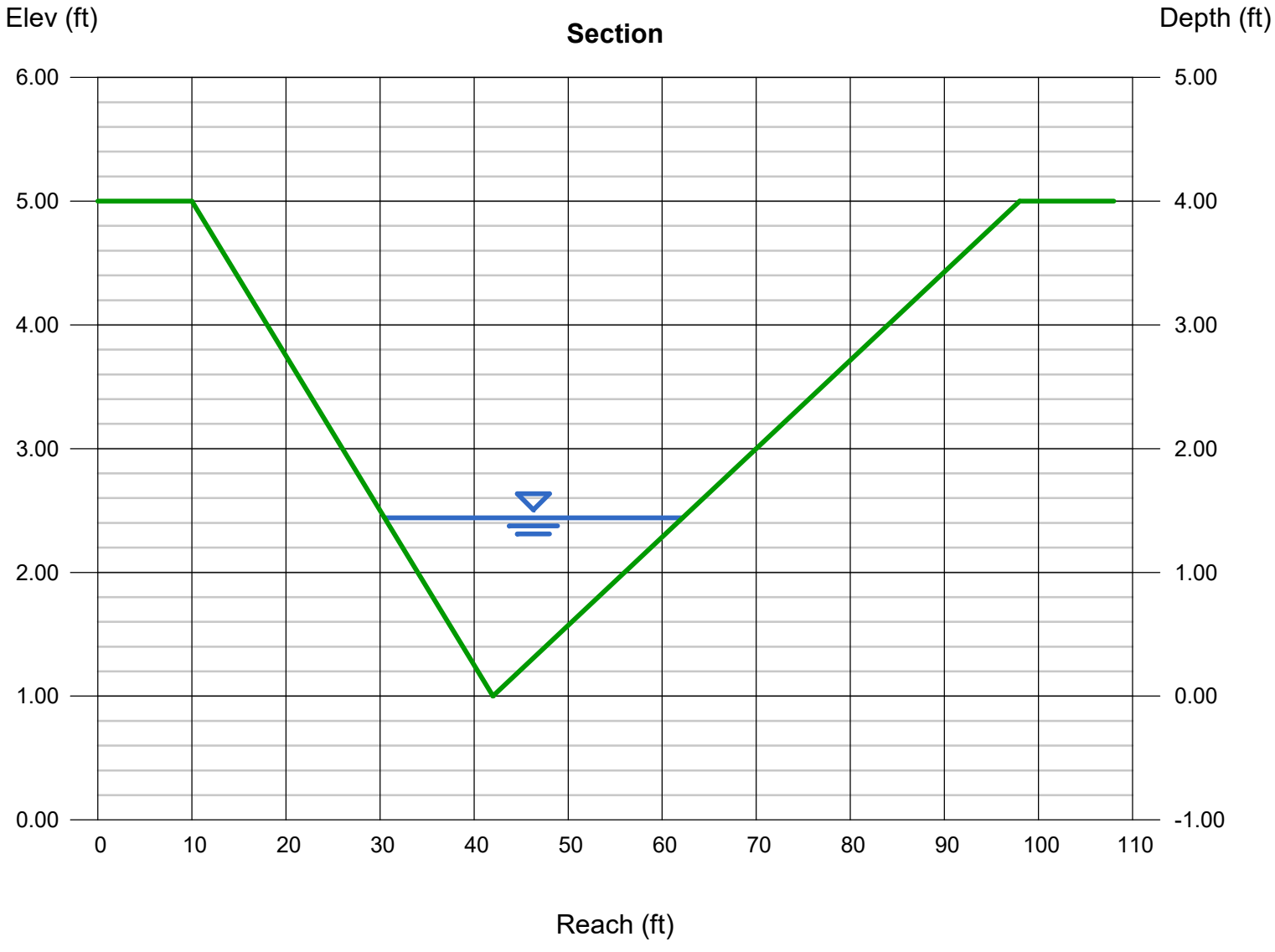
Compute by:	Known Q
Known Q (cfs)	= 112.20

CHANNEL LOCATION:
WITHIN BASIN A2

Highlighted

Depth (ft)	= 1.44
Q (cfs)	= 112.20
Area (sqft)	= 22.81
Velocity (ft/s)	= 4.92
Wetted Perim (ft)	= 31.82
Crit Depth, Yc (ft)	= 1.46
Top Width (ft)	= 31.68
EGL (ft)	= 1.82

Recommended BMP:
North American Green
Rollmax Permanent Turf Reinforcement Mat
P300 (or equiv.)
Permissible Velocity (ft/s) = 9.0
Permissible Shear Stress (lb/ft^2) = 3.0



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section G-G ON-SITE CHANNEL: 5-YR

Trapezoidal

Bottom Width (ft)	= 22.50
Side Slopes (z:1)	= 6.00, 21.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 5.30
N-Value	= 0.035

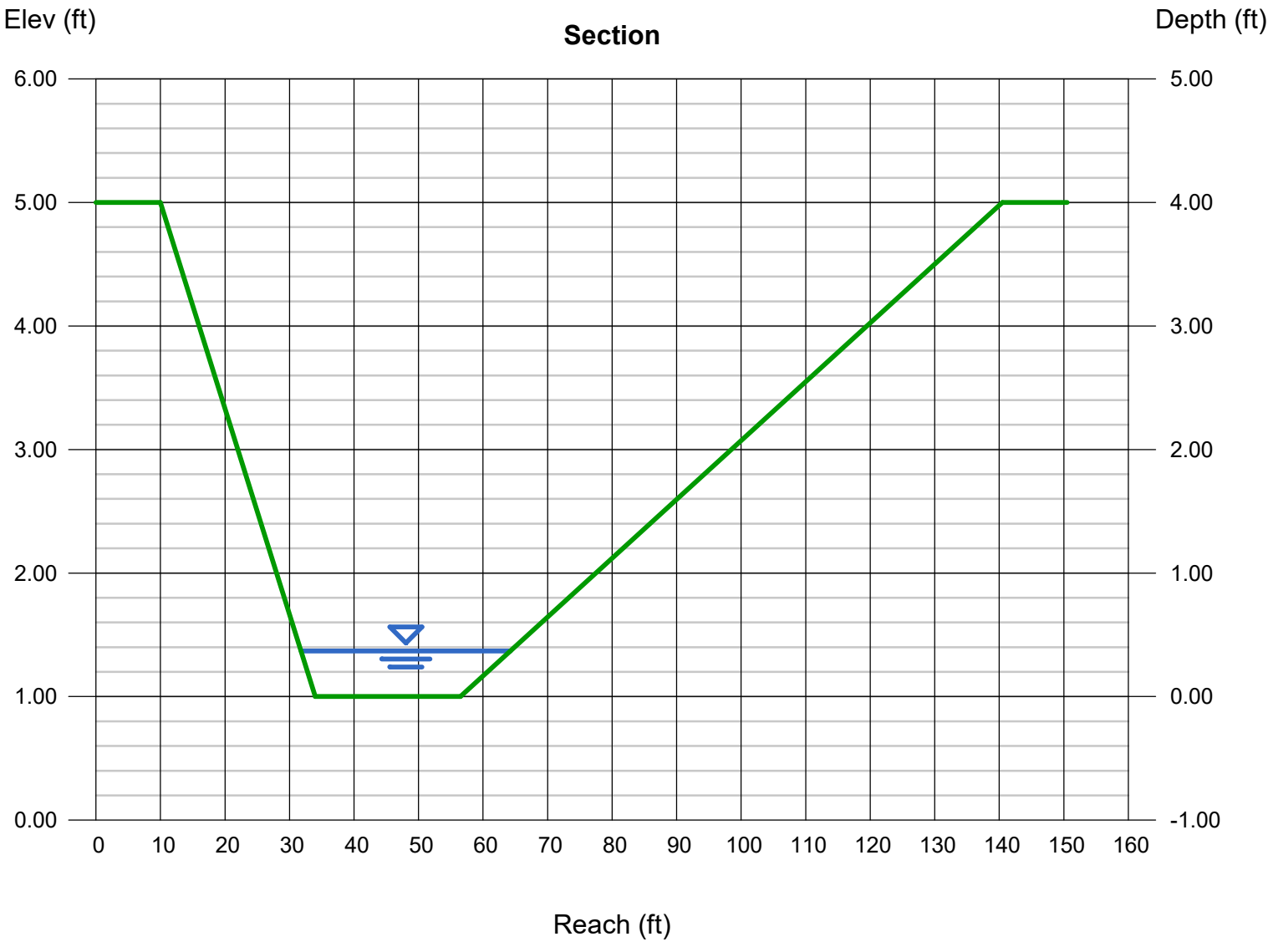
Highlighted

Depth (ft)	= 0.37
Q (cfs)	= 44.30
Area (sqft)	= 10.17
Velocity (ft/s)	= 4.35
Wetted Perim (ft)	= 32.53
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 32.49
EGL (ft)	= 0.66

Calculations

Compute by:	Known Q
Known Q (cfs)	= 44.30

CHANNEL LOCATION:
WITHIN BASIN F



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

Section G-G ON-SITE CHANNEL: 100-YR

Trapezoidal

Bottom Width (ft)	= 22.50
Side Slopes (z:1)	= 6.00, 21.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 5.30
N-Value	= 0.035

Calculations

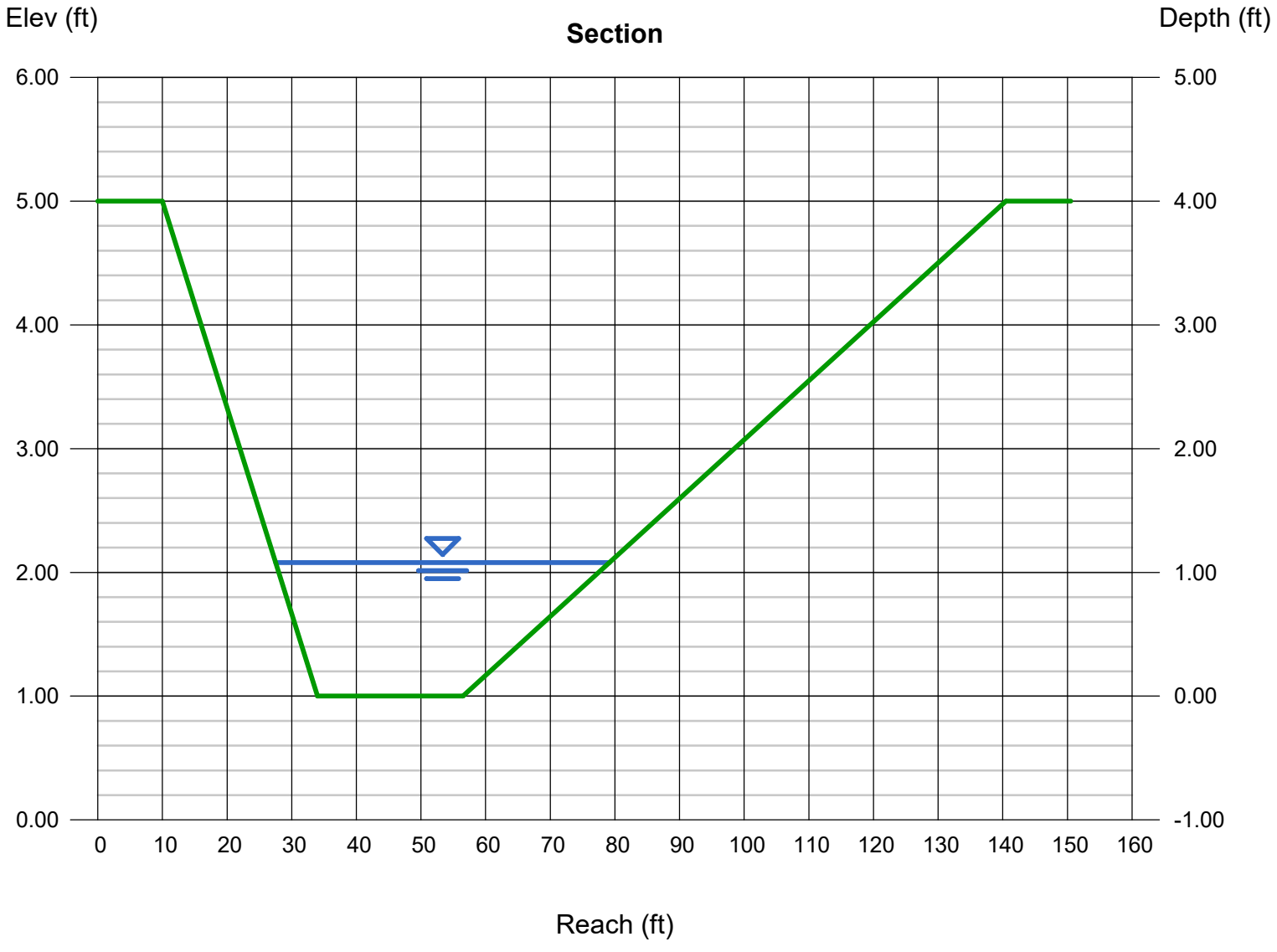
Compute by:	Known Q
Known Q (cfs)	= 325.40

CHANNEL LOCATION:
WITHIN BASIN F

Highlighted

Depth (ft)	= 1.08
Q (cfs)	= 325.40
Area (sqft)	= 40.05
Velocity (ft/s)	= 8.13
Wetted Perim (ft)	= 51.78
Crit Depth, Yc (ft)	= 1.41
Top Width (ft)	= 51.66
EGL (ft)	= 2.11

Recommended BMP:
Rollmax Permanent Turf Reinforcement Mat TMAX (or equiv.)
Permissible Velocity (ft/s) = 25.0
Permissible Shear Stress (lb/ft^2) = 15.0



FROUDE NUMBER CALCULATIONS			CALCULATED BY:	DLH	DATE:	10/10/2023
PROJECT: 211030 Parcels 1-6			CHECKED BY:	RL		

Froude Number Calculations: 100-YR						
Section	Velocity	Gravitational Constant	Hydraulic depth	X-Sectional Area	top Width	Froude #
-	ft/s	ft/s^2	ft	ft^2	ft	N/A
A-A	3.62	32.17	0.38	37.12	98.50	1.04
B-B	6.24	32.17	0.50	8.00	16.00	1.56
C-C	5.01	32.17	0.31	13.55	43.09	1.58
D-D	4.73	32.17	0.60	53.18	88.14	1.07
E-E	4.03	32.17	0.54	17.15	31.95	0.97
F-F	4.92	32.17	0.72	22.81	31.68	1.02
G-G	8.13	32.17	0.78	40.05	51.66	1.63

Shear Stress Calculations: 100-YR				
Section	Unit Weight of Water	Depth of flow	Slope	Shear Stress
-	lb/ft^3	ft	ft/ft	lb/ft^2
A-A	62.43	0.50	0.03	0.84
B-B	62.43	1.00	0.057	3.56
C-C	62.43	0.41	0.066	1.69
D-D	62.43	1.00	0.025	1.56
E-E	62.43	0.63	0.021	0.83
F-F	62.43	1.44	0.021	1.89
G-G	62.43	1.08	0.053	3.57

Channel Lining Determination					
Calculated Values			P300 Max Values		
Section	Shear Stress	Velocity	Shear Stress	Velocity	Lining Required
A-A	0.84	3.62	3	9	P300
B-B	3.56	6.24	3	9	TMAX
C-C	1.69	5.01	3	9	P300
D-D	1.56	4.73	3	9	P300
E-E	0.83	4.03	3	9	P300
F-F	1.89	4.92	3	9	P300
G-G	3.57	8.13	3	9	TMAX

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 9 2023

CULVERT-01

Invert Elev Dn (ft)	=	7581.40
Pipe Length (ft)	=	272.80
Slope (%)	=	3.92
Invert Elev Up (ft)	=	7592.09
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

Embankment

Top Elevation (ft)	=	7609.50
Top Width (ft)	=	124.00
Crest Width (ft)	=	100.00

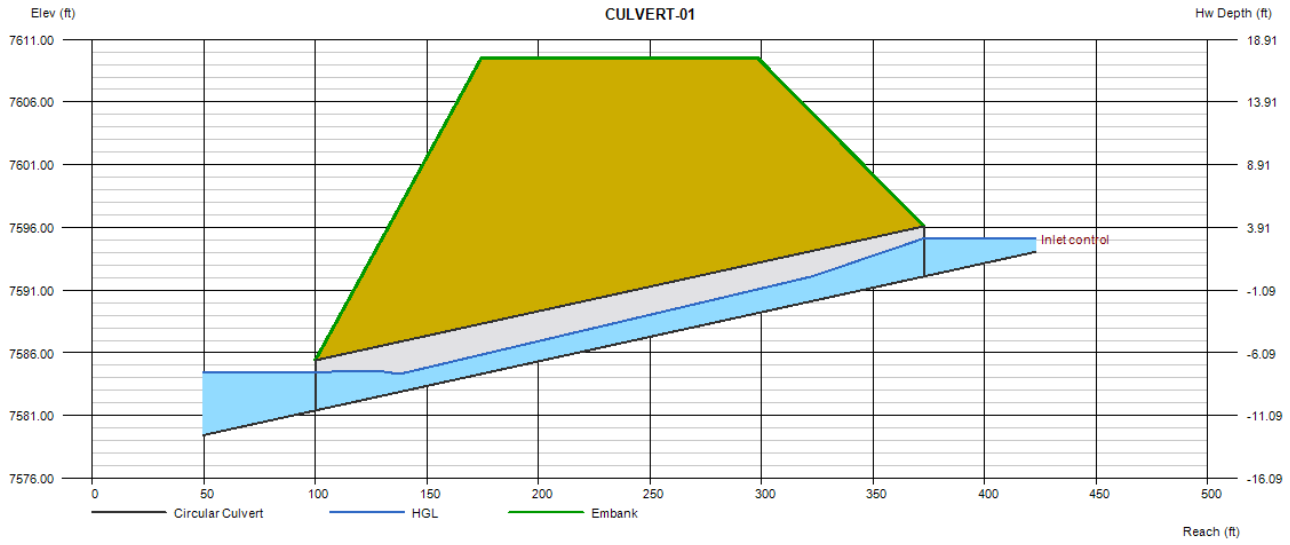
Calculations

Qmin (cfs)	=	6.80
Qmax (cfs)	=	49.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	49.80
Qpipe (cfs)	=	49.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.83
Veloc Up (ft/s)	=	7.38
HGL Dn (ft)	=	7584.46
HGL Up (ft)	=	7594.21
Hw Elev (ft)	=	7595.13
Hw/D (ft)	=	0.76
Flow Regime	=	Inlet Control

CULVERT LOCATION: PARCEL 3, BASIN B, CROSSING HOLMES ROAD, DESIGN POINT 8



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 19 2023

Culvert-02

Invert Elev Dn (ft)	=	7582.02
Pipe Length (ft)	=	188.00
Slope (%)	=	2.12
Invert Elev Up (ft)	=	7586.01
Rise (in)	=	42.0
Shape	=	Circular
Span (in)	=	42.0
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)	=	7609.50
Top Width (ft)	=	55.00
Crest Width (ft)	=	100.00

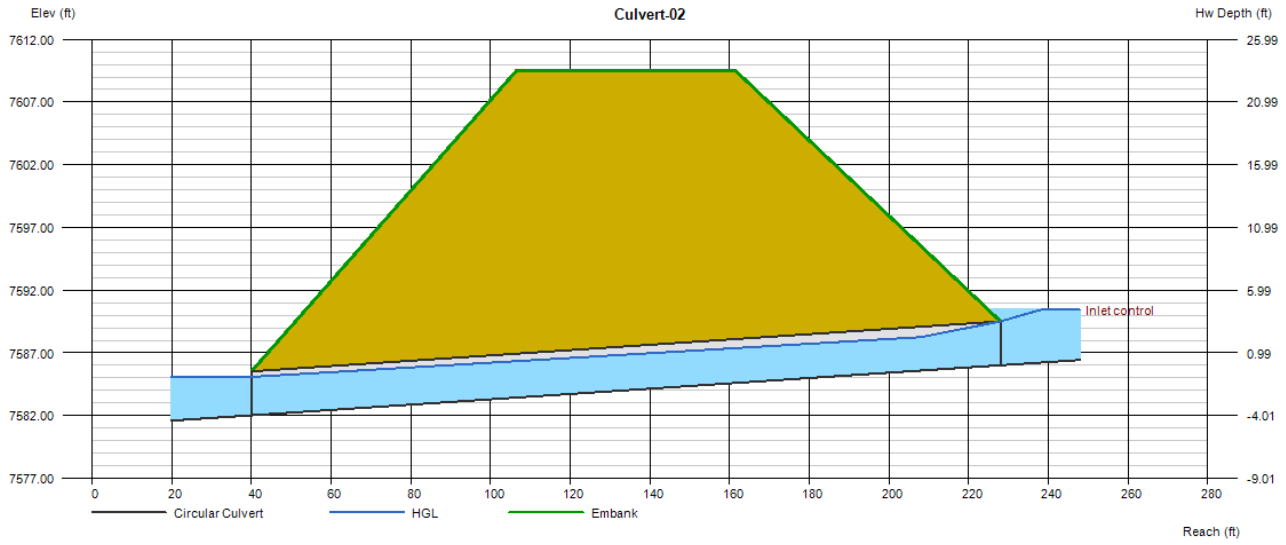
CULVERT LOCATION: PARCEL 3, BASIN A1-A2, CROSSING HOLMES ROAD, DESIGN POINT 4

Calculations

Qmin (cfs)	=	10.00
Qmax (cfs)	=	70.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	70.00
Qpipe (cfs)	=	70.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.85
Veloc Up (ft/s)	=	9.06
HGL Dn (ft)	=	7585.08
HGL Up (ft)	=	7588.63
Hw Elev (ft)	=	7590.42
Hw/D (ft)	=	1.26
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Oct 9 2023

CULVERT-03

Invert Elev Dn (ft)	=	7601.62
Pipe Length (ft)	=	167.11
Slope (%)	=	2.94
Invert Elev Up (ft)	=	7606.53
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

Embankment

Top Elevation (ft)	=	7620.26
Top Width (ft)	=	60.00
Crest Width (ft)	=	100.00

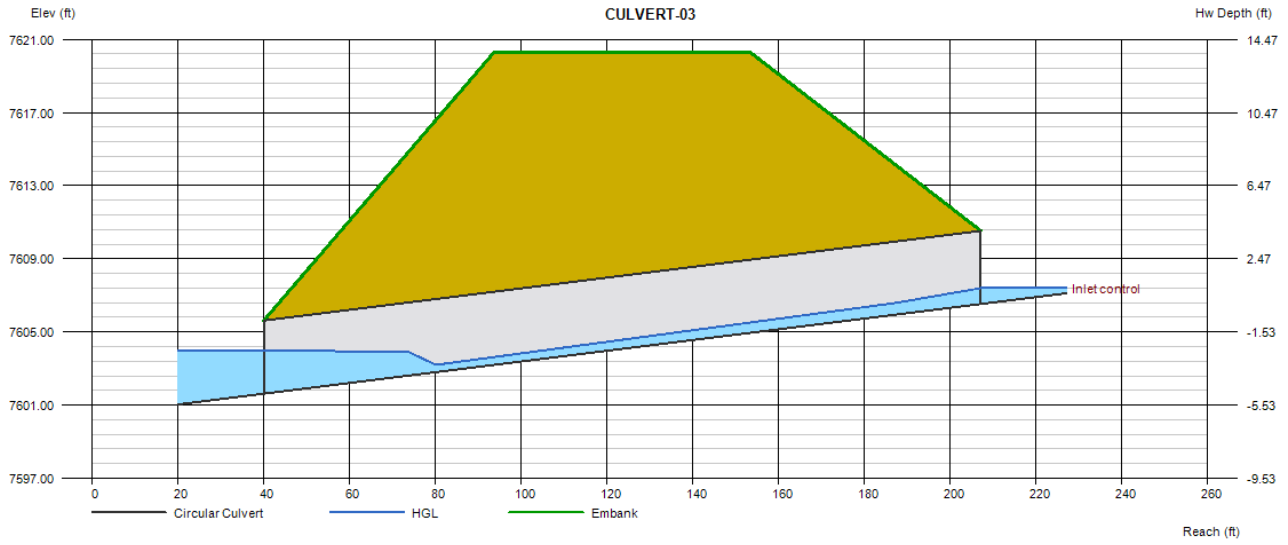
CULVERT LOCATION: PARCEL 3, BASIN A, CROSSING HOLMES ROAD, DESIGN POINT 2

Calculations

Qmin (cfs)	=	5.60
Qmax (cfs)	=	41.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	5.60
Qpipe (cfs)	=	5.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.73
Veloc Up (ft/s)	=	3.92
HGL Dn (ft)	=	7603.96
HGL Up (ft)	=	7607.21
Hw Elev (ft)	=	7607.40
Hw/D (ft)	=	0.22
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

CULVERT-04

Invert Elev Dn (ft)	=	7596.23
Pipe Length (ft)	=	183.00
Slope (%)	=	2.82
Invert Elev Up (ft)	=	7601.39
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)	=	7619.36
Top Width (ft)	=	60.00
Crest Width (ft)	=	50.00

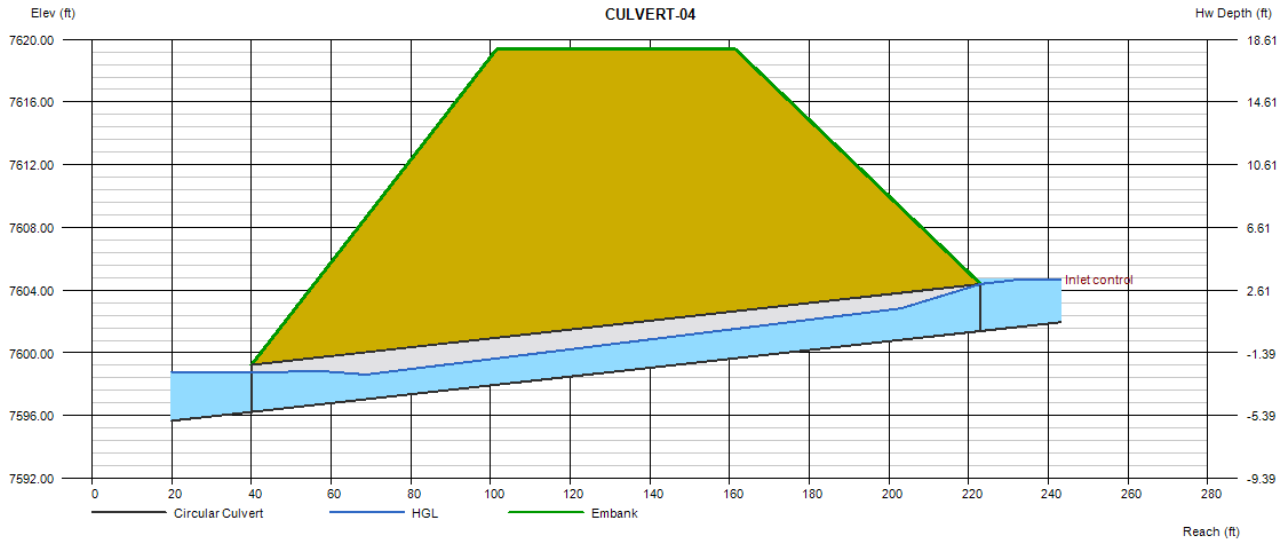
Calculations

Qmin (cfs)	=	5.60
Qmax (cfs)	=	41.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	40.60
Qpipe (cfs)	=	40.60
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.37
Veloc Up (ft/s)	=	7.79
HGL Dn (ft)	=	7598.77
HGL Up (ft)	=	7603.46
Hw Elev (ft)	=	7604.69
Hw/D (ft)	=	1.10
Flow Regime	=	Inlet Control

CULVERT LOCATION: PARCEL 3, BASIN A, CROSSING HOLMES ROAD, DESIGN POINT 1



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

EX-CULVERT-01

Invert Elev Dn (ft)	=	7532.00
Pipe Length (ft)	=	89.39
Slope (%)	=	3.36
Invert Elev Up (ft)	=	7535.00
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

Embankment

Top Elevation (ft)	=	7543.82
Top Width (ft)	=	50.00
Crest Width (ft)	=	50.00

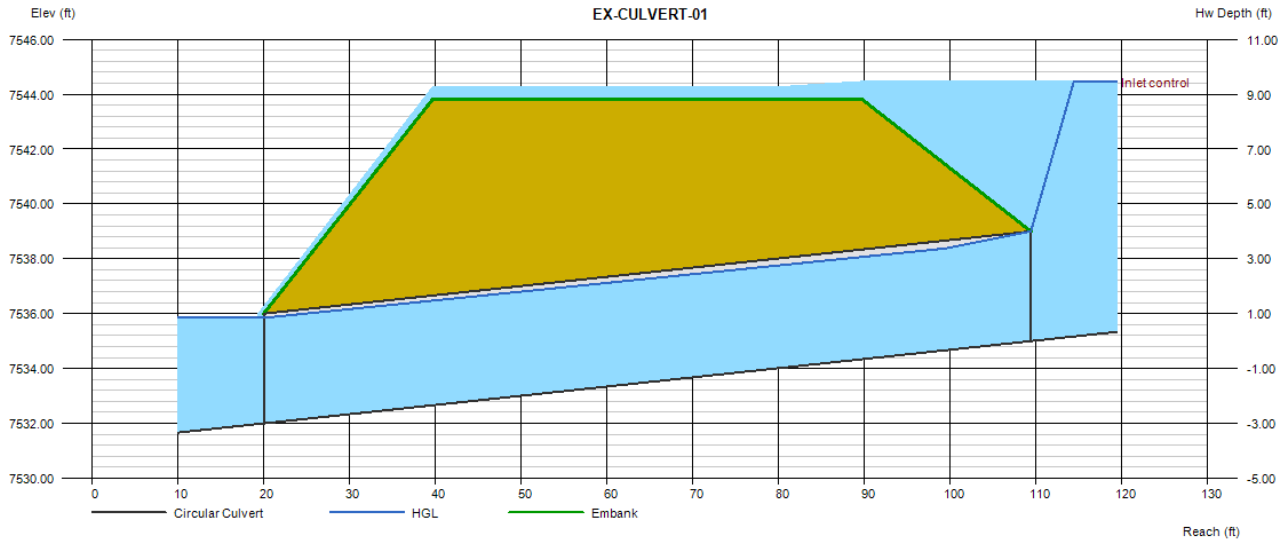
Calculations

Qmin (cfs)	=	81.40
Qmax (cfs)	=	251.40
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	241.40
Qpipe (cfs)	=	164.69
Qovertop (cfs)	=	76.71
Veloc Dn (ft/s)	=	13.27
Veloc Up (ft/s)	=	13.58
HGL Dn (ft)	=	7535.85
HGL Up (ft)	=	7538.70
Hw Elev (ft)	=	7544.45
Hw/D (ft)	=	2.36
Flow Regime	=	Inlet Control

