Marksheffel Road – Segment M3 CDRs

Final Drainage Report

PCD File No: CDR2413

All Terrain Engineering Project No: 24013

November 2026

PREPARED FOR:

Turkey Canon Quarry Inc

Contact: James Morley

20 Boulder Crescent Street, Suite 200

Colorado Springs, CO 80903

PREPARED BY:

All Terrain Engineering LLC

Contact: Ryan Burns

rburns@allterraineng.com

ENGINEER'S STATEMENT

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

_____

Ryan Burns, PE Date

State of Colorado No. 54412

For and on behalf of All Terrain Engineering LLC

DEVELOPER'S STATEMENT

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

Business Name: Turkey Canon Quarry Inc

By: James Morley

Title: Manager

Address: 20 Boulder Crescent Street, Suite 200, Colorado Springs, CO 80903

EL PASO COUNTY STATEMENT

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

_____

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

Conditions:

Table of Contents

I. General Purpose, Location & Description 2
II. Drainage Basins 3
III. Drainage Design Criteria 9
IV. Drainage Facility Design 10
V. Summary 14
VI. References 14

Appendices

A. Vicinity Map, FEMA Map, NRCS Soil Survey & NOAA Atlas 14
B. Hydrologic Analysis
C. Hydraulic Analysis
D. Water Quality & Detention
E. Reference Material
F. Drainage Maps

I. General Purpose, Location & Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for Marksheffel Road – Segment M3 CDRs is to describe the site's onsite and offsite drainage patterns, existing and proposed storm infrastructure, and to safely route developed stormwater to adequate outfalls. This report also supports the construction of future public roadways, Marksheffel & Brushtop Roads, associated utilities and stormwater infrastructure to support future development. No development is proposed with this report, except for the infrastructure described above.

b. Location

The Schmidt Parcel (hereby referred to as the "site") is a collection of undeveloped parcels with a total area of approximately 98 acres, consisting of (4) Parcels per the EPC Assessor, including parcel # 5200000577, owned by Turkey Canon Quarry Inc., parcel #'s 5200000575 & 5200000576, owned by SRW Residential Partners LP LTD., and parcel # 5200000570 owned by Steve Martin.

The site is in the south half of Section 32, Township 12 South, Range 65 West of the Sixth Principal Meridian in the County of El Paso, State of Colorado. The site is located to the west of Vollmer Road and Marksheffel Road intersection. The site is bound by Holiday Hills Filing No.1 to the north, by Vollmer Road to the east, by the Trails at Forest Meadows Filing No. 3 & 4 to the south, and by Black Forest Road, Cottonwood Creek, and Parcel # 520000056 (8585 Black Forest Road to the west. The parcel is planned to be platted after approval of the "Schmidt PUD Preliminary Plan. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 98 acres of undeveloped land with existing vegetation consisting of native grasses. The total disturbance area associated with this FDR is 51.55 acres. A drainage swale exists along the eastern and southern border of the site which intercepts runoff and carries it off-site to the west towards Cottonwood Creek. An existing sediment basin installed with ECP project # CDR22-007 currently intercepts flows and releases them to Cottonwood Creek. The site generally slopes from North to South at 2-4%.

The proposed improvements include overlot grading, construction of Marksheffel Road from Vollmer Road to proposed Brushtop Road, an extension of Brushtop Road from its current terminus at the site's southern border to proposed Marksheffel Road, and storm drainage improvements to support the road construction and future development of on-site parcels 5200000575 & 5200000576 and areas east of Brushtop Road. Water and wastewater infrastructure will also be constructed with this project to support future development. It is assumed that approximately 29 acres of the site (parcels 5200000575 & 5200000576) will be developed as multi-family residential in the future. Areas west of Brushtop Road are also assumed to be developed into single family and single family attached residential in the future, and will be detailed in the forth-coming "Schmidt PUD Preliminary Plan". The remainder of the site will be Public R.O.W. for Brushtop Road and Marksheffel Road, and a tract for a storm infrastructure and water quality pond (Pond E). Pond E, is sized to support the proposed construction within the CDR submittal this FDR supports, and is considered an interim condition until any of the vacant land develops. Any future development will require a site-specific FDR/drainage report, pond modifications, and additional storm/drainage infrastructure.

Per a NRCS soil survey, the site is made up of Blakeland loamy sands and Columbine gravelly sandy loam, which are classified as a Group A soils. Group A soils have a high infiltration rate when thoroughly wet and have a high rate of water transmission. The NRCS soil survey is presented in Appendix A.

There are no known irrigation facilities located on the project site.

d. Floodplain Statement

Based on the FEMA Firm Map Number 08041C0529G, revised December 7, 2018, the proposed site is located within Zone X. Zone X is defined as areas outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. A FEMA panel for the site is presented in Appendix A.

II. Drainage Basins

a. Major Basin Description

The site lies within the Sand Creek and Cottonwood Creek major Drainage Basins. According to FEMA FIRM 08041C0529G a portion of site lies within the existing Zone AE 100-yr flood plain. It should also be noted that as part of the Colorado Spring Black Forest Road Widening Project, a LOMR application was submitted to FEMA under case # 23-08-0623X, but is currently under review.

Based upon the Sand Creek and Cottonwood Creek Drainage Basin Planning Studies, the site falls within each basin. The site was an active quarry in the past and a berm was constructed along the southern border, which intercepted the majority of overland flows, and directed them to Cottonwood Creek, or a low point roughly located where the existing sediment basin is located per # CDR22-007, which also discharges to Cottonwood Creek. Recent site visits have confirmed that the majority of the flows that did not infiltrate into the ground, were tributary to Cottonwood Creek and according to the Master Development Drainage Plan Update for Woodmen Heights Developed Drainage and the various Trails at Forest Meadows FDR's, this condition has been present since the early 2000's.

For this reason there is some discrepancy in past reports regarding the exact split between the basins. Prior project, CDR22-007 also altered surface drainage patterns on-site and changed the receiving waters for a portion of the site. Prior surrounding developments also appear to deviate from the County's DBPS basin lines. Therefore, a major drainage basin line for the split between these two basins is shown on the existing and proposed drainage maps and is based upon our best understanding of historic topography, available infrastructure, and existing off-site drainage patterns. Additional references regarding the major basin split are included in Appendix E.

In the site's existing condition, approximately 64 acres of the site that is identified as tributary to Sand Creek in the County's Sand Creek DBPS, drains to Cottonwood Creek instead. However, after the proposed improvements are constructed, only 37 acres of those 64 will continue to drain to Cottonwood Creek, while the remaining 27 acres will be re-routed to Sand Creek. The remainder of the site lies within the Cottonwood Creek Drainage Basin. The proposed Cottonwood Creek-Sand Creek Drainage Basin line is presented on the

drainage maps in Appendix F and Appendix E contains exhibits and a narrative further explaining the sites drainage patterns in relation to the two major basins as well as prior reports.

Cottonwood Creek is located to the west of the site and runs from north to south. The reach that runs to the west of the site was studied in the Colorado Springs, "Cottonwood Creek Drainage Basin Planning Study" (Cottonwood DBPS) completed by Matrix Design Group in July 2019. According to the Cottonwood Creek DBPS, reach RUC160 runs west of the site and has been identified as being in stable condition. Cottonwood Creek was also studied in the June 1994, "Cottonwood Creek Drainage Basin Planning Study" by URS Consultants, and identified the on-site reach as the segment between Design Points 6 & 7. The study characterized the reach as a naturalized channel with ecological value including wetlands and riparian vegetation.

The channel will be analyzed for stability and required improvements with the forthcoming Schmidt PUD and Preliminary Plan and any required creek improvements will be identified with that project.

The Sand Creek Basin was studied many times over the years by various companies and in various reports. One of the most recent reports adopted by the County is the "Master Development Drainage Plan Amendment for Sterling Ranch" prepared by JR Engineering in March 2023. This report did not include the subject site in the in the Sand Creek Basin, and neither did the original 2018 "Sterling Ranch Master Development Drainage Plan" prepared by M&S in 2018. Although not adopted by the County, the site was partially included in the "Sand Creek Drainage Basin Planning Study" (Sand DBPS) completed by Stantec in January 2021, however it only showed approximately 17 acres of the eastern most portion of the site as tributary to Sand Creek. The Stantec Sand Creek DBPS assumed the Schmidt Parcel property to have an "Open Space" use which is consistent with the property at this time and the Basin line they showed is generally consistent with the existing site topography and drainage patterns.

b. Existing Subbasin Description

The existing condition describes the current state of the site after the early grading for the Schmidt Parcel. The existing condition consists of six on-site basins and one off-site basin. The existing sub-basin delineation is shown on the drainage map within Appendix F and is described as follows:

Basin OSI4 is 27.16 acres of Silver Ponds Subdivision Filing 1 & the existing Colorado Springs R.O.W. reserved for the future Marksheffel Road extension. Values for this basin were taken from "Silver Ponds Subdivision Filing No.1 Final Drainage Report". Runoff from this basin (Q_5=19.0 cfs, Q_{100}=44.2 cfs) flows south and is intercepted by the existing swale/berm that directs runoff around the site. Flows are diverted to the west towards DPI4 and enter Cottonwood Creek.

Basin EXA is 0.25 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.0 cfs, Q_{100}=0.3 cfs) flows along the berm west and enters an existing swale at DP1 and flows offsite and into basin OSI4. Flows in the existing swale combine with a portion of Basin OSI4 at DP14 (Q_5 = 19.0 cfs, Q_{100} = 44.2 cfs) and direct flows to the west towards Cottonwood Creek.

Basin EXB is 1.51 acres of an existing berm with stabilized vegetation, and includes a portion of the "Tahiti Road" R.O.W. Although the R.O.W. exists, the road is shut down and no longer active and generally consists of only a dirt 2-track or varying width drive. Runoff from this basin (Q_5=0.6 cfs, Q_{100}=2.4 cfs) flows east along the berm and enters existing dual 48" RCP culverts at DP2. Culvert flows are directed south along Vollmer Road. There is no drainage infrastructure downstream, therefore; runoff that enters Vollmer Road right-of-way (R.O.W.) flows per existing drainage patterns southeast towards Sand Creek.

Basin EXC is 11.5 acres of native and stabilized vegetation except for a temporary vehicle tracking pad and access that was installed with the CDR22-007 project. Runoff from this basin (Q_5=2.0 cfs, Q_{100}=13.2 cfs) flows overland southeast and enters an existing swale also installed with the CDR22-007 project. The existing swale enters Basin EXD at DP3 and follows the drainage patterns of that Basin EXD.

Basin EXD is 21.8 acres of native and stabilized vegetation. Runoff from this basin (Q_5=3.7 cfs, Q_{100}=23.3 cfs) flows overland southwest and enters an existing swale at DP4. Flows from DP3 and DP4 combine at DP4.1 (Q_5=5.5 cfs, Q_{100}=35.6 cfs) and are conveyed via an existing swale through Basin EX-G and towards the existing Temporary Sediment Basin. The sediment basin outfalls to Cottonwood Creek at DP7.1. See Basin EXG description below.

Basin EXE is 3.96 acres of undeveloped land with native vegetation. Runoff from this basin (Q_5=0.9 cfs, Q_{100}=5.7 cfs) flows overland southeast to DP5, where flow enters Vollmer Road R.O.W. There is no drainage infrastructure downstream, therefore; runoff that enters Vollmer Road R.O.W flows per existing drainage patterns southeast towards Sand Creek.

Basin EXF is 2.58 acres of native and stabilized vegetation. Runoff from this basin (Q_5=0.6 cfs, Q_{100}=4.1 cfs) flows overland south to DP6. Basin EXF overland flows south to Trails at Forest Meadows Filing No. 3. Basin EXF flow was accounted for in "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR) as Basins OS2 and OS3. Basin OS2 and OS3 total 1.56 acres and have a total flow of Q_5=1.0 cfs and Q_{100}=3.6 cfs.

Basin EXG is 39.7 acres of native and stabilized vegetation, although, disturbance from the CDR22-007 project may be present at the time of writing this report. Runoff from this basin (Q_5=4.9 cfs, Q_{100}=32.9 cfs) flows overland southwest and enters an existing sediment basin installed with the CDR22-007 project, at DP7. Flows are then either released through the sediment basin outlet, to DP7.1 or over-top the spillway, and flow to DP7.1 (Q5 = 9.2 cfs, Q100 = 60.8 cfs), where they combine with flows from DP4.1 and enter Cottonwood Creek and continue off-site. Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994.

Historically, this basin flowed to a low point in roughly the same location as the existing sediment basin and flows either infiltrated or over-topped the low-point and entered Cottonwood Creek. The site was previously an active quarry, and therefore the drainage patterns were altered with mining activities over the years. Construction of the Trails at Forest Meadows development to the south stated that the construction company running the mine constructed a large berm to ensure flows did not enter the Trails Subdivision and instead were diverted west.

Basin EXI is 10.3 acres of native and stabilized vegetation, including wetland and riparian vegetation within the Cottonwood Creek Flood Plain. Runoff from this basin (Q_5=2.4 cfs, Q_{100}=16.3 cfs) flows overland south and towards Cottonwood Creek. Flows enter the Creek and combine with flows from upstream and DP7.1 flows and continue south off-site. Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994.

Basin EXJ is 0.33 acres of native and stabilized vegetation and includes just a small sliver of land from the southern property line to the top of a small berm that keeps the majority of the site flows from entering the "Trails at Forest Meadows Filing No. 4 Subdivision. Runoff from this basin (Q_5=0.1 cfs, Q_{100}=0.5cfs) flows overland south to DP10. Flows are distributed over the length of the basin, and are not concentrated. This area was analyzed as part of Trails at Forest Meadows Filing No. 4 drainage report and was delineated as basins OS4 and Basin OS2 which had a combined flow of Q5 = 1.0 cfs & Q100 = 4.7 cfs.

c. Proposed Subbasin Description

The proposed condition consists of 17 on-site basins and 1 off-site basin. The proposed sub-basin delineation is shown on the drainage map within Appendix F and is described as follows:

Basin OSI4 is 27.16 acres of Silver Ponds Subdivision Filing 1. Values for this basin were taken from "Silver Ponds Subdivision Filing No.1 Final Drainage Report". Runoff from this basin (Q_5=19.0 cfs, Q_{100}=44.2 cfs) flows south and is intercepted by the existing swale/berm that directs runoff around the site. Flows are diverted to the west towards DP14 and enter Cottonwood Creek. Basin OSI4 will not be captured nor detained in Pond E. No exclusion is necessary for Basin OSI4 as it is an offsite, undisturbed basin shown for reference only.

Basin A is 0.25 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.1 cfs, Q_{100}=0.5 cfs) flows along the berm west and enters an existing swale at DP1 and flows offsite and into basin OSI4.Flows in the existing swale combine with a portion of Basin OSI4 at DP14 (Q_5 = 19.0 cfs, Q_{100} = 44.2 cfs) and direct flows west to Cottonwood Creek. Basin A will not be captured or detained in Pond A. Water quality is not required for Basin A per ECM Appendix I.6.1.B.7.

Basin B is 0.08 acres of an existing berm with stabilized vegetation. Runoff from this basin (Q_5=0.0 cfs, Q_{100}=0.2 cfs) flows along the berm east and enters an existing pond adjacent to Vollmer Road. Basin B will follow historic drainage patterns. Water quality is not required for Basin B per ECM Appendix I.6.1.B.7.

Basin C is 1.85 acres of undeveloped land and a portion of the north side of Marksheffel Roadway. Runoff from this basin (Q_5=2.2 cfs, Q_{100}=5.8 cfs) flows overland to the south to the CS Type 1 C&G which transports flows west to a 10' Type R sump inlet (CS Type 2 Inlet) at DP3. All flows are captured by the inlet and are piped to DP4.1 where they combine with flows Captured at DP4. This inlet was sized to capture all flow in the 5 and 100-year storm and in the event of inlet failure at DP3, the flow will overtop the roadway crown and flow either to the inlet at DP4 or south in Brushtop Road curb and gutter. See Basin D description below. WQ and detention will be provided for this basin in future detention and wq pond per PUDSP264. In the interim condition all flows will be captured in TSB A.

Basin D is 1.18 acres of proposed Marksheffel Road and proposed sidewalk. Runoff from this basin (Q_5=2.4 cfs, Q_{100}=5.3 cfs) flows toward the CS Type 1 C&G and are transported west to a 5' Type R sump inlet (CS Type 2 Inlet at DP4. All flows at DP4 are captured and piped to DP4.1(Q_5=4.3 cfs, Q_{100}=10.4 cfs), where they combine with DP3 flows. This inlet was sized to capture all flow in the 5 and 100-year storm. In the event of inlet failure at DP4, the flow will continue south in Brushtop Road curb and gutter. Flows at DP4.1 are piped to proposed TSB A (interim condition). WQ and detention will be provided for this basin in future detention and wq pond per PUDSP264. In the interim condition all flows will be captured in TSB A.

Basin F1 is 0.71 acres of the west half of Brush Top Road and sidewalk. Runoff (Q5 = 2.7 cfs & Q100 = 4.9 cfs) flows towards the EPC Type A curb and gutter and is transported south to a 15' CDOT type R on-grade inlet at design point 6. This inlet was sized to capture all flow in the 5 and 100-year storms. Captured flows are piped to DP7.1, see basin G description below. Water quality and detention for Basin F1 is provided in Interim Pond E.

Basin G is 0.7 acres of the east half of Brush Top Road and sidewalk. Runoff (Q5 = 2.7 cfs & Q100 = 4.9 cfs) flows towards the EPC Type A curb and gutter and is transported south to a 15' CDOT type R on-grade inlet at design point 7. This inlet was sized to capture all flow in the 5 and 100-year storms. Captured flows are piped to DP7.1 (Q5 = 5.3 cfs & Q100 = 9.6 cfs) and continue to Forebay W within Pond E (interim condition) and Basin F2. See basin F2 description below. Water quality and detention for Basin G is provided in Interim Pond E.

Basin F2 is 2.17 acres undeveloped open space and interim Pond E. Runoff (Q5 = 0.7 cfs & Q100 = 5.0 cfs) flows towards interim Pond E at design point 11 (Q5 = 11.8 cfs & Q100 = 50.0 cfs) where they combine with flows from DP10.1 & Basins K1 & K2. See applicable basin descriptions below. Water quality and detention for Basin F2 is provided in Interim Pond E.

Basin H is 2.92 acres of undeveloped land and open space consisting of stabilized and native vegetation. No disturbance is proposed in this basin with this project. Runoff (Q5 = 0.8 cfs & Q100 = 6.2 cfs) sheet flows south and east towards the Marksheffel and basin I boundary. Flows enter Basin I and combine with Basin I flows at DP9 (Q5 = 5.3 cfs, Q100 = 9.6 cfs). See basin I description below. Water quality and detention for Basin H is provided in Interim Pond E.
Although no development is proposed in this basin with this project, a 24" storm stub out is provided at the basins low-point and boundary with Basin I to support potential, future development. The stub will remain plugged with this project. A site specific drainage report will be required if this basin develops to confirm storm sizing and routing as well as water quality and detention requirements.

Basin I is 1.56 acres of a portion of the north side of Marksheffel Roadway. Runoff from this basin (Q_5=3.6 cfs, Q_{100}=7.4 cfs) flows to the CS Type 1 C&G which transports flows southeast to a 10' Type R sump inlet (CS Type 2 Inlet) at DP9 (Q5 = 4.2 cfs, Q100 = 13.1 cfs) where flows combine with Basin H flows. All flows are captured by the inlet and are piped to DP10.1 where they combine with flows Captured at DP10, see Basin J description below. This inlet was sized to capture all flow in the 5 and 100-year storm and in the event of inlet failure at DP9, the flow will overtop the roadway crown and flow either to the inlet at DP10 or into the Vollmer Road R.O.W and to an existing CDOT 10' Type R sump inlet. Water quality and detention for Basin I is provided in Interim Pond E.

Basin J is 1.28 acres of a portion of the south half of proposed Marksheffel Road and associated sidewalk. Runoff from this basin (Q_5=4.3 cfs, Q_{100} = 8.1 cfs) flows to the CS Type 1 C&G which transports flows southeast to a 10' Type R sump inlet (CS Type 2 Inlet) at DP10 (Q_5=4.3 cfs, Q_{100} = 8.1 cfs). Captured flows are piped to DP10.1 (Q5 = 7.8 & Q100 = 19.9 cfs) where they combine in the pipe with flows from DP9. Flows from DP10.1 continue in the pipes to Forebay E within interim Pond E, as DP11(Q5 = 11.8 cfs & Q100 = 50.0 cfs). The storm system is over-size to accommodate the potential for future developed flows. See Basin K1 & K2 description below and basin H description above. The inlet in this basin was sized to capture all flows in the 5 and 100-yr design storms. In the event of inlet failure at DP10, flows will overtop to the east and enter Vollmer Road. Water quality and detention for Basin J is provided in Interim Pond E.

Basin K1 is 11.68 acres of undeveloped land with native vegetation. Overlot grading is proposed for this basin at this time but it will remain undeveloped with this project, with exception of stormwater and utility infrastructure to support potential future development. Runoff (Q5 = 2.0 cfs, Q100 = 14.8 cfs) sheet flows overland south and enters swale E1 & E2 which carries flows to interim Pond E @ DP11 (Q5 = 11.8 cfs, Q100 = 50.0 cfs). Swales E1 & E2 were sized to remain stable while conveying the 100-yr design storm flows. It is assumed that upon future development of Basin K1, flows will be captured and piped directly to Forebay E within Pond E, however, a site specific drainage report will be required at the time of development to confirm conveyance and detention and WQ requirements. Water quality and detention for Basin K1 is provided in Interim Pond E.
Although no development is proposed in this basin with this project, the storm system within this basin was sized to support potential, future development. It. A site specific drainage report will be required if this basin develops to confirm storm sizing and routing as well as water quality and detention requirements.

Basin K2 is 12.54 acres of undeveloped land with native vegetation. Overlot grading is proposed for this basin at this time but it will remain undeveloped with this project, with exception of stormwater and utility infrastructure to support potential future development. Runoff (Q5 = 2.2 cfs, Q100 = 16.3 cfs) sheet flows overland south and enters Pond E @ DP11 (Q5 = 11.8 cfs, Q100 = 50.0 cfs) where it combines with flows from Basins K1, F2, DP7.1 & DP10.1. It is assumed that upon future development of Basin K2, flows will be captured and piped directly to Forebay E within Pond E, however, a site specific drainage report will be required at the time of development to confirm conveyance and detention and WQ requirements. Water quality and detention for Basin K2 is provided in interim Pond E.
Although no development is proposed in this basin with this project, the storm system within this basin was sized to support potential, future development. It. A site specific drainage report will be required if this basin develops to confirm storm sizing and routing as well as water quality and detention requirements.

Basin L is 49.78 acres of undeveloped open space. Runoff (Q5 = 6.8 cfs & Q100 = 50.0 cfs) flows towards proposed swale L1 and is carried to the existing sediment basin installed with CDR22-007. Flows continue through existing sediment basin and continue per existing drainage patterns to the sites boundary and Cottonwood Creek at design point 12 (Q5 = 10.4 & Q100 = 65.6). Swale L1 was sized to remain stable while conveying the 100-yr design storm. Water quality and detention for Basin L is not required per ECM Appendix I.6.1.B.7.

Basin N is 0.04 acres of undeveloped land. Runoff (Q5 = 0.0 cfs, Q100 = 0.1 cfs) sheet flows east, offsite towards Vollmer Road R.O.W. Water quality and detention for Basin N is not required per ECM Appendix I.6.1.B.7.

Basin O is 0.75 acres of undeveloped land and a portion of the southern limits of the proposed Bursh Top Road extension. Basin O runoff (Q5 = 0.3 cfs and Q100 = 2.0 cfs) overland flows south to Trails at Forest Meadows Filing No. 3 at DP14 (same as basin flows). Basin O flow was accounted for in "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR) as Basins OS2 and OS3. Basin OS2 and OS3 total 1.56 acres and have a total flow of Q_5=1.0 cfs and Q_{100}=3.6 cfs and these flows are tributary to the "Sand Creek Detention Pond No. 6" which provide both detention and water quality per the "Trails at Forest Meadows Filing No. 3 Final Drainage Report" (Trails No. 3 FDR).

Basin P is 0.33 acres of undeveloped land that will remain undeveloped. Runoff (Q5 = 0.1 cfs and Q100 = 1.0 cfs) sheets flows south and west per existing drainage patterns to DP15 @ the northern border of the Trails @ Forest Meadows Filing No. 4. The majority of this basin will remain undisturbed, except for a portion of the southern limits of this basin along the sites boundary with the "Trails at Forest Meadows Filing No. 4" development. The proposed disturbance is intended to restore the existing property line berm, to ensure no flows negatively impact the homes to the south. Please note, this grading will not change existing drainage patterns, and flows will be distributed along the length of the basin and not concentrated and the basin will remain undeveloped with this project. Water quality and detention for Basin P is not required per ECM Appendix I.6.1.B.7.

Basin Q 10.44 acres of undeveloped land and native and stabilized vegetation, including wetland and riparian vegetation within the Cottonwood Creek Flood Plain. Runoff from this basin (Q_5=2.3 cfs, Q_{100}=16.7 cfs) flows overland south and towards Cottonwood Creek. Flows enter the Creek and combine with flows from upstream and DP14 flows and continue south off-site @ DP12 (Q_5=10.4 cfs, Q_{100}=65.6 cfs). Total flow in Cottonwood Creek, including the site flows, is 854 CFS per the "Cottonwood Creek DBPS" by URS, dated 1994. Water quality and detention for Basin P is not required per ECM Appendix I.6.1.B.7.

Drainage Design Criteria

a. Development Criteria Reference

Storm drainage analysis and design criteria for this project were taken from the "City of Colorado Springs/El Paso County Drainage Criteria Manual" Volumes 1 and 2 (EPCDCM), dated October 12, 1994, the "Urban Storm Drainage Criteria Manual" Volumes 1 to 3 (USDCM) and Chapter 6 and Section 3.2.1 of Chapter 13 of the "Colorado Springs Drainage Criteria Manual" (CSDCM), dated May 2014, as adopted by El Paso County.

b. Hydrologic Criteria

All hydrologic data was obtained from the "El Paso Drainage Criteria Manual" Volumes 1 and 2, and the "Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual" Volumes 1, 2, and 3. On-site drainage improvements were designed based on the 5 year (minor) storm event and the 100-year (major) storm event. Runoff was calculated using the Rational Method, and rainfall intensities for the 5-year and the 100-year storm return frequencies were obtained from Table 6-2 of the CSDCM. One-hour point rainfall data for the storm events is identified in the chart below. Runoff coefficients were determined based on proposed

land use and from data in Table 6-6 from the CSDCM. Time of concentrations were developed using equations from CSDCM. All runoff calculations and applicable charts and graphs are included in the Appendices.

Table 1 - 1-hr Point Rainfall Data

Storm	Rainfall (in.)
5-year	1.50
100-year	2.52

c. Hydraulic Criteria

The Rational Method and USDCM's SF-2 and SF-3 forms are used to determine the runoff from the minor and major storms. MHFD-Detention v4.06 spreadsheet is utilized for full-spectrum extended detention basin design. Hydraflow Express is used for hydraulic modeling of swale, spillway, and emergency overflow calculations. Proposed swales have been designed to meet El Paso County criteria for velocity, freeboard, and stability. Hydraflow Storm Sewers is used for storm sewer hydraulic analysis.

III. Drainage Facility Design

a. General Concept

Onsite stormwater will be conveyed via proposed curb and gutter to proposed Type R/Colorado Springs Type 2 inlets. Captured storm water will be piped to interim Pond E, a full spectrum water quality and detention pond. Drainage infrastructure is sized to account for the assumed future condition of tributary areas. Pond E will discharge to Sand Creek per historic drainage patterns.

b. Water Quality & Detention

Water quality and detention is provided for all on-site basins or excluded per ECM Appendix I.6.1. A Water Quality summary table is included below:

WATER QUALITY SUMMARY TABLE

BASIN	AREA	WATER QUALITY (SOURCE OR EXCLUSION)				NOTES
		POND E	SCD#6	ECM I.6.1.B.7	TSB A	
A	0.25			X		
B	0.08			X		
C	1.85				X	INTERIM ONLY, SEE PUDSP264
D	1.18				X	INTERIM ONLY, SEE PUDSP264
F1	0.70	X				
F2	2.17	X				
G	0.71	X				
H	2.92	X				
I	1.56	X				
J	1.28	X				
K1	11.68	X				
K2	12.54	X				
L	49.78			X		
N	0.04			X		
O	0.75		X			PER TRAILS @ FOREST MEADOWS F3 FDR
P	0.33			X		
Q	10.44			X		
TOTALS	**98.25**	**33.56**	**0.75**	**60.92**	**3.02**	

Interim Pond E provides full spectrum water quality and detention for Basins F-K and their associated improvements. The pond will be retrofitted in the future upon build out of the undeveloped areas in basins F-K. However, the nature and timing of the future development is in the works still, and therefore, the interim pond provides water quality and detention only for the construction proposed with this report and CDR submittal. Individual and site specific drainage reports will be required to support any future development and to address water quality and detention.

Basins C & D include portions of Marksheffel Roadway and due to the sites topography, were not feasible to capture in interim Pond E. Therefore, in the interim condition, these basins are routed to temporary sediment basin A (TSB A). In the future, developed flows from these basins will be piped directly to a full-spectrum detention and water quality pond per PUDSP264.

Basin O is not detained on-site, and instead will flow undetained into the Trails @ Forest Meadows Development. The proposed flows from Basin O are at or below the flows planned for in the Trails @ Forest Meadows FDR and will continue through the subdivision per existing drainage patterns to the existing Sand Creek Detention Pond # 6, which provides detention and water quality for this basin.

See Proposed subbasin descriptions for excluded basins (A, B, L, N, P, Q). A total of 33.56 acres at 10.1% imperviousness are treated in Interim Pond E. The WQCV and EURV are released in 40 and 49 hours, respectively and the pond will completely drain the 100-yr storm in less than 120 hours. Two concrete bottom forebays are located at the outfalls into the pond, Forebay E and Forebay W. A 6.0' wide concrete trickle channel conveys flow towards the full spectrum outlet structure and will also be used as a maintenance access road to the pond structures. A gravel maintenance road is used to access the 6' wide trickle channel. The outlet structure will release 100-year stormwater at less than historic rates to minimize adverse impacts to downstream stormwater facilities. The table below provides the volumes required for the proposed pond, along with the release rates for the 5-year and 100-year storm.

	Required Volume (ac-ft)	Provided Volume (ac-ft)	WQCV (ac-ft)	EURV (ac-ft)	5-year Release (cfs)	100-year Release (cfs)
Pond A	0.796	6.679	0.189	0.061	0.1	9.1

A broad crested weir, lined with Type L buried soil riprap, is provided as an emergency spillway for Pond E. The emergency spillway conveys flow (30.2 cfs) to a Type C inlet with 1.75' of available head and a total interception capacity of 54.3 cfs. The inlet has excess capacity to capture all spillway flows in the interim pond condition. Captured flows are piped via the 42" RCP outfall to an existing 48" RCP pipe within the Trails @ Forest Meadows Filing No. 3 development. This pipe was planned to accept up to 84 cfs from the project site per the Trails @ Forest Meadows FDR's.

It should be noted that upon future development of basins tributary to Pond E, the anticipated spillway flows will exceed the capacity of the downstream outfall pipes which are limited to 84 cfs per the Trails @ Forest Meadows FDR's. Therefore, in the future, it is anticipated that flows exceeding 84 cfs that over-top the ponds spillway will continue to the Brushtop Road ROW and be transported via curb and gutter south to Vanderwood Drive and then along Vanderwood Drive west to an existing pair of sump inlets. Flows will either be captured by the inlets or overtop the inlets and follow their overflow path through the park site.

The Pond E outfall pipe controlled release of Q_5=0.1 cfs, Q_{100}= 9.1 cfs is released through a 30" RCP pipe that is connected to the Type C emergency overflow inlet described above. Downstream of this inlet is a 42" RCP storm system that connects to an existing 48" RCP pipe designed to accept up to 84 cfs from the project site per the Trails @ Forest Meadows FDR's. The existing 48" RCP pipe outfalls to Sand Creek Regional Detention Pond # 6. Pond E will be privately owned and maintained by the Stonebridge Metropolitan District #4.

A Cost estimate for Pond E is included below:

MARKSHEFFEL ROAD - SEGMENT M3				
POND E - ENGINEER'S OPINION OF PROBABLE COSTS				
Item*	**Quantity**	**Units**	**Unit Cost**	**Total**
Earthwork	17750.00	CY	$ 6.50	$115,375.00
Rip Rap, d50 size from 6" to 24" (Forebay, Spillway, Inlet/Outlet Protection)	140.00	TONS	$ 102.00	$ 14,280.00
Aggregate Base Course (135 lbs/cf) - Maint. Road	33.00	CY	$ 81.00	$ 2,673.00
Forebay E	1	EA	$15,000.00	$ 15,000.00
Forebay W	1	EA	$10,000.00	$ 10,000.00
Concrete Trickle Channel (3' wide, 6" deep)	536	LF	$ 60.00	$ 32,160.00
Outlet Structure & Appurtenances	1	EA	$15,000.00	$ 15,000.00
30" RCP	41	LF	$ 167.00	$ 6,847.00
Type C Inlet (spillway overflow)	1	EA	$ 8,156.00	$ 8,156.00
			TOTAL	$219,491.00
*All items include labor costs				

c. Major Drainageways

The Cottonwood Creek major drainage basin and Creek traverses the western portions of the site. According to FEMA FIRM 08041C0529G a potion of site lies within the existing Zone AE 100-yr flood plain. It should also be noted that as part of the Colorado Spring Black Forest Road Widening Project, a LOMR application was submitted to FEMA under case # 23-08-0623X, but is currently under review.

d. Operations & Maintenance

An Operations and Maintenance Manual has been submitted separately. The manual specifies maintenance intervals and required actions to maintain the function of the extended detention basin and appurtenances.

e. Grading & Erosion Control Plan

Due to the project disturbance area, a separate Grading and Erosion Control plan is required. The Grading and Erosion Control Plan has been submitted in conjunction with this FDR.

f. Four Step Process

In accordance with the El Paso County Drainage Criteria Manual Volume 2, this site has implemented the four step process to minimize adverse impacts of urbanization. The four step process includes reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

Step 1 – Reducing Runoff Volumes: The proposed site development consists of open spaces and lawn areas interspersed within the development that helps disconnect impervious areas and reduce runoff volumes. The EDB releases at or below historic levels.

Step 2 – Stabilize Drainageways: The site lies within the Cottonwood Creek & Sand Creek Drainage Basins. The eastern most portion on the property is within the Sand Creek Drainage Basin. Cottonwood Creek is located to the west of the site. Basin and bridge fees will be due at time of platting. There are no proposed improvements within the 100-year flood plain. According to the "Cottonwood Creek Drainage Basin Planning Study" by URS, 1994 (Cottonwood DBPS), the reach adjacent to the site is DP 6 -7, with design point 7 being

the Black Forest Road crossing. The report identifies the reach as having an acceptable slope and velocity range for all alternatives. Proposed outfalls will be analyzed in the final design stage for stability. Applicable excerpts from the Cottonwood DBPS are presented in Appendix D.

Flows released to the Sand Creek are planned to be well below the allowable 84 cfs in the 100-yr event that was planned for and these flows are released into the Sand Creek Regional Detention Pond # 6 which was designed to accept these flows and remain stable with the flows from our project site.

Step 3 – Treat the WQCV: Water quality treatment for this site is provided in a proposed full-spectrum EDB (Interim Pond E). The runoff from this site will be captured by inlets and conveyed to Interim Pond E via storm sewer and open channel. Upon entrance to the ponds, flows will be captured in a concrete bottom forebay designed to promote settlement of suspended solids. A concrete trickle channel will help convey pond flows and minimize standing water. The outlet structure has been designed to release the WQCV in 40 hours and the EURV in 49 hours. 100-year flows released from Pond E will be reduced to historic rates or below.

Step 4 – Consider Need for Industrial and Commercial BMPs: There are no commercial or industrial components to this development, therefore; no Industrial or Commercial BMPs are required. BMPs will be utilized to minimize off-site contaminants and to protect the downstream receiving waters. The site is not a high-risk site per Figure I-1 in ECM Appendix I. Site specific temporary source control BMPs that will be implemented include, but are not limited to, silt fencing placed around downstream areas of disturbance, construction vehicle tracking pads at the entrances, designated vehicle fueling areas, covered storage areas, and spill containment and control. The permanent erosion control BMPs include asphalt drives, storm inlets, storm sewer, Pond A, and permanent vegetation.

g. Drainage Basin & Bridge Fees

Applicable drainage and bridge fees for the site will be paid at time of platting.

IV. Summary

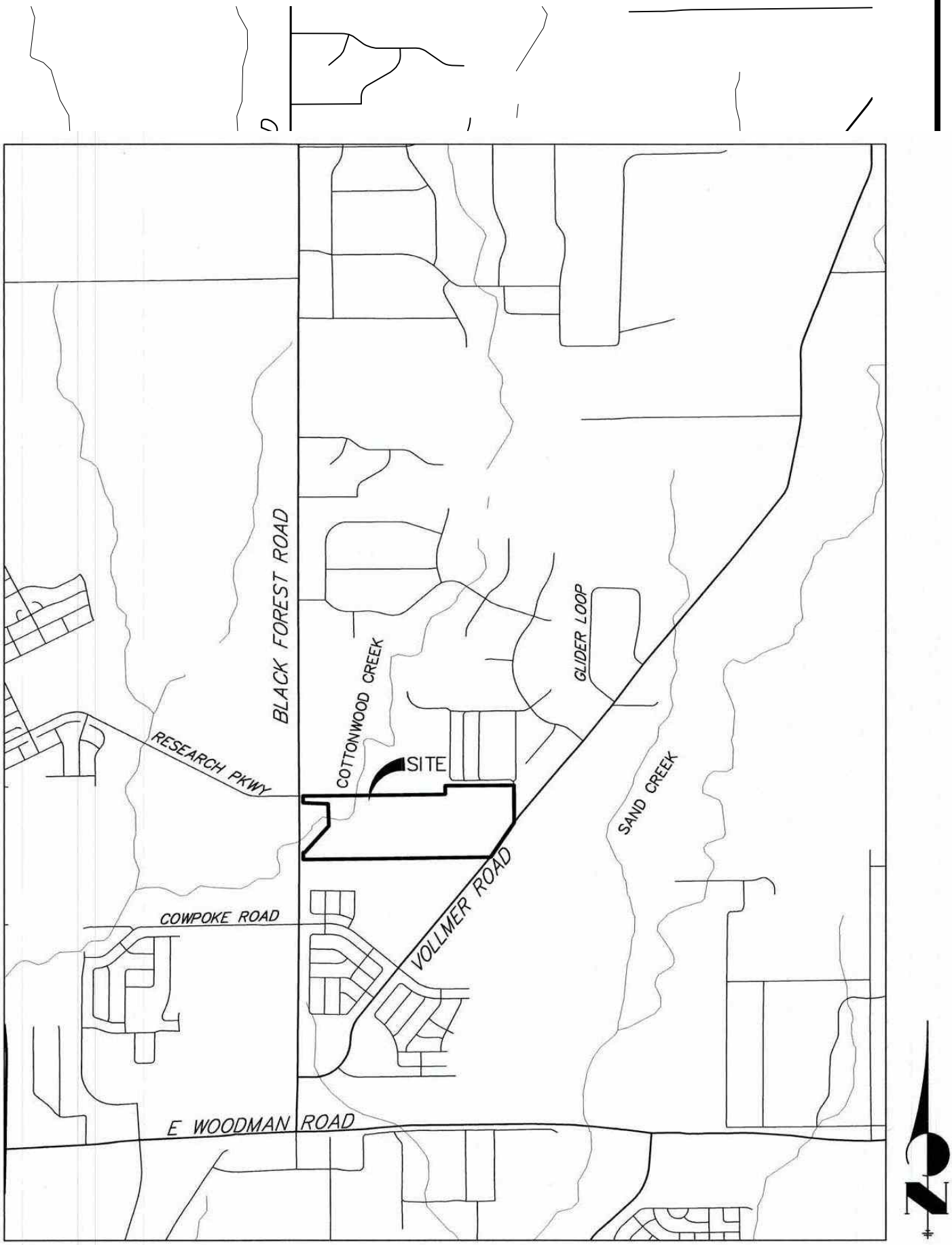
Marksheffel Road – Segment M3 CDRs remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. This report meets the latest El Paso County Drainage Criteria.

V. References

1. El Paso County Drainage Criteria Manual, Vol I & II, as amended.
2. El Paso County Engineering Criteria Manual, 2019.
3. Urban Storm Drainage Criteria Manual (Volumes 1, 2, and 3), Urban Drainage and Flood Control District, June 2001.
4. Final Drainage Report for Silver Ponds Subdivision Filing No. 1, M.V.E. Inc., February 2, 1995, Revised May 5, 1996.
5. Sand Creek Drainage Basin Planning Study, Stantec, January 2021.

6. Cottonwood Creek Drainage Basin Planning Study, Matrix Design Group, July 2019.
7. Trails at Forest Meadows Filing No. 3 Final Drainage Report, M&S Civil Consultants Inc., August 2015.
8. Trails at Forest Meadows Filing No. 4 Final Drainage Report, M&S Civil Consultants Inc., April 2016.
9. "Cottonwood Creek Drainage Basin Planning Study" June 1994, by URS Consultants
10. LOMR associated w/ Black Forest Road Widening – Case # 23-08-0623X, FEMA
11. "Master Development Drainage Plan Amendment for Sterling Ranch" prepared by JR Engineering, March 2023

APPENDIX A – VICINITY MAP, FEMA MAP, NRCS WEB SOIL SURVEY & NOAA ATLAS 14

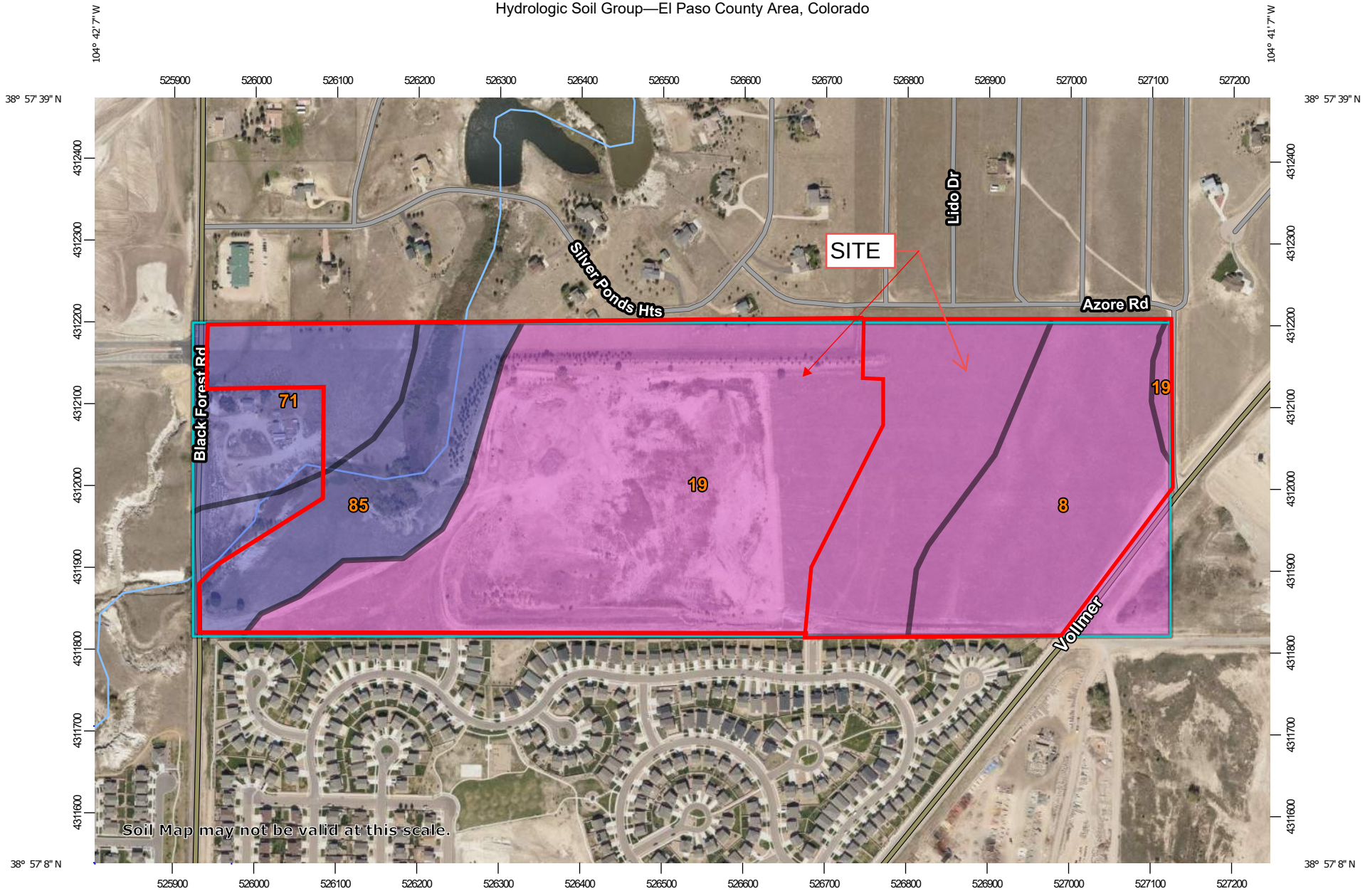


VICINITY MAP

SCALE: 1"=2000'

X:\2510000.all\2518813\Drawings\Blocks\2518813VicMap_District_Infrastructure.dwg, 8.5x11 Portrait, 8/22/2023 7:05:44 AM, CS

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:6,600 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

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.

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 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—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	22.3	19.5%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	64.2	56.2%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	12.1	10.6%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	15.6	13.6%
Totals for Area of Interest			**114.1**	**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.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

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.

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

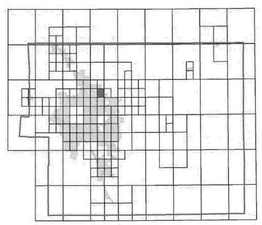
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

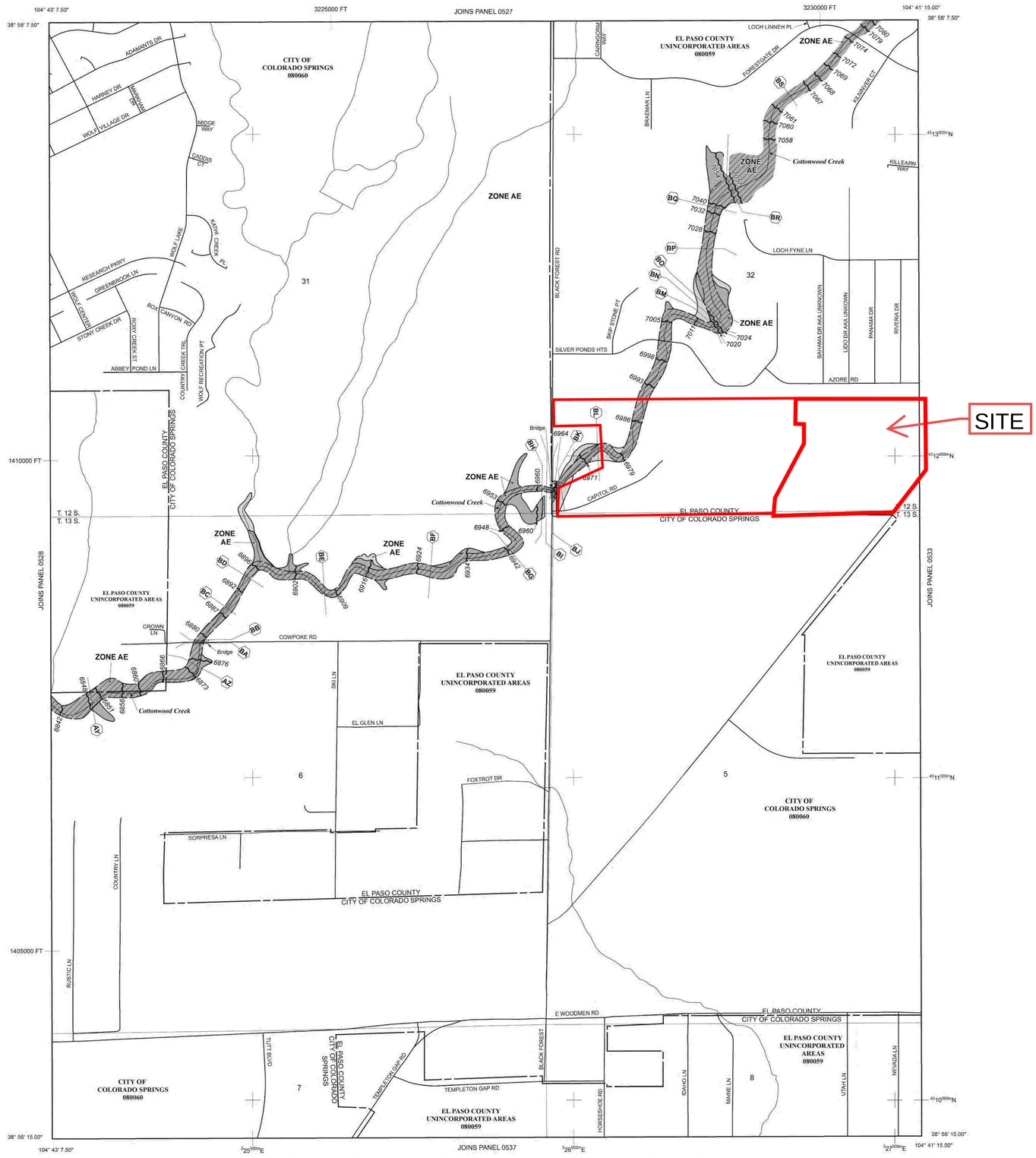
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

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 (EL 987) Base Flood Elevation line and value; elevation in feet*
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)
4375000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
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.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0529G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 529 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0529	G
EL PASO COUNTY	080059	0529	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 08041C0529G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B – HYDROLOGIC CALCULATIONS

ALL TERRAIN
ENGINEERING

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	0.25	2%	0.09	0.36	51.8	0.0	0.3
EXB	1.51	16%	0.18	0.42	34.8	0.6	2.4
EXC	11.55	2%	0.09	0.36	44.5	2.0	13.2
EXD	21.78	3%	0.10	0.36	48.7	3.7	23.3
EXE	3.96	2%	0.09	0.36	31.9	0.9	5.7
EXF	2.58	2%	0.09	0.36	27.1	0.6	4.1
EXG	39.67	2%	0.09	0.36	62.7	4.9	32.9
EXH	6.67	2%	0.09	0.36	26.6	1.6	10.7
EXI	10.29	2%	0.09	0.36	27.3	2.4	16.3
EXJ	0.33	2%	0.09	0.36	25.7	0.1	0.5
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.3
2	0.6	2.4
3	2.0	13.2
4	3.7	23.3
4.1	5.5	35.6
5	0.9	5.7
6	0.6	4.1
7	4.9	32.9
7.1	9.2	60.8
8	1.6	10.7
9	2.4	16.3
10	0.1	0.5
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

COMPOSITE % IMPERVIOUS CALCULATIONS -EXISTING CONDITIONS

Subdivision:
Location: El Paso County

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/23/26

Basin ID	Total Area (ac)	Gravel Street (80% Imp.)				Undeveloped (2% Imp.)				Basins Total Weighted C		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
EXA	0.25	0.59	0.70	0.00	0.0%	0.09	0.36	0.25	2.0%	0.09	0.36	2.0%
EXB	1.51	0.59	0.70	0.27	14.3%	0.09	0.36	1.24	1.6%	0.18	0.42	16.0%
EXC	11.55	0.59	0.70	0.00	0.0%	0.09	0.36	11.55	2.0%	0.09	0.36	2.0%
EXD	21.78	0.59	0.70	0.27	1.0%	0.09	0.36	21.51	2.0%	0.10	0.36	3.0%
EXE	3.96	0.59	0.70	0.00	0.0%	0.09	0.36	3.96	2.0%	0.09	0.36	2.0%
EXF	2.58	0.59	0.70	0.00	0.0%	0.09	0.36	2.58	2.0%	0.09	0.36	2.0%
EXG	39.67	0.59	0.70	0.00	0.0%	0.09	0.36	39.67	2.0%	0.09	0.36	2.0%
EXH	6.67	0.59	0.70	0.00	0.0%	0.09	0.36	6.67	2.0%	0.09	0.36	2.0%
EXI	10.29	0.59	0.70	0.00	0.0%	0.09	0.36	10.29	2.0%	0.09	0.36	2.0%
EXJ	0.33	0.59	0.70	0.00	0.0%	0.09	0.36	0.33	2.0%	0.09	0.36	2.0%
TOTAL	**98.58**											**2.4%**

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision:
Location: El Paso County

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EXA	0.25	A	2.0%	0.09	0.36	10.0	25.0%	2.0	1030	0.5%	7.0	0.5	34.7	36.7	1040.0	51.8	51.8
EXB	1.51	A	16.0%	0.18	0.42	10.0	25.0%	1.8	950	1.5%	15.0	1.8	8.6	10.4	960.0	34.8	34.8
EXC	11.55	A	2.0%	0.09	0.36	300.0	3.0%	22.0	1260	1.8%	7.0	0.9	22.5	44.5	1560.0	42.6	44.5
EXD	21.78	A	3.0%	0.10	0.36	300.0	2.3%	23.8	1400	1.8%	7.0	0.9	24.8	48.7	1700.0	44.0	48.7
EXE	3.96	A	2.0%	0.09	0.36	300.0	2.1%	24.8	425	2.1%	7.0	1.0	7.0	31.9	725.0	31.0	31.9
EXF	2.58	A	2.0%	0.09	0.36	200.0	2.6%	18.9	123	2.3%	7.0	1.1	1.9	20.8	323.0	27.1	27.1
EXG	39.67	A	2.0%	0.09	0.36	200.0	1.0%	25.8	2300	2.2%	7.0	1.0	36.9	62.7	2500.0	53.5	62.7
EXH	6.67	A	2.0%	0.09	0.36	180.0	2.6%	17.9	100	4.0%	7.0	1.4	1.2	19.1	280.0	26.6	26.6
EXI	10.29	A	2.0%	0.09	0.36	300.0	2.0%	25.1	261	8.0%	7.0	2.0	2.2	27.3	561.0	27.3	27.3
EXJ	0.33	A	2.0%	0.09	0.36	22.0	2.6%	6.3	0	0.0%	7.0	0.0	0.0	6.3	22.0	25.7	25.7

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)
t_i = overland (initial) flow time (minutes)
t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

Equation 6-2 $$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-3

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Equation 6-5

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

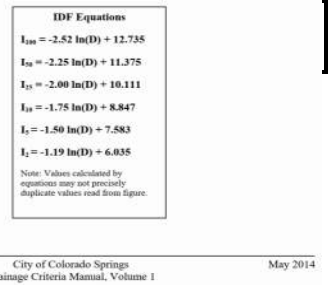
(RATIONAL METHOD PROCEDURE)

Subdivision:
Location: El Paso County
Design Storm: 5-Year

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.30	29.2	8.15	2.33	19.0															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	EXA	0.25	0.09	51.8	0.02	1.66	0.0															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	EXB	1.51	0.18	34.8	0.27	2.26	0.6															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	EXC	11.55	0.09	44.5	1.04	1.89	2.0															Runoff overland flows to existing swale and continues into Basin EXD at DP3.
	4	EXD	21.78	0.10	48.7	2.10	1.75	3.7															Runoff from Basin EXD, overland flows to existing swale at DP4.
	4.1								48.7	3.13	1.75	5.5	48.7	27.75	1.2					1231	1.6	12.5	Flows from DP3 and DP4 combine at DP4.1 and flows to the west to the existing TSB, continue to DP7.1
	5	EXE	3.96	0.09	31.9	0.36	2.39	0.9															Runoff overland flows across exisitng field to DP5 where flow enters Vollmer Road R.O.W.
	6	EXF	2.58	0.09	27.1	0.23	2.63	0.6															Runoff from Basin EXF overland flows south off-site and enters the adjacent property.
	7	EXG	39.67	0.09	62.7	3.57	1.38	4.9															Runoff overland flows SW, enters ex TSB, continues to DP7.1
	7.1								62.7	6.71	1.38	9.2											Combined flow @ DP7.1 from Basin G and DP 4.1, enters Cottonwood Creek and flows off-site
	8	EXH	6.67	0.09	26.6	0.60	2.66	1.6															Runoff from Basin EXH overland flows west, off-site and enters Cottonwood Creek @ DP8
	9	EXI	10.29	0.09	27.3	0.93	2.62	2.4															Runoff from Basin EXI overland flows south and enters Cottonwood Creek & flow off-site.
	10	EXJ	0.33	0.09	25.7	0.03	2.72	0.1															Runoff from Basin EXJ overland flows south off-site and enters the adjacent property.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.



STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

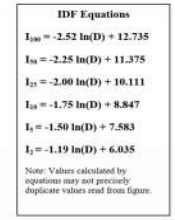
(RATIONAL METHOD PROCEDURE)

Subdivision:
Location: El Paso County
Design Storm: 100-Year

Project Name: Schmidt Parcel-District Infrastructure
Project No.: 24013.00
Calculated By: REB
Checked By: NQJ
Date: 4/27/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.40	29.2	10.86	4.07	44.2															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	EXA	0.25	0.36	51.8	0.09	2.79	0.3															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	EXB	1.51	0.42	34.8	0.63	3.79	2.4															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	EXC	11.55	0.36	44.5	4.16	3.17	13.2															Runoff overland flows to existing swale and continues into Basin EXD at DP3.
	4	EXD	21.78	0.36	48.7	7.93	2.94	23.3															Runoff from Basin EXD, overland flows to existing swale at DP4.
	4.1								48.7	12.09	2.94	35.6	48.7	16.5	1.2					1231	1.6	12.5	Flows from DP3 and DP4 combine at DP2.1 and flows to the west to the existing sediment basin.
	5	EXE	3.96	0.36	31.9	1.42	4.01	5.7															Runoff overland flows across exisitng field to DP5 where flow enters Vollmer Road R.O.W.
	6	EXF	2.58	0.36	27.1	0.93	4.42	4.1															Runoff from Basin EXF overland flows south off-site and enters the adjacent property.
	7	EXG	39.67	0.36	62.7	14.28	2.31	32.9															Runoff overland flows SW, enters ex TSB, continues to DP7.1
	7.1								62.7	26.37	2.31	60.8											Combined flow @ DP7.1 from Basin G and DP 4.1, enters Cottonwood Creek and flows off-site
	8	EXH	6.67	0.36	26.6	2.40	4.47	10.7															Runoff from Basin EXH overland flows west, off-site and enters Cottonwood Creek @ DP8
	9	EXI	10.29	0.36	27.3	3.70	4.40	16.3															Runoff from Basin EXI overland flows south and enters Cottonwood Creek & flow off-site.
	10	EXJ	0.33	0.36	25.7	0.12	4.56	0.5															Runoff from Basin EXJ overland flows south off-site and enters the adjacent property.

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.