CULVERT LOCATION: PARCEL 3-4, BASIN C, CROSSING OLD STAGECOACH ROAD, DESIGN POINT 10



FLOW TO DP10 OVERTOPS OLD STAGECOACH ROAD UNDER SINGLE PIPE ANALYSIS, FUTURE FDR TO DELINEATE SUBBASINS AND REDUCE FLOW TO EXISTING CULVERT PIPE

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 10 2023

EX-CULVERT-02

Invert Elev Dn (ft)	=	7565.03
Pipe Length (ft)	=	70.34
Slope (%)	=	4.54
Invert Elev Up (ft)	=	7568.22
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)	=	50.00
Crest Width (ft)	=	50.00

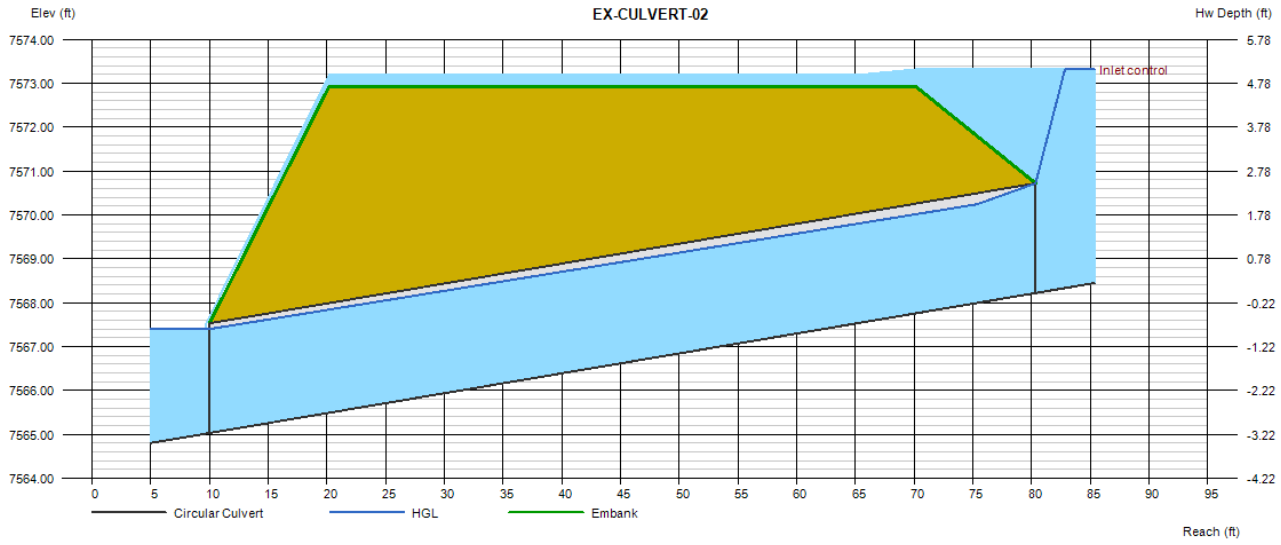
Calculations

Qmin (cfs)	=	33.80
Qmax (cfs)	=	85.50
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

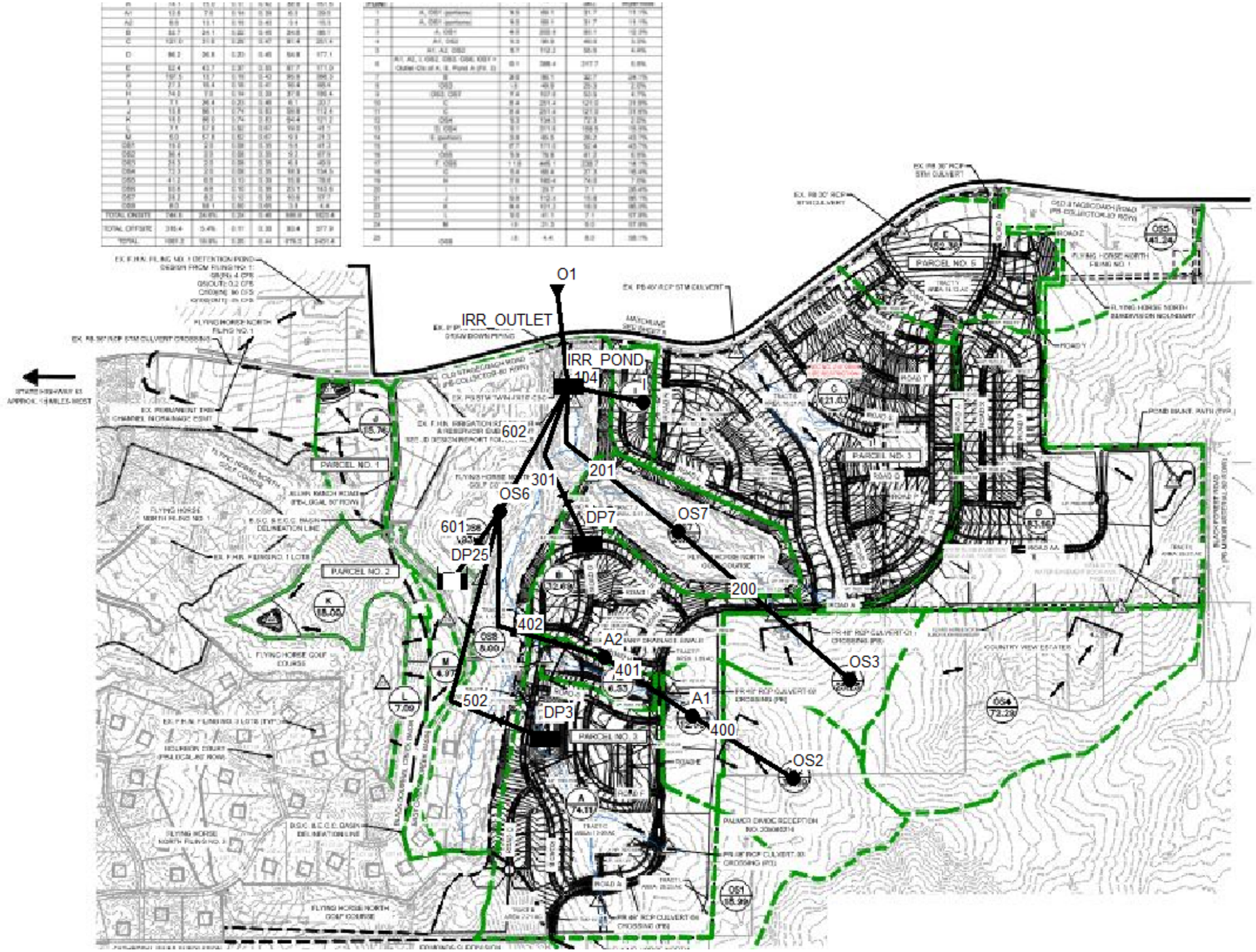
Qtotal (cfs)	=	83.80
Qpipe (cfs)	=	45.88
Qovertop (cfs)	=	37.92
Veloc Dn (ft/s)	=	9.54
Veloc Up (ft/s)	=	9.90
HGL Dn (ft)	=	7567.40
HGL Up (ft)	=	7570.46
Hw Elev (ft)	=	7573.32
Hw/D (ft)	=	2.04
Flow Regime	=	Inlet Control

CULVERT LOCATION: PARCEL 5-4, BASIN E, CROSSING OLD STAGECOACH ROAD, DESIGN POINT 14



FLOW TO DP14 OVERTOPS OLD STAGECOACH ROAD UNDER SINGLE PIPE ANALYSIS, FUTURE FDR TO DELINEATE SUBBASINS AND REDUCE FLOW TO EXISTING CULVERT PIPE

SWMM Model Schematic



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... KINWAVE
Starting Date 01/01/2005 00:00:00
Ending Date 01/04/2005 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:05:00
Routing Time Step ..... 30.00 sec

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	63.827	20.799
External Outflow	63.465	20.681
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.368	0.120
Continuity Error (%)	-0.009	

****
Highest Flow Instability Indexes

****
Link 601 (1)

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
OS2	JUNCTION	0.01	0.62	7643.62	0 00:40	0.62
OS3	JUNCTION	0.02	0.68	7650.68	0 00:40	0.68
A1	JUNCTION	0.01	0.61	7613.61	0 00:48	0.61
A2	JUNCTION	0.04	1.32	7571.32	0 00:48	1.32
OS7	JUNCTION	0.02	0.68	7555.68	0 00:41	0.68
I	JUNCTION	0.00	0.00	7558.00	0 00:00	0.00
OS6	JUNCTION	0.04	1.32	7553.32	0 00:49	1.32
O1	OUTFALL	0.00	0.00	7511.00	0 00:00	0.00
IRR_POND	STORAGE	0.44	3.98	7534.98	0 02:04	3.98
DP25	STORAGE	3.26	8.18	7567.18	0 01:27	8.18
DP3	STORAGE	3.00	8.70	7571.70	0 01:30	8.70
DP7	STORAGE	0.14	5.18	7557.18	0 01:24	5.18

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow	Maximum Total Inflow	Time of Max Occurrence	Lateral Inflow Volume	Total Inflow	Flow Balance

Node	Type	CFS	CFS	days hr:min	10^6 gal	10^6 gal	Volume Error Percent
OS2	JUNCTION	82.92	82.92	0 00:40	2.5	2.5	0.000
OS3	JUNCTION	65.20	65.20	0 00:40	1.73	1.73	-0.000
A1	JUNCTION	27.93	108.39	0 00:47	0.863	3.38	0.000
A2	JUNCTION	9.10	117.37	0 00:48	0.45	3.83	0.000
OS7	JUNCTION	59.52	124.65	0 00:41	1.94	3.67	0.000
I	JUNCTION	15.72	15.72	0 00:40	0.488	0.488	0.000
OS6	JUNCTION	161.12	313.79	0 00:56	6.45	15.1	0.000
O1	OUTFALL	0.00	206.37	0 02:04	0	20.7	0.000
IRR_POND	STORAGE	0.00	459.33	0 00:52	0	20.7	0.060
DP25	STORAGE	63.88	63.88	0 00:35	1.18	1.18	0.068
DP3	STORAGE	187.41	187.41	0 00:40	3.75	3.75	0.052
DP7	STORAGE	64.85	64.85	0 00:40	1.44	1.44	0.006

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Node	Average Volume	Avg Pcnt	Evap Pcnt	Exfil Pcnt	Maximum Volume	Max Pcnt	Time of Max Occurrence	Maximum Outflow

Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days hr:min	CFS
IRR_POND	144.161	2	0	0	1374.169	21	0 02:03	206.37
DP25	23.148	12	0	0	130.463	69	0 01:27	10.46
DP3	59.026	13	0	0	359.899	79	0 01:29	43.10
DP7	2.228	1	0	0	97.286	37	0 01:23	22.75

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
O1	99.72	10.70	206.37	20.679
System	99.72	10.70	206.37	20.679

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
400	CONDUIT	81.34	0	00:48	3.52	0.26	0.51
200	CONDUIT	65.16	0	00:41	20.26	0.00	0.14
401	CONDUIT	108.37	0	00:48	6.88	0.15	0.38
104	DUMMY	15.72	0	00:40			
402	CONDUIT	117.32	0	00:49	6.10	0.05	0.33
201	DUMMY	124.65	0	00:41			
602	DUMMY	313.79	0	00:56			
IRR_OUTLET	DUMMY	206.37	0	02:04			
601	DUMMY	10.46	0	01:27			
301	DUMMY	22.75	0	01:24			
502	DUMMY	43.10	0	01:30			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed Oct 18 09:07:08 2023
Analysis ended on: Wed Oct 18 09:07:08 2023
Total elapsed time: < 1 sec

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
OS3	0.156	0.109	22.8	3.40	11.8	2.40	5.7	52	91,839	2.54	233,060	40.0	65	230,694	2.58
OS7	0.133	0.099	31.1	3.87	16.2	2.73	6.4	42	102,366	2.55	260,801	40.0	60	259,724	2.11
OS6	0.146	0.185	43.4	7.65	22.6	5.41	12.8	101	339,768	2.54	863,660	50.0	161	862,778	1.72
A1	0.137	0.071	28.8	3.07	15.0	2.17	5.1	21	45,738	2.55	116,439	40.0	28	115,392	2.22
A2	0.121	0.048	56.2	3.56	29.2	2.52	5.9	5	23,595	2.56	60,301	50.0	9	60,162	1.40
I	0.103	0.050	28.9	2.60	15.0	1.84	4.3	12	25,773	2.58	66,421	40.0	16	65,254	2.21
OS2	0.156	0.128	28.1	4.26	14.6	3.01	7.1	61	132,132	2.54	335,312	40.0	83	334,189	2.28

Summary of CUHP Input Parameters (Version 2.0.1)

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
OS3	OS3	100-YR	0.040	0.114	0.227	0.060	2.0	0.35	0.08	4.50	0.00	0.6000	0.00	0.04	0.02	2.00
OS7	OS7	100-YR	0.044	0.161	0.322	0.050	8.2	0.35	0.08	4.50	0.00	0.6000	0.00	0.16	0.08	8.20
OS6	OS6	100-YR	0.146	0.331	0.663	0.025	4.6	0.35	0.08	4.50	0.00	0.6000	0.00	0.09	0.05	4.60
A1	A1	100-YR	0.020	0.080	0.180	0.025	7.0	0.35	0.08	4.50	0.00	0.6000	0.00	0.14	0.07	7.00
A2	A2	100-YR	0.010	0.142	0.259	0.030	13.1	0.35	0.08	4.50	0.00	0.6000	0.00	0.26	0.11	13.10
I	I	100-YR	0.011	0.095	0.189	0.050	26.4	0.35	0.08	4.50	0.00	0.6000	0.00	0.53	0.16	26.40
OS2	OS2	100-YR	0.057	0.152	0.303	0.040	2.0	0.35	0.08	4.50	0.00	0.6000	0.00	0.04	0.02	2.00

Printouts for Storm Hydrographs

flow in cfs

time in minutes	OS3	OS7	OS6	A1	A2	I	OS2
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.01	0.01	0.00	0.00	0.04	0.00
15	0.01	0.07	0.03	0.03	0.02	0.21	0.01
20	2.47	2.61	2.77	1.28	0.42	1.34	2.58
25	20.38	16.62	22.60	8.44	2.26	5.27	21.69
30	51.43	41.94	69.84	20.91	5.58	12.09	57.24
35	64.50	55.54	117.60	26.66	7.45	15.12	77.49
40	65.20	59.52	145.40	27.93	8.37	15.72	82.92
45	62.58	59.24	158.13	27.51	8.89	15.46	81.76
50	58.69	57.59	161.12	26.46	9.10	14.86	78.51
55	54.44	54.87	158.30	25.01	9.06	14.03	74.06
60	50.49	52.39	154.79	23.84	8.99	13.37	70.32
65	46.63	50.48	151.16	22.84	8.95	12.79	67.10
70	40.80	46.75	145.04	20.81	8.65	11.63	61.26
75	36.28	42.83	137.43	18.77	8.32	10.50	54.98
80	31.82	38.21	129.54	16.54	7.90	9.26	48.34
85	27.89	34.03	121.14	14.76	7.50	8.27	43.08
90	24.51	30.68	112.90	13.37	7.16	7.49	38.89
95	21.41	28.11	105.10	12.22	6.84	6.85	35.41
100	18.51	25.95	97.48	11.19	6.54	6.27	32.30
105	15.80	24.02	90.14	10.26	6.26	5.74	29.45
110	13.58	22.24	83.47	9.37	5.98	5.25	26.76
115	12.08	20.56	78.19	8.54	5.70	4.77	24.20
120	11.15	18.97	74.07	7.74	5.42	4.32	21.78
125	8.95	16.28	69.09	6.35	4.99	3.55	17.83
130	6.98	13.55	63.09	5.03	4.56	2.81	14.02
135	5.44	10.96	57.15	3.93	4.17	2.20	11.02
140	4.21	8.68	51.50	3.14	3.84	1.75	8.81
145	3.26	6.83	46.26	2.52	3.55	1.41	7.04
150	2.51	5.47	41.53	2.02	3.30	1.13	5.63
155	1.93	4.42	37.07	1.61	3.07	0.90	4.47
160	1.48	3.54	32.83	1.27	2.85	0.71	3.51
165	1.16	2.83	28.78	1.00	2.65	0.56	2.74
170	0.88	2.24	24.87	0.79	2.46	0.44	2.17
175	0.64	1.78	21.04	0.64	2.28	0.36	1.75
180	0.43	1.43	17.30	0.51	2.11	0.29	1.40
185	0.27	1.17	13.75	0.41	1.95	0.23	1.10
190	0.15	0.94	10.79	0.32	1.79	0.18	0.84
195	0.06	0.75	8.68	0.24	1.64	0.13	0.61
200	0.01	0.57	7.09	0.17	1.48	0.10	0.42
205	0.00	0.42	5.83	0.11	1.33	0.06	0.26
210	0.00	0.30	4.81	0.07	1.19	0.04	0.14
215	0.00	0.19	3.95	0.03	1.04	0.02	0.06
220	0.00	0.11	3.22	0.01	0.90	0.01	0.01
225	0.00	0.05	2.61	0.00	0.76	0.00	0.00
230	0.00	0.01	2.14	0.00	0.63	0.00	0.00
235	0.00	0.00	1.73	0.00	0.51	0.00	0.00
240	0.00	0.00	1.38	0.00	0.40	0.00	0.00

245	0.00	0.00	1.07	0.00	0.33	0.00	0.00
250	0.00	0.00	0.80	0.00	0.27	0.00	0.00
255	0.00	0.00	0.57	0.00	0.23	0.00	0.00
260	0.00	0.00	0.37	0.00	0.19	0.00	0.00
265	0.00	0.00	0.22	0.00	0.15	0.00	0.00
270	0.00	0.00	0.11	0.00	0.12	0.00	0.00
275	0.00	0.00	0.03	0.00	0.10	0.00	0.00
280	0.00	0.00	0.00	0.00	0.08	0.00	0.00
285	0.00	0.00	0.00	0.00	0.07	0.00	0.00
290	0.00	0.00	0.00	0.00	0.05	0.00	0.00
295	0.00	0.00	0.00	0.00	0.04	0.00	0.00
300	0.00	0.00	0.00	0.00	0.03	0.00	0.00
305	0.00	0.00	0.00	0.00	0.02	0.00	0.00
310	0.00	0.00	0.00	0.00	0.01	0.00	0.00
315	0.00	0.00	0.00	0.00	0.01	0.00	0.00
320	0.00	0.00	0.00	0.00	0.00	0.00	0.00
325	0.00	0.00	0.00	0.00	0.00	0.00	0.00
330	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Printouts for Unit Hydrographs

flow in cfs

time in minutes	OS3	OS7	OS6	A1	A2	I	OS2
5	51.09	39.50	49.24	20.51	5.23	11.52	53.35
10	49.36	41.72	94.61	19.77	5.39	10.99	59.82
15	39.36	38.17	100.74	17.46	5.26	9.64	53.72
20	32.65	31.77	96.65	14.56	5.04	8.10	43.95
25	26.09	27.93	88.26	12.57	4.73	7.00	37.74
30	22.25	24.08	75.74	10.59	4.32	5.90	31.53
35	18.43	20.65	68.93	9.28	3.94	5.19	27.43
40	14.60	18.38	62.12	8.10	3.68	4.53	23.81
45	10.78	16.12	55.31	6.92	3.42	3.87	20.19
50	9.26	13.86	49.38	5.75	3.16	3.22	16.58
55	7.99	11.59	45.46	4.57	2.90	2.56	12.96
60	6.72	9.33	41.53	3.87	2.67	2.17	11.22
65	5.44	8.02	37.60	3.47	2.51	1.95	10.01
70	4.17	7.26	33.67	3.08	2.35	1.74	8.80
75	2.89	6.51	29.75	2.69	2.19	1.52	7.60
80	1.62	5.75	25.82	2.30	2.04	1.30	6.39
85	0.34	5.00	21.89	1.90	1.88	1.08	5.18
90	0.00	4.25	19.48	1.51	1.72	0.86	3.98
95		3.49	18.17	1.12	1.56	0.64	2.77
100		2.74	16.86	0.73	1.41	0.42	1.57
105		1.98	15.55	0.33	1.25	0.20	0.36
110		1.23	14.24	0.00	1.09	0.00	0.00
115		0.47	12.93		1.03		
120		0.00	11.62		0.98		
125			10.31		0.93		
130			9.00		0.88		
135			7.70		0.82		
140			6.39		0.77		
145			5.08		0.72		
150			3.77		0.67		
155			2.46		0.61		
160			1.15		0.56		
165			0.00		0.51		
170					0.46		
175					0.41		
180					0.35		
185					0.30		
190					0.25		
195					0.20		
200					0.14		
205					0.09		
210					0.04		
215					0.00		

Appendix D:

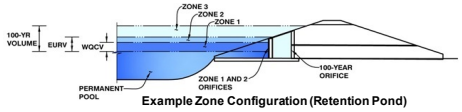
Water Quality & Detention Basin Calculations

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH PUD PRELIMINARY PLAN

Basin ID: BASINS: A, OS1 ; DESIGN POINT 3



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	93.10	acres
Watershed Length =	2,250	ft
Watershed Length to Centroid =	800	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	12.30%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.618	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.094	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.411	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.948	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.463	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	7.102	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	8.925	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	11.525	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	16.296	acre-feet	inches
Approximate 2-yr Detention Volume =	0.714	acre-feet	
Approximate 5-yr Detention Volume =	1.100	acre-feet	
Approximate 10-yr Detention Volume =	2.097	acre-feet	
Approximate 25-yr Detention Volume =	2.828	acre-feet	
Approximate 50-yr Detention Volume =	2.973	acre-feet	
Approximate 100-yr Detention Volume =	3.793	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.618	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.476	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.699	acre-feet
Total Detention Basin Volume =	3.793	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

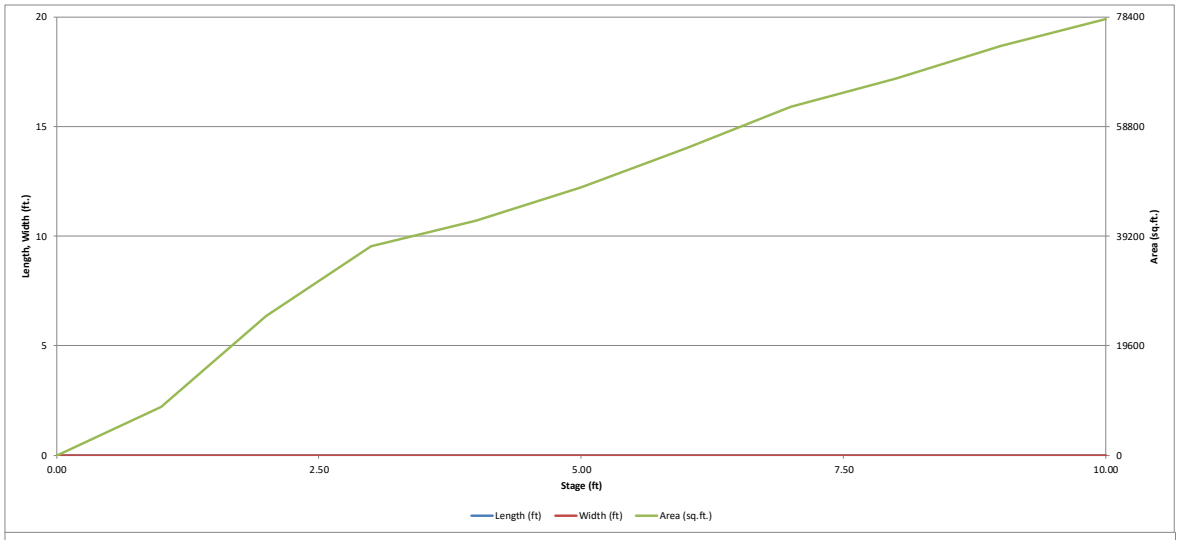
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

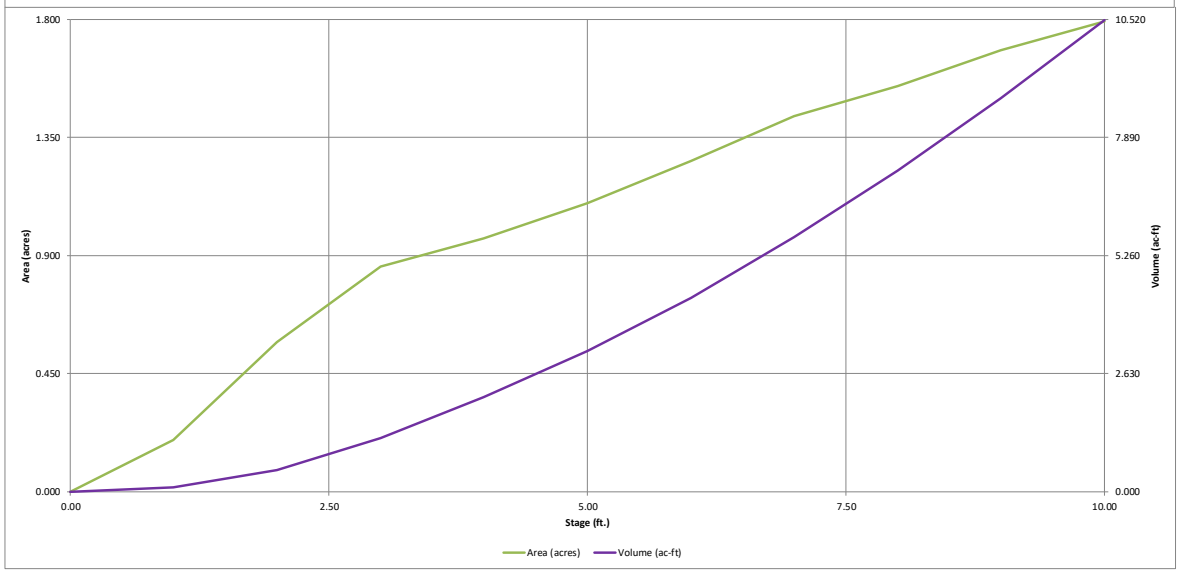
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7562 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	8,622	0.198	4,311	0.099
	--	2.00	--	--	--	24,877	0.571	21,060	0.483
	--	3.00	--	--	--	37,363	0.858	52,180	1.198
	--	4.00	--	--	--	42,000	0.964	91,862	2.109
	--	5.00	--	--	--	47,874	1.099	136,799	3.140
	--	6.00	--	--	--	54,892	1.260	188,182	4.320
	--	7.00	--	--	--	62,293	1.430	246,774	5.665
	--	8.00	--	--	--	67,350	1.546	311,596	7.153
	--	9.00	--	--	--	73,250	1.682	381,896	8.767
TOP: 7572	--	10.00	--	--	--	78,100	1.793	457,571	10.504

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



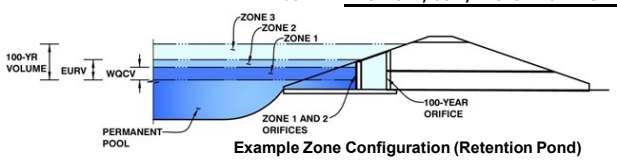


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH PUD PRELIMINARY PLAN

Basin ID: BASINS: A, OS1 ; DESIGN POINT 3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.23	0.618	Orifice Plate
Zone 2 (EURV)	2.88	0.476	Orifice Plate
Zone 3 (100-year)	5.58	2.699	Weir&Pipe (Restrict)
Total (all zones)		3.793	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.778E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	4.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	2.50					
Orifice Area (sq. inches)	4.00	4.00	4.00					

	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)	Vertical Orifice Area =	N/A	N/A
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A
Vertical Orifice Diameter =	N/A	N/A	inches			

Calculated Parameters for Vertical Orif

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected				
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	6.00	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.32	N/A
Overflow Weir Grate Slope =	3.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.45	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	26.41	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	13.21	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow W

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 Orifice Area =	3.13	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	1.00	N/A
Restrictor Plate Height Above Pipe Invert =	23.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.85	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.10	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	11.10	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.79	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	10.50	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

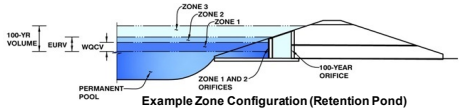
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.618	1.094	1.411	2.948	4.463	7.102	8.925	11.525
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.411	2.948	4.463	7.102	8.925	11.525
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	15.8	43.9	65.0	113.0	141.5	177.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.47	0.70	1.21	1.52	1.91
Peak Inflow Q (cfs) =	N/A	N/A	27.2	55.4	76.6	123.4	151.6	187.4
Peak Outflow Q (cfs) =	0.3	0.5	0.5	2.5	9.9	28.3	39.7	43.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.2	0.3	0.3	0.2
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.3	1.0	1.5	1.6
Max Velocity through Grate 2 (fps) =	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	51	58	76	74	69	65	62
Time to Drain 99% of Inflow Volume (hours) =	**40**	54	62	82	83	81	80	78
Maximum Ponding Depth (ft) =	2.23	2.88	3.16	4.62	5.54	6.78	7.46	8.69
Area at Maximum Ponding Depth (acres) =	0.64	0.82	0.87	1.05	1.19	1.39	1.48	1.64
Maximum Volume Stored (acre-ft) =	0.622	1.097	1.336	2.733	3.757	5.355	6.335	8.252

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH PUD PRELIMINARY PLAN

Basin ID: BASINS: B ; DESIGN POINT 7



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	32.69	acres
Watershed Length =	1,500	ft
Watershed Length to Centroid =	650	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	24.10%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.359 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.794 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.830 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.433 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.999 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.889 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.542 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	4.433 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	6.124 acre-feet		inches
Approximate 2-yr Detention Volume =	0.556 acre-feet		
Approximate 5-yr Detention Volume =	0.810 acre-feet		
Approximate 10-yr Detention Volume =	1.244 acre-feet		
Approximate 25-yr Detention Volume =	1.493 acre-feet		
Approximate 50-yr Detention Volume =	1.576 acre-feet		
Approximate 100-yr Detention Volume =	1.904 acre-feet		

Define Zones and Basin Geometry

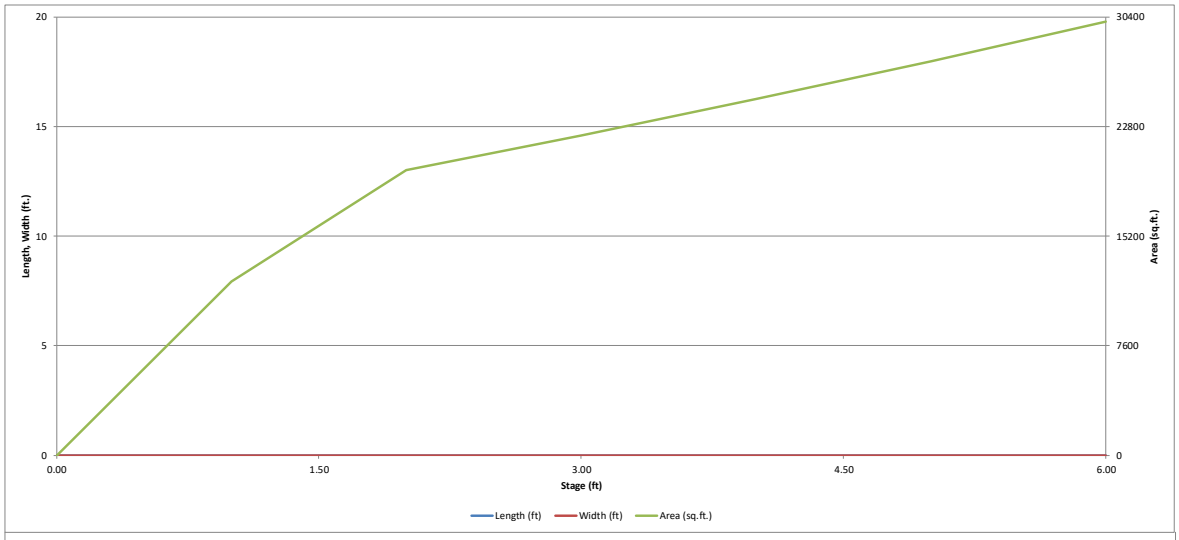
Zone 1 Volume (WQCV) =	0.359	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.436	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.110	acre-feet
Total Detention Basin Volume =	1.904	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

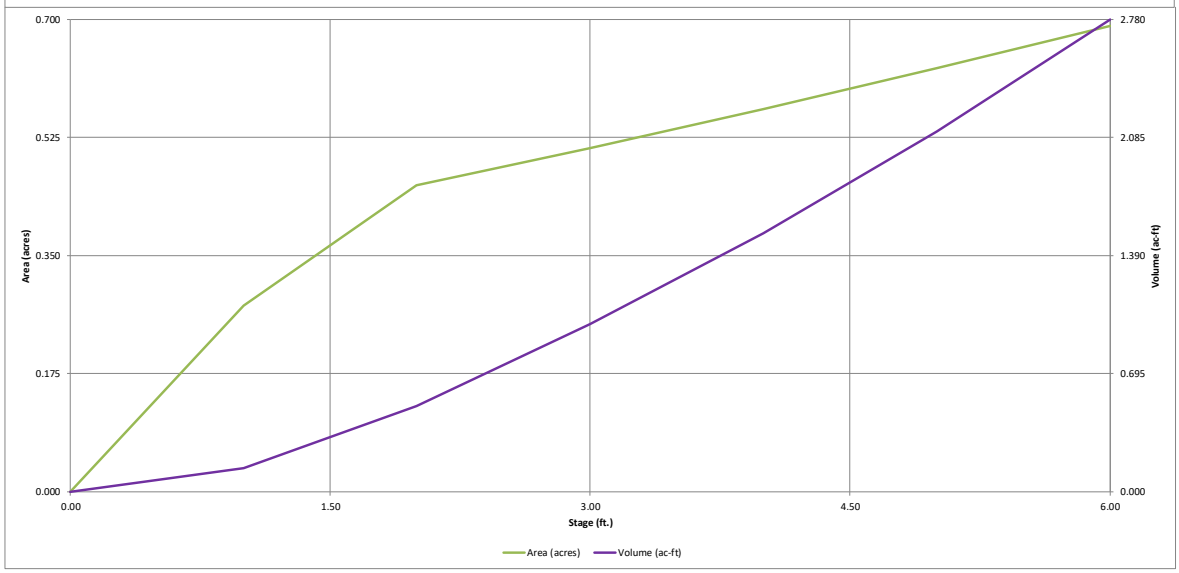
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7552 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	12,035	0.276	6,017	0.138
	--	2.00	--	--	--	19,768	0.454	21,919	0.503
	--	3.00	--	--	--	22,182	0.509	42,894	0.985
	--	4.00	--	--	--	24,710	0.567	66,340	1.523
	--	5.00	--	--	--	27,347	0.628	92,368	2.120
TOP:7558	--	6.00	--	--	--	30,105	0.691	121,094	2.780

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



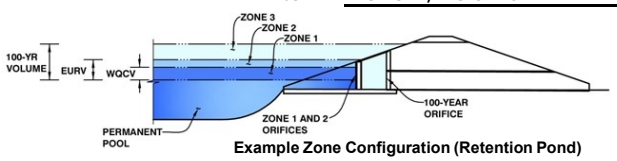


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH PUD PRELIMINARY PLAN

Basin ID: BASINS: B ; DESIGN POINT 7



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.66	0.359	Orifice Plate
Zone 2 (EURV)	2.62	0.436	Orifice Plate
Zone 3 (100-year)	4.65	1.110	Weir&Pipe (Restrict)
Total (all zones)		1.904	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.50	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	2.50					
Orifice Area (sq. inches)	3.25	3.25	6.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orif

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.00	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	9.91	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	25.06	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.53	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow W

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

	Zone 3 Restrictor	Not Selected			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 Orifice Area =	2.53	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.83	N/A
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.55	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	7.55	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.69	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	2.78	acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

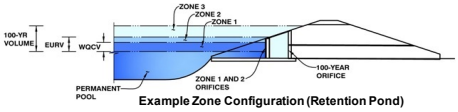
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.359	0.794	0.830	1.433	1.999	2.889	3.542	4.433
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.830	1.433	1.999	2.889	3.542	4.433
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.8	13.2	19.8	34.8	43.6	54.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.15	0.41	0.61	1.06	1.33	1.67
Peak Inflow Q (cfs) =	N/A	N/A	12.9	22.3	29.8	44.1	53.3	64.8
Peak Outflow Q (cfs) =	0.2	0.4	0.3	0.6	5.6	19.2	25.9	27.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.3	0.6	0.6	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.7	1.0	1.1
Max Velocity through Grate 2 (fps) =	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	57	59	70	72	69	66	63
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	62	75	78	77	76	74
Maximum Ponding Depth (ft) =	1.66	2.62	2.59	3.68	4.25	4.61	4.85	5.57
Area at Maximum Ponding Depth (acres) =	0.39	0.49	0.49	0.55	0.58	0.60	0.62	0.66
Maximum Volume Stored (acre-ft) =	0.359	0.795	0.776	1.344	1.667	1.880	2.027	2.489

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASINS: C ; DESIGN POINT 11**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	121.00	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	1,250	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	31.60%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.577	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	3.940	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.965	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.340	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.517	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	11.776	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	14.262	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	17.560	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	23.960	acre-feet	inches
Approximate 2-yr Detention Volume =	2.834	acre-feet	
Approximate 5-yr Detention Volume =	4.038	acre-feet	
Approximate 10-yr Detention Volume =	5.823	acre-feet	
Approximate 25-yr Detention Volume =	6.705	acre-feet	
Approximate 50-yr Detention Volume =	7.060	acre-feet	
Approximate 100-yr Detention Volume =	8.302	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.577	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.364	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.361	acre-feet
Total Detention Basin Volume =	8.302	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

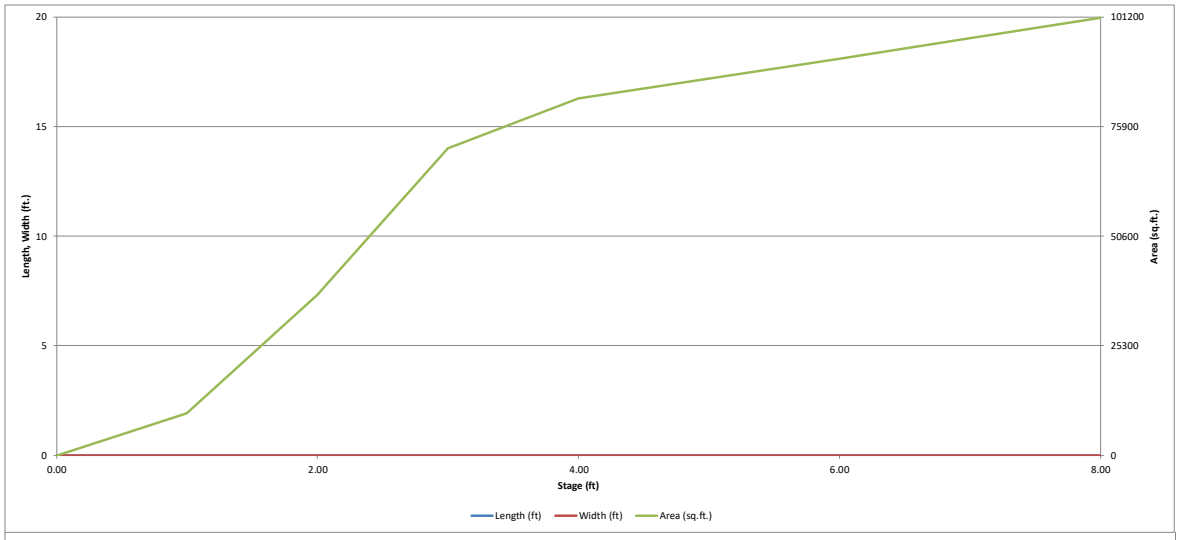
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

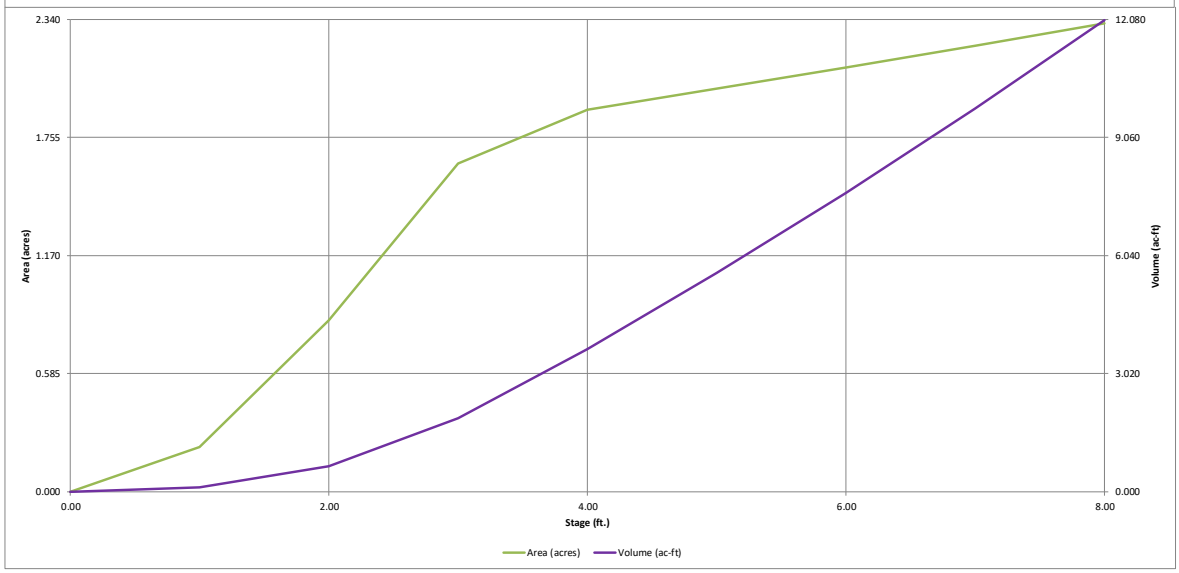
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7526 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	9,667	0.222	4,833	0.111
	--	2.00	--	--	--	37,002	0.849	28,168	0.647
	--	3.00	--	--	--	70,876	1.627	82,106	1.885
	--	4.00	--	--	--	82,455	1.893	158,772	3.645
7531	--	5.00	--	--	--	86,963	1.996	243,481	5.590
	--	6.00	--	--	--	91,578	2.102	332,751	7.639
	--	7.00	--	--	--	96,300	2.211	426,690	9.795
TOP: 7534	--	8.00	--	--	--	101,130	2.322	525,405	12.062

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



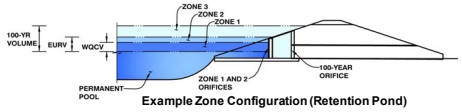


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH PUD PRELIMINARY PLAN

Basin ID: BASINS: D, OS4 ; DESIGN POINT 13



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB		Note: L / W Ratio < 1
Watershed Area =	158.50	acres	L / W Ratio = 0.73
Watershed Length =	2,250	ft	
Watershed Length to Centroid =	1,100	ft	
Watershed Slope =	0.025	ft/ft	
Watershed Imperviousness =	15.50%	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	
Target WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	User Input		

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	1.264	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	2.391	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.840	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.559	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	8.198	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	12.663	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	15.793	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	20.207	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	28.375	acre-feet	inches
Approximate 2-yr Detention Volume =	1.597	acre-feet	
Approximate 5-yr Detention Volume =	2.416	acre-feet	
Approximate 10-yr Detention Volume =	4.232	acre-feet	
Approximate 25-yr Detention Volume =	5.479	acre-feet	
Approximate 50-yr Detention Volume =	5.780	acre-feet	
Approximate 100-yr Detention Volume =	7.254	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.264	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.127	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.863	acre-feet
Total Detention Basin Volume =	7.254	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

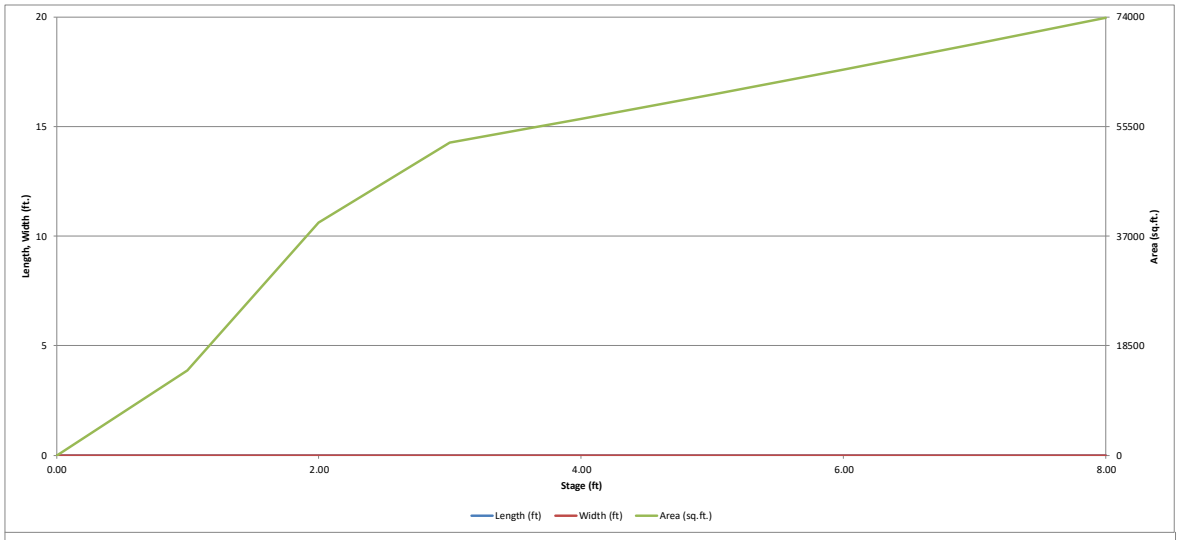
Depth Increment = ft

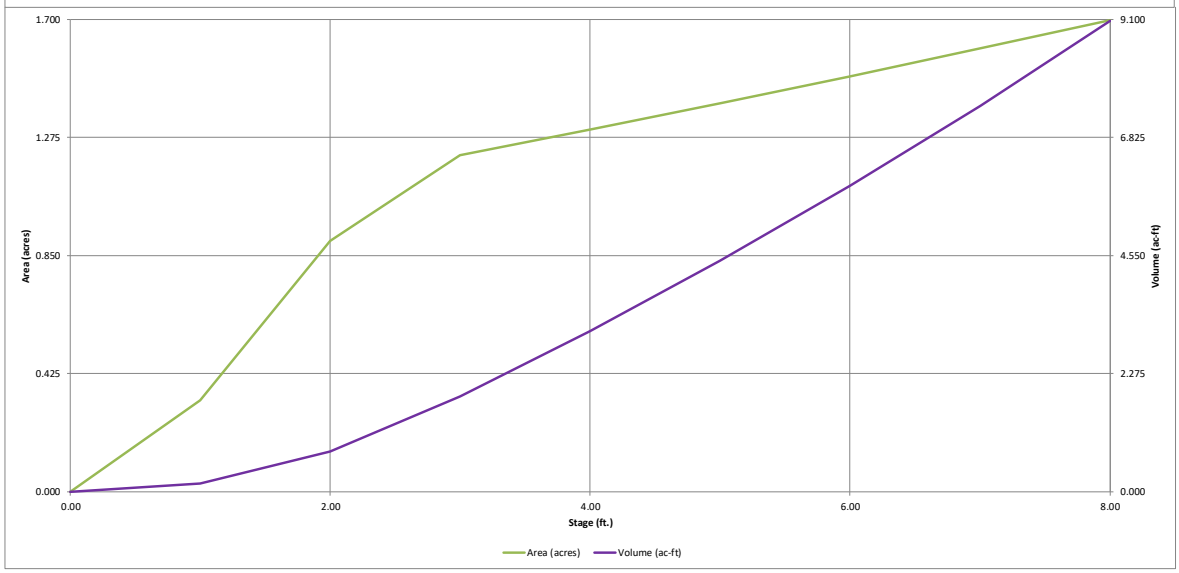
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	14,296	0.328	7,147	0.164
	--	2.00	--	--	--	39,265	0.901	33,928	0.779
	--	3.00	--	--	--	52,784	1.212	79,952	1.835
	--	4.00	--	--	--	56,790	1.304	134,739	3.093
	--	5.00	--	--	--	60,908	1.398	193,588	4.444
	--	6.00	--	--	--	65,138	1.495	256,611	5.891
	--	7.00	--	--	--	69,479	1.595	323,920	7.436
TOP:7538	--	8.00	--	--	--	73,933	1.697	395,626	9.082

7530

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



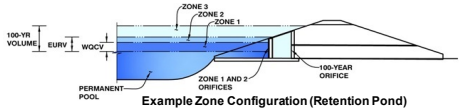


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASIN: E ; DESIGN POINT 15**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	52.40	acres
Watershed Length =	1,700	ft
Watershed Length to Centroid =	650	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	43.70%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.828 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	2.422 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.287 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.360 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	4.316 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	5.656 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	6.714 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	8.081 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	10.820 acre-feet		inches
Approximate 2-yr Detention Volume =	1.802 acre-feet		
Approximate 5-yr Detention Volume =	2.498 acre-feet		
Approximate 10-yr Detention Volume =	3.384 acre-feet		
Approximate 25-yr Detention Volume =	3.748 acre-feet		
Approximate 50-yr Detention Volume =	3.928 acre-feet		
Approximate 100-yr Detention Volume =	4.454 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.828	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.594	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.032	acre-feet
Total Detention Basin Volume =	4.454	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

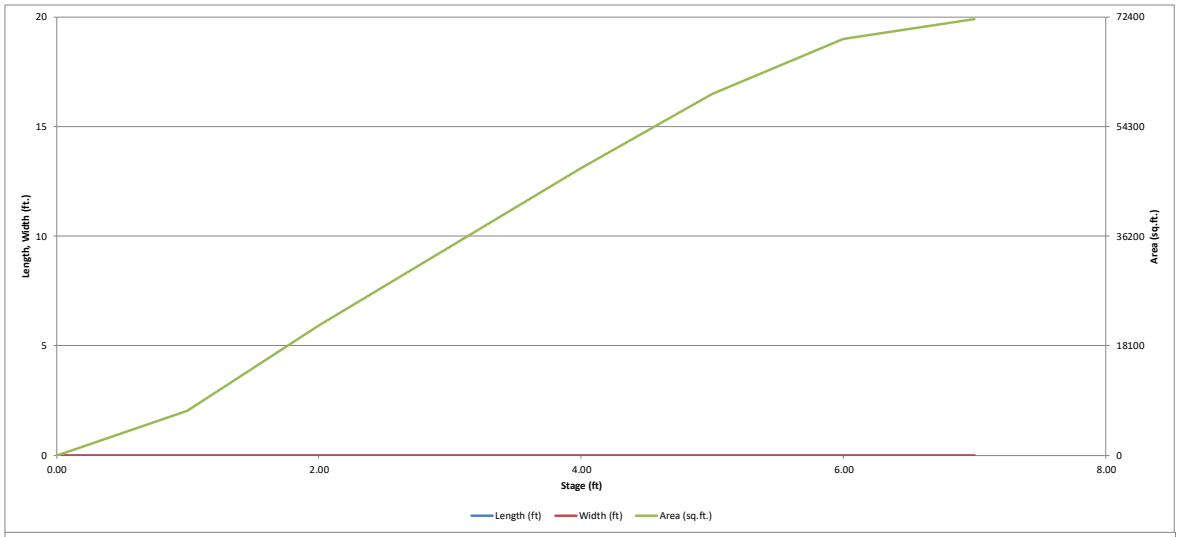
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

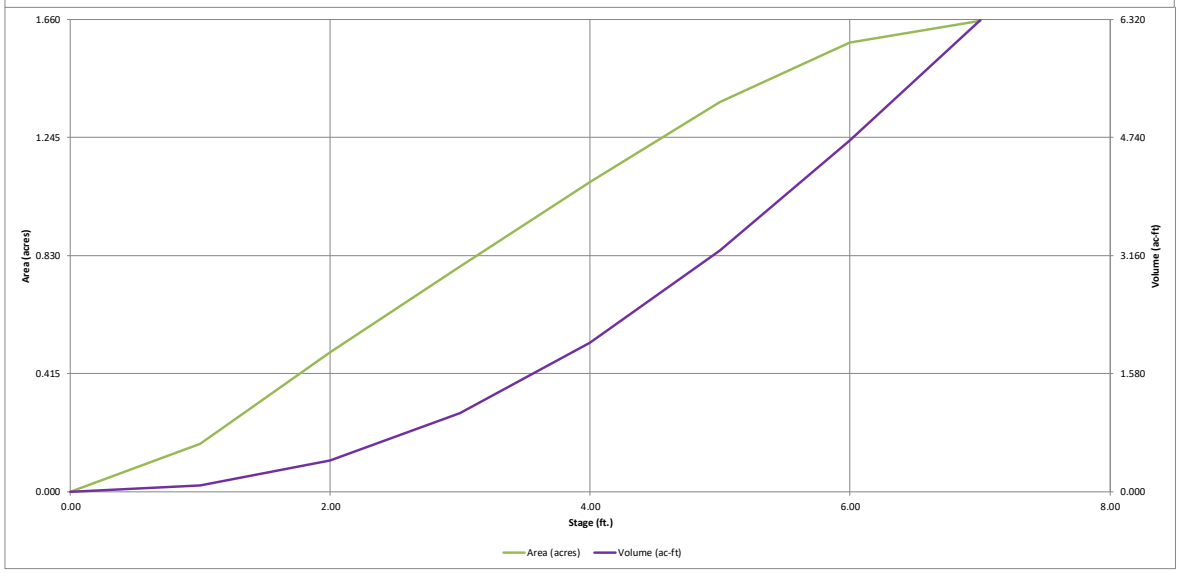
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	7,378	0.169	3,689	0.085
	--	2.00	--	--	--	21,376	0.491	18,066	0.415
	--	3.00	--	--	--	34,450	0.791	45,979	1.056
	--	4.00	--	--	--	47,390	1.088	86,899	1.995
	--	5.00	--	--	--	59,670	1.370	140,429	3.224
	--	6.00	--	--	--	68,780	1.579	204,654	4.698
TOP:7557	--	7.00	--	--	--	72,120	1.656	275,104	6.316

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



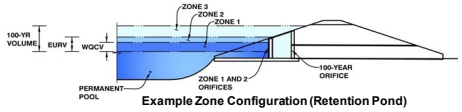


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASINS: F, OS5 ; DESIGN POINT 17**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	238.70	acres
Watershed Length =	5,000	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	14.10%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.768 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.252 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.000 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	8.042 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.991 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	18.755 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	23.467 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	30.144 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	42.456 acre-feet		inches
Approximate 2-yr Detention Volume =	2.151 acre-feet		
Approximate 5-yr Detention Volume =	3.279 acre-feet		
Approximate 10-yr Detention Volume =	5.936 acre-feet		
Approximate 25-yr Detention Volume =	7.816 acre-feet		
Approximate 50-yr Detention Volume =	8.236 acre-feet		
Approximate 100-yr Detention Volume =	10.409 acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.768	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.484	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	7.158	acre-feet
Total Detention Basin Volume =	10.409	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

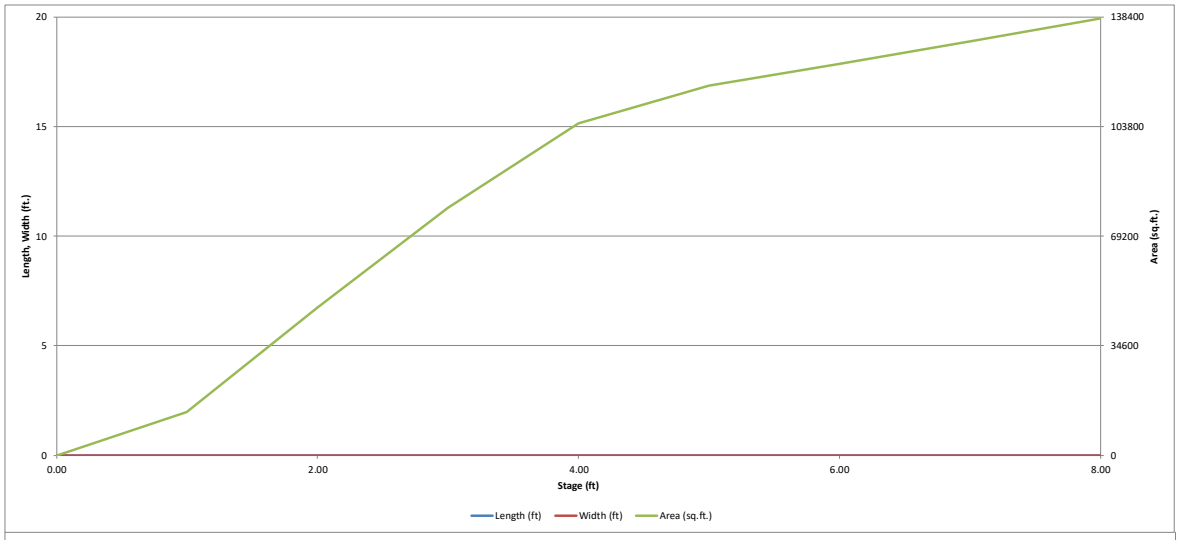
Depth Increment = ft

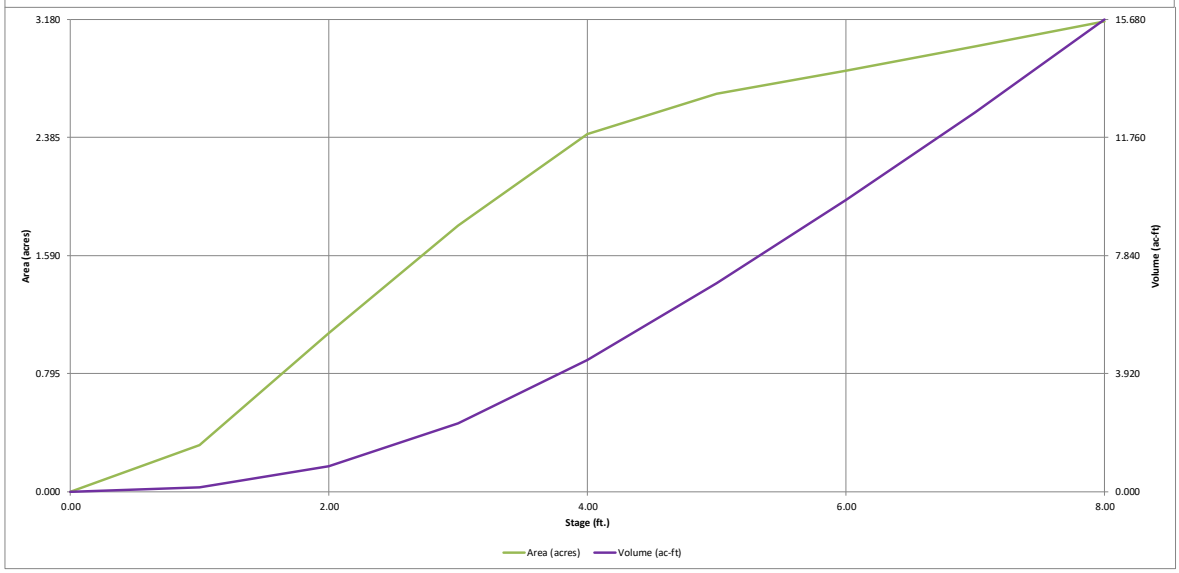
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	13,590	0.312	6,795	0.156
	--	2.00	--	--	--	46,610	1.070	36,894	0.847
	--	3.00	--	--	--	78,060	1.792	99,229	2.278
	--	4.00	--	--	--	104,890	2.408	190,704	4.378
7443	--	5.00	--	--	--	116,640	2.678	301,469	6.921
	--	6.00	--	--	--	123,550	2.836	421,564	9.678
	--	7.00	--	--	--	130,667	3.000	548,673	12.596
7446	--	8.00	--	--	--	138,017	3.168	683,015	15.680

7438

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



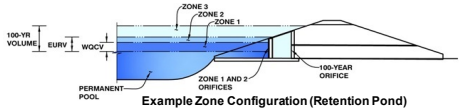


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASIN G ; DESIGN POINT 18**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	27.30	acres
Watershed Length =	1,650	ft
Watershed Length to Centroid =	800	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	16.40%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.227	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.438	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.511	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.984	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.441	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	2.209	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.749	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.509	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.918	acre-feet	inches
Approximate 2-yr Detention Volume =	0.294	acre-feet	
Approximate 5-yr Detention Volume =	0.443	acre-feet	
Approximate 10-yr Detention Volume =	0.761	acre-feet	
Approximate 25-yr Detention Volume =	0.976	acre-feet	
Approximate 50-yr Detention Volume =	1.030	acre-feet	
Approximate 100-yr Detention Volume =	1.287	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.227	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.210	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.849	acre-feet
Total Detention Basin Volume =	1.287	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