ALL TERRAIN ENGINEERING

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	0.25	0%	0.08	0.35	18.2	0.1	0.5
B	0.08	0%	0.08	0.35	8.1	0.0	0.2
C	1.85	31%	0.34	0.54	15.5	2.2	5.8
D	1.18	54%	0.52	0.68	11.5	2.4	5.3
F1	0.70	93%	0.84	0.92	7.4	2.7	4.9
F2	2.17	0%	0.08	0.35	11.7	0.7	5.0
G	0.71	94%	0.85	0.92	8.2	2.7	4.9
H	2.92	0%	0.08	0.35	14.0	0.8	6.2
I	1.56	62%	0.59	0.73	11.9	3.6	7.4
J	1.28	87%	0.79	0.88	9.1	4.3	8.1
K	24.22	0%	0.08	0.35	36.0	4.3	31.4
L	49.78	0%	0.08	0.35	50.1	6.8	50.0
N	0.04	0%	0.08	0.35	5.0	0.0	0.1
O	0.75	0%	0.08	0.35	8.0	0.3	2.0
P	0.33	0%	0.08	0.35	5.0	0.1	1.0
Q	10.44	0%	0.08	0.35	25.5	2.3	16.7
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.1	0.5
2	0.0	0.2
3	2.2	5.8
4	2.4	5.3
4.1	4.3	10.4
6	2.7	4.9
7	2.7	4.9
7.1	5.3	9.6
9	4.2	13.1
10	4.3	8.1
10.1	7.8	19.9
11	12.1	51.2
11.1	0.1	4.6
12	10.4	65.6
13	0.0	0.1
14	0.3	2.0
15	0.1	1.0
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

WATER QUALITY SUMMARY TABLE

BASIN	AREA	WATER QUALITY (SOURCE OR EXCLUSION)				NOTES
		POND E	SCD#6	ECM I.6.1.B.7	TSB A	
A	0.25			X		
B	0.08			X		
C	1.85				X	INTERIM ONLY, SEE PUDSP264
D	1.18				X	INTERIM ONLY, SEE PUDSP264
F1	0.70	X				
F2	2.17	X				
G	0.71	X				
H	2.92	X				
I	1.56	X				
J	1.28	X				
K1	11.68	X				
K2	12.54	X				
L	49.78			X		
N	0.04			X		
O	0.75		X			PER TRAILS @ FOREST MEADOWS F3 FDR
P	0.33			X		
Q	10.44			X		
TOTALS	**98.25**	**33.56**	**0.75**	**60.92**	**3.02**	

ALL TERRAIN ENGINEERING

COMPOSITE % IMPERVIOUS CALCULATIONS -PROPOSED CONDITIONS

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

Basin ID	Total Area (ac)	Paved Streets and Walks (100% Imp.)				Apartments/Mixed Use (75% Imp.)				FUTURE DEVELOPMENT (62.5%)				Lawns/Pasture (0% Imp.)				Basins Total Weighted C		Basins Total Weighted
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A	0.25	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.25	0.0%	0.08	0.35	0.0%
B	0.08	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.08	0.0%	0.08	0.35	0.0%
C	1.85	0.90	0.96	0.58	31.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	1.27	0.0%	0.34	0.54	31.2%
D	1.18	0.90	0.96	0.64	54.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.54	0.0%	0.52	0.68	54.2%
F1	0.70	0.90	0.96	0.65	92.7%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.05	0.0%	0.84	0.92	92.7%
F2	2.17	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	2.17	0.0%	0.08	0.35	0.0%
G	0.71	0.90	0.96	0.67	94.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.04	0.0%	0.85	0.92	94.0%
H	2.92	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	2.92	0.0%	0.08	0.35	0.0%
I	1.56	0.90	0.96	0.97	62.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.59	0.0%	0.59	0.73	62.0%
J	1.28	0.90	0.96	1.12	87.2%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.16	0.0%	0.79	0.88	87.2%
K1	11.68	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	11.68	0.0%	0.08	0.35	0.0%
K2	12.54	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	12.54	0.0%	0.08	0.35	0.0%
L	49.78	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	49.78	0.0%	0.08	0.35	0.0%
N	0.04	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.04	0.0%	0.08	0.35	0.0%
O	0.75	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.75	0.0%	0.08	0.35	0.0%
P	0.33	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	0.33	0.0%	0.08	0.35	0.0%
Q	10.44	0.90	0.96	0.00	0.0%	0.53	0.66	0.00	0.0%	0.45	0.59	0.00	0.0%	0.08	0.35	10.44	0.0%	0.08	0.35	0.0%
TOTAL POND E	**21.02**																			**16.2%**
TOTAL (ON-SITE)	**98.25**																			**4.7%**

Table 6-3. Recommended percentage imperviousness values

ALL TERRAIN ENGINEERING

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	0.25	A	0.0%	0.08	0.35	10.0	25.0%	2.0	1030	0.5%	15.0	1.1	16.2	18.2	1040.0	53.0	18.2
B	0.08	A	0.0%	0.08	0.35	10.0	25.0%	2.0	385	0.5%	15.0	1.1	6.0	8.1	395.0	36.1	8.1
C	1.85	A	31.2%	0.34	0.54	100.0	1.8%	11.4	525	1.1%	20.0	2.1	4.2	15.5	625.0	26.9	15.5
D	1.18	A	54.2%	0.52	0.68	85.0	2.0%	7.6	490	1.1%	20.0	2.1	3.9	11.5	575.0	21.5	11.5
F1	0.70	A	92.7%	0.84	0.92	45.0	2.0%	2.5	1050	3.2%	20.0	3.6	4.9	7.4	1095.0	14.7	7.4
F2	2.17	A	0.0%	0.08	0.35	85.0	15.0%	6.9	400	0.5%	20.0	1.4	4.7	11.7	485.0	36.5	11.7
G	0.71	A	94.0%	0.85	0.92	50.0	2.0%	2.5	1050	2.4%	20.0	3.1	5.6	8.2	1100.0	15.1	8.2
H	2.92	A	0.0%	0.08	0.35	100.0	4.5%	11.2	435	3.0%	15.0	2.6	2.8	14.0	535.0	30.7	14.0
I	1.56	A	62.0%	0.59	0.73	85.0	2.0%	6.8	820	1.8%	20.0	2.7	5.1	11.9	905.0	21.2	11.9
J	1.28	A	87.2%	0.79	0.88	85.0	2.0%	4.0	820	1.8%	20.0	2.7	5.1	9.1	905.0	16.0	9.1
K1	11.68	A	0.0%	0.08	0.35	100.0	2.6%	13.4	1450	2.1%	7.0	1.0	23.8	37.3	1550.0	44.5	37.3
K2	12.54	A	0.0%	0.08	0.35	100.0	2.8%	13.1	1520	2.5%	7.0	1.1	22.9	36.0	1620.0	43.8	36.0
L	49.78	A	0.0%	0.08	0.35	100.0	2.0%	14.7	2000	1.8%	7.0	0.9	35.5	50.1	2100.0	53.6	50.1
N	0.04	A	0.0%	0.08	0.35	25	25.0%	3.2	1	2.0%	10.0	1.4	0.0	3.2	26.0	26.0	5.0
O	0.75	A	0.0%	0.08	0.35	25	2.0%	7.3	60	2.5%	10.0	1.6	0.6	8.0	85.0	26.7	8.0
P	0.33	A	0.0%	0.08	0.35	10	25.0%	2.0	5	0.5%	10.0	0.7	0.1	2.1	15.0	26.1	5.0
Q	10.44	A	0.0%	0.08	0.35	100	30.0%	6.0	1170	1.0%	10.0	1.0	19.5	25.5	1270.0	47.7	25.5

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)
t_i = overland (initial) flow time (minutes)
t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-4

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Equation 6-5

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 5-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	I4	OSI4	27.16	0.30	29.2	8.15	2.33	19.0															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	A	0.25	0.08	18.2	0.02	3.23	0.06															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	B	0.08	0.08	8.1	0.01	4.45	0.03															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	C	1.85	0.34	15.5	0.62	3.47	2.2								2.2	0.62	1.0	18	85	4.6	0.3	RUNOFF SHEET FLOWS TO C&G, CARRIED TO 5' TYPE R SUMP INLET @ DP3, CAPTURED FLOWS CONTINUE IN PIPE TO DP4.1
	3																						TOTAL FLOW @ DP3 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP4.1
	4	D	1.18	0.52	11.5	0.62	3.92	2.4															RUNOFF SHEET FLOWS TO C&G, CARRIED TO DP4 (5' TYPE R SUMP INLET). CAPTURED FLOWS PIPED TO DP4.1 WHERE THEY COMBINE WITH DP3 FLOWS
	4.1								15.8	1.24	3.44	4.3											COMBINED FLOW IN PIPE FROM DP3 & 4, FLOWS DISCHARGE TO TSB A IN BASIN L
	6	F1	0.70	0.84	7.4	0.59	4.58	2.7								2.7	0.59	1.0	18	40	5.0	0.1	RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 6, CAPTURED FLOWS ARE PIPED TO DP7.1
	7	G	0.71	0.85	8.2	0.60	4.43	2.7															RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 7, CAPTURED FLOWS ARE PIPED TO DP7.1
	7.1								8.2	1.19	4.43	5.3				5.3	1.19	1.0	24	45	5.8	0.1	COMBINED FLOW FROM DP6 & 7 IN 24" RCP, FLOWS ARE PIPED TO DP11 (POND E)
	9	H	2.92	0.08	14.0	0.23	3.62	0.8															BASIN H RUNOFF SHEET FLOWS TO C&G IN BASIN I, FLOWS CONTINUE TO DP9 (10' TYPE R SUMP) WHERE THEY COMBINE WITH BASIN I FLOWS
	9	I	1.56	0.59	11.9	0.92	3.87	3.6	14.0	1.15	3.62	4.2				4.2	1.15	1.0	24	90	5.4	0.3	BASIN I RUNOFF CARREID BY C&G TO 10' TYPE R SUMP INLET @ DP9, WHERE FLOWS COMBINE WITH BASIN H FLOWS, CAPTURED FLOWS PIPED TO DP10.1
	10	J	1.28	0.79	9.1	1.02	4.27	4.3															BASIN J RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO DP10 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP10.1
	10.1								14.3	2.17	3.59	7.8				7.8	2.17	0.8	36	1300	5.8	3.8	COMBINED FLOW IN PIPE @ DP10.1, FLOWS CONTINUE IN PIPE TO DP11.1
	11	K1	11.68	0.08	37.3	0.93	2.16	2.0															RUNOFF SHEET FLOWS TOWARDS SWALE E1, FLOWS CONTINUE IN SWALE TO POND E @ DP 11
	11	K2	12.54	0.08	36.0	1.00	2.21	2.2															RUNOFF SHEET FLOWS SOUTH TOWARDS POND E @ DP 11
	11	F2	2.17	0.08	11.7	0.17	3.90	0.7															RUNOFF SHEET FLOWS TO POND E @ DP11
	11								37.3	5.47	2.16	11.8											TOTAL FLOW IN POND E (BASIN K1, K2, F2, DP 7.1
																							CONTROLLED RELEASE FROM POND E, PIPED OFFSITE TO EX 48" RCP AND

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 5-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
POND E RELEASE	11.1											0.1											CONTINUES TO SAND CREEK
	12	L	49.78	0.08	50.1	3.98	1.71	6.8															RUNOFF FROM BASIN L, SHEET FLOWS TO SWALE @ DP13, FLOWS CONTINUE IN SWALE TO DP13.1 WHERE THEY COMBINE WITH DP5.1 FLOWS
	13	N	0.04	0.08	5.0	0.00	5.17	0.0															RUNOFF SHEET FLOWS OFF-SITE @ DP 15
	14	O	0.75	0.08	8.0	0.06	4.47	0.3															RUNOFF SHEET FLOWS OFF-SITE @ DP 16
	15	P	0.33	0.08	5.0	0.03	5.17	0.1															RUNOFF SHEET FLOWS OFF-SITE @ DP 17
	12	Q	10.44	0.08	25.5	0.84	2.73	2.3															RUNOFF SHEET FLOWS OFF-SITE @ DP 18
	12								50.1	6.06	1.71	10.4											RUNOFF SHEET FLOWS OFF-SITE @ DP 18

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

IDF Equations

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

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

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

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

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

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

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

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 100-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	I4	OSI4	27.16	0.30	29.2	8.15	2.33	19.0															Off-site Basin OSI4 Values from Sliver Pond FDR (Bains I4 & DP21)
	1	A	0.25	0.35	18.2	0.09	5.42	0.47															Existing berm sends off-site flow from north to the west to the existing swale at DP1.
	2	B	0.08	0.35	8.1	0.03	7.48	0.21															Existing berm sends off-site flow from north to the east to the exisitng swale and culvert at DP2.
	3	C	1.85	0.54	15.5	1.00	5.82	5.8								5.8	1.00	1.0	18	85	6.1	0.2	RUNOFF SHEET FLOWS TO C&G, CARRIED TO 5' TYPE R SUMP INLET @ DP3, CAPTURED FLOWS CONTINUE IN PIPE TO DP4.1
	3																						TOTAL FLOW @ DP3 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP4.1
	4	D	1.18	0.68	11.5	0.80	6.58	5.3															RUNOFF SHEET FLOWS TO C&G, CARRIED TO DP4 (5' TYPE R SUMP INLET). CAPTURED FLOWS PIPED TO DP4.1 WHERE THEY COMBINE WITH DP3 FLOWS
	4.1								15.8	1.80	5.78	10.4											COMBINED FLOW IN PIPE FROM DP3 & 4, FLOWS DISCHARGE TO TSB A IN BASIN L
	6	F1	0.70	0.92	7.4	0.64	7.69	4.9								4.9	0.64	1.0	18	40	5.8	0.1	RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 6, CAPTURED FLOWS ARE PIPED TO DP7.1
	7	G	0.71	0.92	8.2	0.66	7.44	4.9															RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO 15' TYPE R ON-GRADE INLET @ DP 7, CAPTURED FLOWS ARE PIPED TO DP7.1
	7.1								8.2	1.30	7.44	9.6				9.6	1.30	1.0	24	45	6.8	0.1	COMBINED FLOW FROM DP6 & 7 IN 24" RCP, FLOWS ARE PIPED TO DP11 (POND E)
	9	H	2.92	0.35	14.0	1.02	6.08	6.2															BASIN H RUNOFF SHEET FLOWS TO C&G IN BASIN I, FLOWS CONTINUE TO DP9 (10' TYPE R SUMP) WHERE THEY COMBINE WITH BASIN I FLOWS
	9	I	1.56	0.73	11.9	1.14	6.50	7.4	14.0	2.16	6.08	13.1				13.1	2.16	1.0	24	90	7.4	0.2	BASIN I RUNOFF CARREID BY C&G TO 10' TYPE R SUMP INLET @ DP9, WHERE FLOWS COMBINE WITH BASIN H FLOWS, CAPTURED FLOWS PIPED TO DP10.1
	10	J	1.28	0.88	9.1	1.13	7.16	8.1															BASIN J RUNOFF SHEET FLOWS TO C&G, IS CARRIED TO DP10 (5' TYPE R SUMP INLET), CAPTURED FLOWS ARE PIPED TO DP10.1
	10.1								14.2	3.29	6.05	19.9				19.9	3.29	0.8	36	1300	7.5	2.9	COMBINED FLOW IN PIPE @ DP10.1, FLOWS CONTINUE IN PIPE TO DP11.1
	11	K1	11.68	0.35	37.3	4.09	3.62	14.8															RUNOFF SHEET FLOWS TOWARDS SWALE E1, FLOWS CONTINUE IN SWALE TO POND E @ DP 11
	11	K2	12.54	0.35	36.0	4.39	3.70	16.3															RUNOFF SHEET FLOWS SOUTH TOWARDS POND E @ DP 11
	11	F2	2.17	0.35	11.7	0.76	6.55	5.0								5.0	0.76	1.0	18	40	5.8	0.1	RUNOFF SHEET FLOWS TO POND E @ DP11
	11								37.3	13.82	3.62	50.0											TOTAL FLOW IN POND E (BASIN K1, K2, F2, DP 7.1
POND E RELEASE	11.1											4.6											CONTROLLED RELEASE FROM POND E, PIPED OFFSITE TO EX 48" RCP AND CONTINUES TO SAND CREEK
	12	L	49.78	0.35	50.1	17.42	2.87	50.0															RUNOFF FROM BASIN L, SHEET FLOWS TO SWALE @ DP13, FLOWS CONTINUE IN SWALE TO DP13.1 WHERE THEY COMBINE WITH DP5.1 FLOWS

ALL TERRAIN ENGINEERING

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Schmidt Parcel - District P1
Location: El Paso County
Design Storm: 100-Year

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	13	N	0.04	0.35	5.0	0.01	8.68	0.1															RUNOFF SHEET FLOWS OFF-SITE @ DP 15
	14	O	0.75	0.35	8.0	0.26	7.51	2.0															RUNOFF SHEET FLOWS OFF-SITE @ DP 16
	15	P	0.33	0.35	5.0	0.12	8.68	1.0															RUNOFF SHEET FLOWS OFF-SITE @ DP 17
	12	Q	10.44	0.35	25.5	3.65	4.57	16.7															RUNOFF SHEET FLOWS OFF-SITE @ DP 18
	12								50.1	22.88	2.87	65.6											RUNOFF SHEET FLOWS OFF-SITE @ DP 18

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

IDF Equations

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

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

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

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

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

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

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

APPENDIX C – HYDRAULIC CALCULATIONS

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP4	DP6	DP7
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	On Grade
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.4	2.7	2.7
Major Q_{Known} (cfs)	5.3	4.9	4.9

Bypass (Carry-Over) Flow from Upstream Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**2.4**	**2.7**	**2.7**
Major Total Design Peak Flow, Q (cfs)	**5.3**	**4.9**	**4.9**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	0.0

MHFD-Inlet, Version 5.03 (August 2023)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP9	DP10	DP3
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	4.2	4.3	2.2
Major Q_{Known} (cfs)	13.1	8.1	5.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**4.2**	**4.3**	**2.2**
Major Total Design Peak Flow, Q (cfs)	**13.1**	**8.1**	**5.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

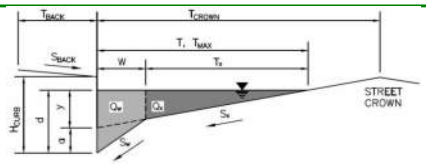
MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Schmidt Parcel - District Infrastructure**

Inlet ID: **DP4**



Gutter Geometry:

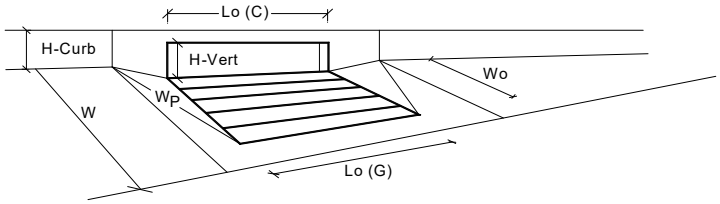
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



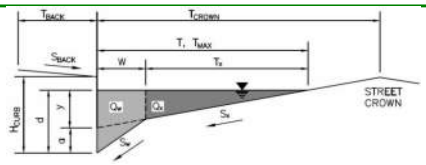
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	8.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.4	5.3	cfs

MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Schmidt Parcel - District Infrastructure
Inlet ID: DP6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.024	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

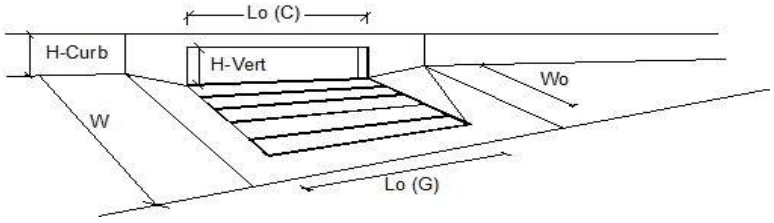
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**29.7**	**30.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.70 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



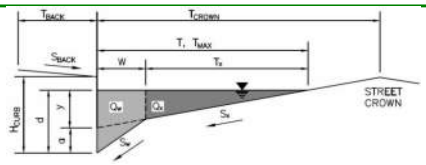
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.7**	**4.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP7**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.024	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.3	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

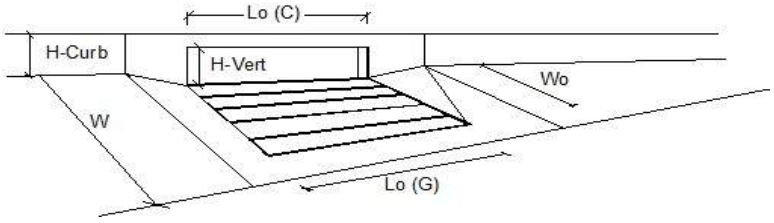
MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
Q_{allow} =	**29.7**	**30.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 2.70 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 4.90 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



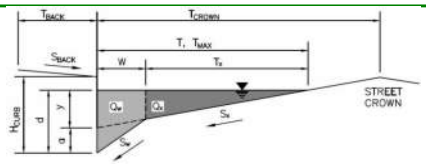
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.7**	**4.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**100**	**100**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP9**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

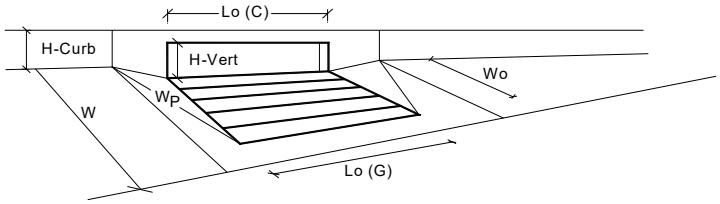
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



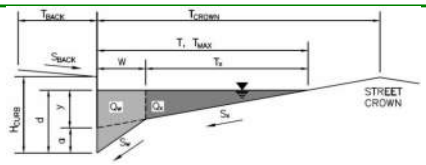
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.7	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.68	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.9**	**20.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	4.2	13.1	cfs

MHFD-Inlet, Version 5.03 (August 2023)

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP10**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.063	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

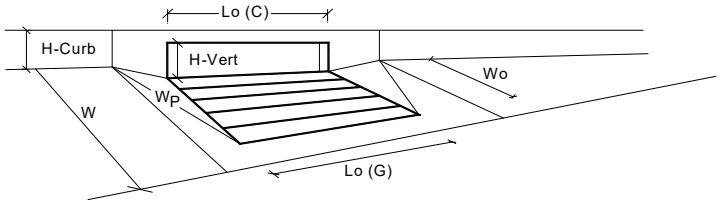
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	10.1	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

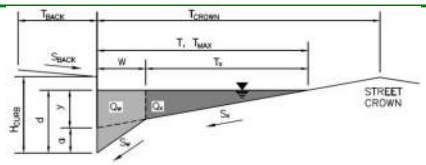


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	9.7	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.38	0.68	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.3**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	4.3	8.1	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: **Schmidt Parcel - District Infrastructure**
Inlet ID: **DP3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	17.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	36.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

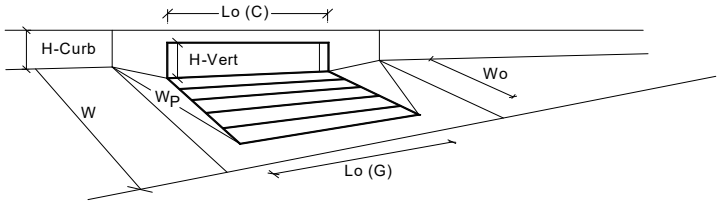
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	36.0	36.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is not applicable to Sump Condition
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	1.00	1.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	8.0	8.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.50	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.7**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.2	5.8	cfs

ATE 5-yr Storm

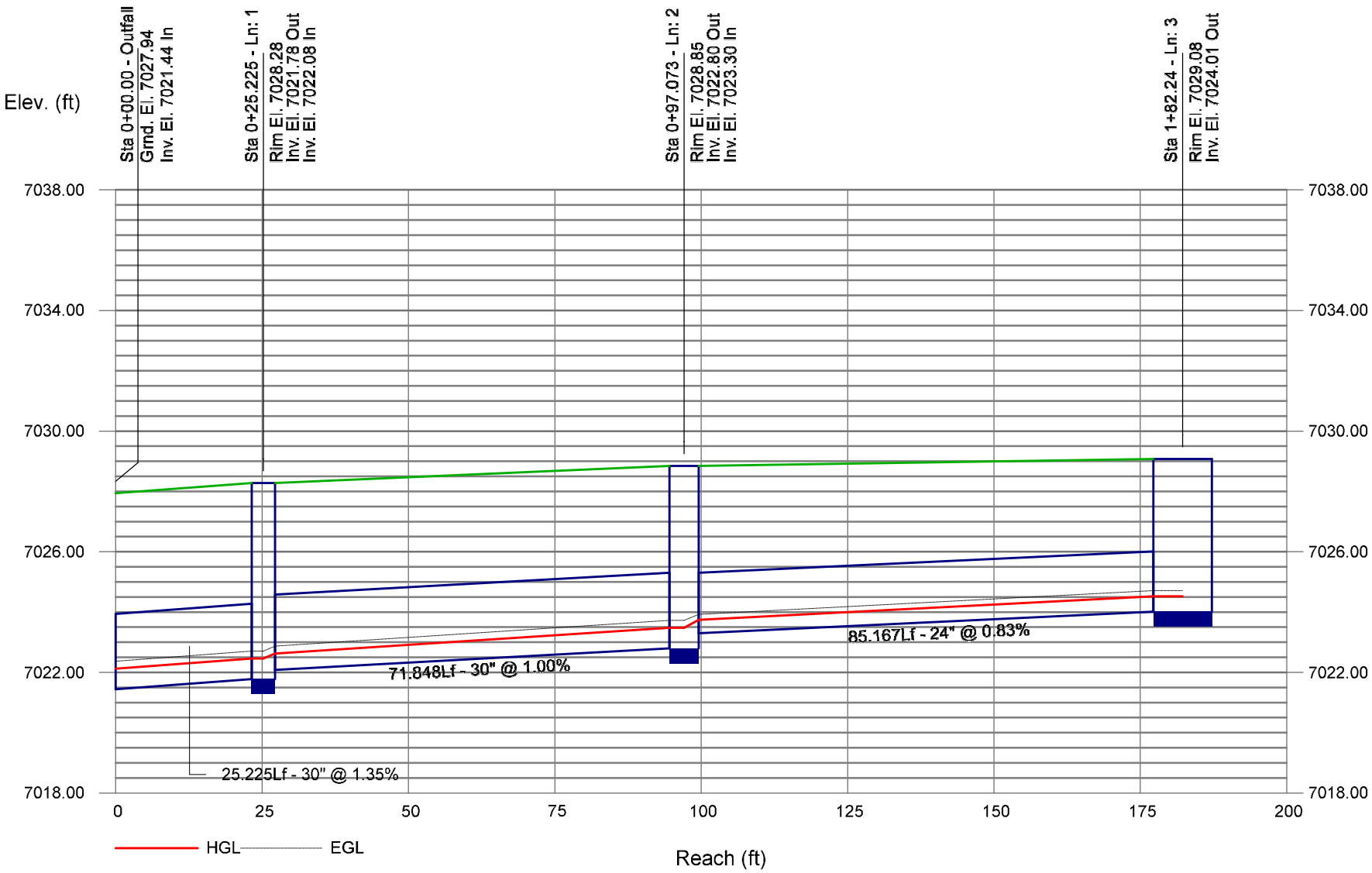
Line No.	DnStm Ln No	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Vel Ave (ft/s)	HGL Dn (ft)	HGL Up (ft)	EGL Dn (ft)	EGL Up (ft)	Line Size (in)	Line Length (ft)	
1	Outfall	4.30	47.60	0.013	7021.44	7021.78	3.97	7022.12	7022.46	7022.36	7022.7019140625	30	25.225	
2	1	4.30	41.05	0.013	7022.08	7022.80	4.69	7022.63	7023.48	7022.87	7023.72193359375	30	71.848	
3	2	2.20	20.65	0.013	7023.30	7024.01	3.86	7023.74	7024.53	7023.92	7024.70490234375	24	85.167	
4	Outfall	7.80	91.93	0.013	6998.13	6998.46	4.39	6998.97	6999.30	6999.27	6999.6017578125	42	39.534	
5	4	7.80	91.71	0.013	6998.76	7001.83	5.09	6999.45	7002.67	6999.75	7002.971875	42	369.477	
6	5	7.80	60.82	0.013	7002.33	7003.47	5.21	7003.06	7004.35	7003.37	7004.66912109375	36	137.088	
7	6	7.80	60.62	0.013	7003.77	7004.89	5.21	7004.50	7005.77	7004.81	7006.08904296875	36	135.592	
8	7	7.80	50.04	0.013	7005.89	7013.28	6.06	7006.56	7014.21	7006.90	7014.54751953125	30	496.348	
9	8	7.80	32.98	0.013	7013.58	7014.40	5.10	7014.41	7015.33	7014.75	7015.66763671875	30	126.786	
10	9	4.30	32.96	0.013	7014.50	7015.09	3.50	7015.33	7015.77 j	7015.57	7016.01197265625	30	91.347	
11	10	0.01	27.40	0.012	7015.59	7016.89	0.47	7015.77	7016.92	7015.78	7016.933828125	24	104.000	
12	11	0.01	27.56	0.012	7017.19	7017.67	0.94	7017.22	7017.70	7017.23	7017.71361328125	24	37.937	
13	Outfall	5.30	26.45	0.013	6997.38	6998.03	4.43	6998.19	6998.84	6998.50	6999.15130859375	24	47.525	
14	13	2.70	22.52	0.013	6998.13	6998.54	3.17	6998.84	6999.11 j	6999.05	6999.32181640625	24	41.369	
15	Outfall	0.10	207.62	0.013	6976.50	6978.52	1.39	6976.59	6978.61	6976.62	6978.6403515625	48	96.697	
16	15	0.10	119.65	0.013	6979.32	6981.61	1.64	6979.40	6981.70	6979.43	6981.733125	42	161.915	
17	16	0.10	84.12	0.013	6981.91	6985.94	1.44	6982.00	6986.03	6982.03	6986.063203125	42	576.500	
18	17	0.10	91.66	0.013	6986.04	6991.02	1.48	6986.13	6991.11	6986.16	6991.14328125	42	600.000	
19	18	0.10	91.96	0.013	6991.32	6992.19	1.48	6991.41	6992.28	6991.44	6992.313203125	42	104.144	
20	19	0.10	41.02	0.013	6993.19	6993.60	1.61	6993.28	6993.70	6993.32	6993.73166015625	30	41.000	

Project File: 2026-09-28_DVDP Interim 5-yr.stm | Number of lines: 20 | Date: 9/29/2026

NOTES: ** Critical depth

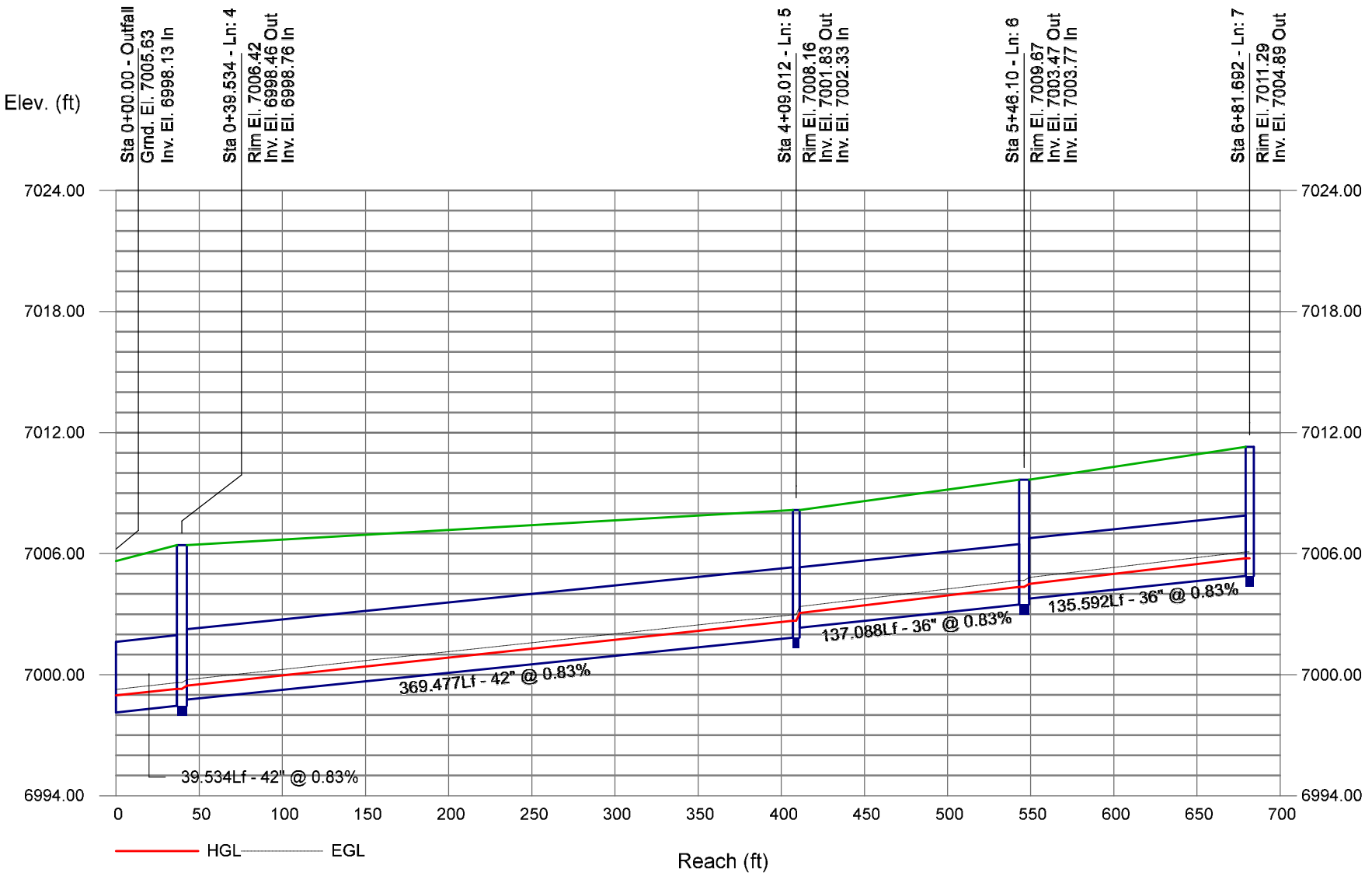
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