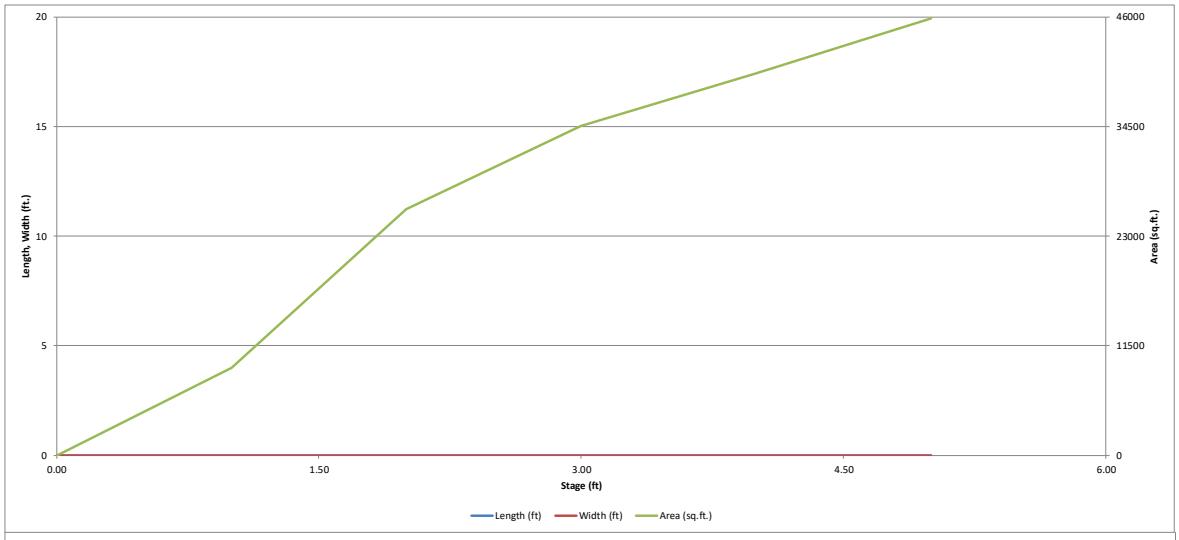
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

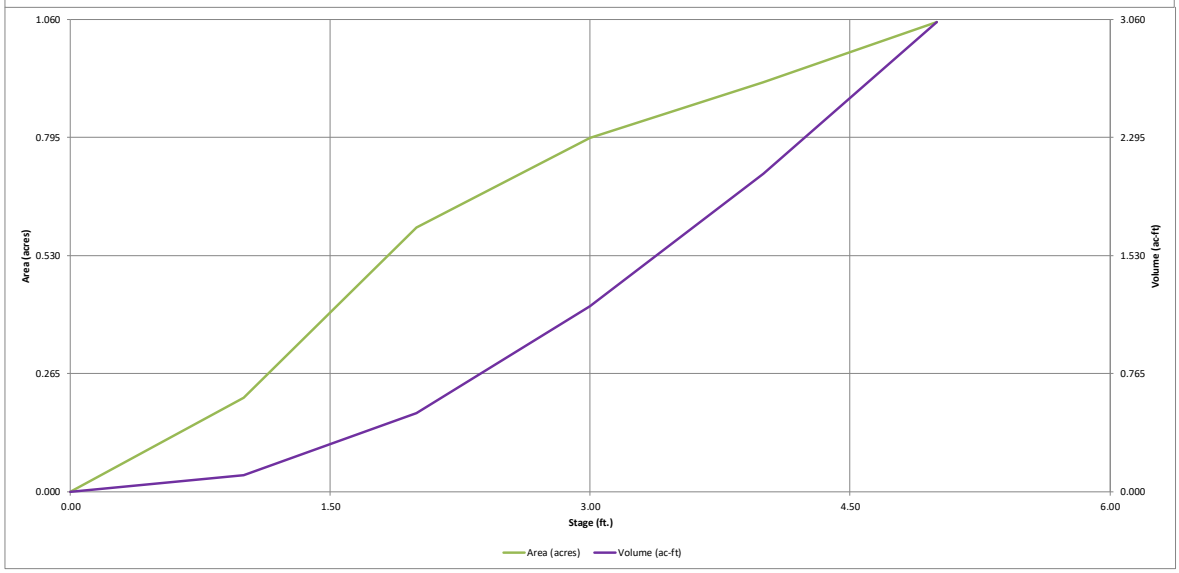
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7442 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	9,180	0.211	4,590	0.105
	--	2.00	--	--	--	25,856	0.594	22,108	0.508
	--	3.00	--	--	--	34,590	0.794	52,331	1.201
	--	4.00	--	--	--	40,046	0.919	89,649	2.058
TOP:7447	--	5.00	--	--	--	45,920	1.054	132,632	3.045

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



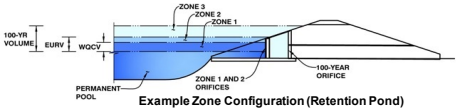


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASIN J ; DESIGN POINT 21**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	15.80	acres
Watershed Length =	1,150	ft
Watershed Length to Centroid =	350	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	86.10%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.487	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	1.519	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.272	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.665	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.988	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	2.332	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.662	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.031	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.854	acre-feet	inches
Approximate 2-yr Detention Volume =	1.213	acre-feet	
Approximate 5-yr Detention Volume =	1.588	acre-feet	
Approximate 10-yr Detention Volume =	1.955	acre-feet	
Approximate 25-yr Detention Volume =	2.094	acre-feet	
Approximate 50-yr Detention Volume =	2.174	acre-feet	
Approximate 100-yr Detention Volume =	2.270	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.487	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.031	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.751	acre-feet
Total Detention Basin Volume =	2.270	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

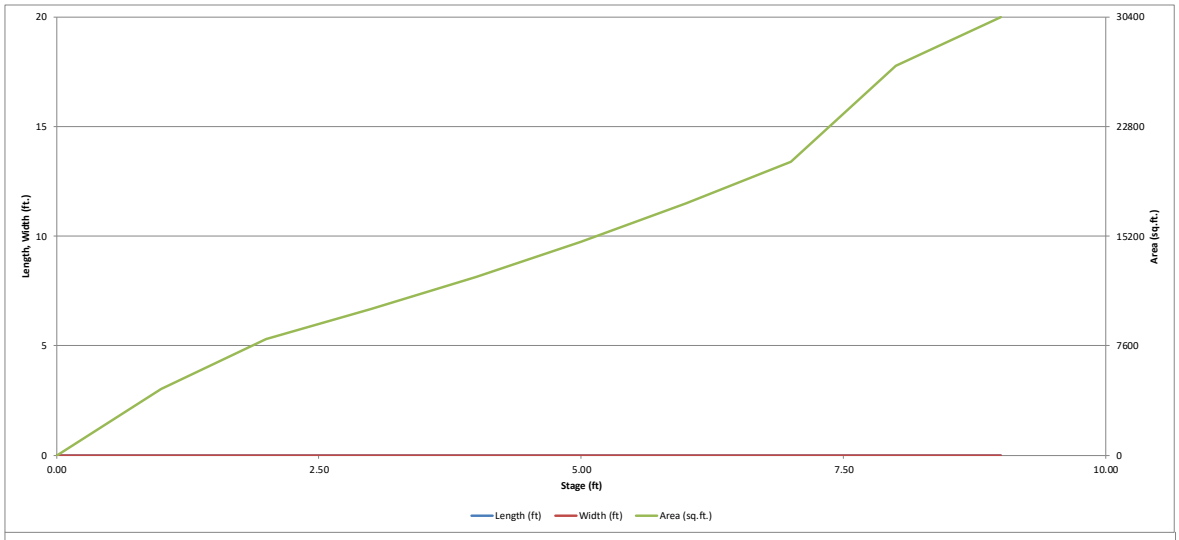
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

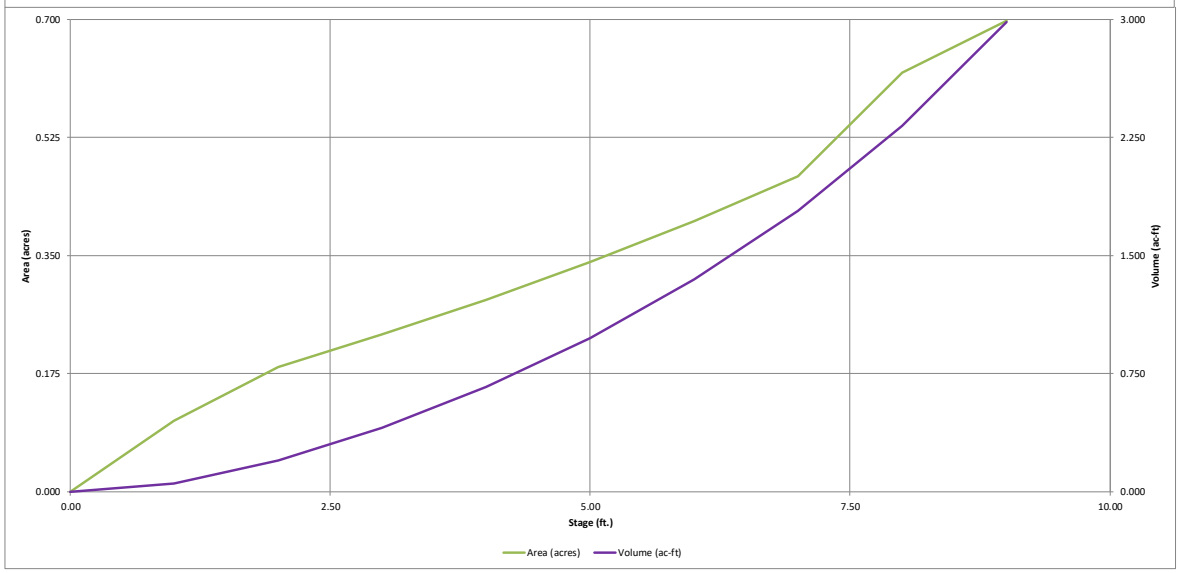
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7583 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	4,576	0.105	2,288	0.053
	--	2.00	--	--	--	8,060	0.185	8,606	0.198
	--	3.00	--	--	--	10,142	0.233	17,707	0.406
	--	4.00	--	--	--	12,370	0.284	28,963	0.665
	--	5.00	--	--	--	14,814	0.340	42,555	0.977
	--	6.00	--	--	--	17,475	0.401	58,699	1.348
	--	7.00	--	--	--	20,351	0.467	77,612	1.782
	--	8.00	--	--	--	27,036	0.621	101,306	2.326
TOP:7592	--	9.00	--	--	--	30,400	0.698	130,024	2.985

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



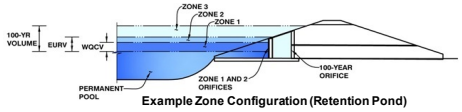


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH PUD PRELIMINARY PLAN**

Basin ID: **BASIN K ; DESIGN POINT 22**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	18.00	acres
Watershed Length =	1,400	ft
Watershed Length to Centroid =	500	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	86.00%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

		Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.554 acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	1.728 acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.470 acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.925 acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.299 acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.697 acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.079 acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.507 acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.460 acre-feet		inches
Approximate 2-yr Detention Volume =	1.380 acre-feet		
Approximate 5-yr Detention Volume =	1.807 acre-feet		
Approximate 10-yr Detention Volume =	2.225 acre-feet		
Approximate 25-yr Detention Volume =	2.383 acre-feet		
Approximate 50-yr Detention Volume =	2.474 acre-feet		
Approximate 100-yr Detention Volume =	2.584 acre-feet		

Define Zones and Basin Geometry

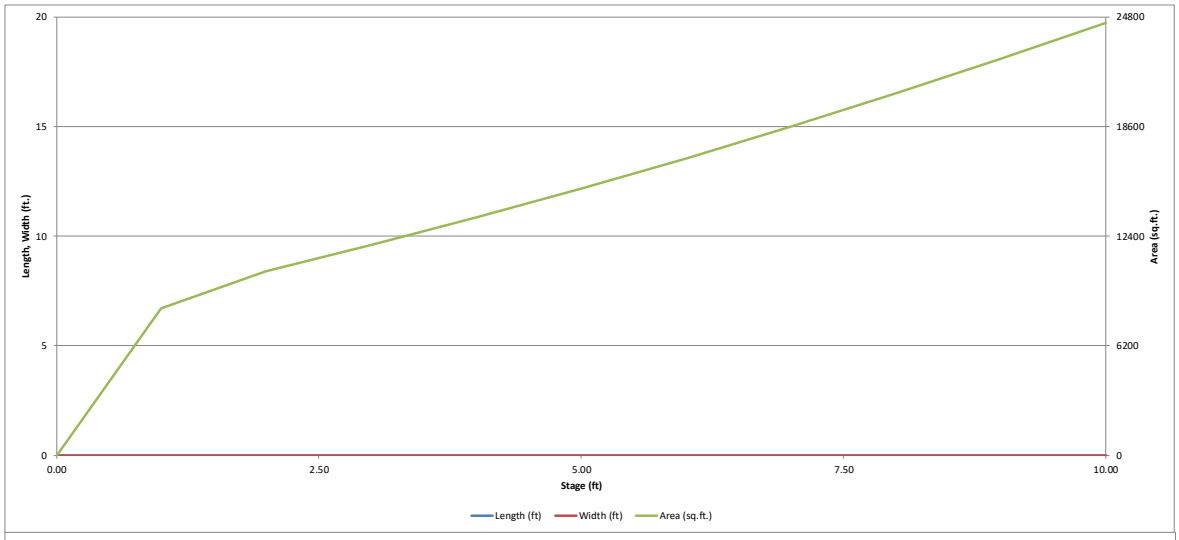
Zone 1 Volume (WQCV) =	0.554	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.174	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.856	acre-feet
Total Detention Basin Volume =	2.584	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

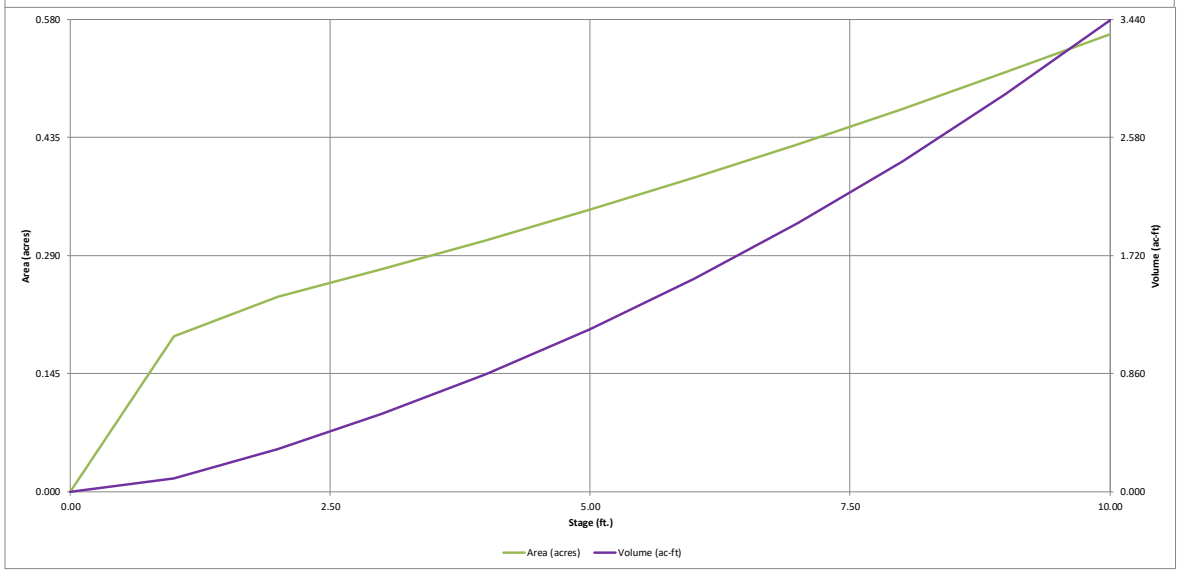
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7501 **Top of Micropool**	--	0.00	--	--	--	0	0.000		
	--	1.00	--	--	--	8,296	0.190	4,148	0.095
	--	2.00	--	--	--	10,427	0.239	13,509	0.310
	--	3.00	--	--	--	11,897	0.273	24,671	0.566
	--	4.00	--	--	--	13,449	0.309	37,344	0.857
	--	5.00	--	--	--	15,082	0.346	51,610	1.185
	--	6.00	--	--	--	16,797	0.386	67,549	1.551
	--	7.00	--	--	--	18,594	0.427	85,245	1.957
	--	8.00	--	--	--	20,473	0.470	104,778	2.405
	--	9.00	--	--	--	22,433	0.515	126,231	2.898
TOP:7511	--	10.00	--	--	--	24,475	0.562	149,685	3.436

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





Design Procedure Form: Runoff Reduction

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

Designer: DLH
Company: HR GREEN
Date: January 15, 2024
Project: FLYING HORSE NORTH PUD
Location:

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA											
Area ID	2.5AC+											
Downstream Design Point ID	OS											
Downstream BMP Type	None											
DCIA (ft^2)	--											
UIA (ft^2)	40,000											
RPA (ft^2)	40,000											
SPA (ft^2)	--											
HSG A (%)	0%											
HSG B (%)	100%											
HSG C/D (%)	0%											
Average Slope of RPA (ft/ft)	0.330											
UIA:RPA Interface Width (ft)	75.00											

CALCULATED RUNOFF RESULTS

Area ID	2.5AC+											
UIA:RPA Area (ft^2)	80,000											
L / W Ratio	14.22											
UIA / Area	0.5000											
Runoff (in)	0.00											
Runoff (ft^3)	0											
Runoff Reduction (ft^3)	1667											

CALCULATED WQCV RESULTS

Area ID	2.5AC+											
WQCV (ft^3)	1667											
WQCV Reduction (ft^3)	1667											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	OS											
DCIA (ft^2)	0											
UIA (ft^2)	40,000											
RPA (ft^2)	40,000											
SPA (ft^2)	0											
Total Area (ft^2)	80,000											
Total Impervious Area (ft^2)	40,000											
WQCV (ft^3)	1,667											
WQCV Reduction (ft^3)	1,667											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	80,000
Total Impervious Area (ft^2)	40,000
WQCV (ft^3)	1,667
WQCV Reduction (ft^3)	1,667
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

NOTE: THE PRESENTED UDBMP CALCULATIONS SHOWN HERE REPRESENT THE WORST CASE SCENARIO RUNOFF REDUCTION FOR "LARGE LOTS" GREATER THAN 2.5 ACRES. WITH 50% DIRECTLY CONNECTED IMPERVIOUS AREA TO 50% RECIEVING PERVIOUS AREA, A TOTAL WQCV REDUCTION OF 100% IS STILL ACHEIVED.

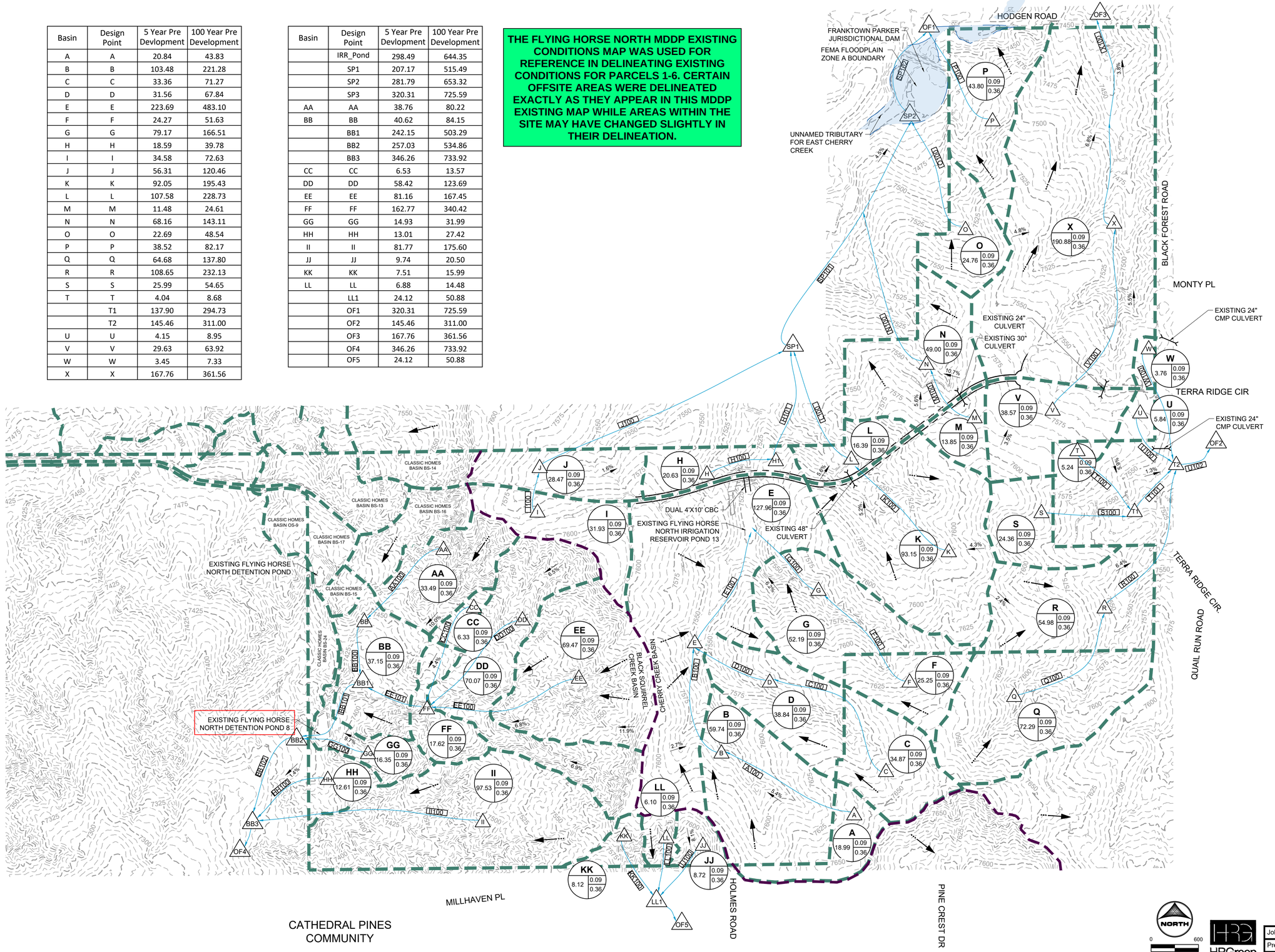
Appendix E:

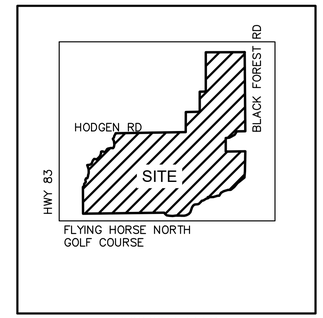
Reference Report Excerpts and Materials

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
A	A	20.84	43.83
B	B	103.48	221.28
C	C	33.36	71.27
D	D	31.56	67.84
E	E	223.69	483.10
F	F	24.27	51.63
G	G	79.17	166.51
H	H	18.59	39.78
I	I	34.58	72.63
J	J	56.31	120.46
K	K	92.05	195.43
L	L	107.58	228.73
M	M	11.48	24.61
N	N	68.16	143.11
O	O	22.69	48.54
P	P	38.52	82.17
Q	Q	64.68	137.80
R	R	108.65	232.13
S	S	25.99	54.65
T	T	4.04	8.68
	T1	137.90	294.73
	T2	145.46	311.00
U	U	4.15	8.95
V	V	29.63	63.92
W	W	3.45	7.33
X	X	167.76	361.56

Basin	Design Point	5 Year Pre Devlopment	100 Year Pre Development
	IRR_Pond	298.49	644.35
	SP1	207.17	515.49
	SP2	281.79	653.32
	SP3	320.31	725.59
AA	AA	38.76	80.22
BB	BB	40.62	84.15
	BB1	242.15	503.29
	BB2	257.03	534.86
	BB3	346.26	733.92
CC	CC	6.53	13.57
DD	DD	58.42	123.69
EE	EE	81.16	167.45
FF	FF	162.77	340.42
GG	GG	14.93	31.99
HH	HH	13.01	27.42
II	II	81.77	175.60
JJ	JJ	9.74	20.50
KK	KK	7.51	15.99
LL	LL	6.88	14.48
	LL1	24.12	50.88
	OF1	320.31	725.59
	OF2	145.46	311.00
	OF3	167.76	361.56
	OF4	346.26	733.92
	OF5	24.12	50.88

THE FLYING HORSE NORTH MDDP EXISTING CONDITIONS MAP WAS USED FOR REFERENCE IN DELINEATING EXISTING CONDITIONS FOR PARCELS 1-6. CERTAIN OFFSITE AREAS WERE DELINEATED EXACTLY AS THEY APPEAR IN THIS MDDP EXISTING MAP WHILE AREAS WITHIN THE SITE MAY HAVE CHANGED SLIGHTLY IN THEIR DELINEATION.





VICINITY MAP

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING CULVERT
- PROPOSED DRAINAGE CHANNEL
- PROPOSED ROAD
- PROPERTY LINE
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERFLOW ARROW
- EXISTING 100-YR FLOODWAY
- EXISTING 100-YR FLOODPLAIN
- PROPOSED 100-YR FLOODPLAIN
- WATERSHED BOUNDARY
- MAJOR BASIN LINE
- 100YR ZONE A FLOODPLAIN
- PROPOSED DETENTION LOCATION (A)
- POTENTIAL WATER QUALITY LOCATION (WQ)
- SWMM CONVEYANCE ELEMENT (SWMM)
- PROPOSED PEAK FLOW RATE (CFS) (850)
- DESIGN POINT (X)
- PROPOSED BASIN LABEL — XX BASIN DESIGNATION; AREA (AC.) XX | XX C5 / XX C100

NOTES:

NORTH
0 300 600

HRGreen

Job No.:	211030.01
Prepared By:	CLB
Date:	02/21/2022

MDDP
EXISTING EX1

FIG.EX1

INNOVATIVE DESIGN. **CLASSIC RESULTS.**

FLYING HORSE NORTH

IRRIGATION RESERVOIR EMBANKMENT

DESIGN REPORT

DAMID: 080459
Construction File No.: C-2085

AUGUST 2018

THIS REPORT WAS USED FOR REFERENCE IN THE SWMM CALCULATIONS AS WELL AS THE CALLOUT OF EXISTING INFRASTRUCTURE IN THE EX AND PR DRAINAGE MAPS. THE FOLLOWING PAGES THAT ARE APART OF THIS DESIGN REPORT WILL HAVE OUTLINES AND HIGHLIGHTED TEXT THAT WERE SPECIFICALLY USED DURING THE PREPERATION OF THIS PDR.

Prepared for:
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Prepared by:
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Job no. 1096.11
PCD File No. SF-18-001

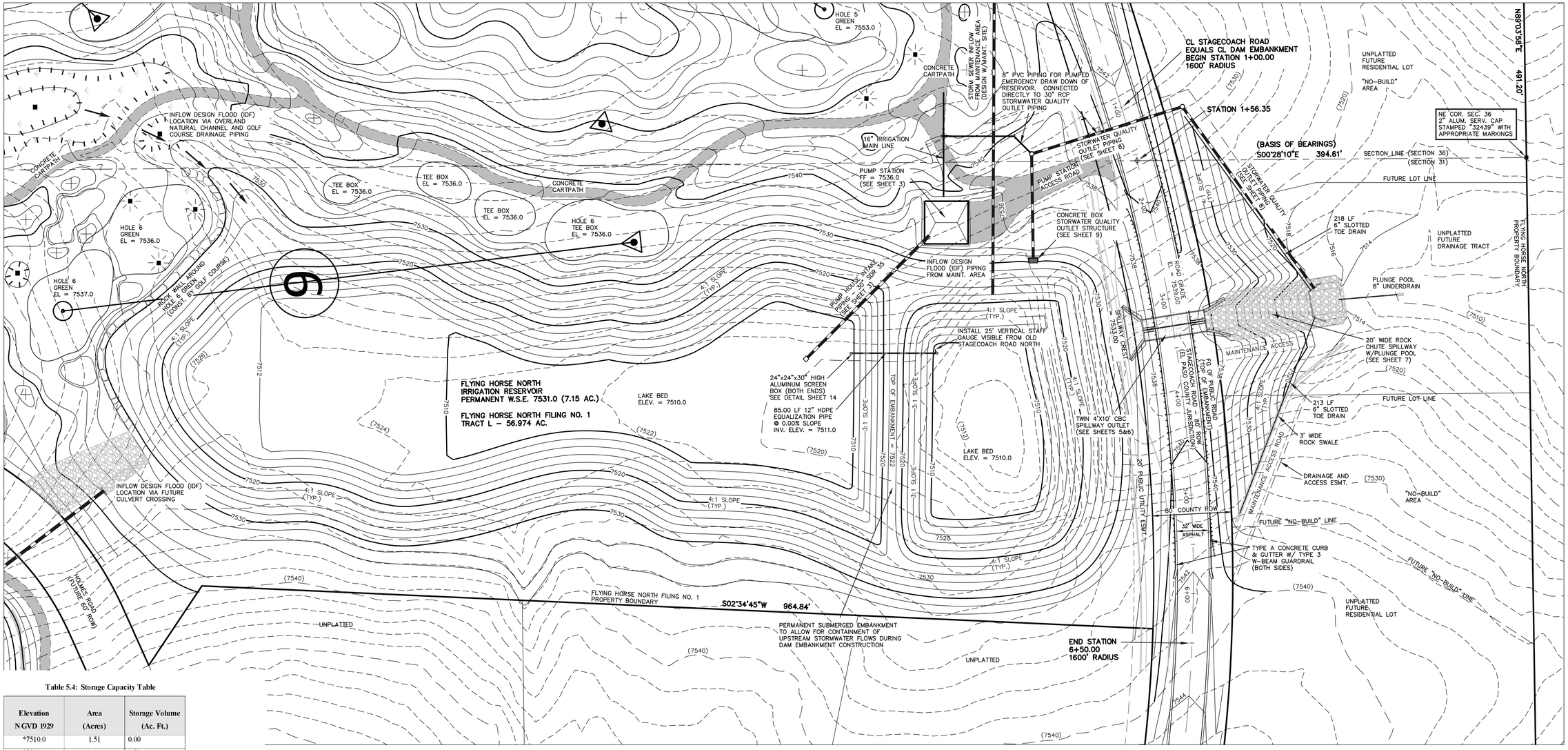

Table 5.4: Storage Capacity Table

Elevation NGVD 1929	Area (Acres)	Storage Volume (Ac. Ft.)
*7510.0	1.51	0.00
*7511.0	1.99	1.74
*7512.0	2.52	3.99
*7513.0	2.85	6.68
*7514.0	3.05	9.63
*7515.0	3.26	12.78
7516.0	3.48	16.15
7517.0	3.70	19.74
7518.0	3.93	23.56
7519.0	4.16	27.60
7520.0	4.40	31.88
7521.0	4.64	36.40
7522.0	4.88	41.16
7523.0	5.14	46.17
7524.0	5.36	51.42
7525.0	5.59	56.89
7526.0	5.84	62.61
7527.0	6.08	68.57
7528.0	6.33	74.77
7529.0	6.57	81.22
7530.0	6.81	87.91
7531.0	7.15	94.89
7532.0	7.52	102.22
7533.0	7.83	109.90
7534.0	8.37	118.00
7535.0	8.77	126.57
7536.0	9.17	135.53

*Indicates dead storage below pumping ability

Table 5.5: Reservoir Discharge Table

Elevation	Discharge (cfs) (SWQ Outlet Box)	Discharge (cfs) (Twin CBC Spillway)	Discharge (cfs) (Total)
7531.0	0.0	0.0	0.0
7532.0	13.89	0.0	13.89
7533.0	27.77	0.0	27.77
7534.0	51.31	49.05	100.36
7535.0	69.52	138.56	208.08
7536.0	74.61	254.72	329.33

Permanent WSE = 7531.0

Top of SWQ Outlet box = 7533.0

Spillway elevation = 7533.0

NOTES:

1. TOPOGRAPHIC BASE MAPPING PRODUCED FROM AERIAL PHOTOGRAPHY PROVIDED BY NORTH AMERICAN MAPPING IN 2009. HORIZONTAL CONTROL IS BASED ON LOCAL CALIBRATION TIED TO SECTION CORNER AND VERTICAL CONTROL IS BASED ON NGVD 1929 DATUM.
2. PERMANENT WSE = 7531.0
3. RESERVOIR LINER INSTALLED UP TO ELEVATION 7534.0

STAFF GAUGE DETAILS:

1. 12"X25"X1/2" PVC
2. LASER CUT ACRYLIC NUMBERS AND HATCH MARKS LIQUID WELDED TO PVC ON 1 FT. INCREMENTS
3. MOUNTED ON ALUMINUM FRAME WITH CROSS BRACKETS ANCHORED INTO SLOPE
4. BASE FASTENED TO 12" PIPE
5. ELEVATION DISPLAY RANGE: 7512–7535

50 25 0 50 100

SCALE: 1" = 50'

FIGURE 1.3

STATE ENGINEER'S CONSTRUCTION FILE NUMBER: C–2085

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS **811** UTILITY NOTIFICATION CENTER OF COLORADO IT'S THE LAW

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE
1	REVISED PER STATE COMMENTS	5–14–18
2	REVISED PER COUNTY COMMENTS	7–31–18

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155 DATE

CLASSIC CONSULTING ENGINEERS & SURVEYORS SM
619 N. Cascade Avenue, Suite 200 (719)785–0790
Colorado Springs, Colorado 80903 (719)785–0799(Fax)

FLYING HORSE NORTH
IRRIGATION RESERVOIR EMBANKMENT
SITE LAYOUT WITH GRADING
DAM ID – 080459

DESIGNED BY	MAW	SCALE		DATE	1–4–18
DRAWN BY	MAW	(H) 1"=	50'	SHEET	4 OF 14
CHECKED BY		(V) 1"=	N/A	JOB NO.	1096.11

N:\1096\1\DRAWINGS\CONSTRUCTION\Jurisdictional Plans\4-0_POND - Site Grading.dwg, 8/21/2018 3:14:51 PM, 1:1

SECTION 4: RESERVOIR AND DAM

4.1 DESIGN CRITERIA

The proposed dam for the Flying Horse North Irrigation Reservoir was designed in accordance with Rule 5 of the State of Colorado Rules and Regulations for Dam Safety and Dam Construction, dated January 2007.

4.2 RESERVOIR

This watershed will contain development of a private golf course (currently under construction) including an outdoor golf maintenance facility, along with 2.5 ac. rural residential lot development accessed by rural County paved roadways. As such, the irrigation reservoir will also be designed with a separate stormwater detention and SWQ component per El Paso County criteria. This separate structure will be in the form of a concrete outlet box with an orifice plate and 30" RCP outlet allowing the release of the smaller storm events to meet the standards as specified per this criteria and the County's MS4 permit with the State. This SWQ release through the 30" RCP will be constructed outside of the reservoir embankment. The specific location of this reservoir is within a portion of Section 36, township 11 south, range 66 west of the sixth principal meridian, and a portion of Section 31 township 11 south, range 65 west of the sixth principal meridian, El Paso County Colorado. **(See Figure 1.3)**

The reservoir has a surface area at its permanent WSE (Elev. 7531.0) of 7.0 acres with a storage volume of 94.9 acre feet. The maximum depth at this elevation is 21 feet with the lake bed at 7510. The reservoir will have a liner constructed of a flexible membrane. This liner will be laid up to a maximum elevation of 7534. The reservoir is supplied by water from a well located on the Clubhouse site within the development approximately 1/4 mile west of the reservoir. The level in the reservoir is controlled by the two outlet structures. The Detention/SWQ structure will facilitate the State required 72 hr. drain time for the smaller stormwater events and help maintain the permanent water level while the twin box culvert spillway will allow for the County required 100 yr. detention release of the major stormwater events. The total storage capacity table is found in Section 5, Table 5.4.

4.3 DAM EMBANKMENT

The dam embankment for this reservoir will be constructed within the County owned and maintained Old Stagecoach Road (80' ROW - Collector). The subdivision Improvement Agreement (SIA) as required by El

Paso County for this subdivision, will be recorded along with the Final Plat and specify ownership and maintenance responsibilities related to the embankment and associated drainage structures. The crest of the embankment, which will be the finished grade of asphalt for the roadway is at elevation 7539.0 at the lowest point. The regulatory height from the twin box culvert emergency spillway invert to the native channel grade equals 23.0'. The length of the embankment measured from the toe of slopes on each side is approximately 450'. Both the upstream and downstream slopes of the embankment will be constructed at no greater than a 4:1 slope. The roadway will have a typical 2% crown with an asphalt width of 32.0' with El Paso County Type A concrete curb and gutter on both sides and then 6:1 maximum to edge of ROW with a County required clear zone of 14.0'. The twin box culvert emergency spillway structure is outside this clear zone. El Paso County will also require CDOT Type 3 W-Beam guardrail along both sides of the embankment. The embankment itself will be constructed of local material found on-site and tested by the Geotech. According to the State of Colorado Rules and Regulations for Dam Safety and Dam Construction, Rule 4.2.5.4, this facility is considered a "**Small Jurisdictional Dam"** given the jurisdictional height greater than 20 feet but less than 50 feet and a capacity greater than 100 acre-feet.

4.4 SPILLWAY AND OUTLET WORKS

This facility will be designed with two separate outlet structures. One will facilitate the State/County required detention/SWQ component of the facility while the other will allow for the 100 yr. stormwater event and emergency flow situations. A low level outlet will be built into the pump station design allowing for an emergency drawdown of the reservoir to be with connection to the SWQ outlet piping.

Detention / SWQ Outlet

Per the County's MS4 permit with the State, this development is required to provide detention and stormwater quality within this reservoir facility. The design for this is being handled by a separate concrete outlet box constructed outside the formal dam embankment. This structure is a 4'x8' concrete box with a steel flow control plate and protective well screen located on the front. The control plate is designed with three rectangular holes to facilitate the State required drain times. The first hole is located at elevation 7531.0 with the top of box at elevation 7533.0. The top of box will be constructed with a grate to allow flows to enter the box as well. A 30" RCP outlet pipe will allow for the release of all the flows entering the box structure. The design of this structure meets all State and County requirements for both EURV and

WQCV. The 30" RCP outlet piping will be routed around the dam embankment and into the rock chute and plunge pool at the base of the emergency spillway.

Spillway Outlet

Given that the embankment for this reservoir will be a County roadway, the conventional emergency spillway channel design at the crest of the embankment was not appropriate. But rather a concrete box culvert spillway design under the roadway to allow for both the major stormwater events and emergency release has been employed. Twin 4'x10' concrete box culverts (CBC) will facilitate the required releases. The crest of the spillway will be constructed at elevation 7533.0 where the release will then travel under the roadway and into a 20' wide rock chute. The rock chute will have a 4:1 slope with 3:1 side slopes and a total drop of 18.0' into a 2.0' deep plunge pool. The following roughness coefficients were used: CBCs 0.013 and Rock Chute 0.035. The rip-rap thickness will be 56" with a gradation specified by the Geotech. (See Design Plans) The spillway CBCs and Rock Chute have been designed to accommodate both the 100 yr. release of 182 cfs with a headwater depth ratio (Hw/D) of 0.54 and the total basin inflow of 609 cfs with a (Hw/D) of 1.31. This design is within the maximum County criteria of (Hw/D) of 1.40. The freeboard design is as follows: 100 Yr. = 4.39' and 500 Yr. = 3.03'. The velocity at inlet of chute = 15.6 fps and velocity at outlet of chute = 6.99 fps, both at normal depth. 1.76' of Freeboard is included in chute design.

Low Level Outlet

This reservoir will not be designed with a formal low level outlet given the nature of the facility and the ability for the pump station to facilitate the draining of the reservoir for embankment inspection or emergency purposes. Thus, directly off of the 16" irrigation main just outside the pump station, a 16"x8" tee with gate valves and a 8" drain line will be installed to allow for the pumped release and draining of the reservoir. This 8" drain line will then connect directly to the 30" RCP storm system via a Type II concrete storm manhole constructed as a part of the release of the Detention/SWQ component as required by El Paso County. This 30" storm system then daylights into the base of the rock chute and plunge pool on the backside of the embankment. The 8" drain line @ 110 psi is expected to release 800-1200 GPM. However, using the maximum pump station capacity of 2,250 GPM while opening system drain valves and irrigation heads, the drain time is as follows: As mentioned earlier, the pumps will allow for release down to an elevation of 7515.67. Based on the permanent WSE of 7531, this equates to a total of approximately 26 million gallons (MG) to be drained. The total drain time is estimated at approximately 8 days.

Hazard Classification" as described in section 5.6 of this report the Inflow Design Flood Requirements (IDF) as found in Rule 5.9.1, Table 5.1 utilize the (NOAA 14 – 24 Hr. duration) 100 Yr. storm event. The UD-Detention v3.07 spreadsheet (Per Urban Drainage Vol. 3) will also be utilized in the final design of the Detention and SWQ aspects of this facility. This spreadsheet uses 1 Hr. precipitation depths. See Table 5.1 for precipitation depth comparison. Please note that the higher precipitation amounts have been used for each return period.

Table 5.1: Precipitation Depth Comparison

Return Period	1-Hr. Depth (City/County)	1-Hr. Depth (NOAA 14)	24-Hr. Depth (City/County)	24-Hr. Depth (NOAA 14)
2	1.19	0.92	2.10	1.93
5	1.50	1.20	2.70	2.44
50	2.25	2.15	4.20	**4.33**
100	2.52	2.49	**4.60**	**5.04**

5.2 WATER RIGHTS

Based on the water decree filed October 6, 2017 (See Appendix), PRI #2, LLC has the water rights to pump and store in the on-site Flying Horse North reservoir. PRI #2, LLC has a lease from the State Land Board for the following water rights: 515 AF in the Dawson, 577 AF in the Denver, 239 AF in the Arapahoe and 182 AF in the Laramie Fox Hills. The Arapahoe and Laramie Fox Hills are both deemed non-tributary reservoirs. The Flying Horse North Golf Course will take an average of 200 AF per year from their Arapahoe well that will be pumped into the reservoir. Evaporative loss is not an issue when pumping from a non-tributary source. Upon termination of the State Land Board Lease in 2048, all water rights revert automatically back to PRI #2, LLC who will own them in perpetuity.

5.3 WATERSHED CHARACTERISTICS

The watershed of the irrigation reservoir includes a total area of 366.8 acres within the East Cherry Creek drainage basin and just north of the Palmer Divide. A portion of this area is outside the Flying Horse North development as shown in basins OS-12, OS-13 and OS-14. These basins are both currently undeveloped and developed as County zoned RR-5 (5 ac. rural residential). All the on-site basins are zoned PUD for either 2.5 ac. rural residential or golf course/open space. (See Tables 5.2 and 5.3 for sub-basin CN values and associated Tc times) Nearly the entire watershed is outside of the black forest tree line and mainly consists of prairie grasses with grades ranging from 2%-20% with three major natural ravines that drain in a northwesterly direction directly towards the planned irrigation reservoir. The golf course layout aides in the natural conveyance of the majority of the stormwater flows to the reservoir. The storage capacity table for the reservoir is listed in Table 5.4.

Table 5.2: Sub-basin CN Values

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

C_N VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE (B)		2 AC. RESIDENTIAL (B)		COMPOSITE C_N
		CN	AREA (Ac.)	CN	AREA (Ac.)	
CC-1	22.3	61	0.0	65	22.3	**65.0**
CC-2	36.4	61	0.0	65	36.4	**65.0**
CC-3	51.9	61	19.1	65	32.8	**63.5**
CC-4A	108.2	61	63.2	65	45.0	**62.7**
CC-4B	17.0	61	5.5	65	11.5	**63.7**
OS-12	67.7	61	0.0	65	67.7	**65.0**
OS-13	36.9	61	0.0	65	36.9	**65.0**
OS-14	26.4	61	0.0	65	26.4	**65.0**

Table 5.3: Sub-basin Time of Concentration

TIME OF CONCENTRATION DEVELOPED

	COMPOSITE		OVERLAND		STREET / CHANNEL FLOW(DCM Vol. 1 Fig. 6-25)				Tc	Tc
BASIN	Cn	Length	Height	Tc	Length	Slope	Velocity	Tc	TOTAL	LAG (0.6tc)
		(ft)	*(ft)*	*(hr)*	*(ft)*	*(%)*	*(fps)*	*(hr)*	*(hr)*	*(hr)*
CC-1	65.0	300	10	0.40	900	2.0%	1.8	0.14	0.53	0.32
CC-2	65.0	300	10	0.40	1700	2.0%	1.8	0.26	0.66	0.39
CC-3	63.5	300	14	0.35	900	2.5%	2.4	0.10	0.45	0.27
CC-4A	62.7	300	14	0.35	2900	2.0%	2.1	0.38	0.73	0.44
CC-4B	63.7	300	12	0.37	900	3.0%	2.5	0.10	0.47	0.28
OS-12	65.0	300	14	0.35	1500	3.0%	2.5	0.17	0.51	0.31
OS-13	65.0	300	16	0.33	900	3.0%	2.5	0.10	0.43	0.26
OS-14	65.0	300	14	0.35	600	3.5%	2.7	0.06	0.41	0.24

Table 5.4: Storage Capacity Table

Elevation NGVD 1929	Area (Acres)	Storage Volume (Ac. Ft.)
*7510.0	1.51	0.00
*7511.0	1.99	1.74
*7512.0	2.52	3.99
*7513.0	2.85	6.68
*7514.0	3.05	9.63
*7515.0	3.26	12.78
7516.0	3.48	16.15
7517.0	3.70	19.74
7518.0	3.93	23.56
7519.0	4.16	27.60
7520.0	4.40	31.88
7521.0	4.64	36.40
7522.0	4.88	41.16

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7523.0	5.14	46.17
7524.0	5.36	51.42
7525.0	5.59	56.89
7526.0	5.84	62.61
7527.0	6.08	68.57
7528.0	6.33	74.77
7529.0	6.57	81.22
7530.0	6.81	87.91
7531.0	7.15	94.89
7532.0	7.52	102.22
7533.0	7.83	109.90
7534.0	8.37	118.00
7535.0	8.77	126.57
7536.0	9.17	135.53

*Indicates dead storage below pumping ability

5.4 HYDROLOGIC MODEL

The PondPack model produced peak discharges for the 2-yr, 5-yr, 50-yr and 100-yr storm events assuming a permanent pool elevation of 7531.0. Reference Appendix B for specific hydrologic model results. Table 5.5 below shows the results of these storm events upon the irrigation reservoir.

Table 5.5: Inflow Design Flood (IDF) Summary Table

Storm Event	Peak Inflow (cfs)	Max. WSE (ft.)	Total Discharge (cfs)
2-yr (City/County)	48	7531.40	6
5-yr (City/County)	119	7531.87	12
50-yr (NOAA 14)	431	7533.58	64
100-yr (NOAA 14)	609	7534.23	124

5.5 HYDRAULIC MODEL

Both the SWQ Outlet and the CBC Spillway were modeled using both PondPack (24-hr. precipitation) and the Urban Drainage UD Detention Spreadsheet (1-hr precipitation) as required by County design criteria. Table 5.6 below shows the results of the PondPack model. Reference Appendix B for the UD Detention – Retention Pond Spreadsheet results. As this facility is required to meet both detention and SWQ criteria, the following is applicable to these design components:

Required WQCV =	1.36 ac-ft.	Provided WQCV =	15.01 ac-ft.
Required EURV =	2.83 ac-ft.	Provided EURV =	15.01 ac-ft.
Required 100-yr. =	12.42 ac-ft.	Provided 100-yr =	27.35 ac-ft.

Table 5.6: Reservoir Discharge Table

Elevation	Discharge (cfs) (SWQ Outlet Box)	Discharge (cfs) (Twin CBC Spillway)	Discharge (cfs) (Total)
7531.0	0.0	0.0	0.0
7532.0	13.89	0.0	13.89
7533.0	27.77	0.0	27.77
7534.0	51.31	49.05	100.36
7535.0	69.52	138.56	208.08
7536.0	74.61	254.72	329.33

Permanent WSE = 7531.0

Top of SWQ Outlet box = 7533.0

Spillway elevation = 7533.0

The twin 4'x10' CBC Spillway design has the following results:

100-yr storm release = 182 cfs	Hw/D = 0.54
Emergency release – Max. basin IDF = 609 cfs	Hw/D = 1.31
County Criteria (max.)	Hw/D = 1.40

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North

Basin ID: Golf Course Irrigation Reservoir (Pond - 13)

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	RP	
Watershed Area =	366.80	acres
Watershed Length =	5,175	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	8.30%	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 =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	1.395	acre-feet
Excess Urban Runoff Volume (EURV) =	2.819	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.903	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3.006	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	7.525	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	21.442	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	30.109	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	41.427	acre-feet
500-yr Runoff Volume (P1 = 3.39 in.) =	68.375	acre-feet
Approximate 2-yr Detention Volume =	1.765	acre-feet
Approximate 5-yr Detention Volume =	2.813	acre-feet
Approximate 10-yr Detention Volume =	6.361	acre-feet
Approximate 25-yr Detention Volume =	9.142	acre-feet
Approximate 50-yr Detention Volume =	9.507	acre-feet
Approximate 100-yr Detention Volume =	12.417	acre-feet

Optional User Override 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.39	inches

Stage-Storage Calculation

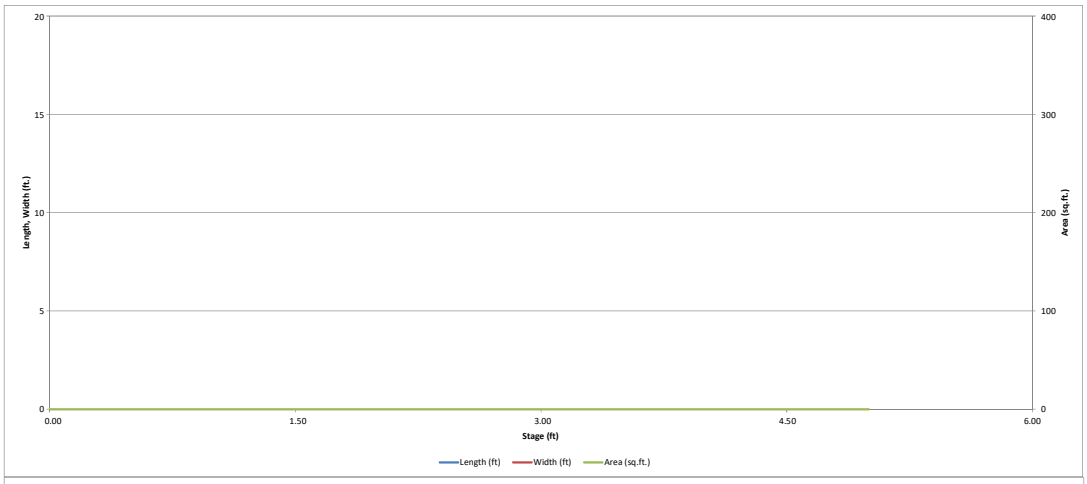
Zone 1 Volume (WQCV) =	1.395	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.424	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	9.598	acre-feet
Total Detention Basin Volume =	12.417	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

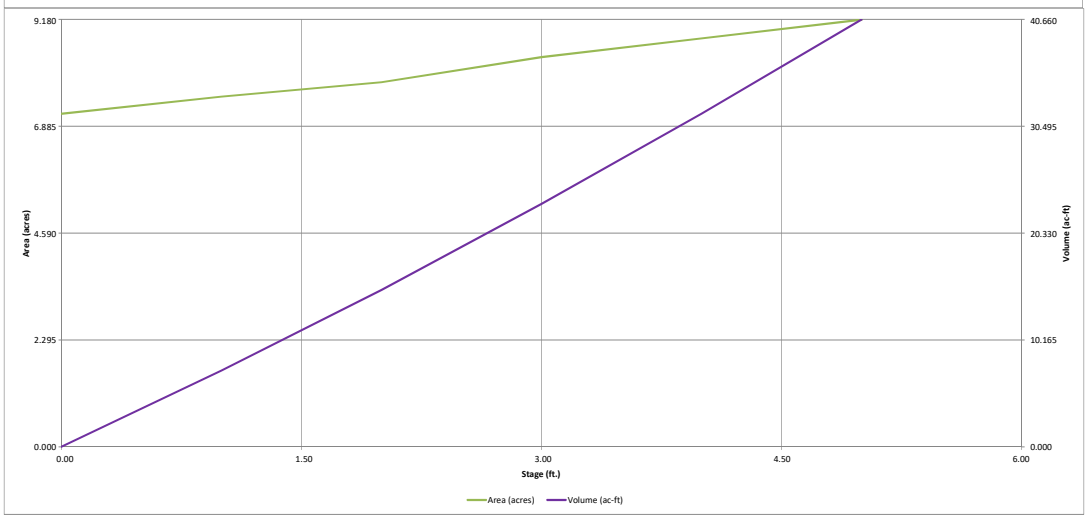
Depth Increment = 0.5 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Permanent Pool	--	0.00	--	--	--	311,545	7.152		
7532	--	1.00	--	--	--	327,571	7.520	316,283	7.261
7533	--	2.00	--	--	--	341,084	7.830	650,475	14.933
7534	--	3.00	--	--	--	364,597	8.370	1,006,726	23.111
7535	--	4.00	--	--	--	382,021	8.770	1,380,035	31.681
7536	--	5.00	--	--	--	399,445	9.170	1,770,768	40.651

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



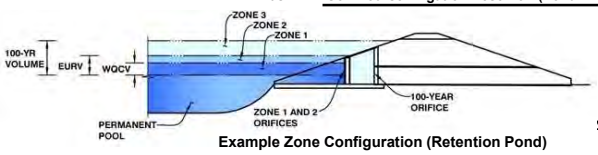


Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Flying Horse North

Basin ID: Golf Course Irrigation Reservoir (Pond - 13)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.20	1.395	Orifice Plate
Zone 2 (EURV)	0.40	1.424	Orifice Plate
Zone 3 (100-year)	1.67	9.598	Weir&Pipe (Restrict)
		12.417	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	1.354E+00	ft^2
Depth at top of Zone using Orifice Plate =	2.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	195.00	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.40					
Orifice Area (sq. inches)	195.00	195.00	195.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.00	N/A	feet
Overflow Weir Front Edge Length =	8.00	N/A	feet	Over Flow Weir Slope Length =	4.12	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	5.04	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	4.00	N/A	feet	Overflow Grate Open Area w/o Debris =	24.74	N/A	ft^2
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	12.37	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	4.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A	ft^2
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A	feet
Restrictor Plate Height Above Pipe Invert =	30.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	4.13	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	7.13	feet
Spillway End Slopes =	0.00	H:V	Basin Area at Top of Freeboard =	9.17	acres
Freeboard above Max Water Surface =	1.00	feet			

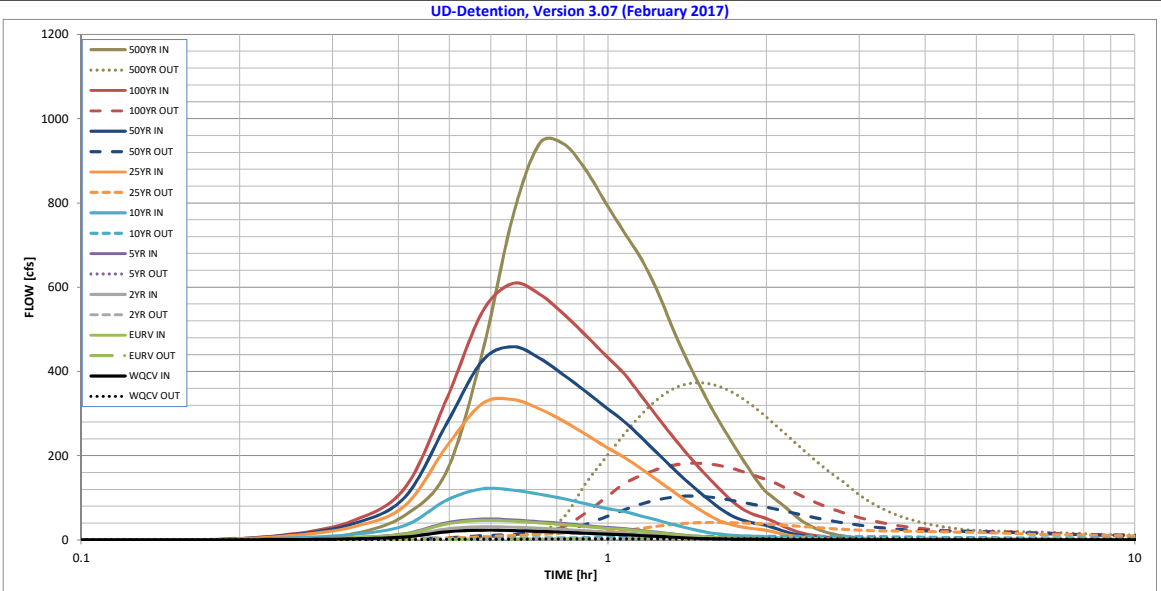
Calculated Parameters for Spillway

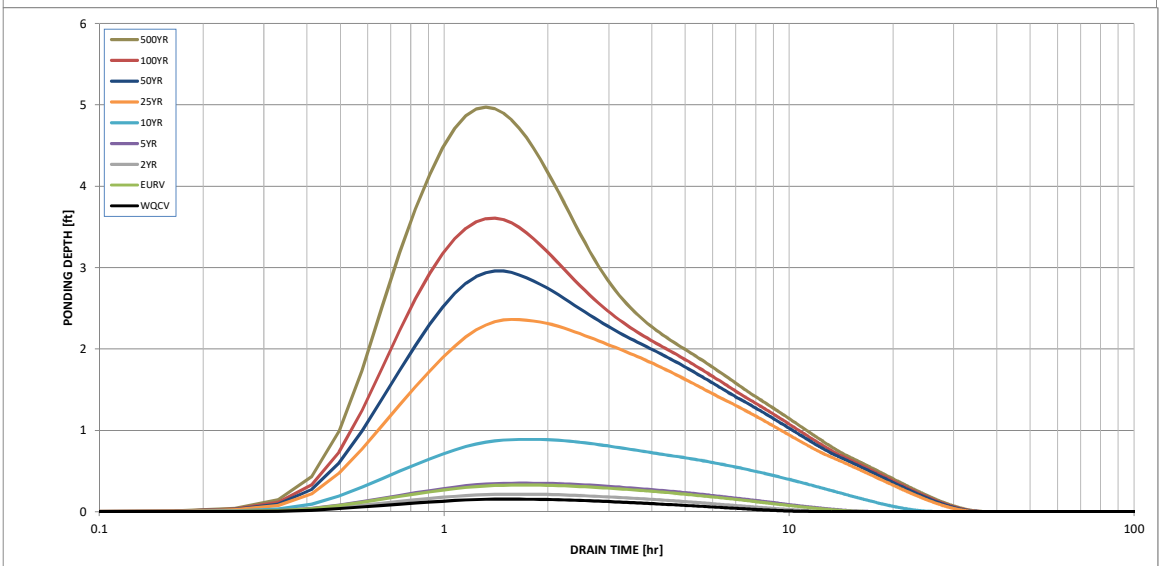
Routed Hydrograph Results

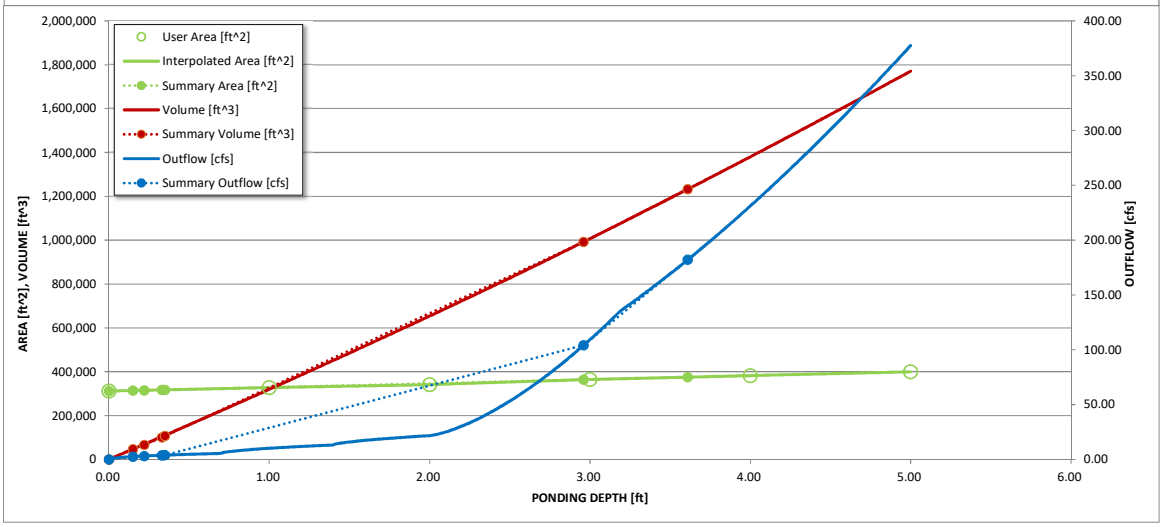
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.39
Calculated Runoff Volume (acre-ft) =	1.395	2.819	1.903	3.006	7.525	21.442	30.109	41.427	68.375
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.395	2.819	1.902	3.006	7.522	21.445	30.113	41.428	68.385
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.20	0.67	0.93	1.25	2.00
Predevelopment Peak Q (cfs) =	0.0	0.0	4.5	7.8	75.1	247.4	342.3	460.1	734.0
Peak Inflow Q (cfs) =	23.2	46.4	31.5	49.5	121.4	333.1	458.5	608.8	941.9
Peak Outflow Q (cfs) =	2.6	3.7	3.0	3.9	9.0	41.5	103.9	182.0	373.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.1	0.2	0.3	0.4	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.7	1.1	1.0
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) =	11	15	12	15	22	27	27	25	23
Time to Drain 99% of Inflow Volume (hours) =	**12**	16	14	16	24	31	31	30	29
Maximum Ponding Depth (ft) =	0.15	0.33	0.22	0.35	0.89	2.36	2.96	3.61	4.97
Area at Maximum Ponding Depth (acres) =	7.21	7.27	7.23	7.28	7.48	8.02	8.34	8.61	9.16
Maximum Volume Stored (acre-ft) =	1.077	2.308	1.510	2.453	6.436	17.865	22.693	28.205	40.376