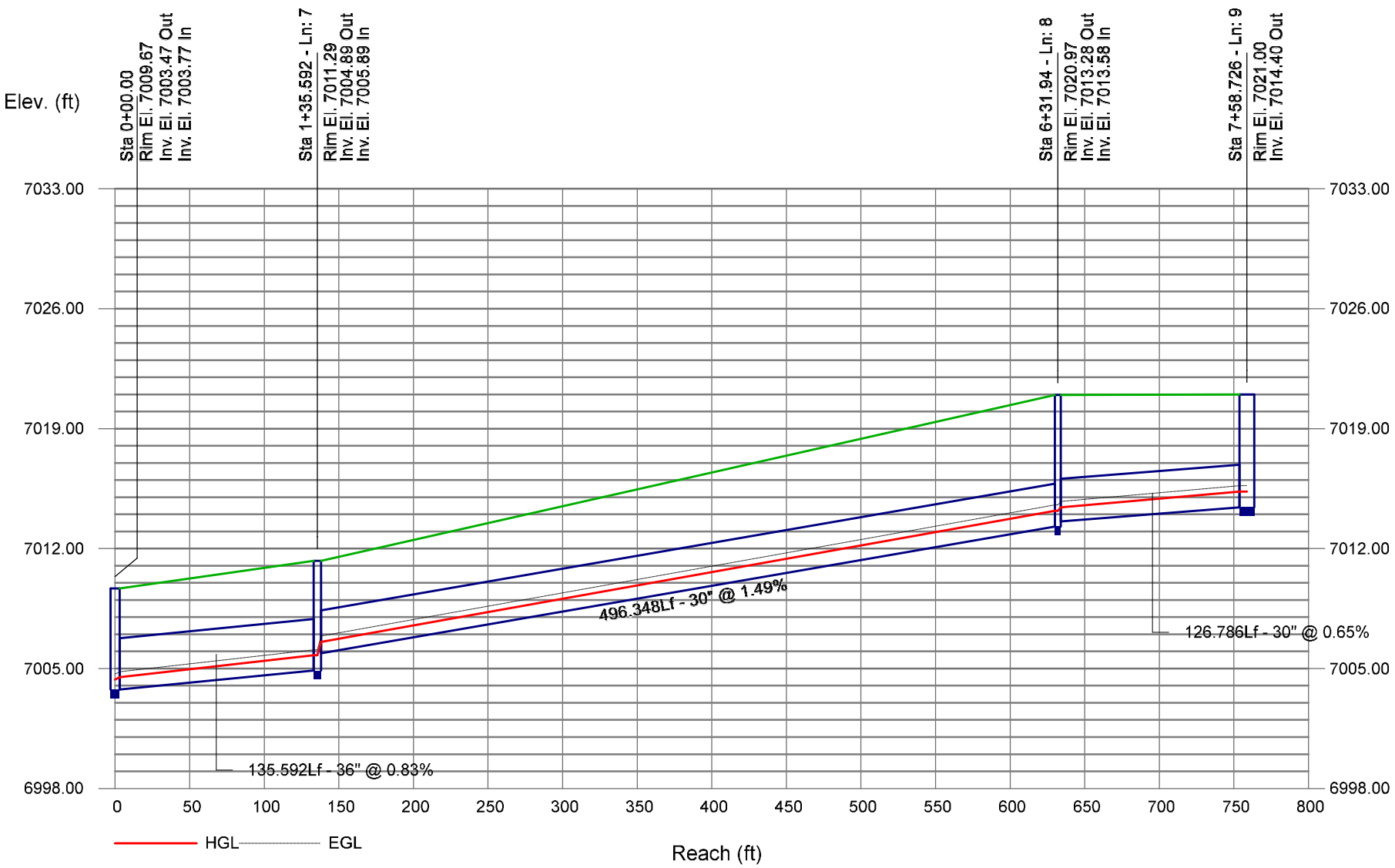
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



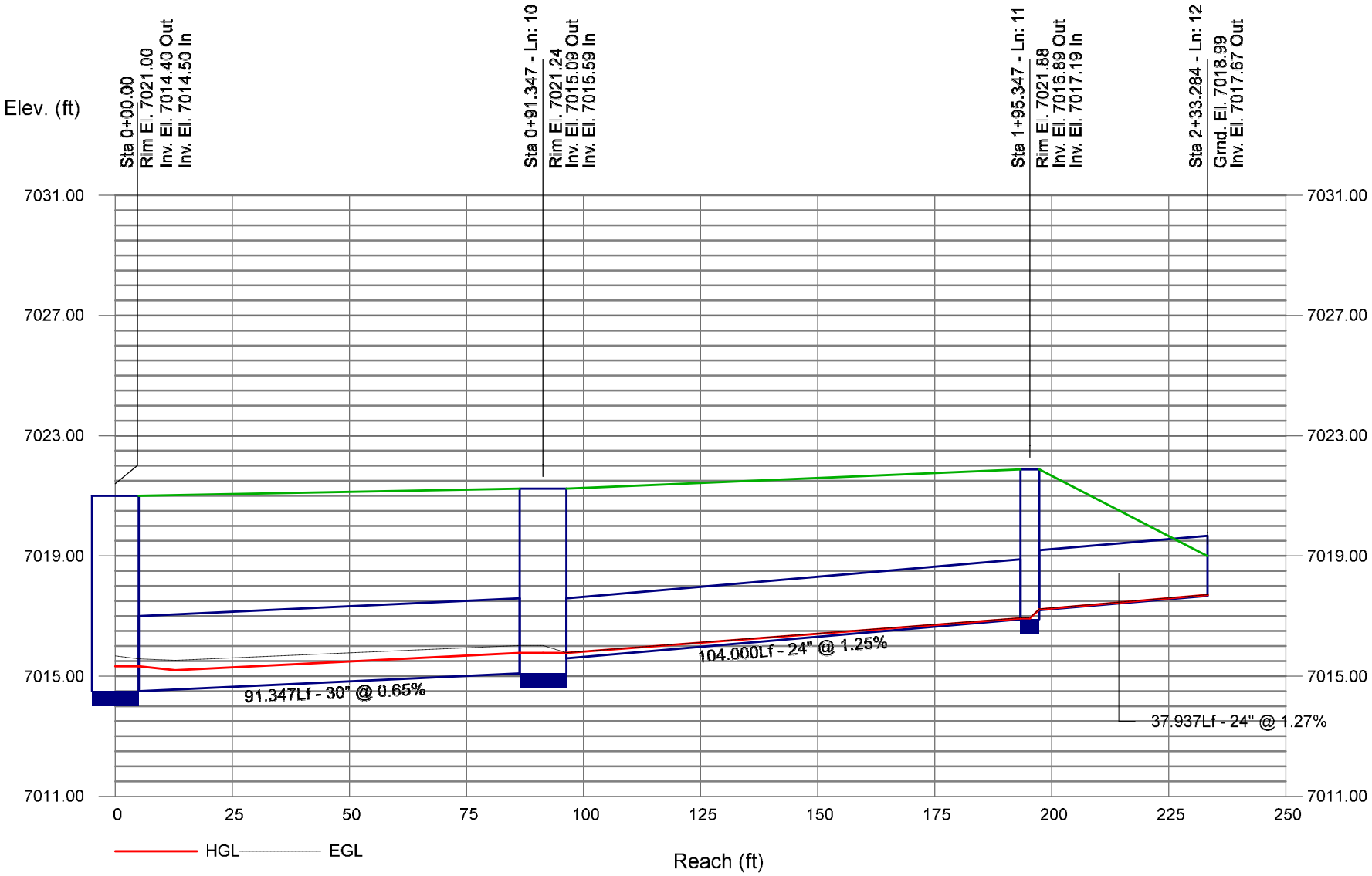
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



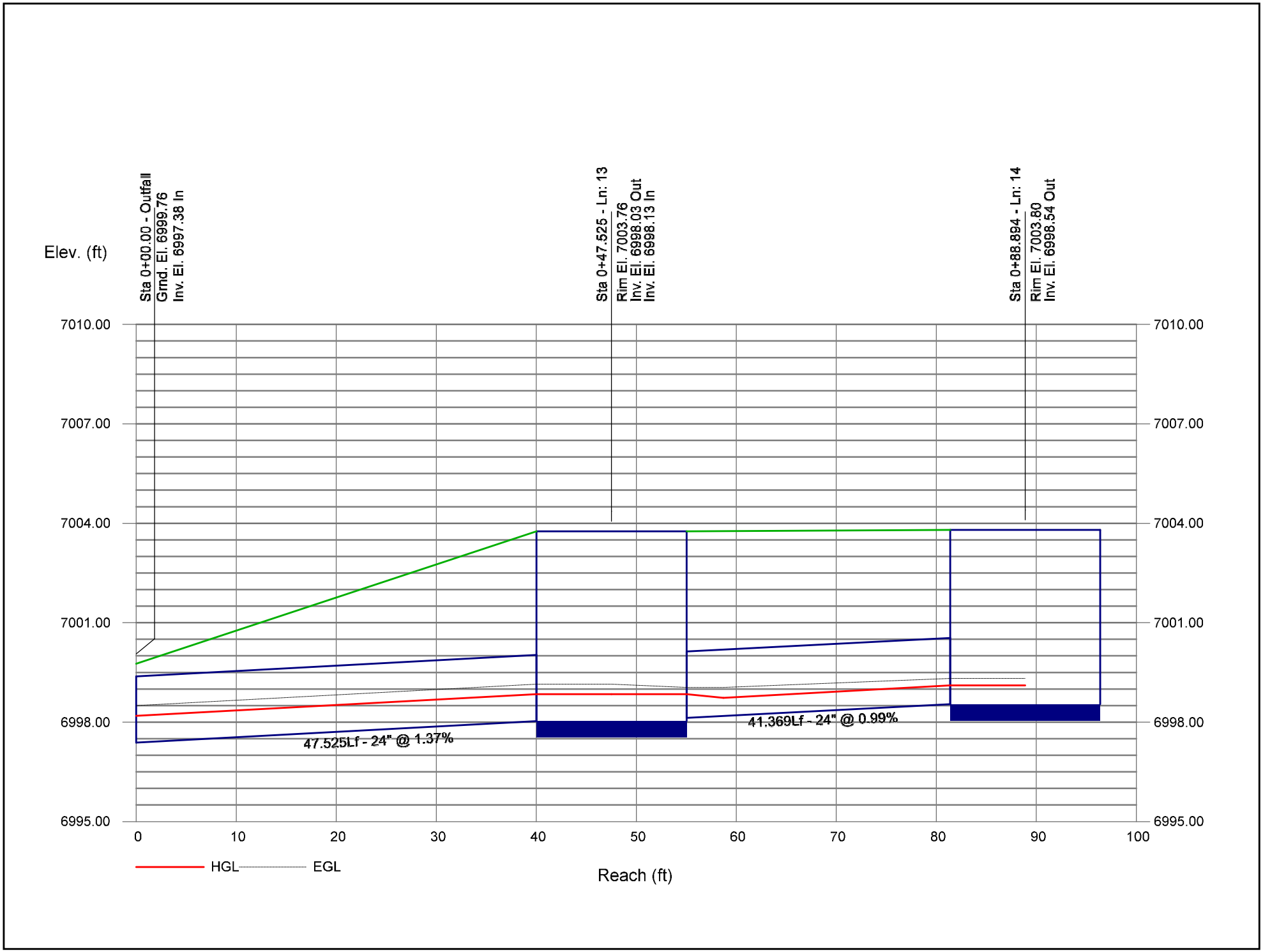
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



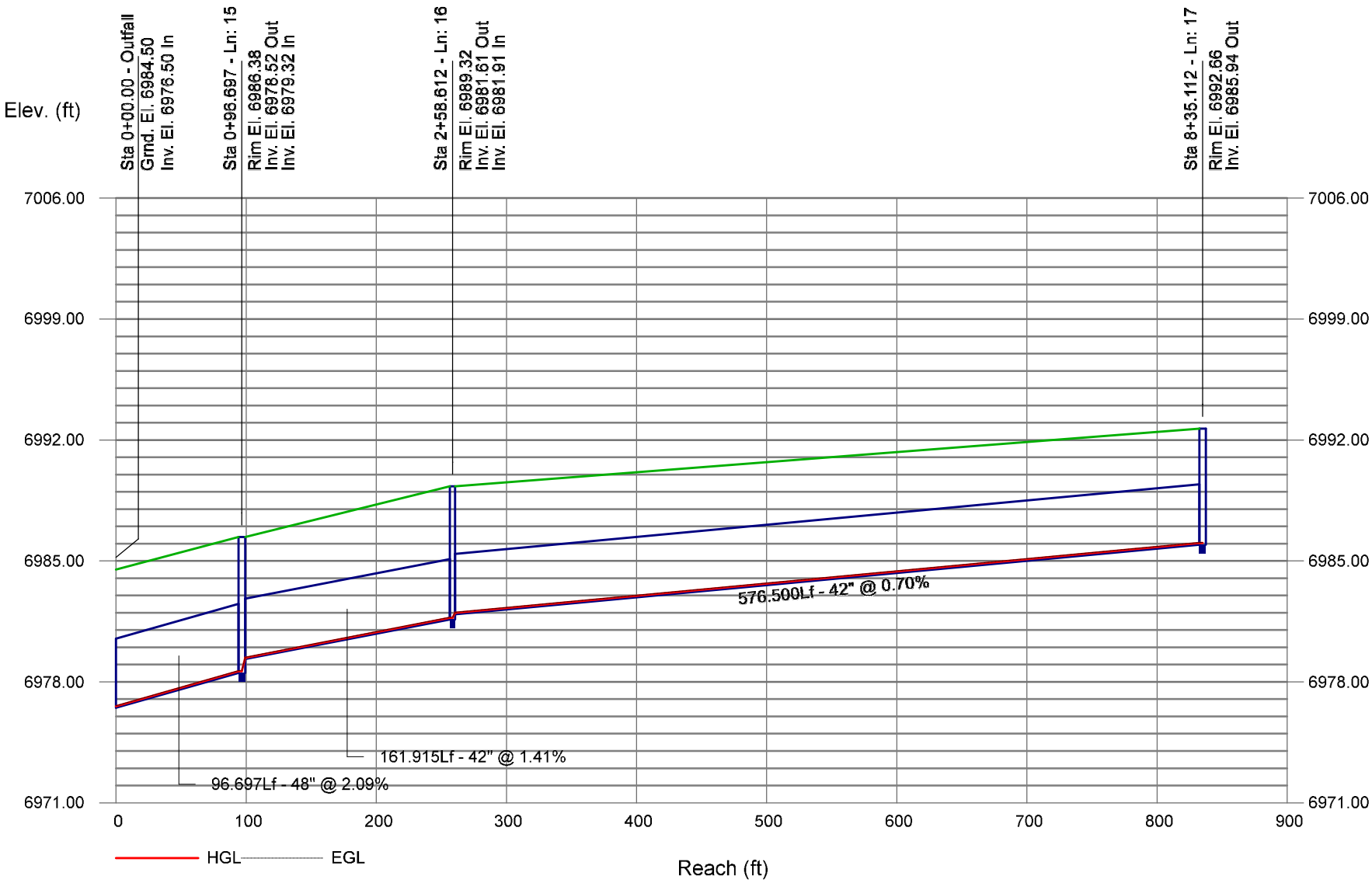
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



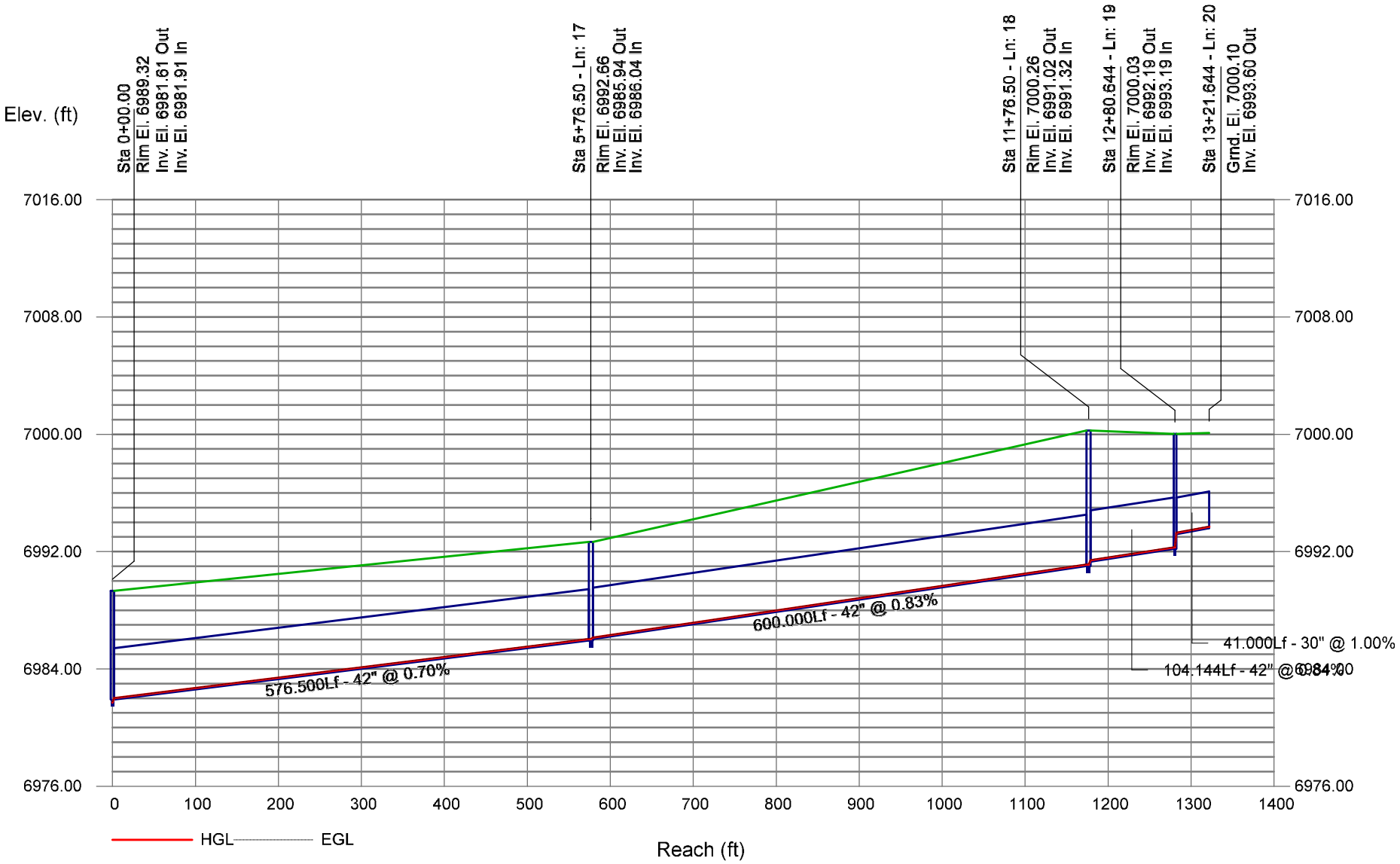
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 5-yr.stm



ATE 100-yr Storm

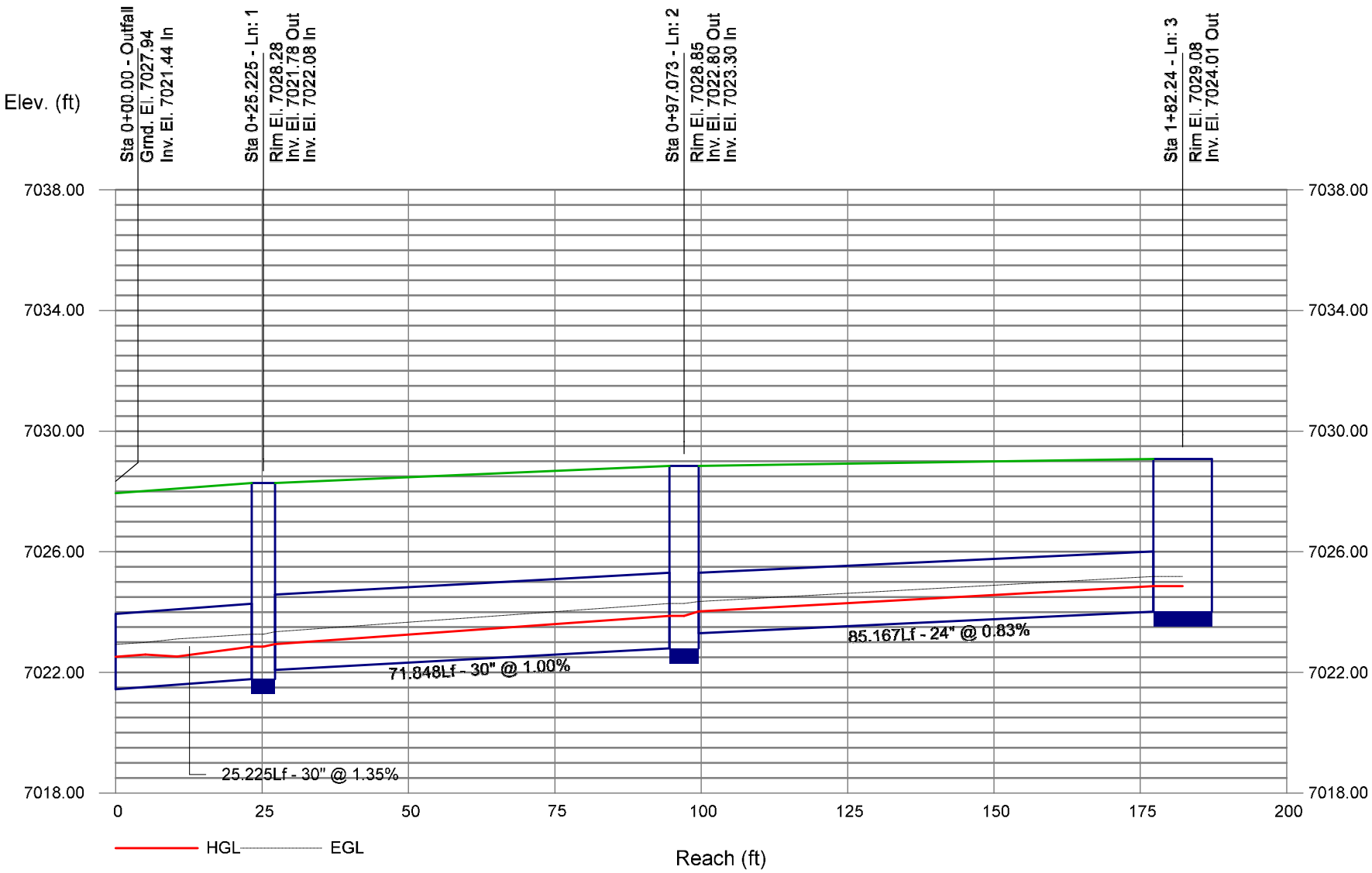
Line No.	DnStm Ln No	Flow Rate (cfs)	Capac Full (cfs)	n-val Pipe	Invert Dn (ft)	Invert Up (ft)	Vel Ave (ft/s)	HGL Dn (ft)	HGL Up (ft)	EGL Dn (ft)	EGL Up (ft)	Line Size (in)	Line Length (ft)	
1	Outfall	10.40	47.60	0.013	7021.44	7021.78	5.14	7022.52	7022.86	7022.93	7023.267421875	30	25.225	
2	1	10.40	41.05	0.013	7022.08	7022.80	6.05	7022.94	7023.88	7023.35	7024.28744140625	30	71.848	
3	2	5.80	20.65	0.013	7023.30	7024.01	5.10	7024.03	7024.86	7024.35	7025.17986328125	24	85.167	
4	Outfall	19.90	91.93	0.013	6998.13	6998.46	5.73	6999.50	6999.83	7000.01	7000.3351953125	42	39.534	
5	4	19.90	91.71	0.013	6998.76	7001.83	6.67	6999.87	7003.20	7000.38	7003.7053125	42	369.477	
6	5	19.90	60.82	0.013	7002.33	7003.47	6.84	7003.51	7004.90	7004.07	7005.45990234375	36	137.088	
7	6	19.90	60.62	0.013	7003.77	7004.89	6.83	7004.95	7006.32	7005.51	7006.87982421875	36	135.592	
8	7	19.90	50.04	0.013	7005.89	7013.28	8.01	7006.99	7014.79	7007.63	7015.43248046875	30	496.348	
9	8	19.90	32.98	0.013	7013.58	7014.40	6.72	7014.98	7015.91	7015.62	7016.55259765625	30	126.786	
10	9	13.10	32.96	0.013	7014.50	7015.09	5.06	7015.91	7016.31 j	7016.39	7016.78517578125	30	91.347	
11	10	0.01	27.40	0.012	7015.59	7016.89	0.44	7016.31	7016.92	7016.32	7016.933828125	24	104.000	
12	11	0.01	27.56	0.012	7017.19	7017.67	0.94	7017.22	7017.70	7017.23	7017.71361328125	24	37.937	
13	Outfall	9.60	26.45	0.013	6997.38	6998.03	5.38	6998.49	6999.14	6998.94	6999.58623046875	24	47.525	
14	13	4.90	22.52	0.013	6998.13	6998.54	3.71	6999.14	6999.32 j	6999.43	6999.60884765625	24	41.369	
15	Outfall	30.20	207.62	0.013	6976.50	6978.52	6.28	6978.13	6980.15	6978.74	6980.7584375	48	96.697	
16	15	30.20	119.65	0.013	6979.32	6981.61	8.45	6980.52	6983.31	6981.18	6983.96615234375	42	161.915	
17	16	30.20	84.12	0.013	6981.91	6985.94	7.28	6983.36	6987.64	6984.02	6988.29623046875	42	576.500	
18	17	30.20	91.66	0.013	6986.04	6991.02	6.80	6987.64	6992.72	6988.30	6993.37630859375	42	600.000	
19	18	30.20	91.96	0.013	6991.32	6992.19	7.48	6992.72	6993.89	6993.38	6994.54623046875	42	104.144	
20	19	4.60	40.92	0.013	6993.19	6993.60	4.08	6993.89	6994.31	6994.14	6994.55615234375	30	41.210	

Project File: 2026-09-28_DVDP Interim 100-yr.stm | Number of lines: 20 | Date: 9/29/2026

NOTES: ** Critical depth

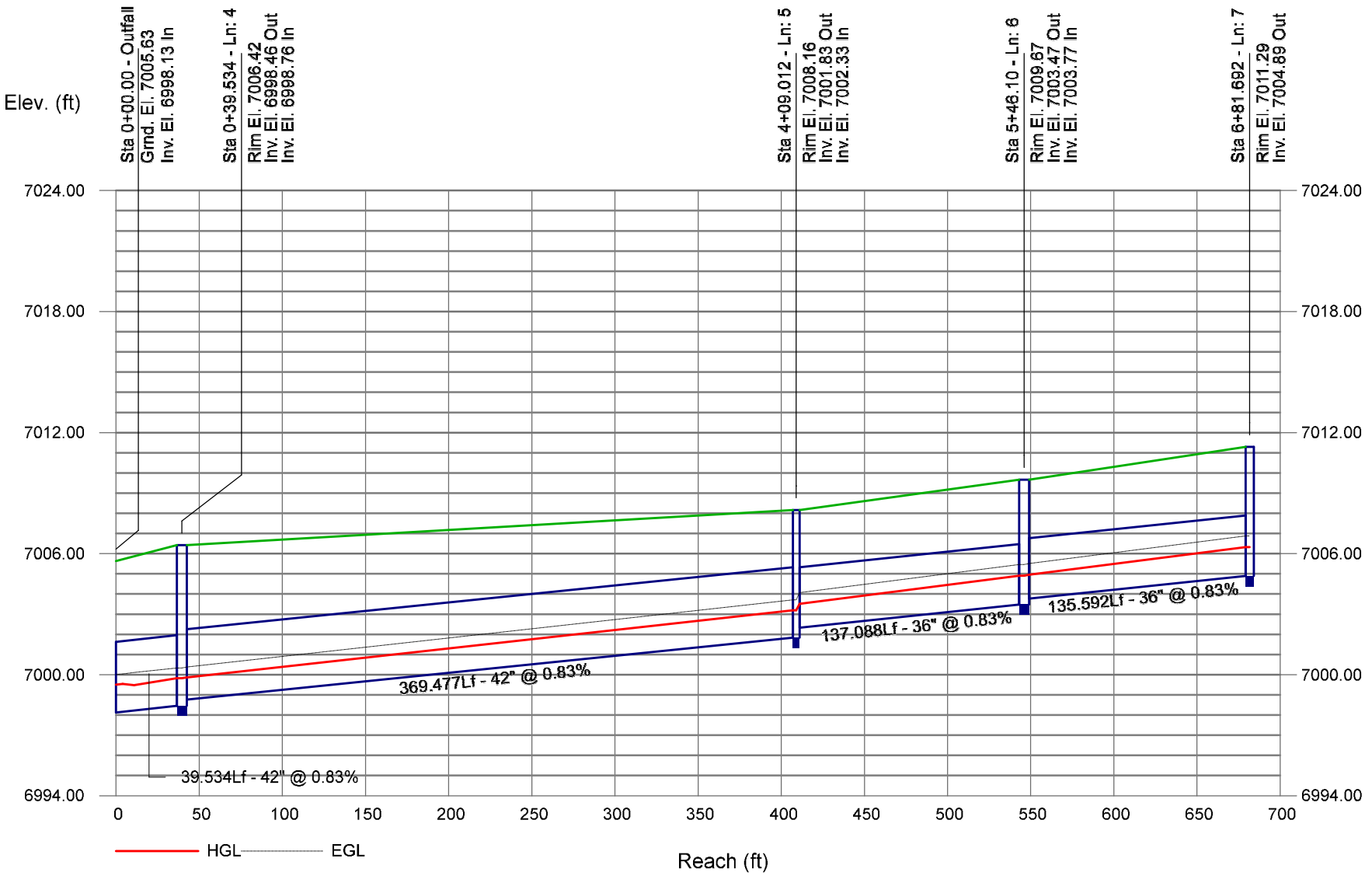
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