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

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

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

	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.95 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:09:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:14:51	1.01	1.97	1.36	2.10	4.69	9.77	11.39	12.89	15.10
1.010	0:19:48	2.74	5.42	3.70	5.77	13.49	31.71	39.07	46.76	59.45
	0:24:45	7.04	13.91	9.51	14.80	34.64	82.12	102.73	124.75	164.90
	0:29:42	19.32	38.17	26.10	40.61	94.81	223.20	277.98	336.63	444.01
	0:34:39	23.19	46.42	31.50	49.46	121.39	323.47	425.12	541.27	768.07
	0:39:36	22.19	44.52	30.16	47.44	118.28	333.14	458.54	608.77	941.94
	0:44:33	20.20	40.51	27.45	43.17	108.29	310.79	431.04	582.87	939.56
	0:49:30	18.10	36.44	24.64	38.84	97.66	281.42	390.98	535.69	878.35
	0:54:27	15.70	31.77	21.42	33.89	85.81	250.82	352.31	485.61	800.60
	0:59:24	13.65	27.68	18.60	29.53	75.09	221.36	315.01	438.24	731.15
	1:04:21	12.38	25.04	16.87	26.71	67.46	196.13	281.72	395.12	668.65
	1:09:18	10.29	20.92	14.06	22.33	56.98	169.57	244.05	343.20	594.66
	1:14:15	8.46	17.30	11.59	18.47	47.35	142.96	207.70	294.13	509.61
	1:19:12	6.60	13.63	9.08	14.56	37.87	117.65	173.58	249.28	435.39
	1:24:09	4.99	10.46	6.92	11.19	29.48	94.26	142.59	208.99	372.25
	1:29:06	3.64	7.75	5.08	8.30	22.24	74.08	115.60	173.54	316.50
	1:34:03	2.78	5.85	3.86	6.26	16.51	56.37	91.58	142.20	268.83
	1:39:00	2.28	4.73	3.14	5.06	13.16	42.77	70.68	113.81	225.24
	1:43:57	1.92	3.99	2.65	4.26	11.04	34.92	55.08	89.03	185.28
	1:48:54	1.68	3.48	2.32	3.72	9.57	29.75	45.79	70.94	149.07
	1:53:51	1.51	3.12	2.08	3.33	8.53	26.20	39.69	59.85	118.87
	1:58:48	1.39	2.86	1.91	3.05	7.79	23.63	35.39	52.61	99.74
	2:03:45	1.02	2.12	1.41	2.26	5.92	18.97	28.99	43.64	83.33
	2:08:42	0.75	1.54	1.03	1.64	4.27	13.83	21.64	33.32	65.70
	2:13:39	0.55	1.13	0.76	1.21	3.17	10.12	15.73	24.54	49.44
	2:18:36	0.41	0.84	0.56	0.90	2.35	7.55	11.63	18.13	37.08
	2:23:33	0.29	0.61	0.41	0.66	1.73	5.63	8.83	13.58	27.60
	2:28:30	0.21	0.44	0.29	0.47	1.25	4.16	6.61	10.30	20.70
	2:33:27	0.15	0.32	0.21	0.34	0.91	3.03	4.92	7.75	15.78
	2:38:24	0.10	0.22	0.14	0.24	0.64	2.25	3.67	5.84	11.98
	2:43:21	0.06	0.14	0.09	0.15	0.42	1.58	2.71	4.47	9.20
	2:48:18	0.03	0.08	0.05	0.08	0.25	1.03	1.90	3.30	7.18
	2:53:15	0.01	0.03	0.02	0.04	0.12	0.60	1.23	2.30	5.41
	2:58:12	0.00	0.01	0.00	0.01	0.04	0.28	0.71	1.49	3.89
	3:03:09	0.00	0.00	0.00	0.00	0.00	0.08	0.33	0.85	2.62
	3:08:06	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.39	1.60
	3:13:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.83
	3:18:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
	3:22:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	3:27:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:37:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:52:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:02:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:07:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:12:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:17:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:27:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:37:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:42:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:47:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:52:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:57:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:06:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:16:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:31:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:36:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:41:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:46:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:51:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:56:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
PERMANENT WSE	0.00	311,545	7.152	0	0.000	0.00
WQCV	0.15	313,949	7.207	46,912	1.077	2.53
2 YR. WSE	0.22	314,910	7.229	65,778	1.510	2.99
EURV	0.33	316,673	7.270	100,515	2.308	3.69
5 YR. WSE	0.35	316,994	7.277	106,852	2.453	3.80
50 YR. WSE	2.96	363,656	8.348	992,161	22.777	104.11
100 YR. WSE	3.61	375,226	8.614	1,232,372	28.291	182.18

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

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

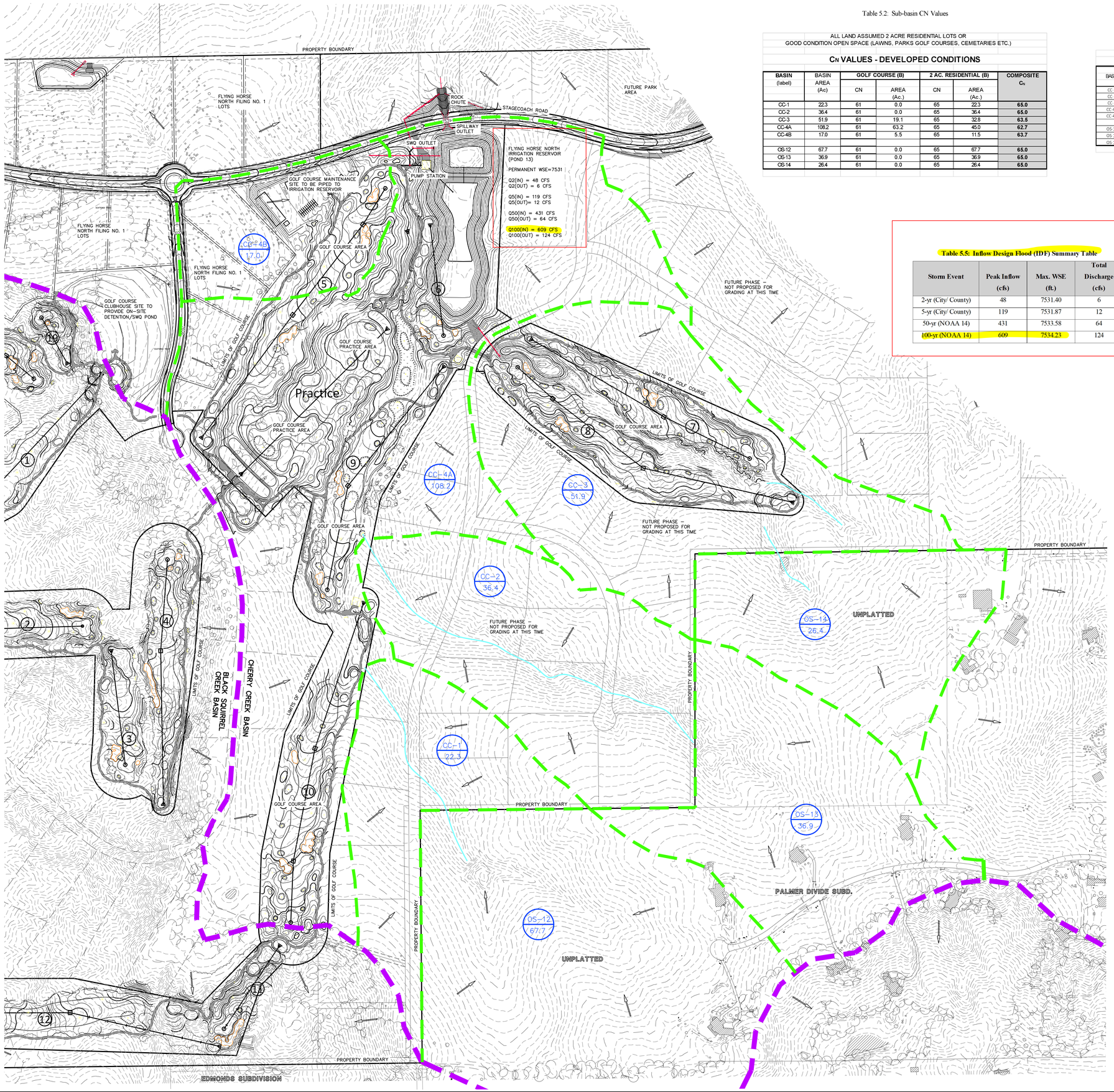


Table 5.2: Sub-basin CN Values

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

CN VALUES - DEVELOPED CONDITIONS

BASIN (label)	BASIN AREA (Ac)	GOLF COURSE (B)		2 AC. RESIDENTIAL (B)		COMPOSITE C_N
		CN	AREA (Ac.)	CN	AREA (Ac.)	
CC-1	22.3	61	0.0	65	22.3	**65.0**
CC-2	36.4	61	0.0	65	36.4	**65.0**
CC-3	51.9	61	19.1	65	32.8	**63.5**
CC-4A	108.2	61	63.2	65	45.0	**62.7**
CC-4B	17.0	61	5.5	65	11.5	**63.7**
OS-12	67.7	61	0.0	65	67.7	**65.0**
OS-13	36.9	61	0.0	65	36.9	**65.0**
OS-14	26.4	61	0.0	65	26.4	**65.0**

Table 5.3 Sub-basin Time of Concentration

TIME OF CONCENTRATION DEVELOPED

BASIN	COMPOSITE Cn	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (hr)	STREET / CHANNEL FLOW(UDCM Vol 1 Fig 6-25) Length (ft)	Slope (%)	Velocity (fps)	Tc (hr)	Tc TOTAL (hr)	Tc LAG(0.6tc) (hr)
CC-1	65.0	300	10	0.40	900	2.0%	1.8	0.14	0.53	0.32
CC-2	65.0	300	10	0.40	1700	2.0%	1.8	0.26	0.66	0.39
CC-3	63.5	300	14	0.35	900	2.5%	2.4	0.10	0.45	0.27
CC-4A	62.7	300	14	0.35	2900	2.0%	2.1	0.38	0.73	0.44
CC-4B	63.7	300	12	0.37	900	3.0%	2.5	0.10	0.47	0.28
OS-12	65.0	300	14	0.35	1500	3.0%	2.5	0.17	0.51	0.31
OS-13	65.0	300	16	0.33	900	3.0%	2.5	0.10	0.43	0.26
OS-14	65.0	300	14	0.35	600	3.5%	2.7	0.06	0.41	0.24

Table 5.5: Inflow Design Flood (IDF) Summary Table

Storm Event	Peak Inflow (cfs)	Max. WSE (ft.)	Total Discharge (cfs)
2-yr (City/ County)	48	7531.40	6
5-yr (City/ County)	119	7531.87	12
50-yr (NOAA 14)	431	7533.58	64
100-yr (NOAA 14)	609	7534.23	124

Table 5.6: Reservoir Discharge Table

Elevation	Discharge (cfs) (SWQ Outlet Box)	Discharge (cfs) (Twin CBC Spillway)	Discharge (cfs) (Total)
7531.0	0.0	0.0	0.0
7532.0	13.89	0.0	13.89
7533.0	27.77	0.0	27.77
7534.0	51.31	49.05	100.36
7535.0	69.52	138.56	208.08
7536.0	74.61	254.72	329.33

Permanent WSE = 7531.0

Top of SWQ Outlet box = 7533.0

Spillway elevation = 7533.0

Table 5.4: Storage Capacity Table

Elevation NGVD 1929	Area (Acres)	Storage Volume (Ac. Ft.)
*7510.0	1.51	0.00
*7511.0	1.99	1.74
*7512.0	2.52	3.99
*7513.0	2.85	6.68
*7514.0	3.05	9.63
*7515.0	3.26	12.78
7516.0	3.48	16.15
7517.0	3.70	19.74
7518.0	3.93	23.56
7519.0	4.16	27.60
7520.0	4.40	31.88
7521.0	4.64	36.40
7522.0	4.88	41.16
7523.0	5.14	46.17
7524.0	5.36	51.42
7525.0	5.59	56.89
7526.0	5.84	62.61
7527.0	6.08	68.57
7528.0	6.33	74.77
7529.0	6.57	81.22
7530.0	6.81	87.91
7531.0	7.15	94.89
7532.0	7.52	102.22
7533.0	7.83	109.90
7534.0	8.37	118.00
7535.0	8.77	126.57
7536.0	9.17	135.53

*Indicates dead storage below pumping ability

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY EAST CHERRY CREEK	
MAJOR BASIN BOUNDARY	
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
STORM SEWER	

N

200 100 0 200 400

SCALE: 1" = 200'

CLASSIC CONSULTING ENGINEERS & SURVEYORS
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799 (Fax)

FLYING HORSE NORTH
IRRIGATION RESERVOIR
DEVELOPED DRAINAGE MAP

DESIGNED BY	MAW	SCALE		DATE	9-20-17
DRAWN BY	MAW	(H) 1"= 200'		SHEET	1 OF 1
CHECKED BY		(V) 1"= N/A		JOB NO.	1096.11

HRGreen

HRGREEN.COM

Flying Horse North Filing No. 3
Final Drainage Report

July 27, 2023

Prepared For:

Mr. Drew Balsick

Vice President / Project Manager

Flying Horse Development, LLC
2138 Flying Horse Club Drive

Colorado Springs, CO 80921

(719) 785-3237

Prepared By:

HR Green Development, LLC

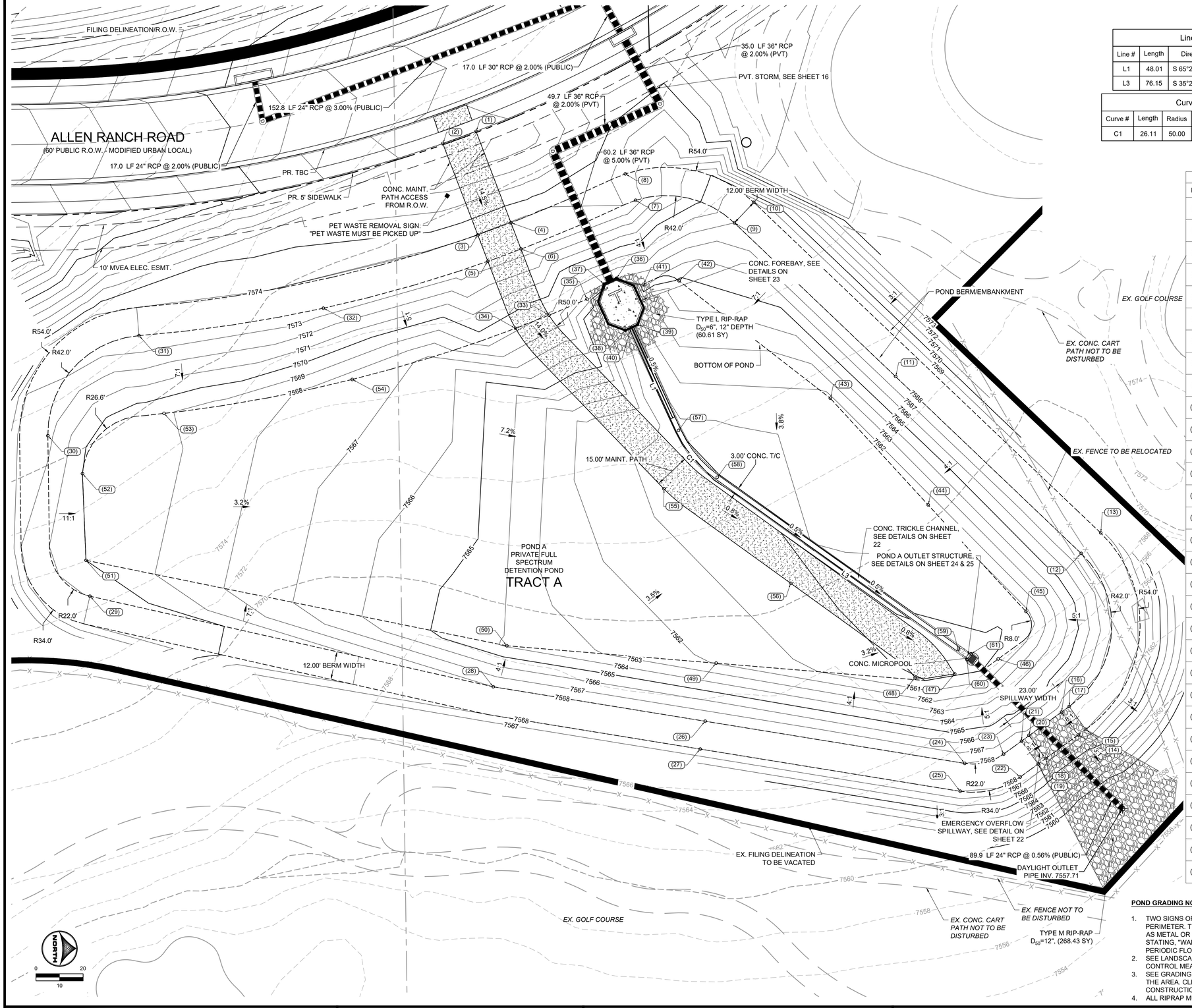
Contact: Richie Lyon, PE

Richie.Lyon@hrgreen.com

719-318-0871

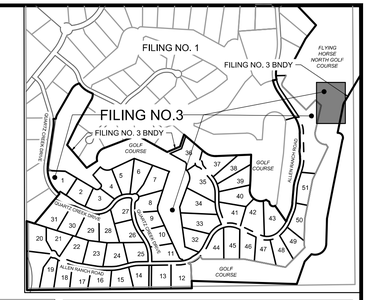
PCD File No. SF-XXXX

THE FLYING HORSE FILING NO. 3 FDR CONTAINS A SECTION OF ALLEN RANCH ROAD AS WELL AS A DETENTION POND THAT ARE TO BE USED IN THE CAPTURE AND DETENTION OF BASINS EX5.1 AND M, EXISTING AND PROPOSED, LOCATED WITHIN PARCEL NO. 2 OF THIS PDR. THE FDR HAS INCLUDED THESE BASINS INTO THE DESIGN OF ITS PROPOSED STORM INFRASTRUCTURE.



Line Table			
Line #	Length	Direction	Centerline/Flowline
L1	48.01	S 65°23'51" W	Centerline
L3	76.15	S 35°28'45" W	Centerline

Curve Table				
Curve #	Length	Radius	Delta	Centerline/Flowline
C1	26.11	50.00	29°55'06"	Flowline



POINT TABLE			
No.	DESC.	NORTHING & EASTING	ELEV
(1)	Begin Maint. Road	N: 444397.98 E: 222117.93	7577.25
(2)	Begin Maint. Road	N: 444383.89 E: 222123.10	7577.52
(3)	Maint. Road/TP	N: 444398.71 E: 222161.88	7573.99
(4)	Maint. Road/TP	N: 444412.80 E: 222156.70	7573.99
(5)	Maint. Road/TP	N: 444402.99 E: 222173.05	7573.47
(6)	Maint. Road/TP	N: 444417.06 E: 222167.86	7573.49
(7)	TOP	N: 444465.65 E: 222147.18	7573.33
(8)	TOP	N: 444461.27 E: 222135.99	7573.44
(9)	TOP	N: 444507.54 E: 222156.75	7568.00
(10)	TOP	N: 444515.82 E: 222148.06	7568.00
(11)	TOP	N: 444575.94 E: 222221.96	7568.00
(12)	TOP	N: 444654.66 E: 222297.02	7568.00
(13)	TOP	N: 444662.94 E: 222288.33	7568.00
(14)	Spillway Crest	N: 444653.37 E: 222374.04	7567.50
(15)	Spillway	N: 444656.60 E: 222371.69	7568.00
(16)	Spillway Crest	N: 444646.31 E: 222364.33	7567.50
(17)	Spillway	N: 444649.55 E: 222361.98	7568.00
(18)	Spillway Crest	N: 444639.62 E: 222384.04	7567.50
(19)	Spillway	N: 444636.38 E: 222386.39	7568.00
(20)	Spillway Crest	N: 444632.48 E: 222374.23	7567.47
(21)	Spillway	N: 444629.32 E: 222376.69	7568.00
(22)	TOP	N: 444628.79 E: 222391.91	7568.00
(23)	TOP	N: 444621.73 E: 222382.20	7568.00
(24)	TOP	N: 444605.27 E: 222386.12	7568.00
(25)	TOP	N: 444603.35 E: 222397.96	7568.00
(26)	TOP	N: 444495.20 E: 222368.23	7568.00
(27)	TOP	N: 444493.09 E: 222380.04	7568.00
(28)	TOP	N: 444405.28 E: 222353.61	7568.00
(29)	TOP	N: 444234.21 E: 222315.18	7571.00
(30)	TOP	N: 444216.37 E: 222247.07	7572.28
(31)	TOP	N: 444255.02 E: 222204.61	7574.00

POINT TABLE			
No.	DESC.	NORTHING & EASTING	ELEV
(32)	TOP	N: 444333.24 E: 222192.98	7573.62
(33)	Maint. Road/BP	N: 444428.92 E: 222195.95	7568.88
(34)	Maint. Road/BP	N: 444414.74 E: 222201.51	7569.17
(35)	BP	N: 444445.02 E: 222189.13	7566.50
(36)	Forebay	N: 444457.51 E: 222180.26	7567.00
(37)	Forebay	N: 444452.26 E: 222182.67	7567.00
(38)	Forebay	N: 444461.27 E: 222202.37	7561.75
(39)	Forebay	N: 444466.49 E: 222199.98	7561.75
(40)	TC Flow Line	N: 444463.87 E: 222201.18	7560.00
(41)	BP	N: 444468.96 E: 222182.83	7566.50
(42)	BP	N: 444484.08 E: 222181.36	7564.82
(43)	BP	N: 444548.26 E: 222231.20	7561.78
(44)	BP	N: 444589.73 E: 222276.41	7561.26
(45)	BP	N: 444631.20 E: 222321.62	7560.75
(46)	BP	N: 444619.45 E: 222341.83	7560.29
(47)	End Maint. Road	N: 444601.01 E: 222348.15	7559.97
(48)	End Maint. Road	N: 444584.21 E: 222349.80	7560.05
(49)	BP	N: 444499.83 E: 222343.59	7561.95
(50)	BP	N: 444411.05 E: 222336.22	7563.90
(51)	BP	N: 444232.53 E: 222299.95	7570.00
(52)	BP	N: 444231.04 E: 222263.18	7570.00
(53)	BP	N: 444265.64 E: 222237.60	7569.08
(54)	BP	N: 444345.47 E: 222223.20	7567.51
(55)	Maint. Road	N: 444477.67 E: 222269.58	7560.71
(56)	Maint. Road	N: 444531.50 E: 222309.73	7560.24
(57)	TC Flow Line	N: 444483.85 E: 222244.83	7559.76
(58)	TC Flow Line	N: 444500.29 E: 222264.73	7559.63
(59)	TC Flow Line	N: 444602.60 E: 222337.65	7559.00
(60)	Outlet Structure	N: 444606.19 E: 222342.05	7559.02
(61)	Outlet Structure	N: 444607.93 E: 222339.61	7559.02

POND GRADING NOTES:

1. TWO SIGNS OF MINIMUM 3 SQ. FT. AREA, SHALL BE INSTALLED AROUND THE POND PERIMETER. THE SIGNS WILL BE CONSTRUCTED OF A DURABLE MATERIAL SUCH AS METAL OR PLASTIC AND HAVE RED LETTERING ON A WHITE BACKGROUND STATING, "WARNING- THIS AREA IS A STORMWATER FACILITY AND IS SUBJECT TO PERIODIC FLOODING.
2. SEE LANDSCAPE PLAN FOR RE-SEEDING AREAS ASSOCIATED WITH PERMANENT CONTROL MEASURE IMPROVEMENTS.
3. SEE GRADING & EROSION CONTROL PLANS FOR ANY EXISTING VEGETATION IN THE AREA. CLEARING AND GRUBBING WILL OCCUR PRIOR TO POND CONSTRUCTION AND THEREFORE, NO EXISTING VEGETATION WILL BE PRESENT.
4. ALL RIPRAP MUST BE INSTALLED PER DETAIL ON NEXT PAGE.

ABBREVIATIONS:

B.O.P ~ BOTTOM OF POND
T.O.P. ~ TOP OF POND
T.C. ~TRICKLE CHANNEL
T.B.C~ TOP BACK OF CURB
C.L.~ CENTERLINE
E.O.G~ EDGE OF GRADING
S.W ~ SPILLWAY

DRAWN BY:	DLH	JOB DATE:	3/1/24
APPROVED:	RDL	JOB NUMBER:	211030
CAD DATE:	3/4/2024		
CAD FILE:	J:\2021\211030\CAD\Dwgs\C\Estates_CDs\Pond_A_Grading		

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH FILING 3
PRI #2, LLC.
EL PASO COUNTY, CO

DRAINAGE DETAILS
POND A GRADING PLAN

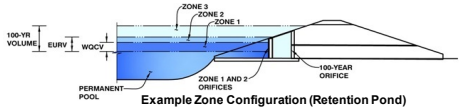
SHEET PND 21

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: FLYING HORSE NORTH FILING NO. 3

Basin ID: DESIGN POINT 2 (FLATS/CONDO AREA)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	25.30	acres
Watershed Length =	1,800	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	35.00%	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
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.350	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.920	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.896	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.390	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.839	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.496	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.004	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.671	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.979	acre-feet		inches
Approximate 2-yr Detention Volume =	0.669	acre-feet		
Approximate 5-yr Detention Volume =	0.945	acre-feet		
Approximate 10-yr Detention Volume =	1.334	acre-feet		
Approximate 25-yr Detention Volume =	1.515	acre-feet		
Approximate 50-yr Detention Volume =	1.593	acre-feet		
Approximate 100-yr Detention Volume =	1.853	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.350	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.570	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.933	acre-feet
Total Detention Basin Volume =	1.853	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	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_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

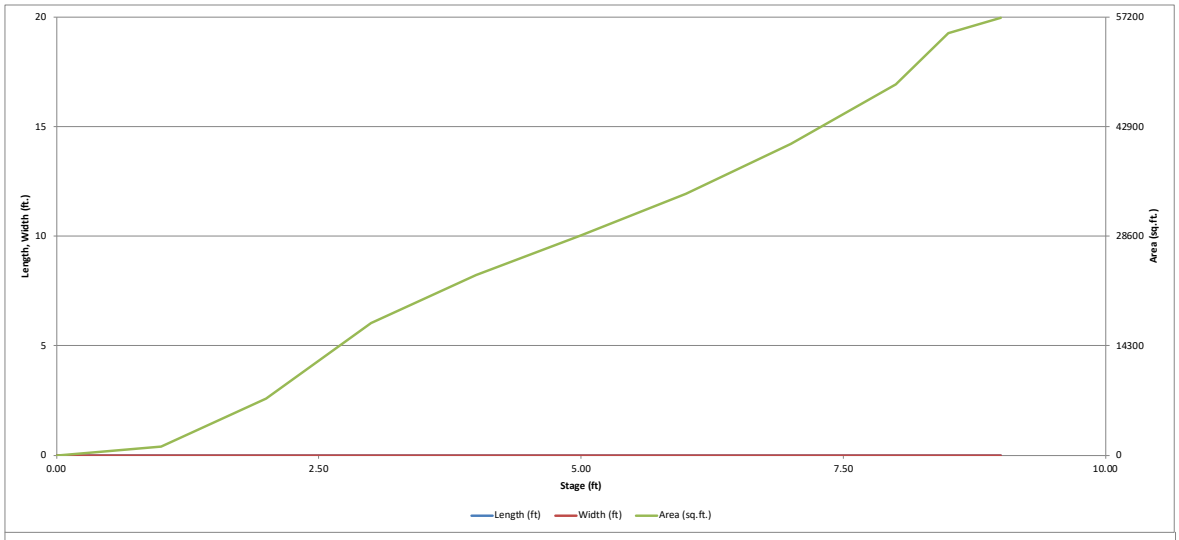
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

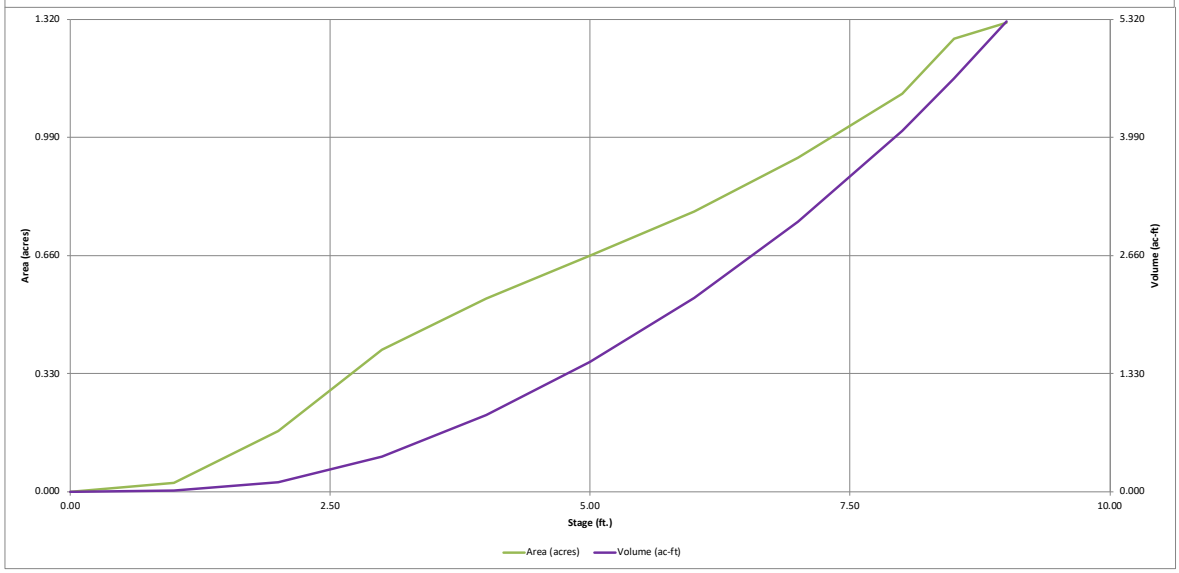
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7559 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
7560	--	1.00	--	--	--	1,091	0.025	550	0.013
7561	--	2.00	--	--	--	7,411	0.170	4,801	0.110
7562	--	3.00	--	--	--	17,259	0.396	17,136	0.393
7563	--	4.00	--	--	--	23,517	0.540	37,524	0.861
7564	--	5.00	--	--	--	28,715	0.659	63,640	1.461
7565	--	6.00	--	--	--	34,100	0.783	95,048	2.182
7566	--	7.00	--	--	--	40,636	0.933	132,416	3.040
7567	--	8.00	--	--	--	48,445	1.112	176,956	4.062
7567.5	--	8.50	--	--	--	55,140	1.266	202,853	4.657
7568	--	9.00	--	--	--	57,141	1.312	230,923	5.301