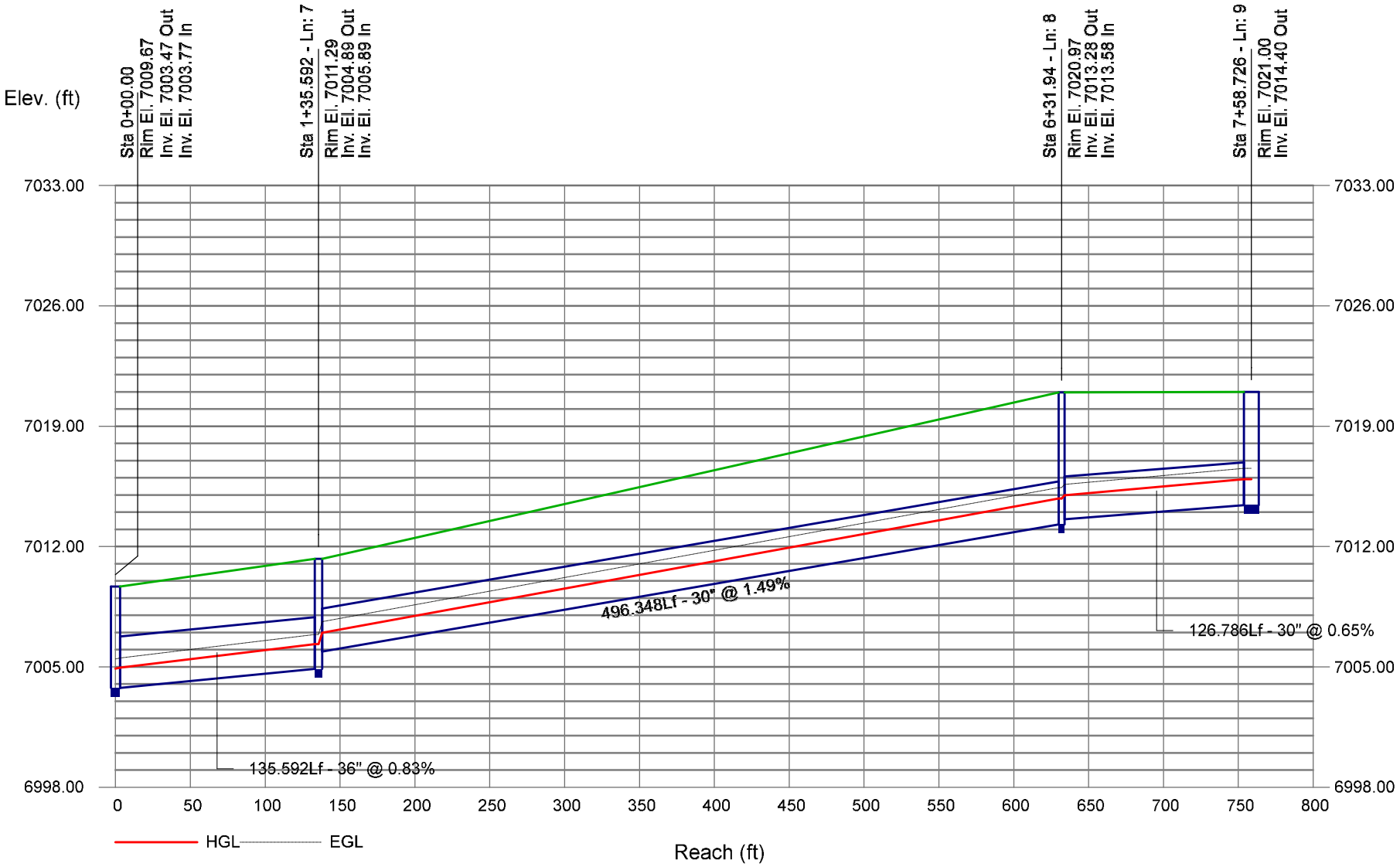
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



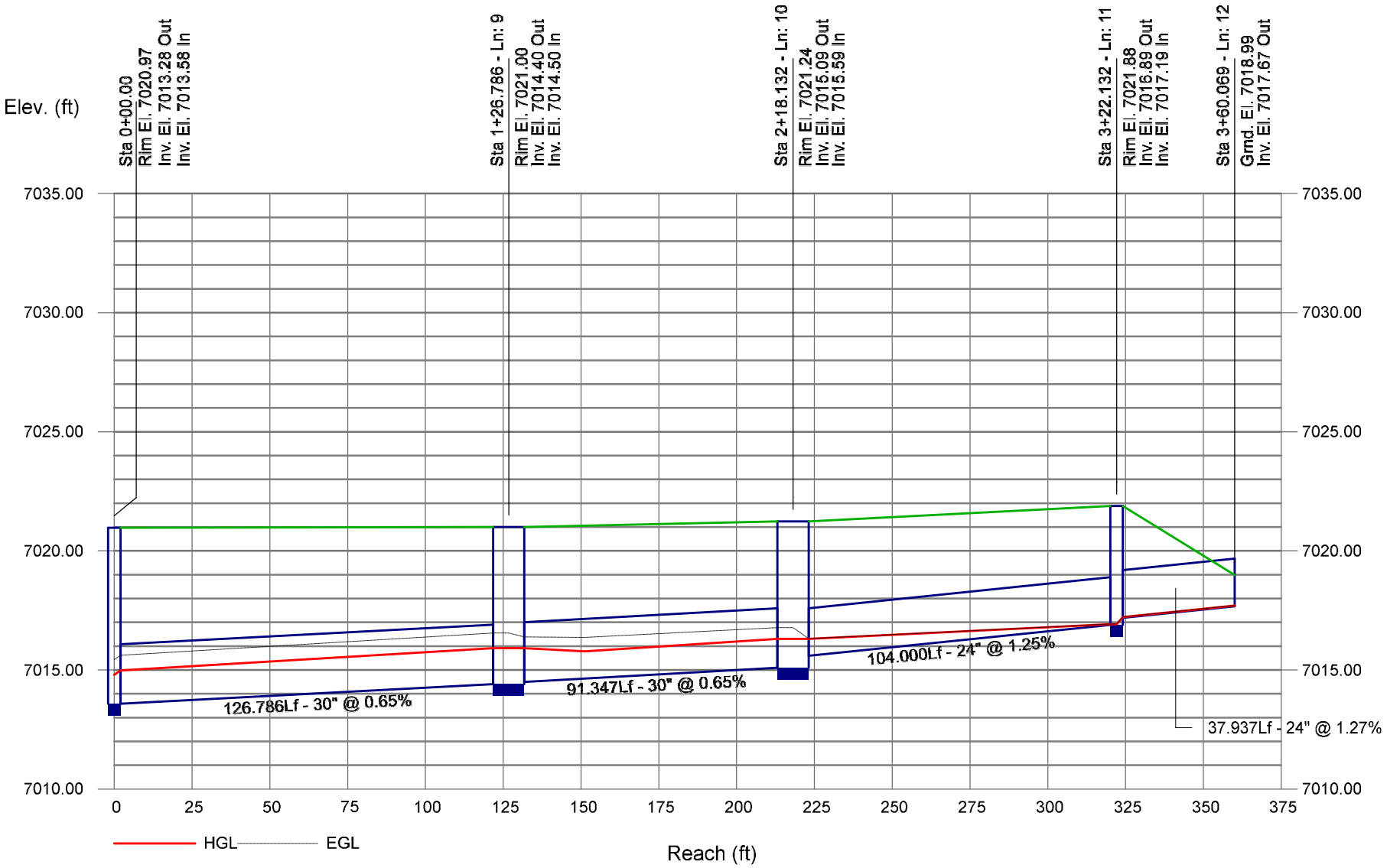
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



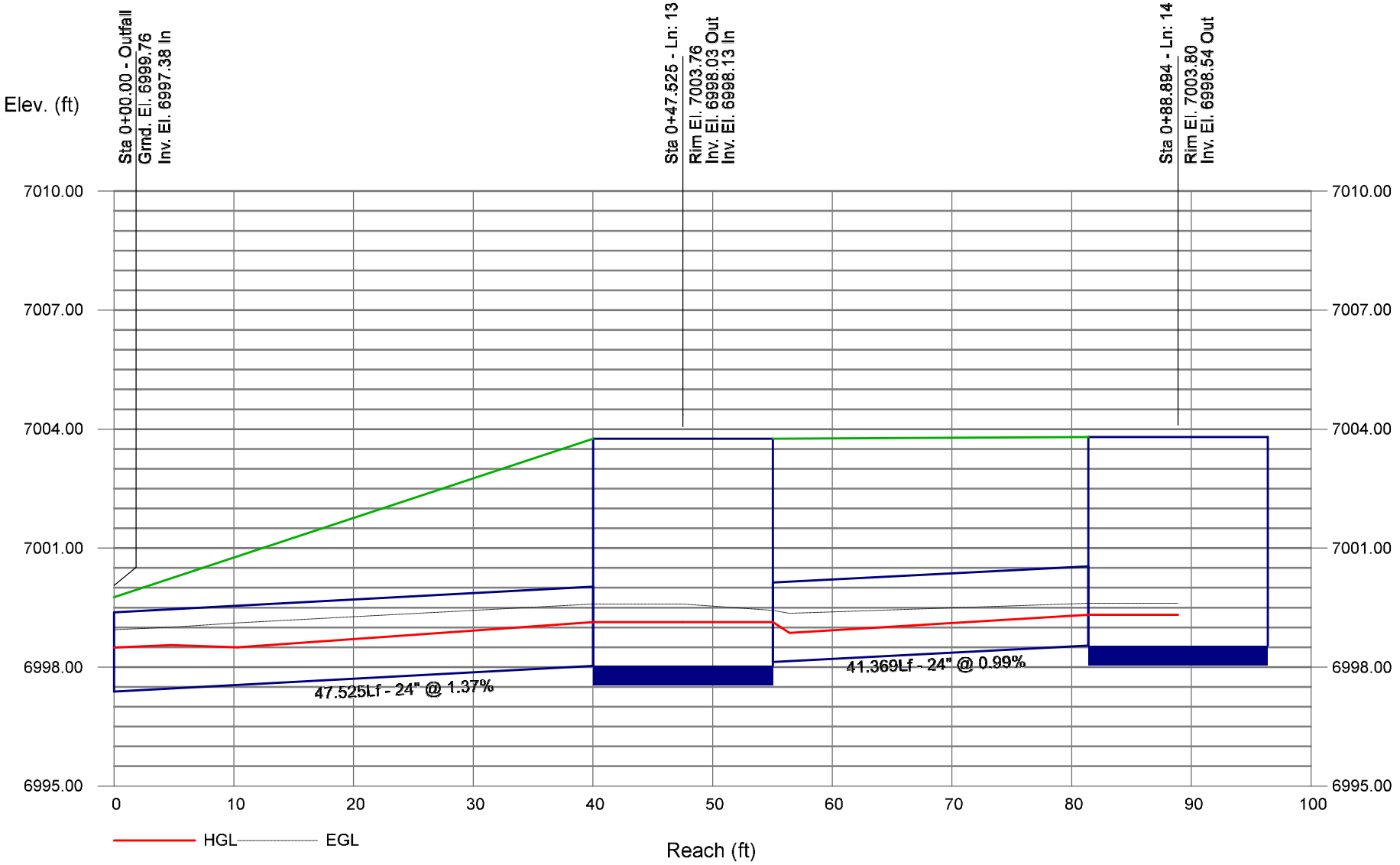
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



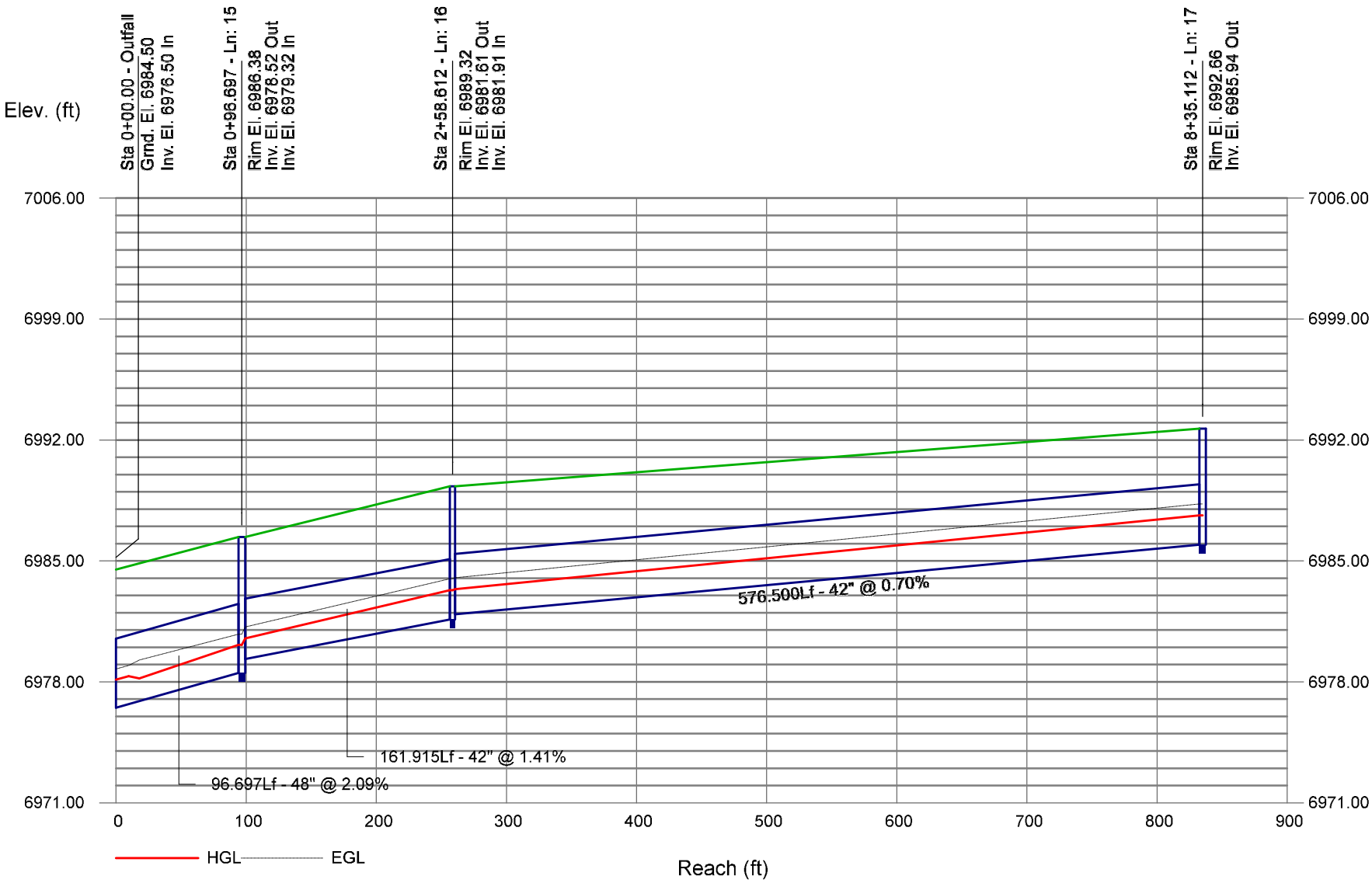
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



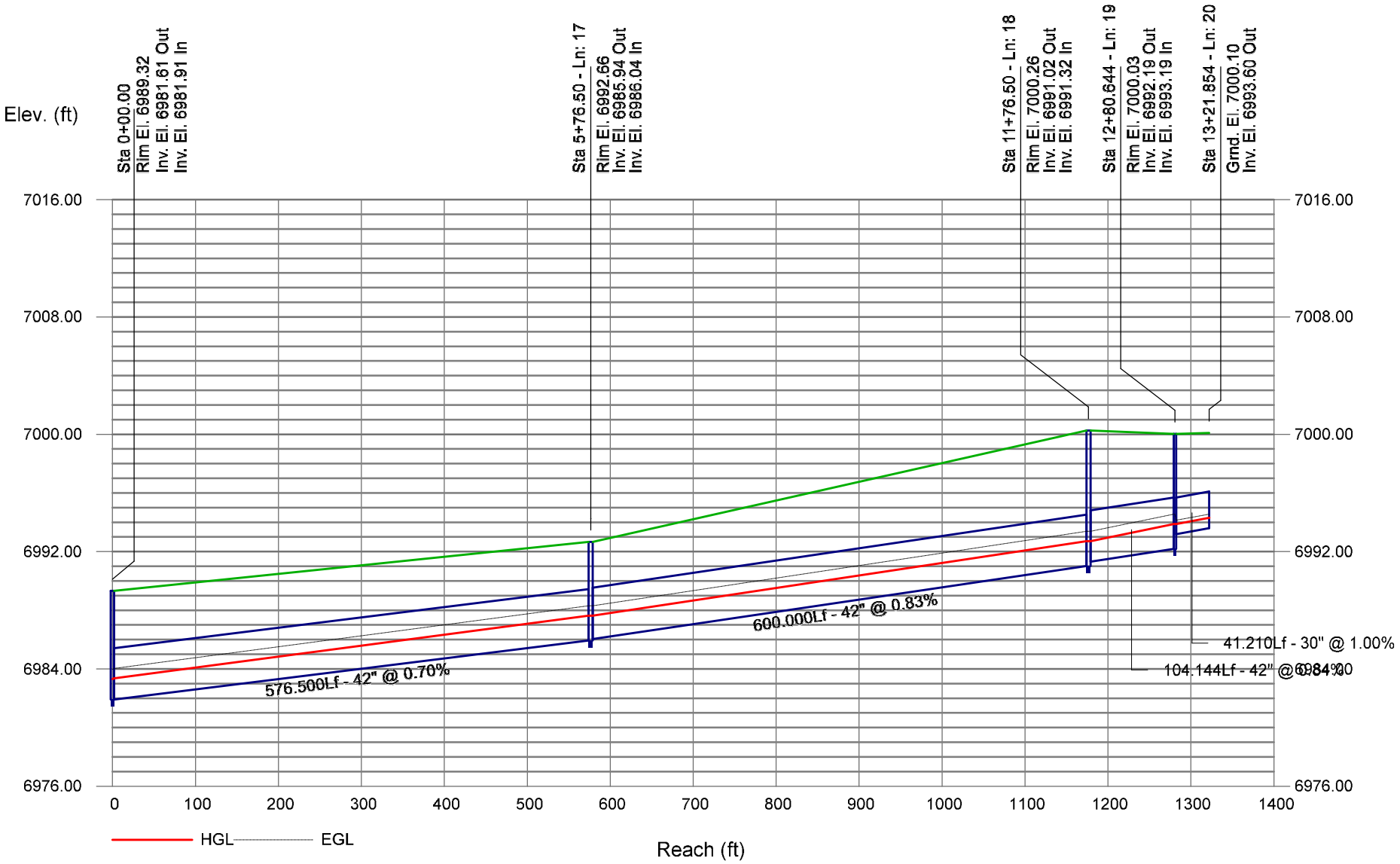
Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



Storm Sewer Profile

Proj. file: 2026-09-28_DVDP Interim 100-yr.stm



ALL TERRAIN ENGINEERING

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Schmidt Parcel - District P1
Location: El Paso County

Project Name: Schmidt Parcel - INTERIM
Project No.: 24013.00
Calculated By: REB
Checked By:
Date: 11/10/26

	STORM DRAIN SYSTEM			
	DESIGN POINT 4.1			**Notes**
Q_{100} (cfs):	10.4			
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	30			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	1.00			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40			
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	1.05			
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:	N/A			$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	2.18			
Required Riprap Size:	**L**			**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**			
Expansion Factor, $1/(2\tan\theta)$:	6.00			Read from Fig. 9-35 or 9-36
θ:	0.08			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	1.49			$A_t=Q/V$
Length of Protection, L_p (ft):	-6.1			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	7.5			Min L=3D or 3H
Max Length (ft)	25.0			Max L=10D or 10H
Min Bottom Width, T (ft):	1.5			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**			
Design Width (ft)	**1.5**			
Riprap Depth (in)	**18**			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

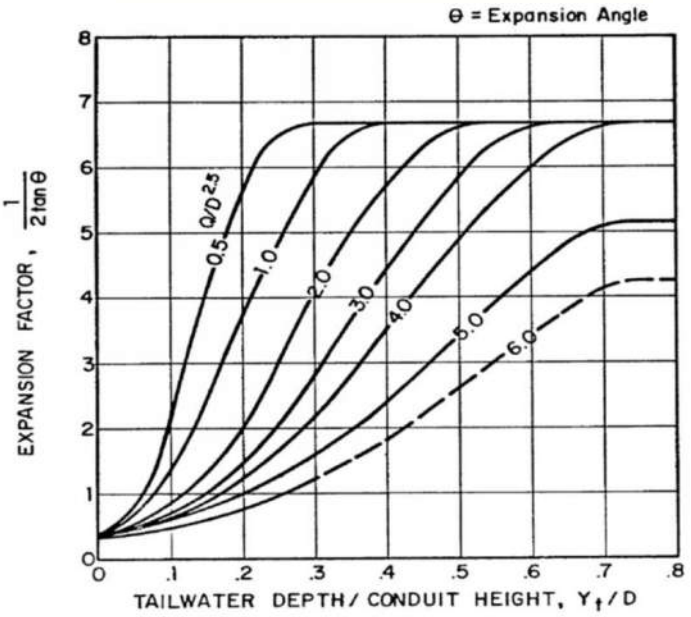


Figure 9-35. Expansion factor for circular conduits

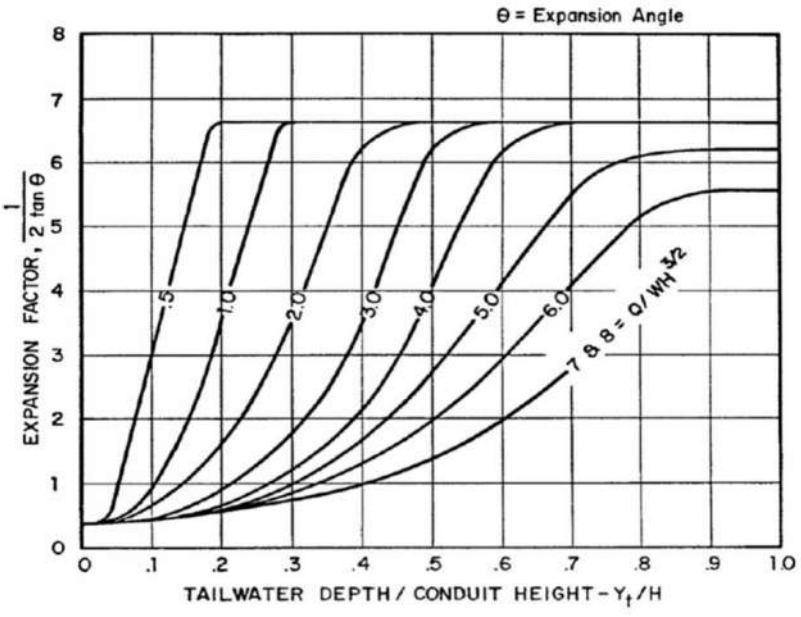


Figure 9-36. Expansion factor for rectangular conduits

ALL TERRAIN ENGINEERING

Subdivision:	Schmidt - CDRs
Location:	El Paso County
Project Name:	Schmidt - CDRs
Project Number:	24013
Calculated By:	NQJ
Checked By:	REB
Date:	10/26/2026

Proposed Conditions - Drainageway/Swale Summary Table

Channel Section	Section Slope, ft/ft	100-year Depth, ft	100-year Velocity, ft/s	100-year Hydraulic Radius, ft	Froude, 100-yr	Shear Stress, 100-yr
E1	0.0180	0.5	2.15	0.25	0.54	0.3
E1 Max Side Slope	0.0180	0.54	2.31	0.27	0.55	0.3
E2	0.0110	0.26	1.54	0.22	0.53	0.2
L1	0.0070	0.63	2.11	0.44	0.47	0.2

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 5 2026

SWALE E1 (MIN. SIDE SLOPE) (Q100+)

Triangular

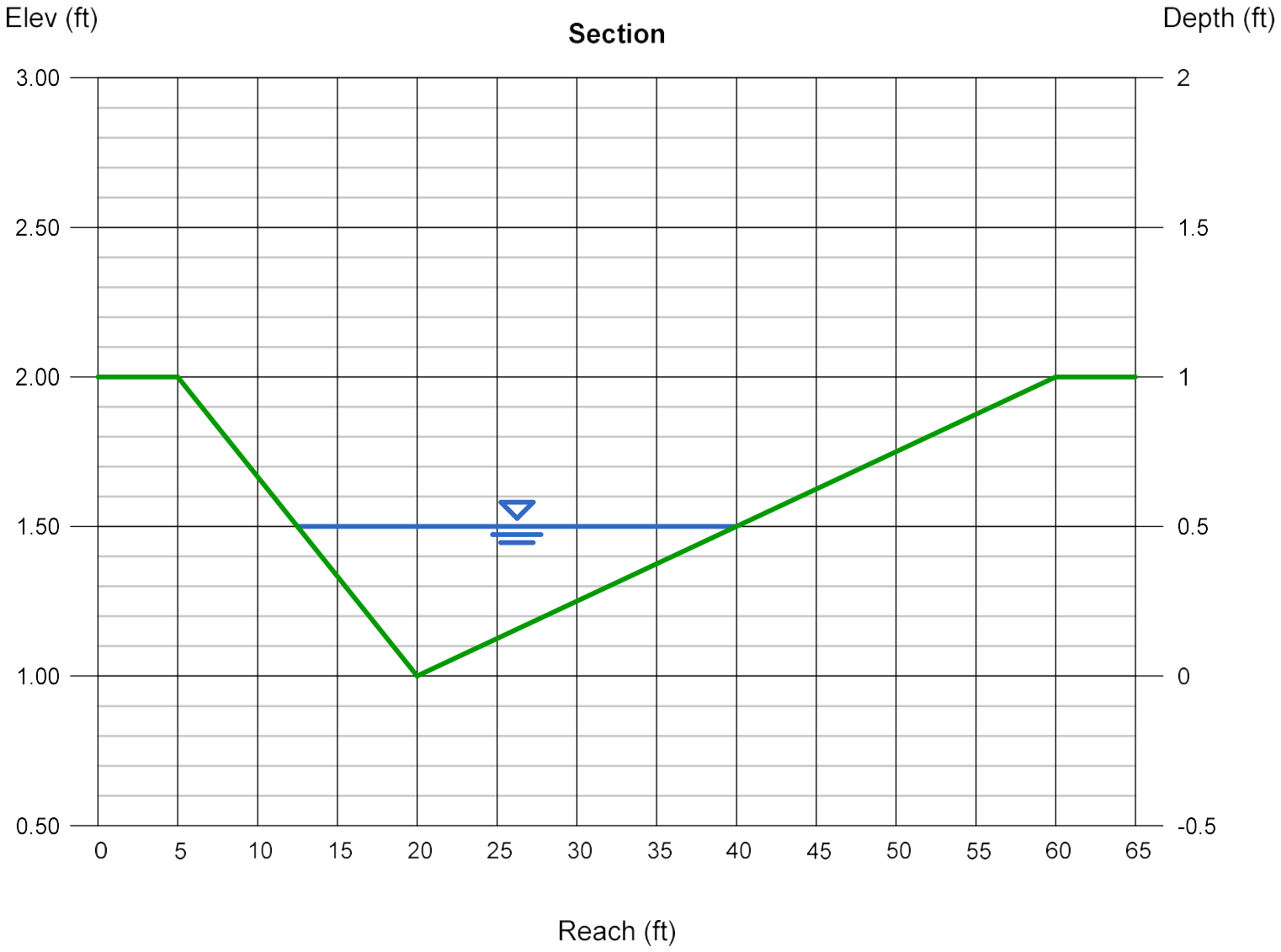
Side Slopes (z:1)	= 15.00, 40.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.80

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 14.80
Area (sqft)	= 6.87
Velocity (ft/s)	= 2.15
Wetted Perim (ft)	= 27.52
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 27.50
EGL (ft)	= 0.57



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 5 2026

SWALE E1 (MAX SIDE SLOPE) (Q100+)