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



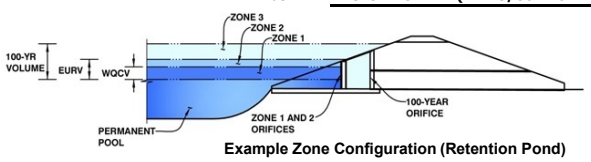


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **FLYING HORSE NORTH FILING NO. 3**

Basin ID: **DESIGN POINT 2 (FLATS/CONDO AREA)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.89	0.350	Orifice Plate
Zone 2 (EURV)	4.11	0.570	Orifice Plate
Zone 3 (100-year)	5.57	0.933	Weir&Pipe (Restrict)
Total (all zones)		1.853	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	4.00	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.60						
Orifice Area (sq. inches)	2.00	4.50						

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.07	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.53	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.26	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			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 Orifice Area =	2.07	N/A	ft^2
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.71	N/A	feet
Restrictor Plate Height Above Pipe Invert =	15.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.82	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.91	feet
Spillway Crest Length =	23.00	feet	Stage at Top of Freeboard =	9.91	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.31	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.30	acre-ft

Calculated Parameters for Spillway

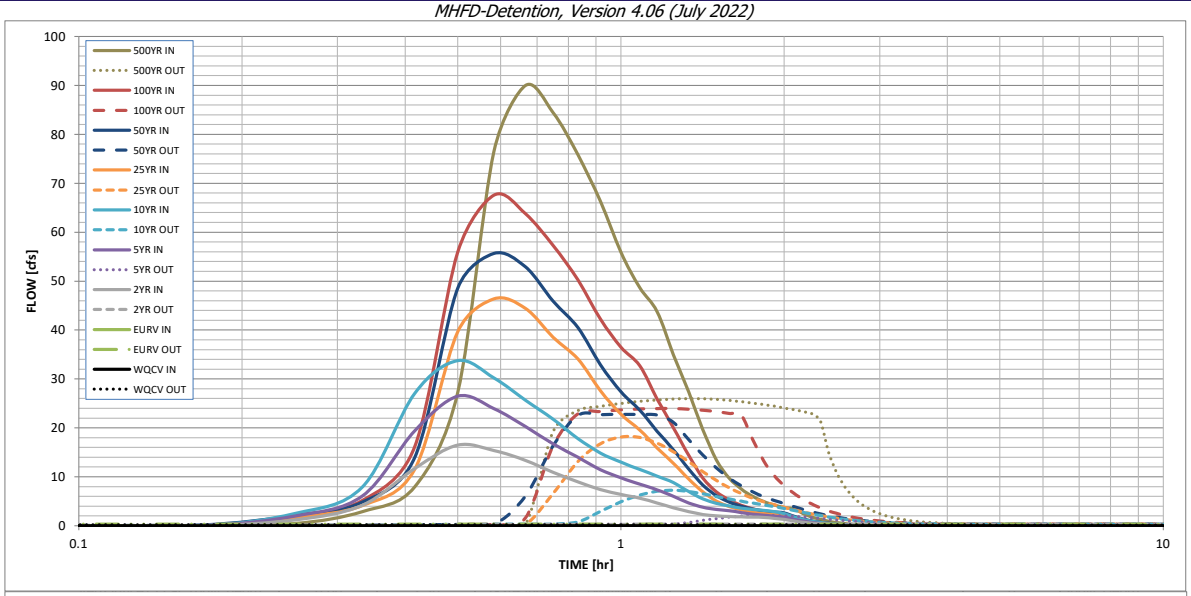
Routed Hydrograph Results

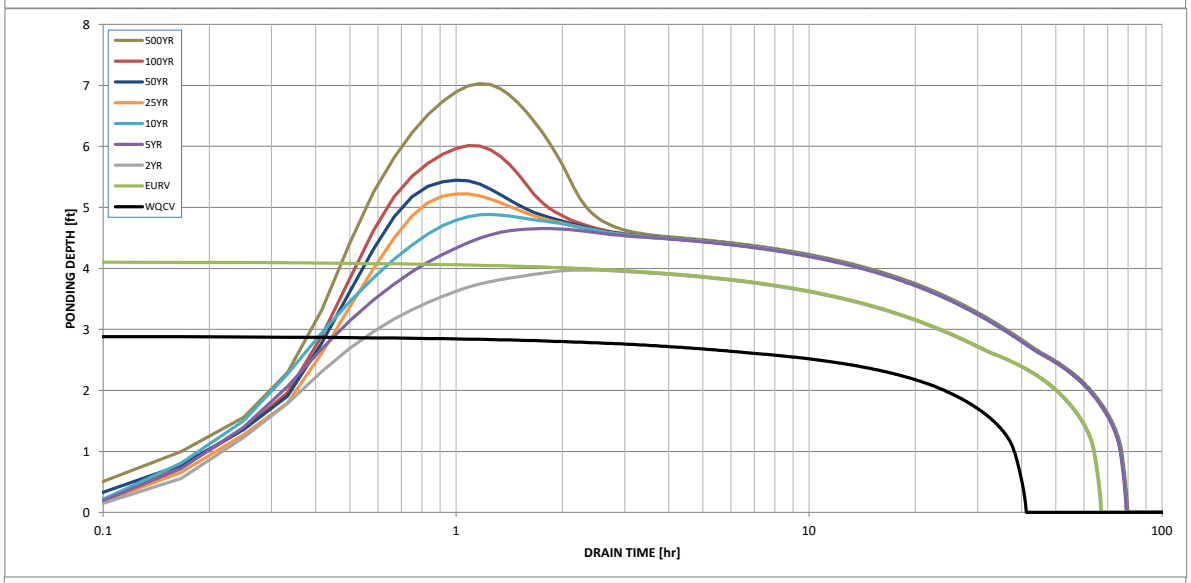
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

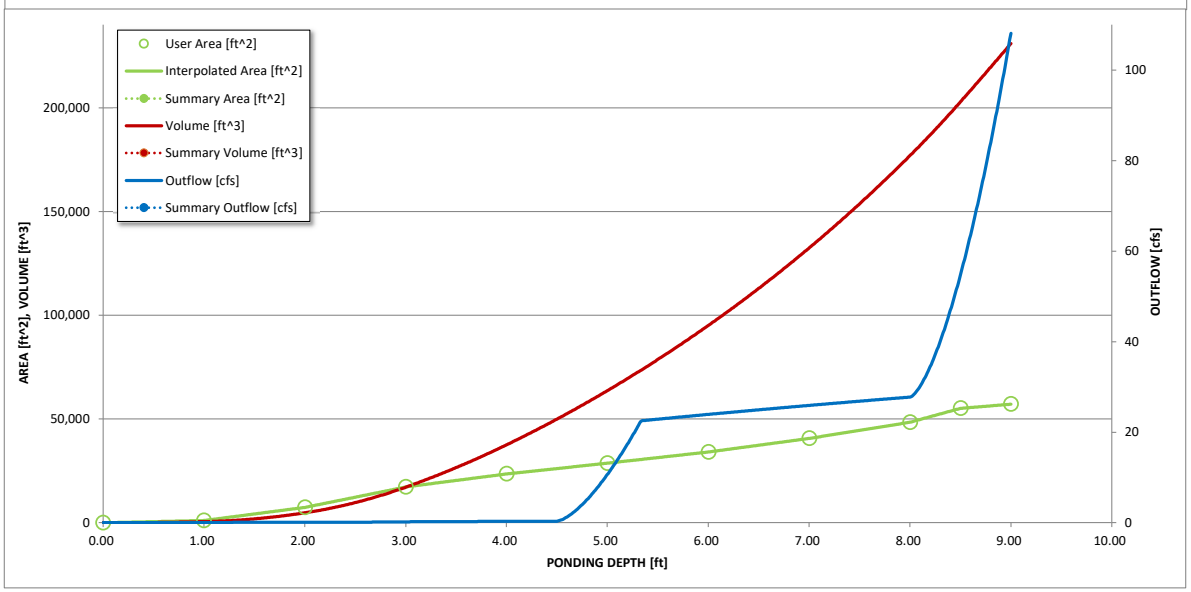
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.350	0.920	0.896	1.390	1.839	2.496	3.004	3.671	4.979
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.896	1.390	1.839	2.496	3.004	3.671	4.979
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.0	10.9	16.1	28.3	35.4	44.3	61.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.16	0.43	0.64	1.12	1.40	1.75	2.43
Peak Inflow Q (cfs) =	N/A	N/A	16.5	26.5	33.7	46.4	55.6	67.6	90.0
Peak Outflow Q (cfs) =	0.2	0.3	0.3	2.1	7.3	18.1	22.8	24.0	26.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.5	0.6	0.6	0.5	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.5	1.4	1.8	1.9	2.0
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	62	62	72	70	67	65	63	58
Time to Drain 99% of Inflow Volume (hours) =	**40**	65	65	76	75	74	74	73	71
Maximum Ponding Depth (ft) =	2.89	4.11	3.97	4.65	4.88	5.22	5.44	6.01	7.03
Area at Maximum Ponding Depth (acres) =	0.37	0.55	0.54	0.62	0.64	0.69	0.71	0.78	0.94
Maximum Volume Stored (acre-ft) =	0.351	0.922	0.845	1.238	1.383	1.609	1.763	2.190	3.059

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

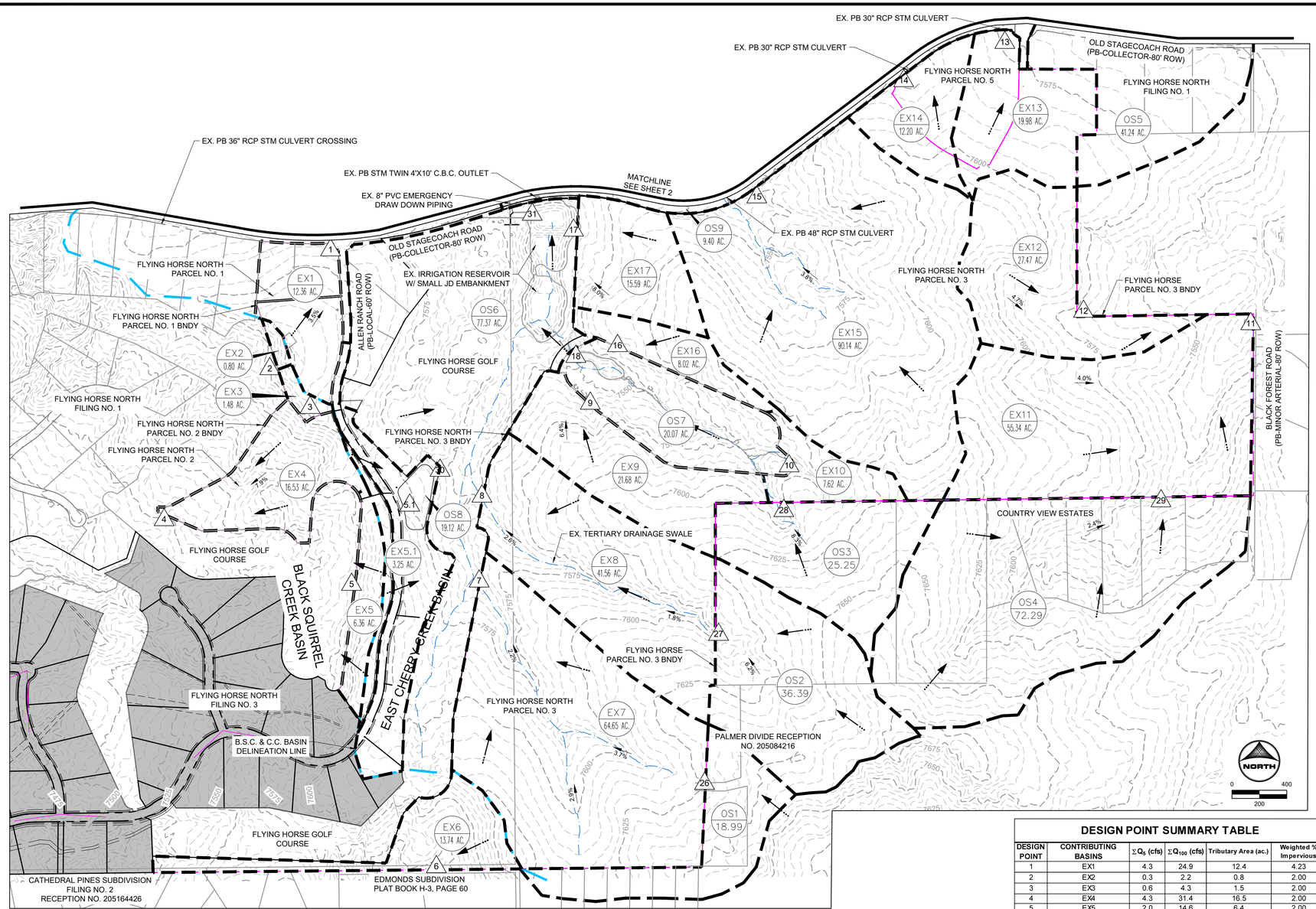
Inflow Hydrographs

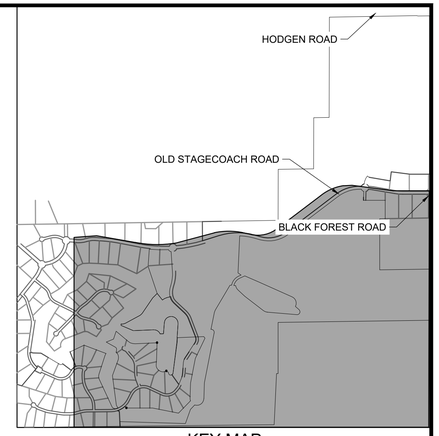
The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.01	0.45
	0:15:00	0.00	0.00	1.20	1.98	2.46	1.66	2.06	2.03	2.90
	0:20:00	0.00	0.00	4.20	6.05	7.89	4.12	4.80	5.16	7.95
	0:25:00	0.00	0.00	11.73	19.44	27.07	11.59	13.98	16.18	27.22
	0:30:00	0.00	0.00	16.48	26.46	33.72	39.65	48.53	55.91	76.43
	0:35:00	0.00	0.00	15.39	23.95	30.18	46.35	55.64	67.59	90.00
	0:40:00	0.00	0.00	13.34	20.25	25.65	44.39	52.88	63.75	84.45
	0:45:00	0.00	0.00	10.91	16.76	21.76	38.54	45.89	57.28	75.78
	0:50:00	0.00	0.00	8.93	13.97	17.79	34.04	40.51	50.20	66.31
	0:55:00	0.00	0.00	7.40	11.45	14.85	27.59	32.92	42.22	55.94
	1:00:00	0.00	0.00	6.37	9.77	12.98	22.81	27.38	36.51	48.67
	1:05:00	0.00	0.00	5.62	8.51	11.51	19.57	23.63	32.71	43.72
	1:10:00	0.00	0.00	4.61	7.34	10.11	15.92	19.30	25.90	34.95
	1:15:00	0.00	0.00	3.68	5.99	8.79	12.73	15.51	20.03	27.35
	1:20:00	0.00	0.00	2.88	4.65	6.96	9.56	11.60	14.39	19.62
	1:25:00	0.00	0.00	2.31	3.77	5.47	6.89	8.32	9.72	13.47
	1:30:00	0.00	0.00	2.00	3.33	4.59	5.05	6.16	6.93	9.75
	1:35:00	0.00	0.00	1.86	3.09	4.01	3.93	4.83	5.29	7.51
	1:40:00	0.00	0.00	1.79	2.68	3.61	3.23	3.99	4.19	5.99
	1:45:00	0.00	0.00	1.74	2.36	3.33	2.76	3.42	3.44	4.95
	1:50:00	0.00	0.00	1.70	2.12	3.13	2.47	3.06	2.93	4.23
	1:55:00	0.00	0.00	1.48	1.95	2.86	2.27	2.80	2.57	3.72
	2:00:00	0.00	0.00	1.29	1.77	2.48	2.14	2.64	2.36	3.43
	2:05:00	0.00	0.00	0.96	1.30	1.81	1.57	1.93	1.74	2.50
	2:10:00	0.00	0.00	0.71	0.94	1.28	1.12	1.38	1.24	1.78
	2:15:00	0.00	0.00	0.51	0.67	0.91	0.80	0.98	0.90	1.29
	2:20:00	0.00	0.00	0.37	0.47	0.65	0.57	0.69	0.64	0.91
	2:25:00	0.00	0.00	0.26	0.32	0.45	0.39	0.48	0.44	0.63
	2:30:00	0.00	0.00	0.17	0.21	0.31	0.27	0.33	0.31	0.43
	2:35:00	0.00	0.00	0.11	0.14	0.20	0.18	0.22	0.20	0.29
	2:40:00	0.00	0.00	0.07	0.09	0.12	0.11	0.13	0.12	0.17
	2:45:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.06	0.08
	2:50:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix F:

Drainage Maps





KEY MAP
SCALE: N.T.S

LEGEND

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING TERTIARY DRAINAGE WAY
- EXISTING STORM INFRASTRUCTURE
- PROPOSED PARCEL BOUNDARY
- BASIN BOUNDARY
- B.S.C. - C.C. BASIN DELINEATION
- EXISTING FLOW DIRECTION
- DESIGN POINT
- EXISTING BASIN LABEL
- 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	EX1	4.3	24.9	12.4	4.23
2	EX2	0.3	2.2	0.8	2.00
3	EX3	0.6	4.3	1.5	2.00
4	EX4	4.3	31.4	16.5	2.00
5	EX5	2.0	14.6	6.4	2.00
5.1	EX5.1	0.8	5.7	3.3	2.00
6	EX6	3.9	28.8	13.7	2.00
7	EX7 & DP26	22.7	150.9	83.6	2.70
8	EX8 & DP27	23.2	144.5	78.0	3.39
9	EX9	6.0	44.2	21.7	2.00
10	EX10 & DP28	10.5	70.3	32.9	2.76
11	EX11 & DP29	42.5	235.3	127.6	4.83
12	EX12	6.8	49.6	27.5	2.00
13	EX13	5.4	39.8	20.0	2.00
14	EX14 & 1/3RD OS9	12.4	41.0	15.3	20.02
15	EX15 & 1/3RD OS9	30.7	175.3	93.3	4.96
16	EX16	2.3	16.6	8.0	2.00
17	EX17	4.4	32.3	15.6	2.00
18	OS5, DP9, 16, 10	23.5	165.9	82.6	1.39
19	EX18, EX19, DP31	7.0	203.7	368.0	3.65
20	EX20 & DP15	34.9	205.9	108.2	1.94
21	EX21 & DP14	26.6	144.9	63.8	1.90
22	EX22	6.7	49.3	24.6	2.00
23	EX23, DP13 &32	65.9	443.4	184.4	2.00
24	EX24	3.3	24.0	17.3	2.00
25	EX25	11.2	82.1	42.7	2.00
26	OS1	7.9	42.7	19.0	5.06
27	OS2	13.5	73.4	36.4	4.99
28	OS3	8.2	53.9	25.3	2.99
29	OS4	28.8	134.6	72.3	7.00
30	OS8	3.8	4.4	20.1	2.00
31	OS6, DP7, 8, 17, 18, 30	101.6	616.8	357.3	3.70
32	OS5	16.2	78.3	41.2	6.47

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
EX1	12.4	4.2	0.11	0.37	4.3	24.9
EX2	0.8	2.0	0.08	0.35	0.3	2.2
EX3	1.5	2.0	0.08	0.35	0.6	4.3
EX4	16.5	2.0	0.08	0.35	4.3	31.4
EX5	6.4	2.0	0.08	0.35	2.0	14.6
EX5.1	3.3	2.0	0.08	0.35	0.8	5.7
EX6	13.7	2.0	0.08	0.35	3.9	28.8
EX7	64.7	2.0	0.08	0.35	14.7	108.1
EX8	41.6	2.0	0.08	0.35	9.7	71.1
EX9	21.7	2.0	0.08	0.35	6.0	44.2
EX10	7.6	2.0	0.08	0.35	2.2	16.4
EX11	55.3	2.0	0.08	0.35	13.7	100.7
EX12	27.5	2.0	0.08	0.35	6.8	49.6
EX13	20.0	2.0	0.08	0.35	5.4	39.8
EX14	12.2	2.0	0.08	0.35	3.3	24.2
EX15	90.1	2.0	0.08	0.35	21.6	158.5
EX16	8.0	2.0	0.08	0.35	2.3	16.6
EX17	15.6	2.0	0.08	0.35	4.4	32.3
EX18	5.4	2.0	0.08	0.35	1.4	10.4
EX19	5.4	2.0	0.08	0.35	1.5	11.3
EX20	14.9	2.0	0.08	0.35	4.2	30.5
EX21	48.4	2.0	0.08	0.35	14.1	103.8
EX22	24.6	2.0	0.08	0.35	6.7	49.3
EX23	164.4	2.0	0.08	0.35	44.3	325.4
EX24	17.3	2.0	0.08	0.35	3.3	24.0
EX25	42.7	2.0	0.08	0.35	11.2	82.1
OS1	19.0	5.1	0.12	0.37	7.9	42.7
OS2	36.4	5.0	0.12	0.37	13.5	73.4
OS3	25.3	3.0	0.09	0.36	8.2	53.9
OS4	72.3	7.0	0.14	0.39	28.8	134.6
OS5	41.2	6.5	0.13	0.39	16.2	78.3
OS6	77.4	2.6	0.09	0.35	14.9	102.0
OS7	20.1	2.0	0.08	0.35	4.7	34.9
OS8	19.1	25.5	0.28	0.50	3.8	4.4
OS9	9.4	90.2	0.82	0.90	27.4	50.6
TOTAL ONSITE	741.8	2.04%	0.08	0.35	192.9	1410.0
TOTAL OFFSITE	320.1	8.44%	0.14	0.39	125.5	574.7
TOTAL	1062.0	3.97%	0.10	0.36	318.5	1984.7

PCD FILE NO.: PUDSP234

DRAWN BY: YOU JOB DATE: 3/6/2024
APPROVED: KEN JOB NUMBER: 211030
CAD DATE: 3/6/2024
CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\PDR\Ex_Drainage_Map_1030

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

NO.	DATE	BY	REVISION DESCRIPTION

HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

PRELIMINARY DRAINAGE REPORT
EXISTING CONDITIONS

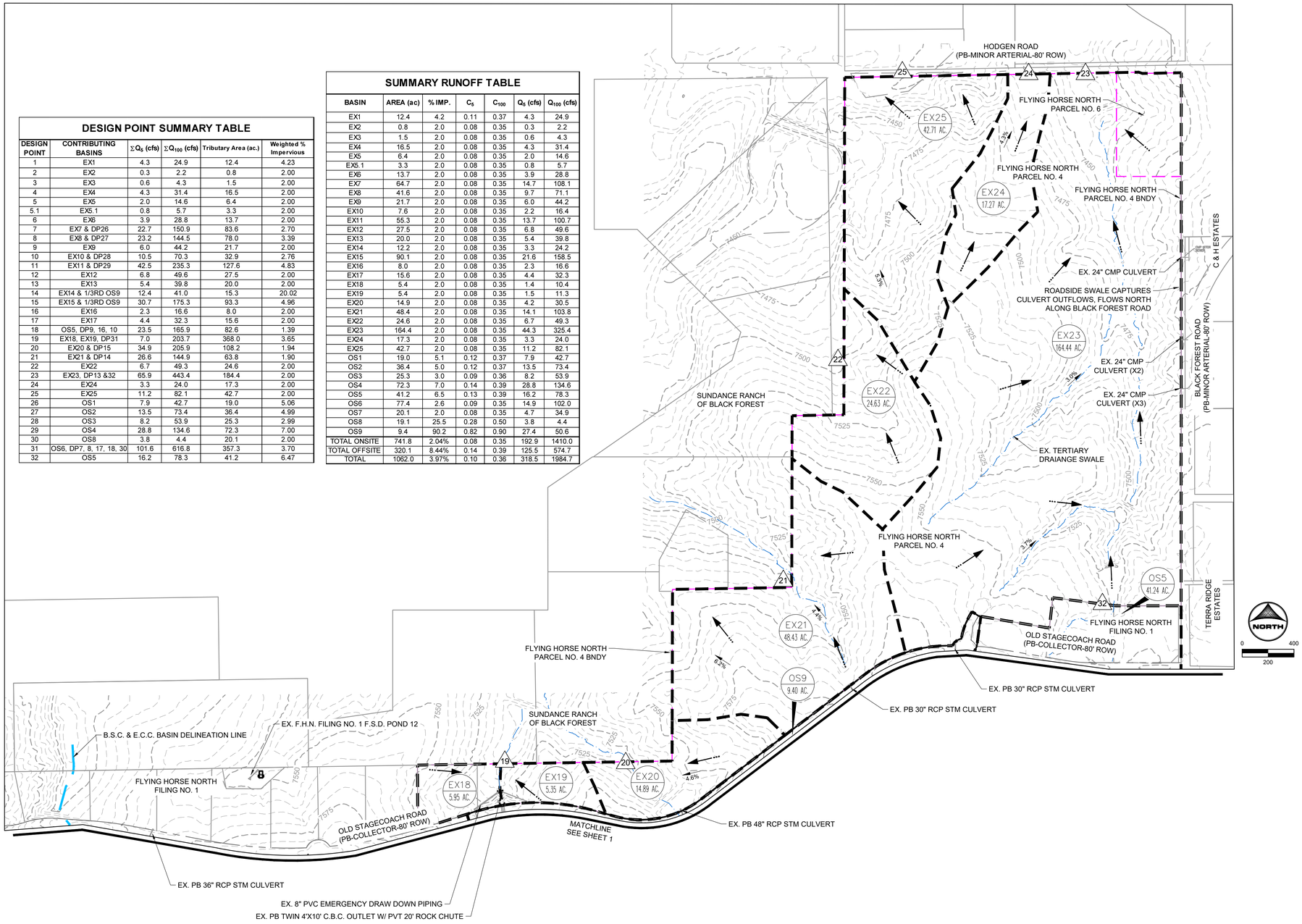
SHEET EX 1

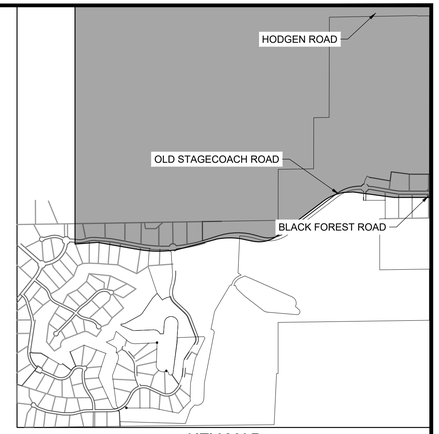
DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	EX1	4.3	24.9	12.4	4.23
2	EX2	0.3	2.2	0.8	2.00
3	EX3	0.6	4.3	1.5	2.00
4	EX4	4.3	31.4	16.5	2.00
5	EX5	2.0	14.6	6.4	2.00
5.1	EX5.1	0.8	5.7	3.3	2.00
6	EX6	3.9	28.8	13.7	2.00
7	EX7 & DP26	22.7	150.9	83.6	2.70
8	EX8 & DP27	23.2	144.5	78.0	3.39
9	EX9	6.0	44.2	21.7	2.00
10	EX10 & DP28	10.5	70.3	32.9	2.76
11	EX11 & DP29	42.5	235.3	127.6	4.83
12	EX12	6.8	49.6	27.5	2.00
13	EX13	5.4	39.8	20.0	2.00
14	EX14 & 1/3RD OS9	12.4	41.0	15.3	20.02
15	EX15 & 1/3RD OS9	30.7	175.3	93.3	4.96
16	EX16	2.3	16.6	8.0	2.00
17	EX17	4.4	32.3	15.6	2.00
18	OS5, DP9, 16, 10	23.5	165.9	82.6	1.39
19	EX18, EX19, DP31	7.0	203.7	368.0	3.65
20	EX20 & DP15	34.9	205.9	108.2	1.94
21	EX21 & DP14	26.6	144.9	63.8	1.90
22	EX22	6.7	49.3	24.6	2.00
23	EX23, DP13 &32	65.9	443.4	184.4	2.00
24	EX24	3.3	24.0	17.3	2.00
25	EX25	11.2	82.1	42.7	2.00
26	OS1	7.9	42.7	19.0	5.06
27	OS2	13.5	73.4	36.4	4.99
28	OS3	8.2	53.9	25.3	2.99
29	OS4	28.8	134.6	72.3	7.00
30	OS8	3.8	4.4	20.1	2.00
31	OS6, DP7, 8, 17, 18, 30	101.6	616.8	357.3	3.70
32	OS5	16.2	78.3	41.2	6.47

SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
EX1	12.4	4.2	0.11	0.37	4.3	24.9
EX2	0.8	2.0	0.08	0.35	0.3	2.2
EX3	1.5	2.0	0.08	0.35	0.6	4.3
EX4	16.5	2.0	0.08	0.35	4.3	31.4
EX5	6.4	2.0	0.08	0.35	2.0	14.6
EX5.1	3.3	2.0	0.08	0.35	0.8	5.7
EX6	13.7	2.0	0.08	0.35	3.9	28.8
EX7	64.7	2.0	0.08	0.35	14.7	108.1
EX8	41.6	2.0	0.08	0.35	9.7	71.1
EX9	21.7	2.0	0.08	0.35	6.0	44.2
EX10	7.6	2.0	0.08	0.35	2.2	16.4
EX11	55.3	2.0	0.08	0.35	13.7	100.7
EX12	27.5	2.0	0.08	0.35	6.8	49.6
EX13	20.0	2.0	0.08	0.35	5.4	39.8
EX14	12.2	2.0	0.08	0.35	3.3	24.2
EX15	90.1	2.0	0.08	0.35	21.6	158.5
EX16	8.0	2.0	0.08	0.35	2.3	16.6
EX17	15.6	2.0	0.08	0.35	4.4	32.3
EX18	5.4	2.0	0.08	0.35	1.4	10.4
EX19	5.4	2.0	0.08	0.35	1.5	11.3
EX20	14.9	2.0	0.08	0.35	4.2	30.5
EX21	48.4	2.0	0.08	0.35	14.1	103.8
EX22	24.6	2.0	0.08	0.35	6.7	49.3
EX23	164.4	2.0	0.08	0.35	44.3	325.4
EX24	17.3	2.0	0.08	0.35	3.3	24.0
EX25	42.7	2.0	0.08	0.35	11.2	82.1
OS1	19.0	5.1	0.12	0.37	7.9	42.7
OS2	36.4	5.0	0.12	0.37	13.5	73.4
OS3	25.3	3.0	0.09	0.36	8.2	53.9
OS4	72.3	7.0	0.14	0.39	28.8	134.6
OS5	41.2	6.5	0.13	0.39	16.2	78.3
OS6	77.4	2.6	0.09	0.35	14.9	102.0
OS7	20.1	2.0	0.08	0.35	4.7	34.9
OS8	19.1	25.5	0.28	0.50	3.8	4.4
OS9	9.4	90.2	0.82	0.90	27.4	50.6
TOTAL ONSITE	741.8	2.04%	0.08	0.35	192.9	1410.0
TOTAL OFFSITE	320.1	8.44%	0.14	0.39	125.5	574.7
TOTAL	1062.0	3.97%	0.10	0.36	318.5	1984.7





KEY MAP
SCALE: N.T.S

LEGEND

- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- EXISTING TERTIARY DRAINAGE WAY
- EXISTING STORM INFRASTRUCTURE
- PROPOSED PARCEL BOUNDARY
- BASIN BOUNDARY
- B.S.C. - C.C. BASIN DELINEATION
- EXISTING FLOW DIRECTION
- DESIGN POINT
- EXISTING BASIN LABEL — 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

PCD FILE NO.: PUDSP234

DRAWN BY: DLH	JOB DATE: 3/6/2024	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
APPROVED: KMH	JOB NUMBER: 211030	0 1"	
CAD DATE: 3/6/2024		IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\PDR\Ex_Drainage_Map_1030			

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

PRELIMINARY DRAINAGE REPORT
EXISTING CONDITIONS

SHEET EX

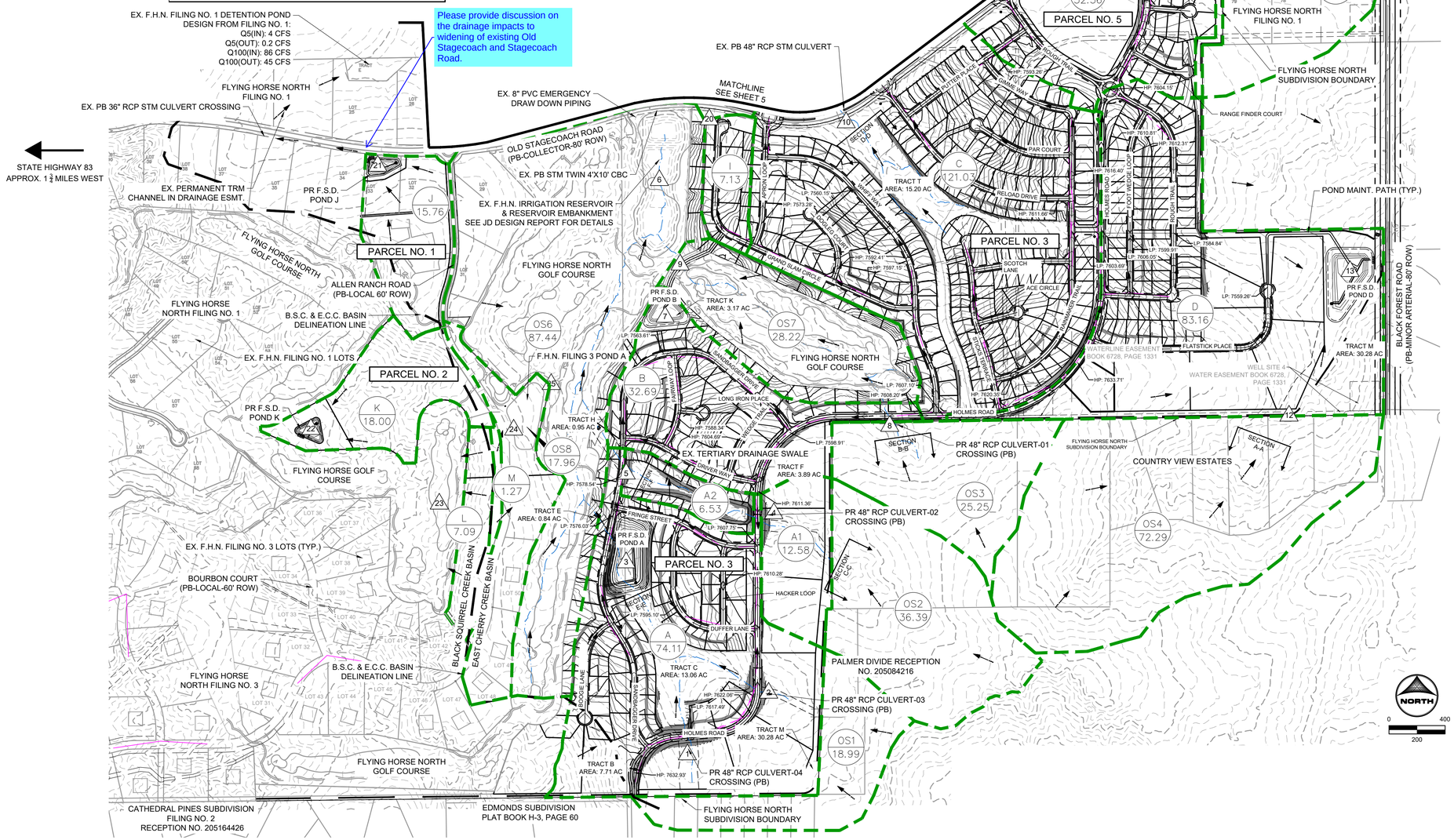
2

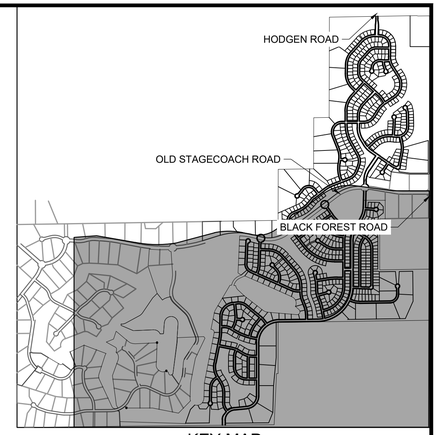
SUMMARY RUNOFF TABLE

BASIN	AREA (ac)	% IMP.	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)
A	74.1	15.0	0.17	0.42	38.9	161.6
A1	12.6	7.0	0.14	0.39	6.0	29.0
A2	6.5	13.1	0.15	0.40	3.4	15.3
B	32.7	24.1	0.22	0.45	24.6	86.1
C	121.0	31.6	0.26	0.47	81.4	251.4
D	86.2	26.8	0.23	0.45	54.8	177.1
E	52.4	43.7	0.37	0.55	67.7	171.0
F	197.5	15.7	0.19	0.43	95.9	366.3
G	27.3	16.4	0.16	0.41	16.4	68.4
H	74.0	7.0	0.14	0.39	37.6	180.4
I	7.1	26.4	0.23	0.46	6.1	20.7
J	15.8	86.1	0.74	0.83	59.8	112.4
K	18.0	86.0	0.74	0.83	64.4	121.2
L	7.1	57.8	0.52	0.67	19.0	41.1
M	1.3	57.8	0.52	0.67	2.5	5.5
OS1	19.0	2.0	0.08	0.35	5.6	41.3
OS2	36.4	2.0	0.08	0.35	9.2	67.9
OS3	25.3	2.0	0.08	0.35	6.8	49.9
OS4	72.3	2.0	0.08	0.35	18.3	134.5
OS5	41.2	6.5	0.13	0.39	15.9	78.8
OS6	87.4	4.0	0.09	0.36	20.3	132.5
OS7	28.2	8.2	0.12	0.38	10.6	57.7
OS8	18.0	23.1	0.24	0.47	3.8	4.4
TOTAL ONSITE	747.3	24.5%	0.24	0.46	578.5	1807.6
TOTAL OFFSITE	317.7	4.9%	0.10	0.38	90.6	566.8
TOTAL	1061.3	18.6%	0.20	0.43	669.0	2374.4

CUMULATIVE DESIGN POINT SUMMARY TABLE

DESIGN POINT	CONTRIBUTING BASINS	ΣQ_5 (cfs)	ΣQ_{100} (cfs)	Tributary Area (ac.)	Weighted % Impervious
1	A, OS1 (portions)	14.5	69.1	31.7	11.1%
2	A, OS1 (portions)	14.5	69.1	31.7	11.1%
3	A, OS1	44.5	202.8	93.1	12.3%
4	A1, OS2	15.3	96.9	49.0	3.3%
5	A1, A2, OS2	18.7	112.2	55.5	4.4%
6	A1, A2, I, OS2, OS3, OS6, OS7 + Outlet Q's of A, B, Pond A (Fil. 3)	69.4	448.3	221.5	5.2%
7	B	24.6	86.1	32.7	24.1%
8	OS3	6.8	49.9	25.3	2.0%
9	OS3, OS7	17.4	107.6	53.5	4.7%
10	C	81.4	251.4	121.0	31.6%
11	C	81.4	251.4	121.0	31.6%
12	OS4	18.3	134.5	72.3	2.0%
13	D, OS4	73.1	311.6	158.5	15.5%
14	E (portion)	33.8	85.5	26.2	43.7%
15	E	67.7	171.0	52.4	43.7%
16	OS5	15.9	78.8	41.2	6.5%
17	F, OS5	111.8	445.1	238.7	14.1%
18	G	16.4	68.4	27.3	16.4%
19	H	37.6	180.4	74.0	7.0%
20	I	6.1	20.7	7.1	26.4%
21	J	59.8	112.4	15.8	86.1%
22	K	64.4	121.2	18.0	86.0%
23	L	19.0	41.1	7.1	57.8%
24	M	2.5	5.5	1.3	57.8%
25	OS8	3.8	4.4	18.0	23.1%





KEY MAP
SCALE: N.T.S

LEGEND:

- PROPOSED MAJOR CONTOUR (5250)
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR (5250)
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- BASIN BOUNDARY
- PARCEL BOUNDARY
- FEMA FLOODPLAIN
- PROPOSED FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL (11 / 1.25) — BASIN DESIGNATION / AREA (AC.)

PCD FILE NO.: PUDSP234

DRAWN BY: DLH | JOB DATE: 3/6/2024
APPROVED: KEN | JOB NUMBER: 211030
CAD DATE: 3/6/2024
CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\PDR\Pr_Drainage_Map_Parcels 1-6

BAR IS ONE INCH ON OFFICIAL DRAWINGS. IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

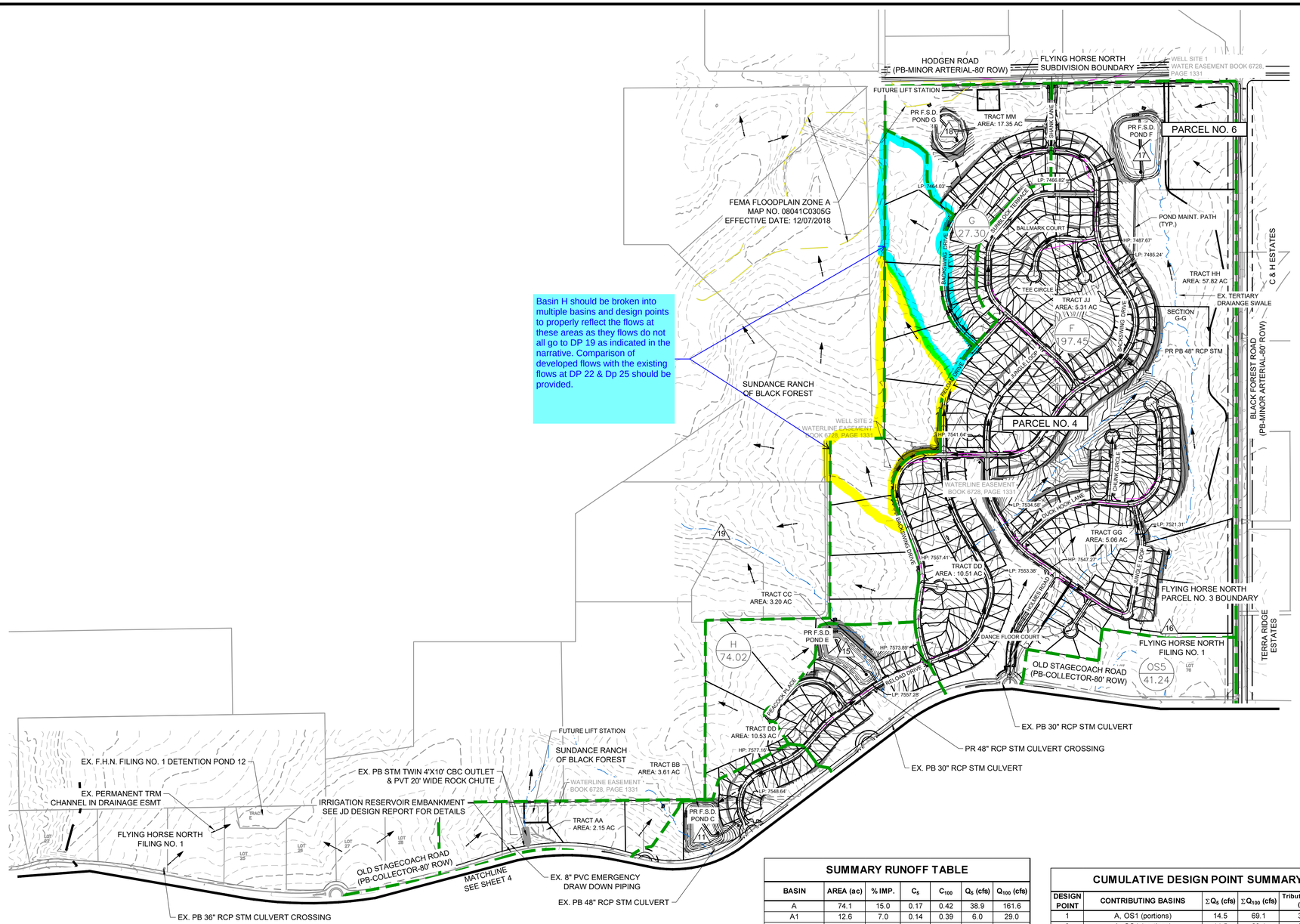
NO.	DATE	BY	REVISION DESCRIPTION

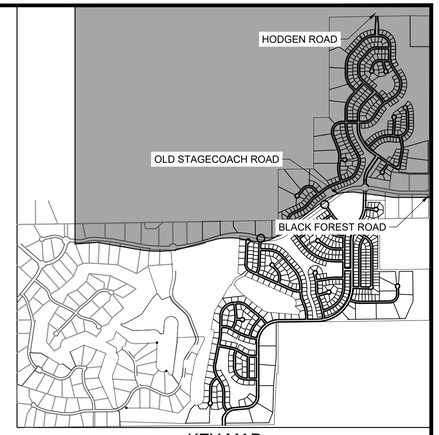
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

PROPOSED DRAINAGE CONDITIONS
PROPOSED DRAINAGE CONDITIONS

SHEET PR 4





KEY MAP
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D	86.2	26.8	0.23	0.45	54.8	177.1
E	52.4	43.7	0.37	0.55	67.7	171.0
F	197.5	15.7	0.19	0.43	95.9	366.3
G	27.3	16.4	0.16	0.41	16.4	68.4
H	74.0	7.0	0.14	0.39	37.6	180.4
I	7.1	26.4	0.23	0.46	6.1	20.7
J	15.8	86.1	0.74	0.83	59.8	112.4
K	18.0	86.0	0.74	0.83	64.4	121.2
L	7.1	57.8	0.52	0.67	19.0	41.1
M	1.3	57.8	0.52	0.67	2.5	5.5
OS1	19.0	2.0	0.08	0.35	5.6	41.3
OS2	36.4	2.0	0.08	0.35	9.2	67.9
OS3	25.3	2.0	0.08	0.35	6.8	49.9
OS4	72.3	2.0	0.08	0.35	18.3	134.5
OS5	41.2	6.5	0.13	0.39	15.9	78.8
OS6	87.4	4.0	0.09	0.36	20.3	132.5
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2	A, OS1 (portions)	14.5	69.1	31.7	11.1%
3	A, OS1	44.5	202.8	93.1	12.3%
4	A1, OS2	15.3	96.9	49.0	3.3%
5	A1, A2, OS2	18.7	112.2	55.5	4.4%
6	A1, A2, I, OS2, OS3, OS6, OS7 + Outlet Q's of A, B, Pond A (Fil. 3)	69.4	448.3	221.5	5.2%
7	B	24.6	86.1	32.7	24.1%
8	OS3	6.8	49.9	25.3	2.0%
9	OS3, OS7	17.4	107.6	53.5	4.7%
10	C	81.4	251.4	121.0	31.6%
11	C	81.4	251.4	121.0	31.6%
12	OS4	18.3	134.5	72.3	2.0%
13	D, OS4	73.1	311.6	158.5	15.5%
14	E (portion)	33.8	85.5	26.2	43.7%
15	E	67.7	171.0	52.4	43.7%
16	OS5	15.9	78.8	41.2	6.5%
17	F, OS5	111.8	445.1	238.7	14.1%
18	G	16.4	68.4	27.3	16.4%
19	H	37.6	180.4	74.0	7.0%
20	I	6.1	20.7	7.1	26.4%
21	J	59.8	112.4	15.8	86.1%
22	K	64.4	121.2	18.0	86.0%
23	L	19.0	41.1	7.1	57.8%
24	M	2.5	5.5	1.3	57.8%
25	OS8	3.8	4.4	18.0	23.1%

LEGEND:

- PROPOSED MAJOR CONTOUR — 5250
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR — 5250
- EXISTING MINOR CONTOUR
- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- EXISTING DRAINAGE SWALE
- PROPOSED DRAINAGE SWALE
- EXISTING TERTIARY DRAINAGE WAY
- BASIN BOUNDARY
- PARCEL BOUNDARY
- FEMA FLOODPLAIN
- PROPOSED FLOW DIRECTION
- PROPOSED DRAINAGE BASIN
- DESIGN POINT
- PROPOSED BASIN LABEL — 11 / 1.25 — BASIN DESIGNATION / AREA (AC.)

PCD FILE NO.: PUDSP234

DRAWN BY: DLH JOB DATE: 3/6/2024
APPROVED: KEN JOB NUMBER: 211030
CAD DATE: 3/6/2024
CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\PDR\Pr_Drainage_Map_Parcels 1-6

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

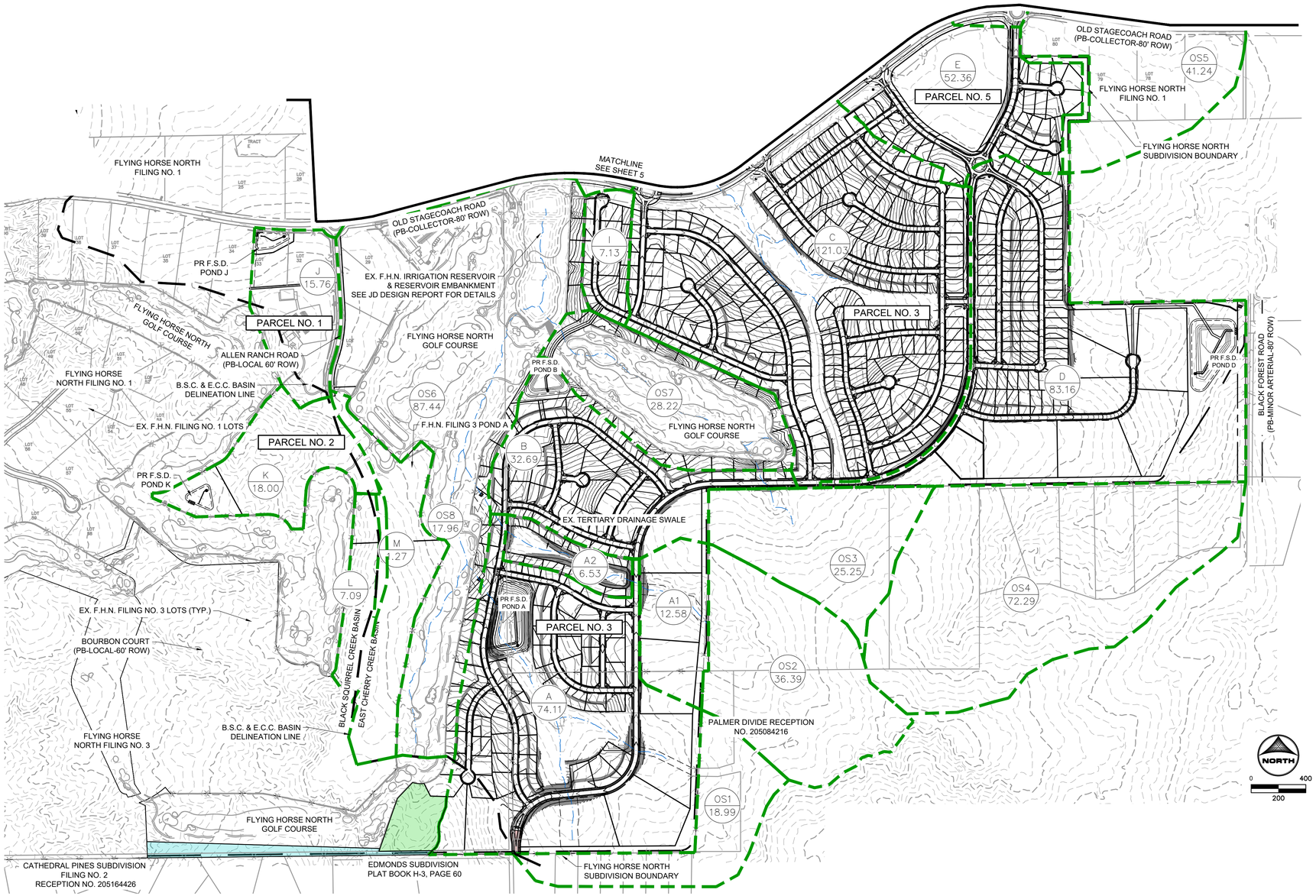
NO.	DATE	BY	REVISION DESCRIPTION

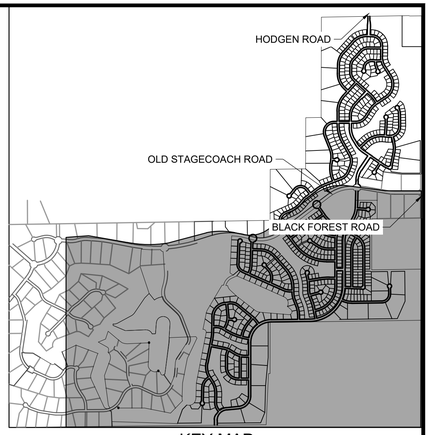
HR GREEN - COLORADO SPRINGS
1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
FAX: 713.965.0044

FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

PROPOSED DRAINAGE CONDITIONS
PROPOSED DRAINAGE CONDITIONS

SHEET PR 5





KEY MAP
SCALE: N.T.S

LEGEND:

PROPOSED MAJOR CONTOUR	5250
PROPOSED MINOR CONTOUR	
EXISTING MAJOR CONTOUR	5250
EXISTING MINOR CONTOUR	
PROPOSED STORM SEWER	
EXISTING STORM SEWER	
EXISTING DRAINAGE SWALE	
PROPOSED DRAINAGE SWALE	
EXISTING TERTIARY DRAINAGE WAY	
BASIN BOUNDARY	
PARCEL BOUNDARY	
FEMA FLOODPLAIN	
PROPOSED FLOW DIRECTION	
PROPOSED DRAINAGE BASIN	
PROPOSED BASIN LABEL	11 / 1.25 — BASIN DESIGNATION / AREA (AC.)
100% WATER QUALITY RUNOFF REDUCTION	
NO-DETENTION PROVIDED	
AREA TO REMAIN UNDEVELOPED NO-DETENTION REQUIRED	

AREAS WITH NO REQUIRED DETENTION

100% WATER QUALITY REDUNOFF REDUCTION: 75.24 ACRES

NO-DETENTION: 0.70 ACRES

AREA TO REMAIN UNDEVELOPED: 3.56 ACRES

NORTH
0
400
200

PCD FILE NO.: PUDSP234

DRAWN BY: DLH	JOB DATE: 3/6/2024	BAR IS ONE INCH ON OFFICIAL DRAWINGS.	
APPROVED: RDL	JOB NUMBER: 211030	0 1"	
CAD DATE: 3/6/2024		IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.	
CAD FILE: J:\2021\211030\CAD\Dwgs\C\Drainage\PDR\Detention_Exclusion_Exhibit			

NO.	DATE	BY	REVISION DESCRIPTION

HRGreen
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1975 RESEARCH PARKWAY SUITE 230
COLORADO SPRINGS, CO 80920
PHONE: 719.300.4140
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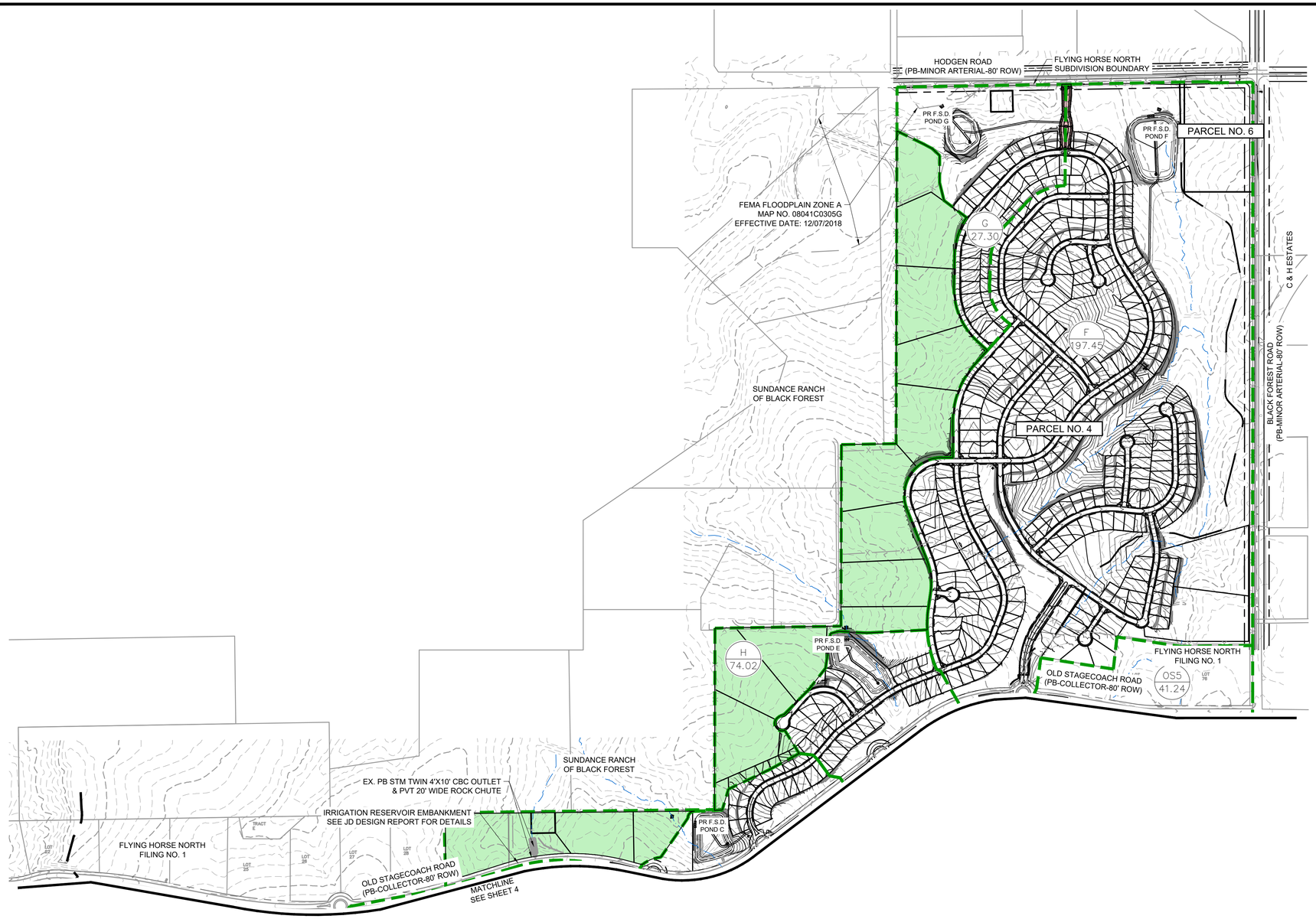
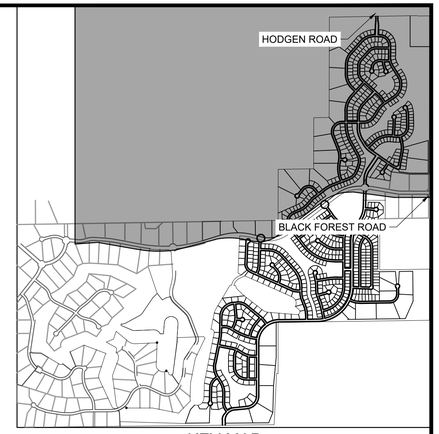
FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

NO DETENTION AREAS

DETENTION EXCLUSION EXHIBIT

SHEET EXH 1





KEY MAP
SCALE: N.T.S

LEGEND:

PROPOSED MAJOR CONTOUR	5250
PROPOSED MINOR CONTOUR	
EXISTING MAJOR CONTOUR	5250
EXISTING MINOR CONTOUR	
PROPOSED STORM SEWER	
EXISTING STORM SEWER	
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PROPOSED DRAINAGE BASIN	
PROPOSED BASIN LABEL	11 / 1.25 — BASIN DESIGNATION / AREA (AC.)
100% WATER QUALITY RUNOFF REDUCTION	
NO–DETENTION PROVIDED	
AREA TO REMAIN UNDEVELOPED NO–DETENTION REQUIRED	

AREAS WITH NO REQUIRED DETENTION

100% WATER QUALITY RUNOFF REDUCTION: 75.24 ACRES

NO-DETENTION: 0.70 ACRES

AREA TO REMAIN UNDEVELOPED: 3.56 ACRES

NORTH
0
400
200

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FLYING HORSE NORTH PHASE 2 PUD
PRI #2, LLC.
EL PASO COUNTY, CO

NO DETENTION AREAS

DETENTION EXCLUSION EXHIBIT

SHEET EXH 2