Triangular

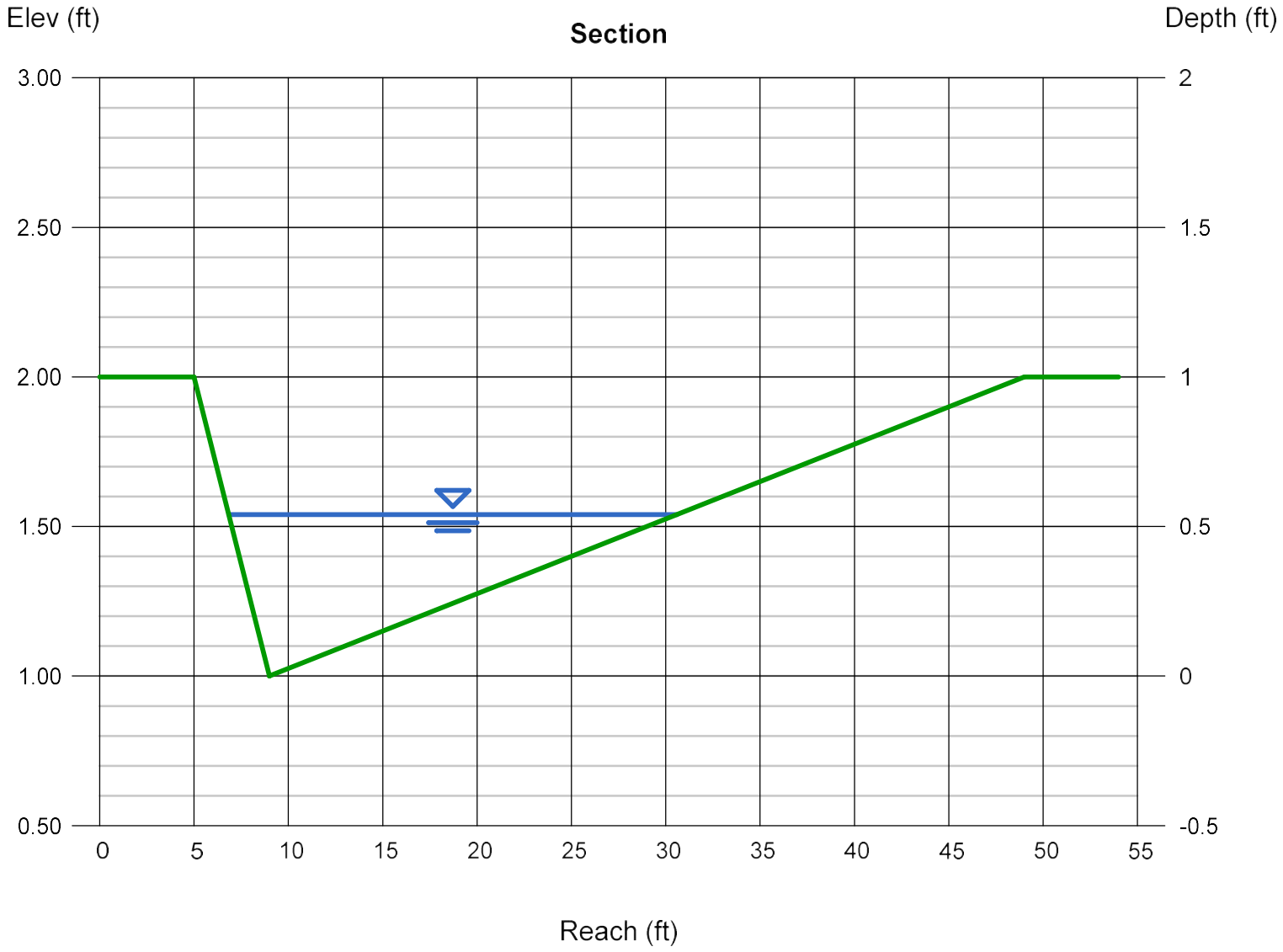
Side Slopes (z:1)	= 4.00, 40.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.80
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.80

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 14.80
Area (sqft)	= 6.42
Velocity (ft/s)	= 2.31
Wetted Perim (ft)	= 23.83
Crit Depth, Yc (ft)	= 0.49
Top Width (ft)	= 23.76
EGL (ft)	= 0.62



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 5 2026

SWALE E2 (Q100)

Trapezoidal

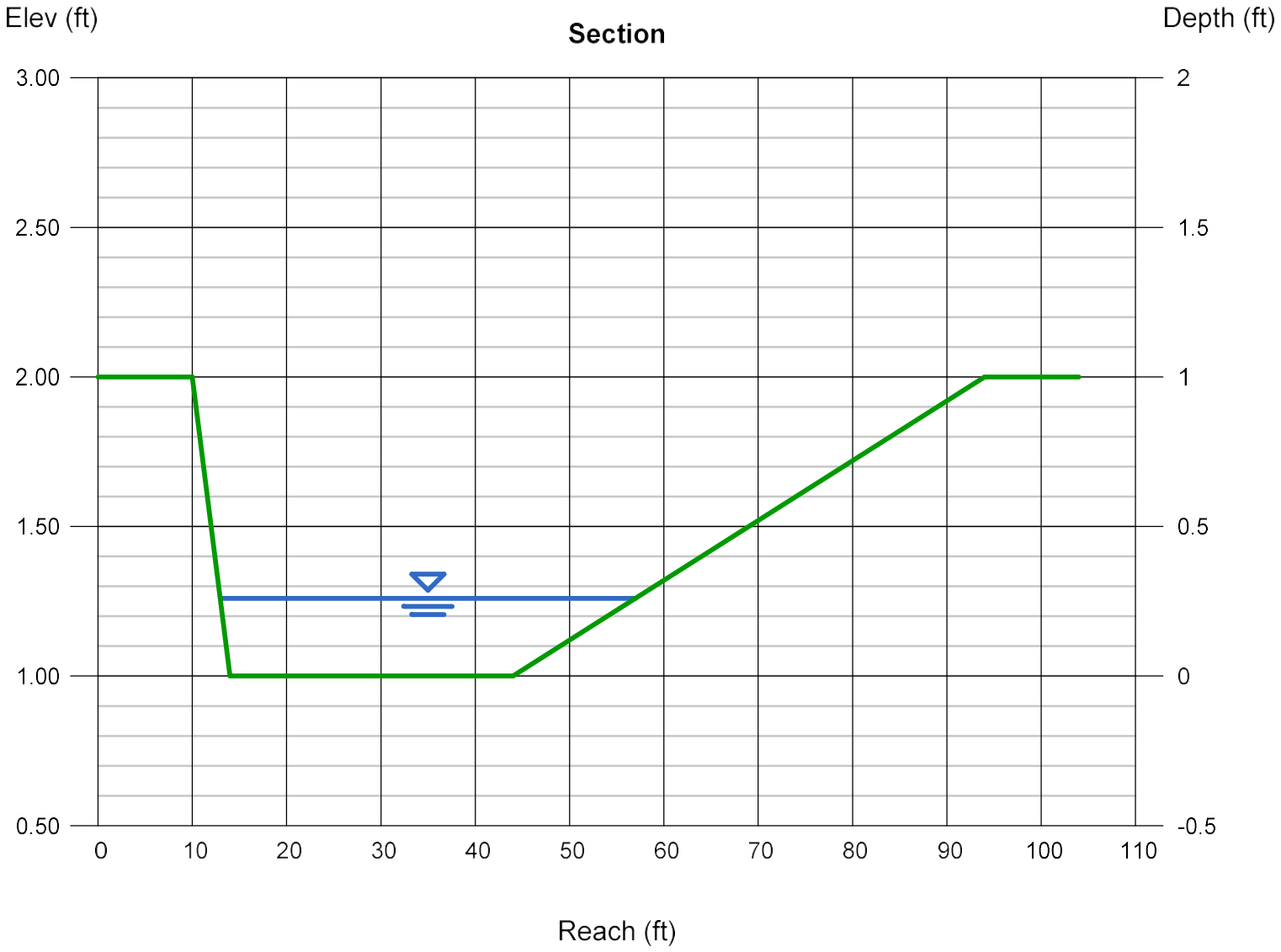
Bottom Width (ft)	= 30.00
Side Slopes (z:1)	= 4.00, 50.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.80

Highlighted

Depth (ft)	= 0.26
Q (cfs)	= 14.80
Area (sqft)	= 9.63
Velocity (ft/s)	= 1.54
Wetted Perim (ft)	= 44.07
Crit Depth, Yc (ft)	= 0.19
Top Width (ft)	= 44.04
EGL (ft)	= 0.30



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 5 2026

SWALE L1 (Q100 (40% of BASIN K FLOW)

User-defined

Invert Elev (ft)	= 1.00
Slope (%)	= 0.70
N-Value	= 0.033

Calculations

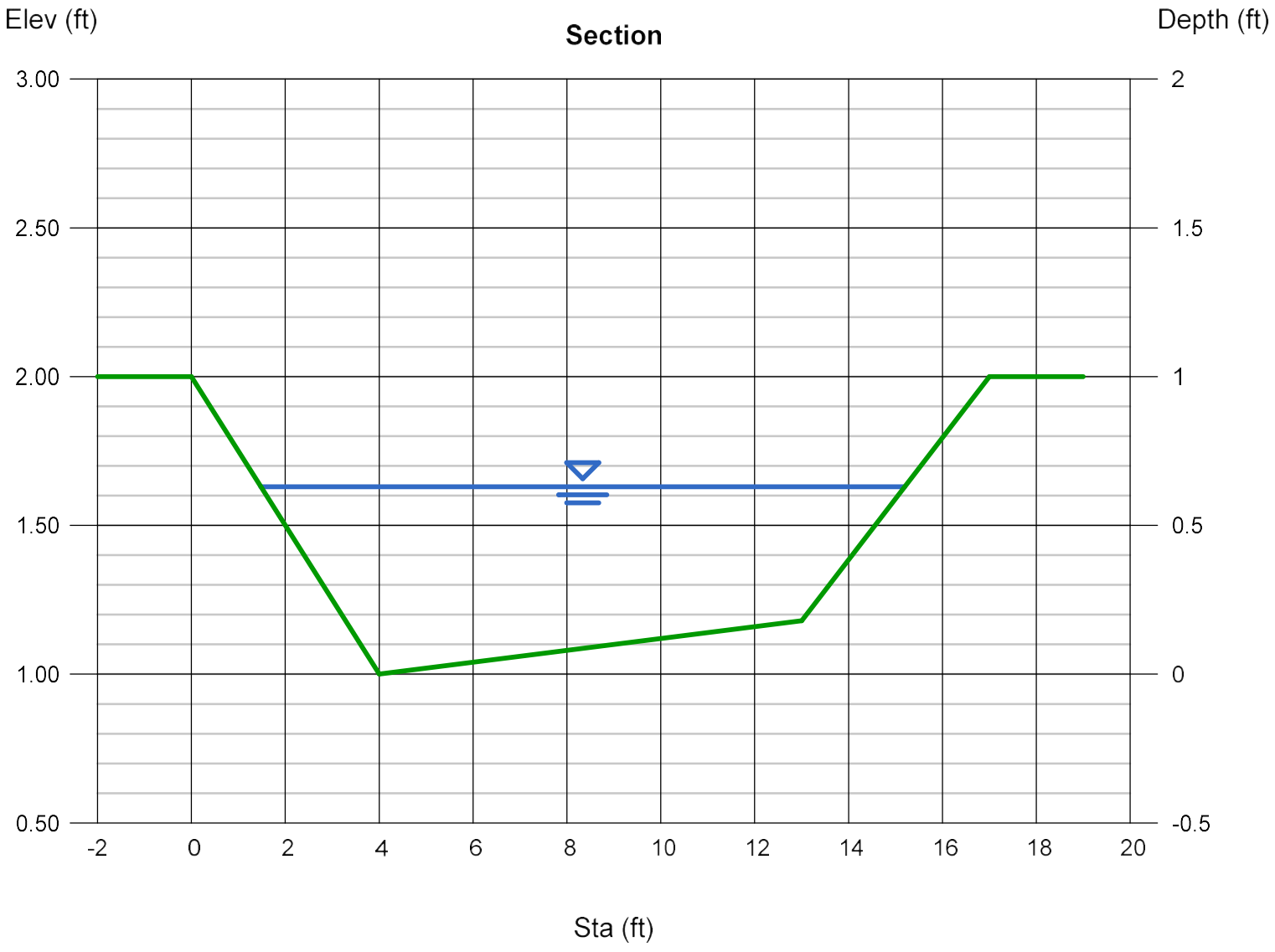
Compute by:	Known Q
Known Q (cfs)	= 13.00

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 13.00
Area (sqft)	= 6.15
Velocity (ft/s)	= 2.11
Wetted Perim (ft)	= 13.84
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 13.72
EGL (ft)	= 0.70

(Sta, El, n)-(Sta, El, n)...

(0.00, 2.00)-(4.00, 1.00, 0.034)-(13.00, 1.18, 0.034)-(17.00, 2.00, 0.034)



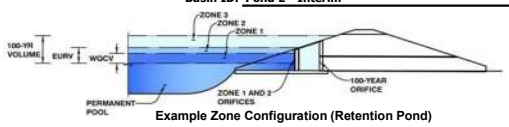
APPENDIX D – WATER QUALITY & DETENTION

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Schmidt CDRs

Basin ID: Pond E - Interim



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	33.56	acres
Watershed Length =	1,400	ft
Watershed Length to Centroid =	600	ft
Watershed Slope =	0.022	ft/ft
Watershed Imperviousness =	10.10%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	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) =	0.189	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.250	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.123	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.209	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.281	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.733	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.188	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.828	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	3.238	acre-feet		inches
Approximate 2-yr Detention Volume =	0.150	acre-feet		
Approximate 5-yr Detention Volume =	0.205	acre-feet		
Approximate 10-yr Detention Volume =	0.270	acre-feet		
Approximate 25-yr Detention Volume =	0.366	acre-feet		
Approximate 50-yr Detention Volume =	0.491	acre-feet		
Approximate 100-yr Detention Volume =	0.796	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.189	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.061	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.546	acre-feet
Total Detention Basin Volume =	0.796	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

6994.6

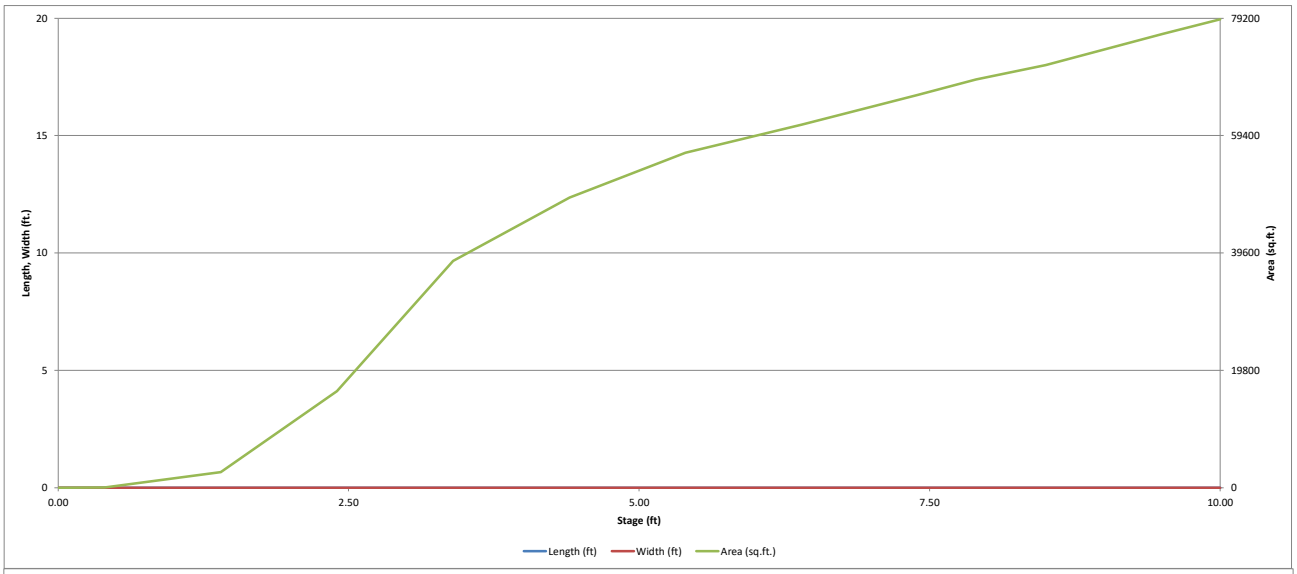
Spillway

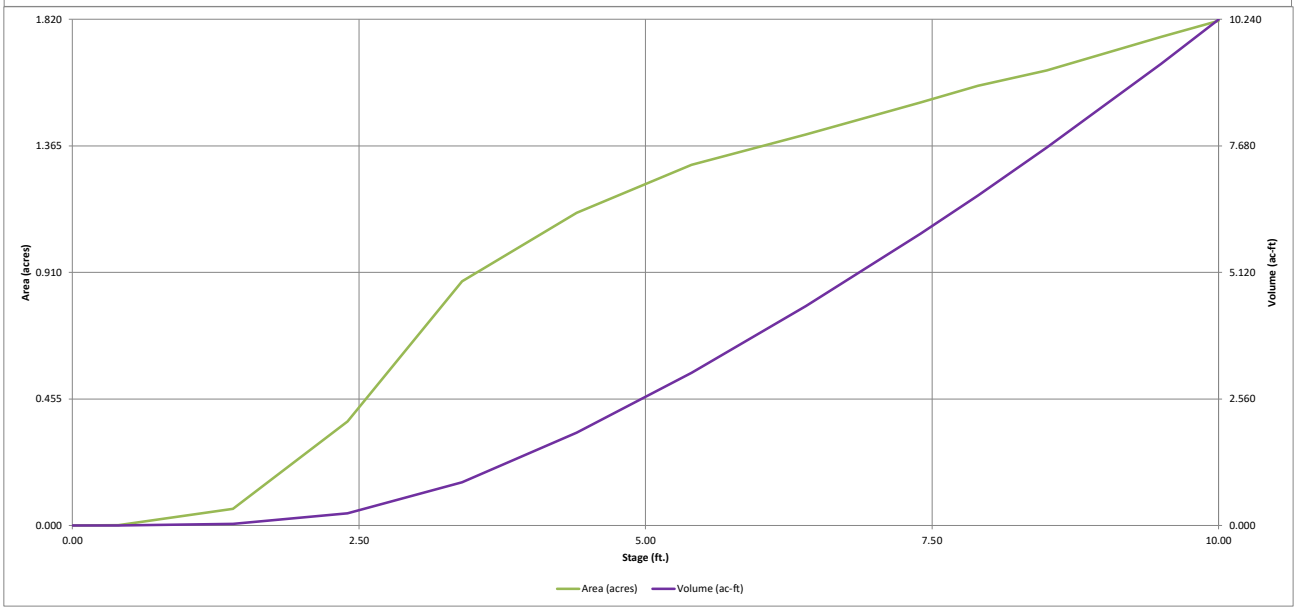
Depth Increment = ft

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	--	--	--	10	0.000		
6995	--	0.40	--	--	--	61	0.001	14	0.000
6996	--	1.40	--	--	--	2,633	0.060	1,361	0.031
6997	--	2.40	--	--	--	16,290	0.374	10,823	0.248
6998	--	3.40	--	--	--	38,266	0.878	38,100	0.875
6999	--	4.40	--	--	--	48,963	1.124	81,715	1.876
7000	--	5.40	--	--	--	56,521	1.298	134,457	3.087
7001	--	6.40	--	--	--	61,281	1.407	193,358	4.439
7002	--	7.40	--	--	--	66,302	1.522	257,149	5.903
7002.5	--	7.90	--	--	--	68,867	1.581	290,942	6.679
7003	--	8.50	--	--	--	71,303	1.637	332,993	7.644
7004	--	9.50	--	--	--	76,557	1.758	406,923	9.342
7004.5	--	10.00	--	--	--	79,051	1.815	445,825	10.235

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



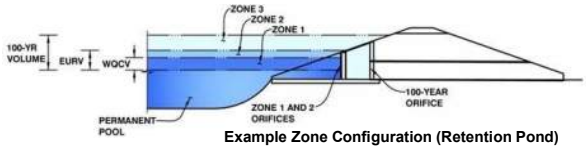


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Schmidt CDRs**

Basin ID: **Pond E - Interim**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.23	0.189	Orifice Plate
Zone 2 (EURV)	2.41	0.061	Orifice Plate
Zone 3 (100-year)	3.31	0.546	Rectangular Orifice
Total (all zones)		0.796	

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 =	2.39	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	1.25						
Orifice Area (sq. inches)	0.79	1.23						

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 3 Rectangular	Not Selected		Zone 3 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	3.00	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	3.31	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.75	N/A	feet
Vertical Orifice Height =	18.00	N/A	inches				
Vertical Orifice Width =	24.00		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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.50	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	3.97	N/A	
Horiz. Length of Weir Sides =	7.00	N/A	feet	Overflow Grate Open Area w/o Debris =	19.49	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	9.74	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)

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.91	N/A	ft^2
Circular Orifice Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	1.25	N/A	feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.46	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	9.36	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.74	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.10	acre-ft

Calculated Parameters for Spillway

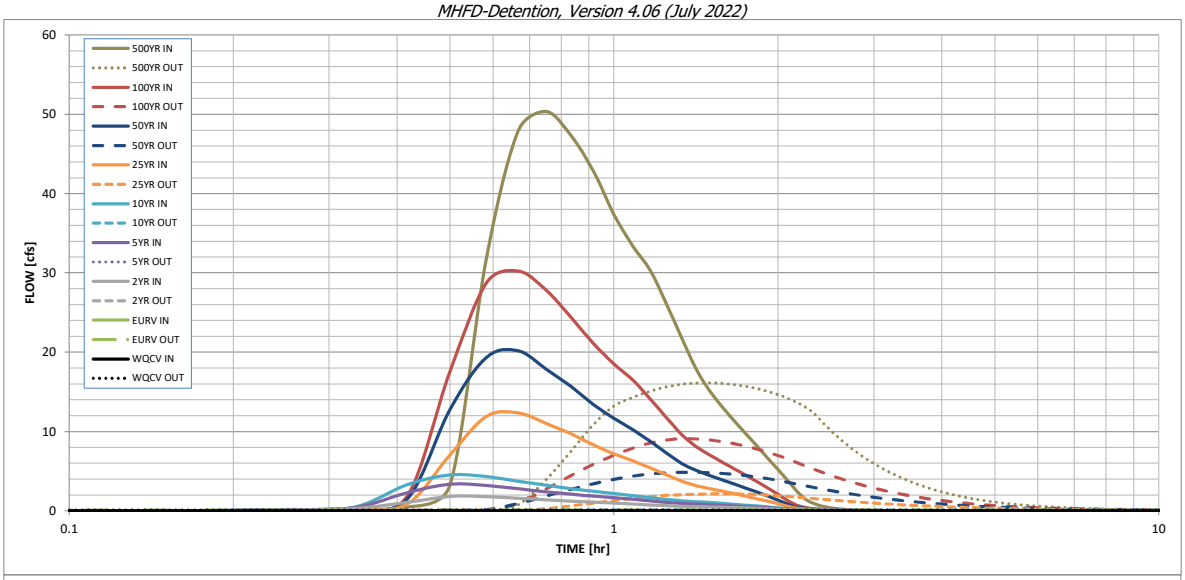
Routed Hydrograph Results

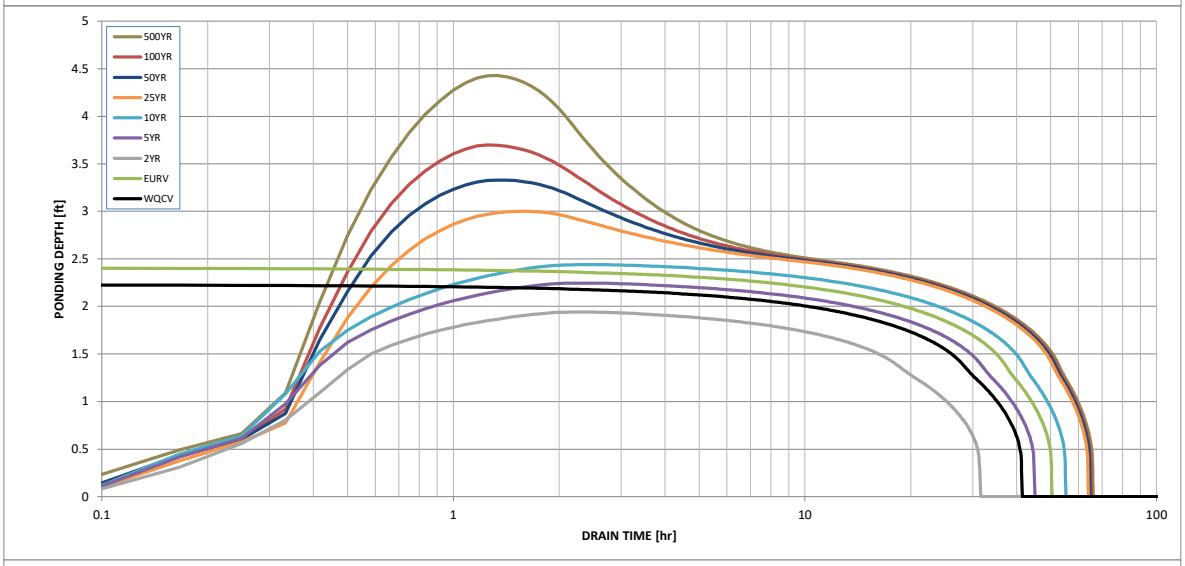
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

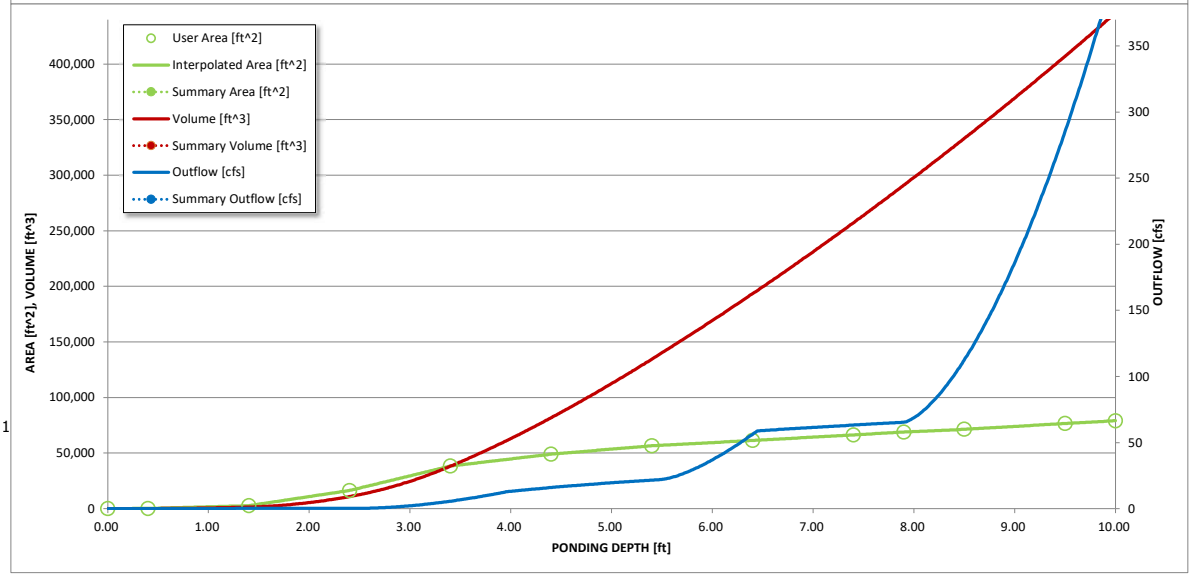
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.189	0.250	0.123	0.209	0.281	0.733	1.188	1.828	3.238
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.123	0.209	0.281	0.733	1.188	1.828	3.238
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	0.9	7.8	15.5	25.5	45.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.23	0.46	0.76	1.35
Peak Inflow Q (cfs) =	N/A	N/A	1.8	3.3	4.5	12.3	20.2	30.2	50.4
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	2.1	4.9	9.1	16.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.1	0.3	0.3	0.4	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	46	29	41	51	53	50	47	39
Time to Drain 99% of Inflow Volume (hours) =	**40**	49	31	44	54	60	59	56	52
Maximum Ponding Depth (ft) =	2.23	2.41	1.94	2.25	2.44	3.00	3.33	3.70	4.43
Area at Maximum Ponding Depth (acres) =	0.32	0.38	0.23	0.32	0.39	0.68	0.84	0.95	1.13
Maximum Volume Stored (acre-ft) =	0.189	0.252	0.110	0.193	0.264	0.564	0.806	1.140	1.898

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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: _____

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	0.01	0.00	0.03
	0:15:00	0.00	0.00	0.08	0.12	0.15	0.10	0.13	0.12	0.18
	0:20:00	0.00	0.00	0.28	0.37	0.43	0.27	0.32	0.34	0.45
	0:25:00	0.00	0.00	1.05	2.28	3.28	0.80	1.41	1.79	3.25
	0:30:00	0.00	0.00	1.80	3.35	4.53	7.04	12.76	17.56	31.82
	0:35:00	0.00	0.00	1.77	3.19	4.31	11.90	19.33	28.73	47.89
	0:40:00	0.00	0.00	1.59	2.77	3.73	12.34	20.17	30.24	50.35
	0:45:00	0.00	0.00	1.38	2.40	3.23	11.01	17.90	27.87	47.35
	0:50:00	0.00	0.00	1.21	2.09	2.78	9.71	15.70	24.43	42.86
	0:55:00	0.00	0.00	1.07	1.85	2.46	8.30	13.40	21.09	37.37
	1:00:00	0.00	0.00	0.97	1.64	2.18	7.19	11.66	18.53	33.35
	1:05:00	0.00	0.00	0.86	1.44	1.91	6.30	10.23	16.47	30.30
	1:10:00	0.00	0.00	0.75	1.24	1.64	5.41	8.75	14.08	26.02
	1:15:00	0.00	0.00	0.64	1.06	1.42	4.53	7.28	11.72	21.73
	1:20:00	0.00	0.00	0.57	0.94	1.28	3.72	5.95	9.56	17.82
	1:25:00	0.00	0.00	0.52	0.86	1.15	3.17	5.08	8.08	15.11
	1:30:00	0.00	0.00	0.48	0.79	1.04	2.79	4.44	7.02	13.03
	1:35:00	0.00	0.00	0.44	0.71	0.92	2.45	3.89	6.11	11.27
	1:40:00	0.00	0.00	0.40	0.62	0.81	2.13	3.36	5.27	9.66
	1:45:00	0.00	0.00	0.36	0.54	0.70	1.82	2.85	4.44	8.13
	1:50:00	0.00	0.00	0.32	0.45	0.60	1.51	2.34	3.64	6.64
	1:55:00	0.00	0.00	0.26	0.37	0.48	1.21	1.84	2.85	5.21
	2:00:00	0.00	0.00	0.21	0.29	0.37	0.91	1.35	2.09	3.83
	2:05:00	0.00	0.00	0.16	0.21	0.27	0.59	0.84	1.31	2.46
	2:10:00	0.00	0.00	0.12	0.16	0.21	0.34	0.45	0.71	1.43
	2:15:00	0.00	0.00	0.10	0.13	0.17	0.21	0.27	0.40	0.88
	2:20:00	0.00	0.00	0.08	0.11	0.14	0.15	0.19	0.26	0.57
	2:25:00	0.00	0.00	0.07	0.09	0.12	0.11	0.14	0.18	0.38
	2:30:00	0.00	0.00	0.06	0.07	0.09	0.09	0.11	0.13	0.25
	2:35:00	0.00	0.00	0.04	0.06	0.08	0.07	0.08	0.09	0.16
	2:40:00	0.00	0.00	0.04	0.05	0.06	0.05	0.06	0.06	0.09
	2:45:00	0.00	0.00	0.03	0.04	0.05	0.04	0.05	0.04	0.06
	2:50:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.04
	2:55:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:00:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:05:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	3:10:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:15:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:20:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	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

POND E - FOREBAY E

$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$ **Equation 4-1**

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	WATERSHED IMPERVIOUS AREA (IA)				
	IA UP TO 2 ACRES	IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume [1]		1% of WQCV			
Forebay Depth [1]		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

[1] Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 76.2% * 30.42 acres = 23.18 IA's
Design Depth = 24" - 30"

Minimum Volume = 1% of WQCV = 1% * 0.776 ac-ft * 43,560 = 338 CF MIN.

Provided Volume ~ 269.5 SF * 1.75' = 472 CF

4 MIN. DRAIN TIME = w =9.23* (A_{FB}/t)
(1sqrt(h_{MAX}) = 9.23 * (269.5/240)
(1/sqrt(1.75') = 7.83"

5 MIN. DRAIN TIME = w =9.23* (A_{FB}/t)
(1sqrt(h_{MAX}) = 9.23 * (269.5/300)
(1/sqrt(1.75') = 6.27"

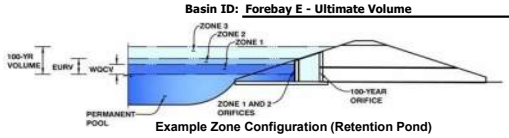
USE 7" NOTCH

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Schmidt CDRs

Basin ID: Forebay E - Ultimate Volume



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	30.42	acres
Watershed Length =	1,400	ft
Watershed Length to Centroid =	600	ft
Watershed Slope =	0.022	ft/ft
Watershed Imperviousness =	76.20%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	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	

Spillway

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) =	0.776	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.007	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =		acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =		acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =		acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =		acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =		acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =		acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =		acre-feet		inches
Approximate 2-yr Detention Volume =		acre-feet		
Approximate 5-yr Detention Volume =		acre-feet		
Approximate 10-yr Detention Volume =		acre-feet		
Approximate 25-yr Detention Volume =		acre-feet		
Approximate 50-yr Detention Volume =		acre-feet		
Approximate 100-yr Detention Volume =		acre-feet		

Define Zones and Basin Geometry

Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =		ft^3
Initial Surcharge Depth (ISD) =		ft
Total Available Detention Depth (H_{total}) =		ft
Depth of Trickle Channel (H_{TC}) =		ft
Slope of Trickle Channel (S_{TC}) =		ft/ft
Slopes of Main Basin Sides (S_{main}) =		H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =		

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

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 17 2026

FOREBAY E - NOTCH MAX FLOW WEIR CALC

Rectangular Weir

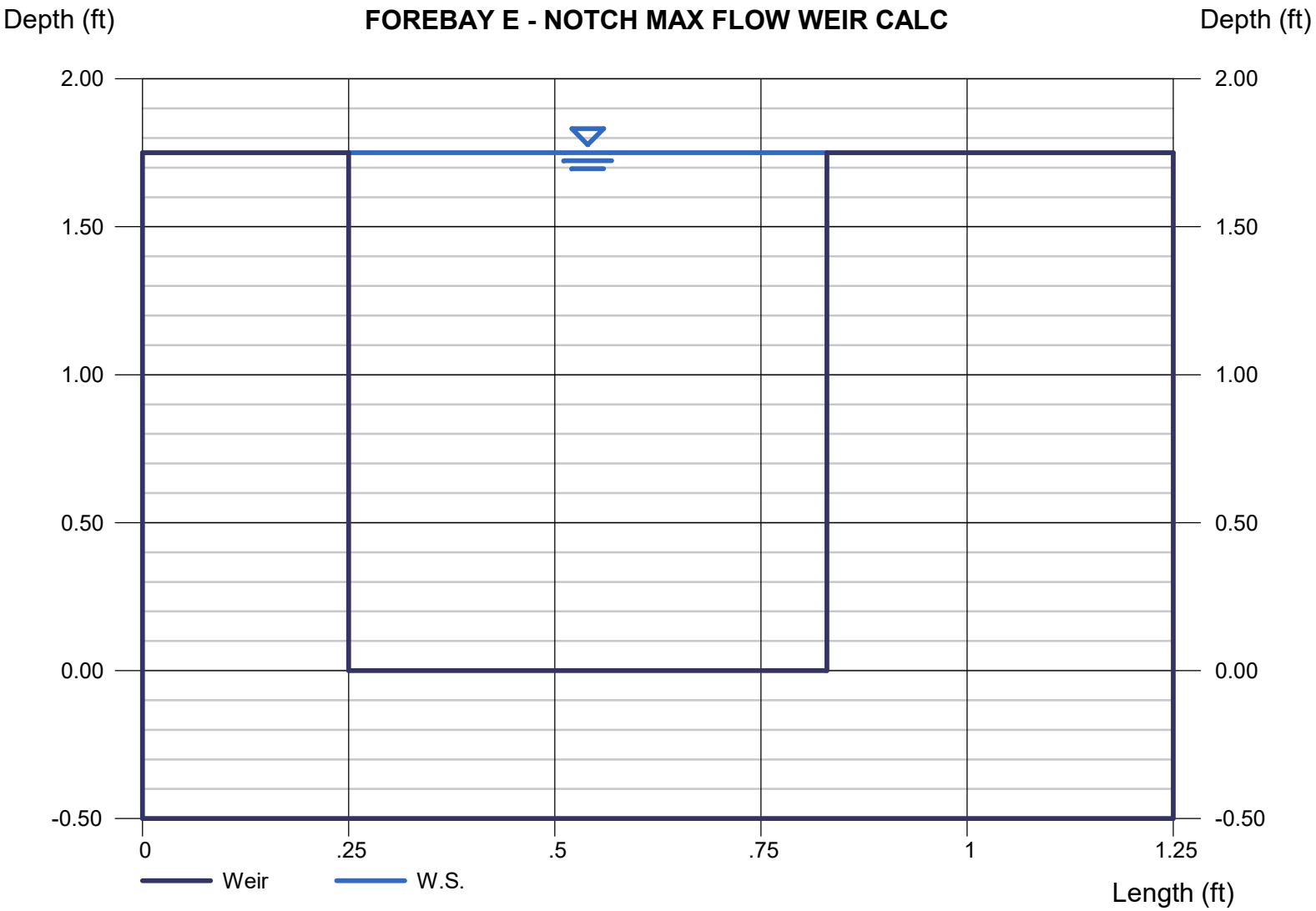
Crest	= Sharp
Bottom Length (ft)	= 0.58
Total Depth (ft)	= 1.75

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.75
Q (cfs)	= 4.471
Area (sqft)	= 1.02
Velocity (ft/s)	= 4.41
Top Width (ft)	= 0.58



POND E - FOREBAY W

$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$ **Equation 4-1**

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	WATERSHED IMPERVIOUS AREA (IA)				
	IA UP TO 2 ACRES	IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume [1]		1% of WQCV			
Forebay Depth [1]		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

[1] Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 39.4% * 3.34 acres = 1.32 IA's
Design Depth = 12" - 15"

Minimum Volume = 1% of WQCV = 1% * 0.050 ac-ft * 43,560 = 22 CF MIN.

Provided Volume ~ 58.5 SF * 1.0' = 58.5 CF

4 MIN. DRAIN TIME = w =9.23* (A_{FB}/t) (1sqrt(h_{MAX}) = 9.23 * (58.5/240) (1/sqrt(1') = 2.25"

5 MIN. DRAIN TIME = w =9.23* (A_{FB}/t) (1sqrt(h_{MAX}) = 9.23 * (58.5/300) (1/sqrt(1') = 1.8"

USE 2" NOTCH

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 17 2026

TRICKLE CHANNEL MAX FLOW - POND E

Rectangular

Bottom Width (ft)	= 6.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.013

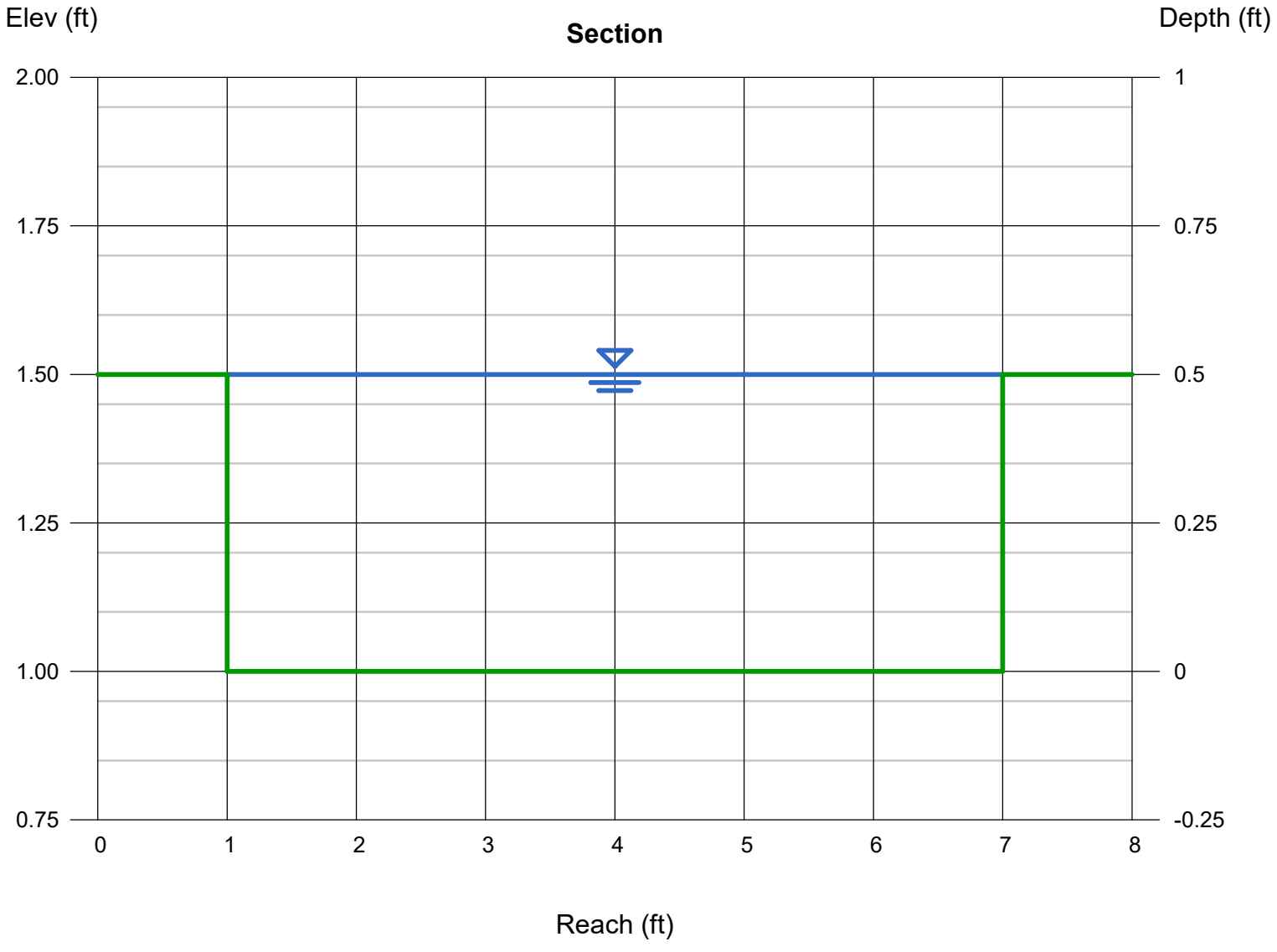
Calculations

Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 13.78
Area (sqft)	= 3.00
Velocity (ft/s)	= 4.59
Wetted Perim (ft)	= 7.00
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 6.00
EGL (ft)	= 0.83

FOREBAY W HAS SMALLER NOTCH,
UTILIZES SAME TRICKLE CHANEL,
CHECKS PERFOMRED ON FOREBAY E
FOREBAY E RELEASE RATE ~ 4.5 CFS
MIN. TRICKLE CHANNEL CAPACITY ~ 9 CFS
PROVIDED CAPCITY ~ 13.8 CFS

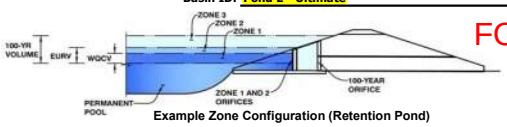


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Schmidt CDRs

Basin ID: Pond E - Ultimate



Example Zone Configuration (Retention Pond)

FOR INFORMATION ONLY

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	33.76	acres
Watershed Length =	1,400	ft
Watershed Length to Centroid =	600	ft
Watershed Slope =	0.022	ft/ft
Watershed Imperviousness =	72.50%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	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) =	0.807	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.132	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.228	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.905	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.447	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.116	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.770	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.547	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	7.256	acre-feet		inches
Approximate 2-yr Detention Volume =	2.047	acre-feet		
Approximate 5-yr Detention Volume =	2.669	acre-feet		
Approximate 10-yr Detention Volume =	3.200	acre-feet		
Approximate 25-yr Detention Volume =	3.825	acre-feet		
Approximate 50-yr Detention Volume =	4.195	acre-feet		
Approximate 100-yr Detention Volume =	4.556	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.807	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.325	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.425	acre-feet
Total Detention Basin Volume =	4.556	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

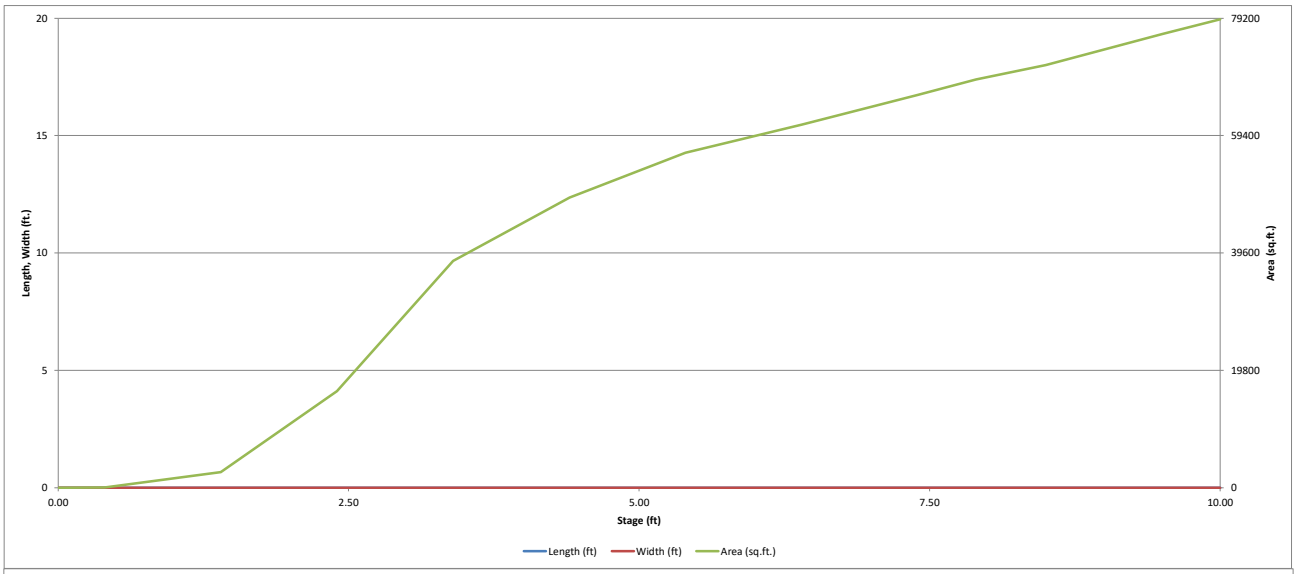
Depth Increment = ft

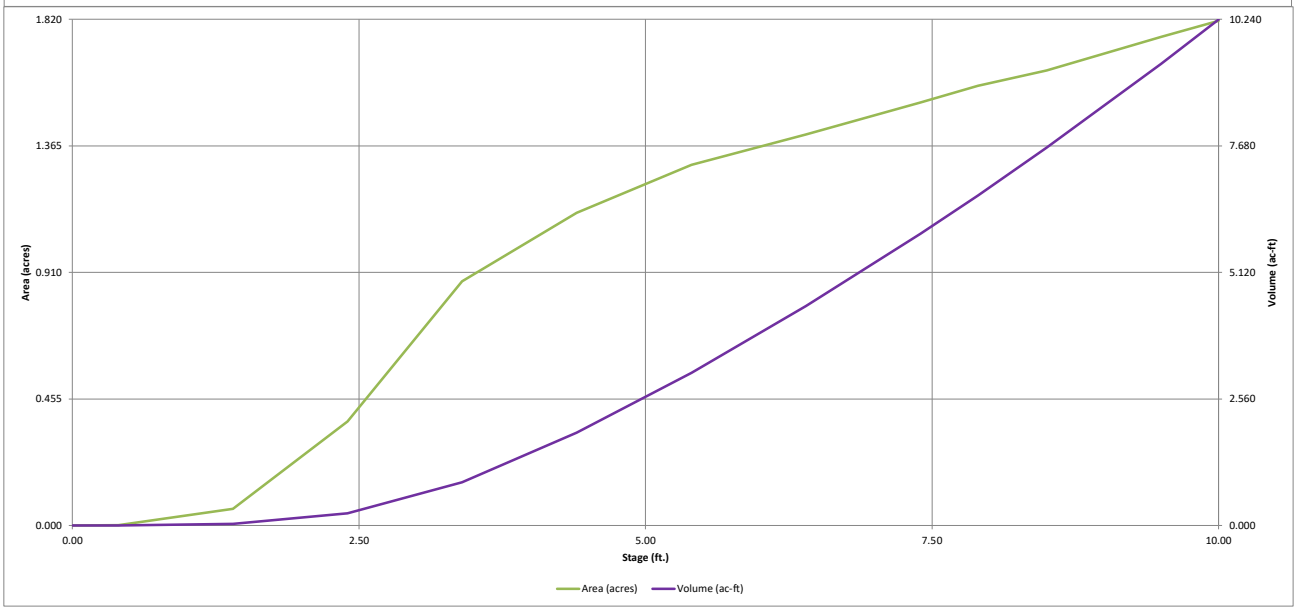
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	10	0.000		
6995	--	0.40	--	--	--	61	0.001	14	0.000
6996	--	1.40	--	--	--	2,633	0.060	1,361	0.031
6997	--	2.40	--	--	--	16,290	0.374	10,823	0.248
6998	--	3.40	--	--	--	38,266	0.878	38,100	0.875
6999	--	4.40	--	--	--	48,963	1.124	81,715	1.876
7000	--	5.40	--	--	--	56,521	1.298	134,457	3.087
7001	--	6.40	--	--	--	61,281	1.407	193,358	4.439
7002	--	7.40	--	--	--	66,302	1.522	257,149	5.903
7002.5	--	7.90	--	--	--	68,867	1.581	290,942	6.679
7003	--	8.50	--	--	--	71,303	1.637	332,993	7.644
7004	--	9.50	--	--	--	76,557	1.758	406,923	9.342
7004.5	--	10.00	--	--	--	79,051	1.815	445,825	10.235

6994.6 Spillway

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





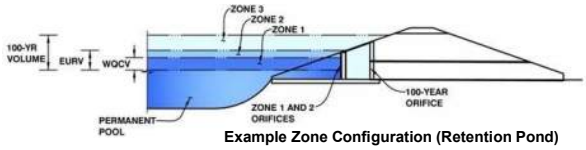
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Schmidt CDRs

Basin ID: Pond E - Ultimate

FOR INFORMATION ONLY



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.33	0.807	Orifice Plate
Zone 2 (EURV)	5.44	2.325	Rectangular Orifice
Zone 3 (100-year)	6.49	1.425	Weir&Pipe (Restrict)
Total (all zones)		4.556	

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

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

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	4.20	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	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.25	2.10	3.00				
Orifice Area (sq. inches)	2.00	2.00	3.00	3.00				

	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)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.28	N/A	ft²
Depth at top of Zone using Vertical Orifice =	6.30	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.17	N/A	feet
Vertical Orifice Height =	4.00	N/A	inches				
Vertical Orifice Width =	10.00		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 =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.50	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	10.86	N/A	
Horiz. Length of Weir Sides =	7.00	N/A	feet	Overflow Grate Open Area w/o Debris =	22.15	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	11.07	N/A	ft²
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 =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.04	N/A	ft²
Outlet Pipe Diameter =	30.00	N/A	inches	Outlet Orifice Centroid =	0.63	N/A	feet
Restrictor Plate Height Above Pipe Invert =	13.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.44	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.09	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	9.99	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.81	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	10.22	acre-ft

Calculated Parameters for Spillway

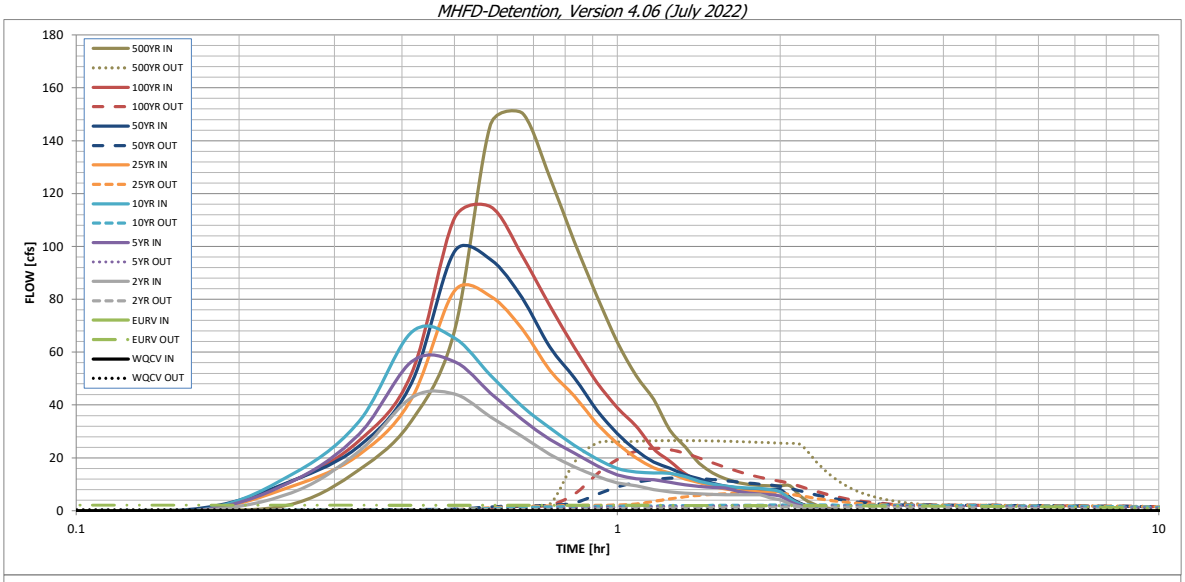
Routed Hydrograph Results

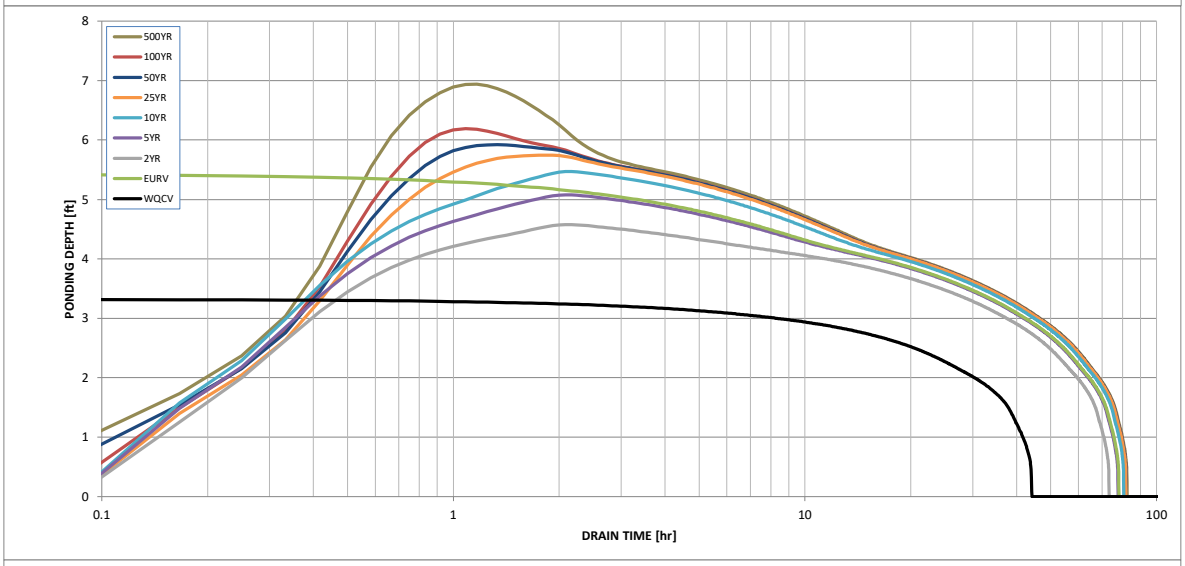
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

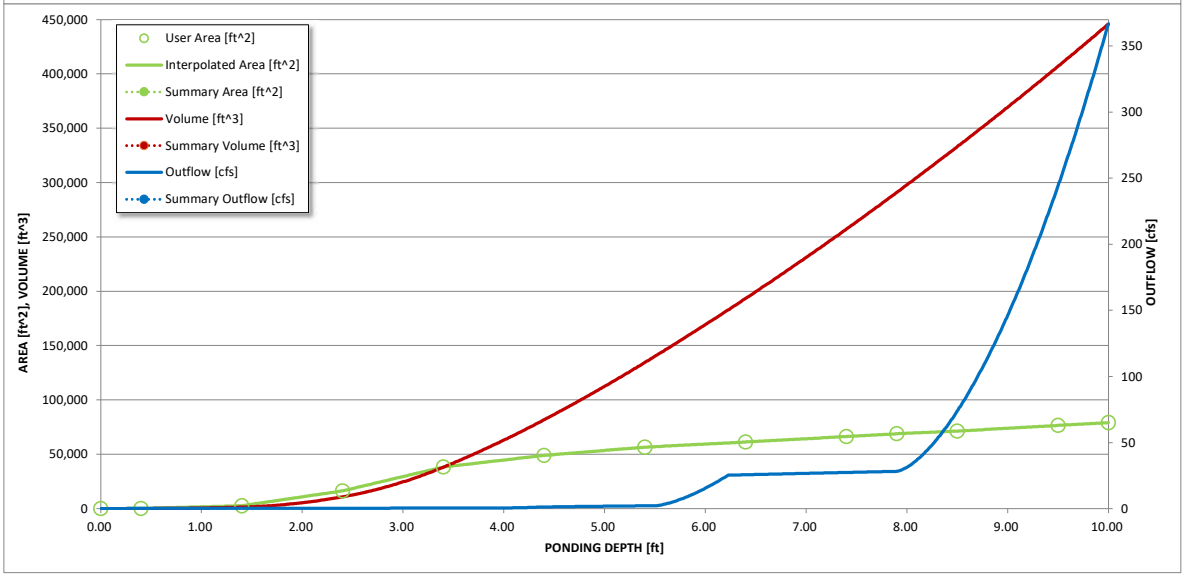
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.807	3.132	2.228	2.905	3.447	4.116	4.770	5.547	7.256
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	2.228	2.905	3.447	4.116	4.770	5.547	7.256
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.6	0.9	7.9	15.7	25.7	45.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.23	0.46	0.76	1.35
Peak Inflow Q (cfs) =	N/A	N/A	44.2	56.5	67.6	83.2	98.1	115.1	150.4
Peak Outflow Q (cfs) =	0.4	2.1	1.4	1.9	2.2	6.8	12.4	23.6	26.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.0	2.5	0.9	0.8	0.9	0.6
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.4	0.9	1.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	67	64	67	69	68	67	65	63
Time to Drain 99% of Inflow Volume (hours) =	**42**	73	69	73	75	75	75	74	73
Maximum Ponding Depth (ft) =	3.33	5.44	4.58	5.08	5.47	5.75	5.92	6.19	6.94
Area at Maximum Ponding Depth (acres) =	0.84	1.30	1.15	1.24	1.30	1.33	1.35	1.38	1.47
Maximum Volume Stored (acre-ft) =	0.814	3.139	2.070	2.668	3.165	3.534	3.776	4.146	5.201

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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: _____

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	0.76	0.08	2.46
	0:15:00	0.00	0.00	6.78	11.02	13.65	9.16	11.25	11.15	15.44
	0:20:00	0.00	0.00	22.48	28.94	33.82	21.19	24.46	26.48	34.02
	0:25:00	0.00	0.00	42.82	56.45	67.57	42.31	48.35	51.91	67.90
	0:30:00	0.00	0.00	44.16	56.47	65.34	83.20	98.09	110.65	146.19
	0:35:00	0.00	0.00	35.41	44.45	51.15	81.13	95.03	115.05	150.43
	0:40:00	0.00	0.00	28.13	34.46	39.52	68.74	80.50	96.48	126.19
	0:45:00	0.00	0.00	21.26	26.98	31.36	53.16	61.92	77.61	101.70
	0:50:00	0.00	0.00	16.60	21.84	24.70	43.33	50.28	61.71	81.28
	0:55:00	0.00	0.00	13.01	17.01	19.64	32.97	38.05	48.57	63.78
	1:00:00	0.00	0.00	10.52	13.58	15.99	25.41	29.14	38.94	51.09
	1:05:00	0.00	0.00	9.46	12.15	14.68	20.01	22.83	31.94	42.07
	1:10:00	0.00	0.00	7.99	11.68	14.31	16.19	18.39	23.42	30.55
	1:15:00	0.00	0.00	7.13	10.77	14.16	14.22	16.08	18.73	24.16
	1:20:00	0.00	0.00	6.66	9.78	12.94	12.03	13.57	14.04	17.93
	1:25:00	0.00	0.00	6.37	9.16	11.18	10.70	12.06	11.28	14.30
	1:30:00	0.00	0.00	6.18	8.80	10.05	9.21	10.37	9.60	12.08
	1:35:00	0.00	0.00	6.06	8.57	9.34	8.26	9.30	8.53	10.67
	1:40:00	0.00	0.00	6.00	7.43	8.89	7.68	8.64	7.93	9.88
	1:45:00	0.00	0.00	6.00	6.69	8.60	7.36	8.28	7.72	9.62
	1:50:00	0.00	0.00	6.00	6.25	8.43	7.18	8.07	7.62	9.49
	1:55:00	0.00	0.00	4.86	6.00	8.04	7.09	7.98	7.62	9.49
	2:00:00	0.00	0.00	4.13	5.55	7.16	7.05	7.93	7.62	9.49
	2:05:00	0.00	0.00	2.53	3.40	4.42	4.38	4.92	4.72	5.88
	2:10:00	0.00	0.00	1.51	2.03	2.66	2.66	2.98	2.86	3.55
	2:15:00	0.00	0.00	0.85	1.18	1.53	1.54	1.73	1.66	2.06
	2:20:00	0.00	0.00	0.44	0.66	0.83	0.87	0.97	0.93	1.16
	2:25:00	0.00	0.00	0.19	0.32	0.39	0.43	0.48	0.46	0.57
	2:30:00	0.00	0.00	0.06	0.10	0.12	0.14	0.16	0.15	0.19
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	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

POND E

Figure 13-12c. Emergency Spillway Protection

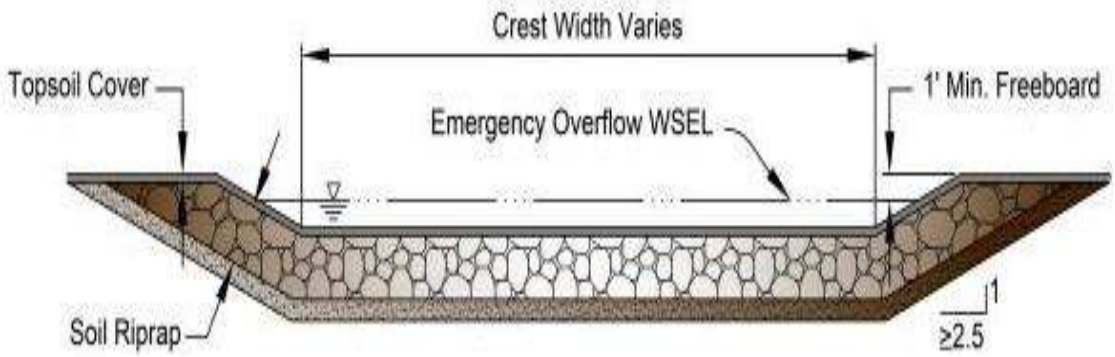
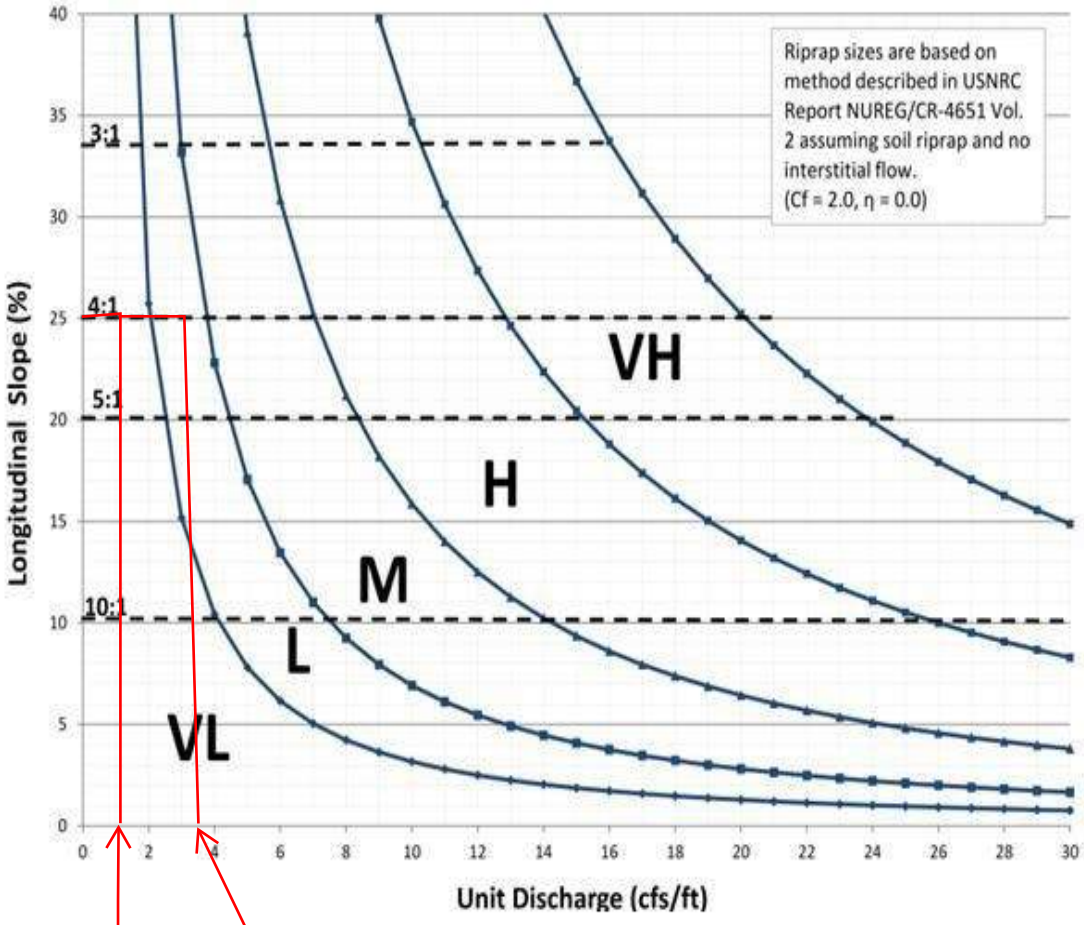


Figure 13-12d. Riprap Types for Emergency Spillway Protection



INTERIM CONDITION

ULTIMATECONDITION (CHECK FOR INFO ONLY)

USE TYPE L RIPRAP MINIMUM

Pond E Spillway Inlet (Single Type C Grate)				
Orifice Flow Calculation				
Q = C*A* square root (2gH)				
C = 0.6	A = 8.53 sq ft		g = 32.2	
Head (ft)	CA	(2GH)	Sqrt (2GH)	Capacity
1	**5.118**	**64.40**	**8.025**	**41.1**
1.25	5.118	80.50	8.972	45.9
1.5	5.118	96.60	9.829	50.3
1.75	5.118	112.70	10.616	54.3
2	5.118	128.80	11.349	58.1
2.25	5.118	144.90	12.037	61.6

CAPTURES ALL SPILLWAY FLOWS IN THE INTERIM CONDITION

FUTURE CONDITION = SPILLWAY FLOWS IN EXCESS OF INLET CAPACITY TO CONTINUE TO BRUSHTOP AND VANDERWOOD ROADS. SEE STREET CAPCITY CALCULATION BELOW.

Channel Report

Brushtop Road-Emergency Overflow

FUTURE CONDITION (INFO ONLY)
(ALL SPILLWAY FLOWS ARE CAPTURED BY TYPE C INLET IN THE INTERIM CONDITION)

User-defined

Invert Elev (ft)	= 6998.49
Slope (%)	= 3.00
N-Value	= 0.019

Calculations

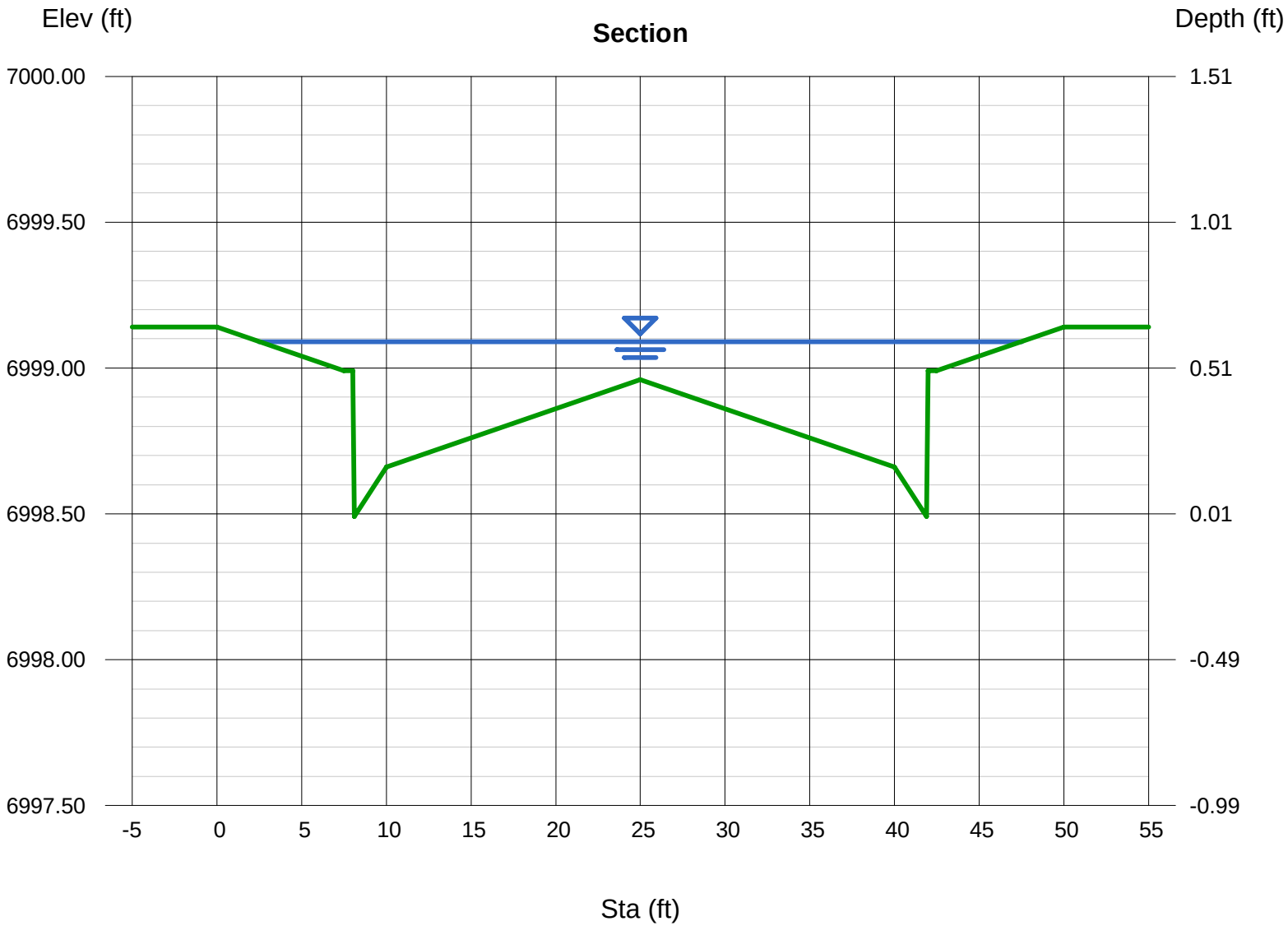
Compute by:	Known Q
Known Q (cfs)	= 55.00

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 55.00
Area (sqft)	= 11.04
Velocity (ft/s)	= 4.98
Wetted Perim (ft)	= 45.86
Crit Depth, Yc (ft)	= 0.65
Top Width (ft)	= 45.02
EGL (ft)	= 0.99

(Sta, El, n)-(Sta, El, n)...

(0.00, 6999.14) -(7.50, 6998.99, 0.030) -(8.00, 6998.99, 0.013) -(8.10, 6998.49, 0.013) -(10.00, 6998.66, 0.016) -(25.00, 6998.96, 0.016) -(40.00, 6998.66, 0.016) -(41.90, 6998.49, 0.013) -(42.00, 6998.99, 0.013) -(42.50, 6998.99, 0.013) -(50.00, 6999.14, 0.030)



Channel Report

Vanderwood Road-Emergency Overflow

FUTURE CONDITION (INFO ONLY)
(ALL SPILLWAY FLOWS ARE CAPTURED BY TYPE C INLET IN THE INTERIM CONDITION)

User-defined

Invert Elev (ft)	= 6994.52
Slope (%)	= 1.10
N-Value	= 0.020

Calculations

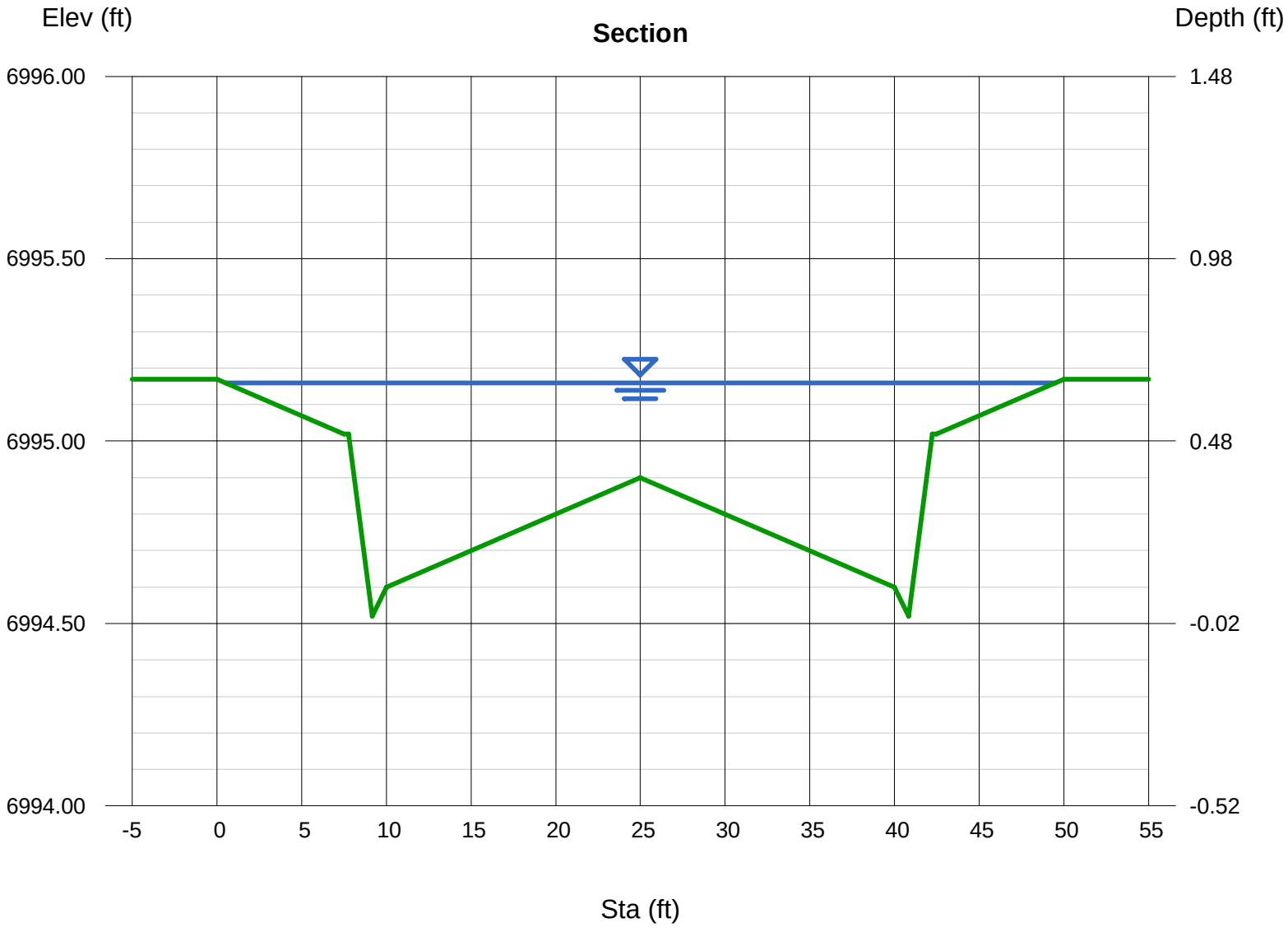
Compute by:	Known Q
Known Q (cfs)	= 55.00

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 55.00
Area (sqft)	= 15.46
Velocity (ft/s)	= 3.56
Wetted Perim (ft)	= 49.21
Crit Depth, Yc (ft)	= 0.65
Top Width (ft)	= 49.02
EGL (ft)	= 0.84

(Sta, El, n)-(Sta, El, n)...

(0.00, 6995.17) -(7.50, 6995.02, 0.030) -(7.75, 6995.02, 0.013) -(9.17, 6994.52, 0.013) -(10.00, 6994.60, 0.016) -(25.00, 6994.90, 0.016) -(40.00, 6994.60, 0.016) -(40.83, 6994.52, 0.013) -(42.25, 6995.02, 0.013) -(42.50, 6995.02, 0.013) -(50.00, 6995.17, 0.030)



APPENDIX E – REFERENCE MATERIAL

MAJOR BASIN REFERENCES

SCHMIDT SITE – BASIN TRANSFER

Summary: the "Schmidt" site is a 97-acre parcel bounded by Black Forest Road and Cottonwood Creek on the west, the "Trails @ Forrest Meadows Subdivision" and the City/County line on the South, Vollmer Road on the East, and Marksheffel Road(Future), The Silver Ponds Subdivision, and the Holiday Hills Subdivision on the north.

The site has been an active quarry since the 1983 and has remained undeveloped. The surrounding area on all sides of the site has been developed.

Historically, the site and the area directly north drains to both Cottonwood Creek and Sand Creek. The area north of the site was developed starting in the 70's with Holiday Hills, prior to the quarry operations, and then Silver Ponds and Highland Park were developed in 90's and early 2000's respectively.

It is unclear whether the subdivisions north of our site transferred runoff from Sand Creek to Cottonwood Creek or visa versa, however, the drainage patterns north of site that exist today, and as documented in the applicable FDR's do not reflect the County's Sand Creek DBPS basin line.

These areas north of the site, in general, drain to either Pond W4 and Sand Creek, or they drain to Cottonwood Creek directly. Very little, if any water from these subdivisions, reach our site. An existing basin map is included as an attachment to show the drainage patterns that exist today.

The areas north of our site were identified in the Sterling Ranch MDDP and Trails At Forest Meadows MDDP and FDR's as Historic Basin OS-20 through OS-23. OS-20 and OS-21, currently drain to Pond W4 and Sand Creek per the SRF2 FDR. Basin's OS-22 and OS-23 span a portion of the Schmidt site and areas to the north and flow through our site to the Trails @ Forest Meadows development according to the MDDP.

However, in the MDDP Update for Woodmen Heights by ESI, dated February 2006, it stated that only 50% of the flows from basins OS22 & OS23 would be accommodated. The accommodation provided is a 48" pipe at the southern border of our site with a maximum capacity of 84 cfs. There was no indication in the report where the other 50% of the flow went or how it was being accommodated downstream of our project site.

The Woodmen Heights MDDP stated that any increase in flow from our site (above the 84 cfs or half of the existing flow per MDDP/DBPS basins), would have to be mitigated with a detention and WQ pond. The MDDP stated that an overflow channel would be built which would accommodate the required spillway flows, however this channel was never built.

The Woodmen Heights MDDP and Trails @ Forest Meadows developments further restricted our site's options for stormwater conveyance by stating that little to no flow would be accepted at either of the two roadway connections (Brushtop and Salt Brush Roads).

Per a meeting with County staff on 8/10/2026 where these drainage patterns were discussed, it was determined that All Terrain should look into two items:

1. Historic Drainage patterns along the Cottonwood/Sand Creek basin divide upstream and on our project site in relation to the Couty DBPS basin line
2. Investigate available outfalls and capacity to Sand Creek from our site and use them to the extent practicable

All Terrain visited the project site, downstream conveyances, and the limits of the upstream basins along the Cottonwood/Sand Creek divide the week of 8/10/2026. During our field investigations we determined the drainage patterns north of our site by visual inspection. We also reviewed historic Contour data from USGS, applicable surrounding drainage reports (old and new), aerial imagery, and the latest available County Contour data to confirm our findings. These areas included the Highland Park, Silver Ponds, and Holiday Hill's Developments as well as Sterling Ranch and the Retreat @ Prairie Ridge developments. The results of this field investigation are shown on the "Existing Basin Patterns" map. In general we found:

- Historic basins OS22 and OS23, generally drain to Cottonwood Creek and do not reach our project site from the north
    - On-site areas of OS22 and OS23 also drain to Cottonwood Creek per CDR22-007
    - It appears a portion of these basins also historically drained to Cottonwood Creek prior to quarry operations which included the stockpiling of materials along Cottonwood Creek @ the western limits of the project site, although the exact historic split cannot be determined.
- The Couty DBPS basin divide between Sand Creek and Cottonwood Creek is depicted further West than existing and assumed historic conditions.
    - It is our belief that in general, historic basin patterns were not significantly altered due to development north of our site, but at the time the DBPS was written, the limitations of mapping and data did not allow for the same level of accuracy that is typical today. The contour data mapped in the DBPS and available USGS contour data was typically in 20-100' intervals, which is not detailed enough to accurately determine the basin divide for the areas being discussed.

- The quarry, due to being mined since the 80's is tough to determine exact historical drainage patterns, but it is our assumption, that since the basin split from the northern limits (Poco Road) all the way to our project site, was found to be consistently further east than the County's DBPS depicts it, that the same is true on the project site.

All Terrain also explored the available outfalls to Sand Creek from and adjacent to our project site with the goal of coming up with a viable outfall to Sand Creek for as much of the Sand Creek basin area as depicted by the Couty DBPS as practicable. Because of the existing drainage patterns north of our site, we limited the scope of this investigation to items we can control through development of our project site, as we have no control of off-site drainage patterns to our north. Options we explored were:

- Vollmer Road conveyance
- Black Forest Road Conveyance
- Cottonwood Creek Spillway w/ pipe to Sand Creek
- Trails @ Forest Meadows conveyance
    a. 48" RCP pipe w/ 84 cfs capacity
    b. Street conveyance
- Pond W4 and associated 54" storm outfall

Vollmer Road Conveyance: No available conveyance capacity for our site due to pipe capacities and/or inlet capacities. To outfall a pipe to the road, we would have to raise the southern half of the site by over 10', which is not feasible. Our site, also does not border the Vollmer ROW which limits our ability to fit the required infrastructure and grading, and an easement or land acquisition would be required. We also looked at sending just the spillway to Vollmer Road and piping the outlet to the 48" pipe within the Trails subdivision and found that this option also required raising the pond higher than practicable and would not allow us to capture a portion of developed flows that are required to be treated on-site.

Black Forest Road Conveyance: We reviewed the existing topography of Black Forest Road @ the southern limits of our site, and found that it does not flow to Sand Creek, and therefore is not a viable outfall to Sand Creek.

Cottonwood Creek Spillway w/ Pipe to Sand Creek: Due to topography, we found this cannot work. Our site adjacent to Cottonwood Creek where our access must be taken from is 11' below the 48" RCP pipe that we would have to outfall the pond to. This makes it impossible to collect and detain flows, and then outfall underneath this road and to the 48" pipe.

Trails @ Forest Meadows conveyance: The Trails at Forest Meadow's development provided our site a 48" pipe with 84 cfs of capacity to outfall to but did not provide any overland capacity for our site within their streets or elsewhere. As previously stated, this is less than half the historic flow that was identified as reaching the Trails development at the southern border of our project site per the DBPS and MDDP. Due to the lack of overland conveyance and existing homes along our site's southern border, our options to safely route spillway flows are limited. We reviewed the available street capacity for emergency flows within the Trails Subdivision and found that the capacity is limited to approximately 55 cfs. We have come up with an alternative (Alt 2) that utilizes Brushtop Road and Vanderwood Drive as spillway conveyance as well as the existing 48" pipe within the Trails subdivision. The outlet structure would also utilize the 48" pipe that is tributary to Sand Creek. This alternative allows us to send approximately 36 acres of runoff to Sand Creek that currently drains to Cottonwood Creek.

Pond W4 and Associated 54" storm outfall: we reviewed the existing tributary area of this pond to confirm its basin limits which appear generally consistent with the SRF2 FDR. Because this pond is located adjacent to our site's high-point, it cannot provide significant detention or wq treatment for the majority of our site.

We did however find that the pond and it's 54" outfall storm sewer is a viable outfall for the Holiday Hills site, should detention and WQ be provided on that site when developed. This would only be possible with:

- Storm infrastructure and grading revisions within the Holiday Hills development
    - The majority of the Holiday hills site drains to Cottonwood Creek currently. The western limits of the site would need to be raised up to 16' in order to surface drain east towards Pond W4, or a collection and storm system could collect and pipe these flows east to Pond W4.
    - Tahiti ROW is reserved for a future outfall pipe that will connect to the existing 54" outfall from Pond W4 to Sand Creek

SCHMIDT SITE

EXISTING DRAINAGE PATTERNS

POCO ROAD

LOCHWINNOCH LANE

RANNOCH MOOR WAY

EASTERN BASIN LIMITS PER RETREAT @ PRAIRIE RIDGE FDR

BANNOCKBURN TRAIL

COTTONWOOD CREEK

GLIDER LOOP

FORESTGATE DRIVE

COUNTY BASIN LINE DOES NOT REFLECT EXISTING CONDITIONS
VERIFIED BY FIELD INVESTIGATION & APPLICABLE FDR'S

PER HIGHLAND PARK FILING NO. 2 FDR
FLOWS ARE INTERCEPTED BY ROADSIDE SWALE AND CARRIED WEST
(CONFIRMED BY FIELD INVESTIGATION)

PER HOLIDAY HILLS DOT MEMO 1977
ROADS WERE NOT CONSTRUCTED TO EPC STANDARDS & LACK DRAINAGE INFRASTRUCTURE
PER FIELD OBSERVATION AUGUST 2026,
FLOWS ARE INTERCEPTED BY ROAD BENCH GRADING AND FOLLOW THE ROW PER EXISTING TOPOGRAPHY

LOCH FYNE LANE

LOCHWINNOCH LANE

100.9 AC AREA NORTH OF SITE
WITHIN COUNTY SAND CREEK
BASIN THAT CURRENTLY DRAINS
TO COTTONWOOD CREEK

COTTONWOOD CREEK

POND W4 EX BASIN
349.78 ACRES

VOLLMER RD

SILVER PONDS FILING NO. 1 FDR
SHOWS ALL FLOW AS TRIBUTARY TO COTTONWOOD CREEK AND
PAID NO SAND CREEK DRAINAGE BASIN FEES
FDR STATED PROPOSED DRAINAGE PATTERNS WERE CONSISTENT W/ HISTORIC PATTERNS
AUGUST 2026 FIELD INVESTIGATION HAS CONFIRMED FLOWS FROM ENTIRE SUBDIVISION ARE TRIBUTARY TO COTTONWOOD CREEK

FLOWS FROM TAHITI DRIVE ROW
CURRENTLY EITHER ENTER POND W4 DIRECTLY OR
FLOW TO EXISTING SUMP INLETS IN VOLLMER ROAD
AND ENTER POND W4

POND W4

ELEVATION: 6974

APPROXIMATE HP LOCATION
ALL FLOW NORTH OF HERE
DRAINS TO COTTONWOOD
CREEK (NO FEASIBLE
OUTFALL TO SAND CREEK
VIA BFR)

63.8 AC ON-SITE AREA WITHIN
THE COUNTY SAND CREEK
BASIN THAT CURRENTLY DRAINS
TO COTTONWOOD CREEK

VOLLMER RD

POND W4 OUTFALLS VIA 54" RCP TO SAND CREEK

KSHEFFEL ROAD

STERLING RANCH ROAD

RESEARCH PKWY

BLACK FOREST ROAD

COUNTY SAND/COTTONWOOD CREEK BASIN

CITY SAND CREEK BASIN

ELEVATION: 6990 @ PARCEL LINE
INVERT ELEVATION = 6985

ELEVATION: 7006

NO STORM
INFRASTRUCTURE IN
VOLLMER ROAD WITH
AVAILABLE CAPACITY

VANDERWOOD ROAD

SALT BRUSH ROAD

EXISTING 48" PIPE ~84 CFS CAPACITY PER TRAILS @ FOREST MEADOWS FDR
(DRAINS TO SAND CREEK)

OAK VINE COURT

AREA DIVERTED FROM COTTONWOOD
CREEK TO SAND CREEK PER TRAILS
AT FOREST MEADOWS F4
4.64± AC

© 2026 Microsoft Corporation © Maxar ©CNES (2026) Distribution Airbus DS ©

300 150 0 300 600

ORIGINAL SCALE: 1" = 300'

SCHMIDT SITE

EXISTING DRAINAGE PATTERNS

JOB NO. 24013
LOCATION: EPC/CS
2026-11-06

SHEET 1

ALL TERRAIN ENGINEERING

SCHMIDT SITE

PROPOSED STORM WATER ROUTING

COUNTY BASIN LINE DOES NOT REFLECT EXISTING CONDITIONS VERIFIED BY FIELD INVESTIGATION & APPLICABLE FDR'S

ADDITIONAL AREA THAT COULD BE ROUTED TO SAND CREEK THROUGH POND W4'S OUTFALL PIPE (REQUIRES REVISED GRADING AND STORM INFRASTRUCTURE WITHIN THE HOLIDAY HILLS SUBDIVISION AND ON-SITE DETENTION/WQ WHEN DEVELOPED)

PER HIGHLAND PARK FILING NO. 2 FDR
FLOWS ARE INTERCEPTED BY ROADSIDE SWALE AND CARRIED WEST (CONFIRMED BY FIELD INVESTIGATION)

COTTONWOOD CREEK

SILVER PONDS FILING NO. 1 FDR
SHOWS ALL FLOW AS TRIBUTARY TO COTTONWOOD CREEK AND PAID NO SAND CREEK DRAINAGE BASIN FEES
FDR STATED PROPOSED DRAINAGE PATTERNS WERE CONSISTENT W/ HISTORIC PATTERNS
AUGUST 2026 FIELD INVESTIGATION HAS CONFIRMED FLOWS FROM ENTIRE SUBDIVISION ARE TRIBUTARY TO COTTONWOOD CREEK

POND W4 EX BASIN
349.78 ACRES

HH POND

POND W4

COUNTY SAND/COTTONWOOD CREEK BASIN

37 ON-SITE AREA WITHIN THE COUNTY SAND CREEK BASIN PROPOSED TO CONTINUE TO DRAIN TO COTTONWOOD CREEK

27 AC ON-SITE AREA THAT CURRENTLY DRAINS TO COTTONWOOD CREEK, PROPOSED TO BE RE-ROUTED TO SAND CREEK VIA PROPOSED POND & TRAILS @ FOREST MEADOWS 48" PIPE

POND W4 OUTFALLS VIA 54" RCP TO SAND CREEK

ELEVATION: 6990 @ PARCEL LINE
INVERT ELEVATION = 6985

ELEVATION: 6974

PROPOSED POND

CITY SAND CREEK BASIN

ELEVATION: 7006

NO STORM INFRASTRUCTURE IN VOLLMER ROAD WITH AVAILABLE CAPACITY

EXISTING 48" PIPE ~84 CFS CAPACITY PER TRAILS @ FOREST MEADOWS FDR (DRAINS TO SAND CREEK)

AREA DIVERTED FROM COTTONWOOD CREEK TO SAND CREEK PER TRAILS AT FOREST MEADOWS F4
4.64± AC

APPROXIMATE HP LOCATION ALL FLOW NORTH OF HERE DRAINS TO COTTONWOOD CREEK (NO FEASIBLE OUTFALL TO SAND CREEK VIA BFR)

BLACK FOREST ROAD
LOCHWINNOCH LANE
VOLLMER RD
MARKSHEFFEL ROAD
STERLING RANCH ROAD
SALT BRUSH ROAD
VANDERWOOD ROAD
OAK VINE COURT

© 2026 Microsoft Corporation © Maxar ©CNES (2026) Distribution Airbus DS © 2026 TMAP MOBILITY Earthstar Geographics SIO © Mapbox

300 150 0 300 600
ORIGINAL SCALE: 1" = 300'

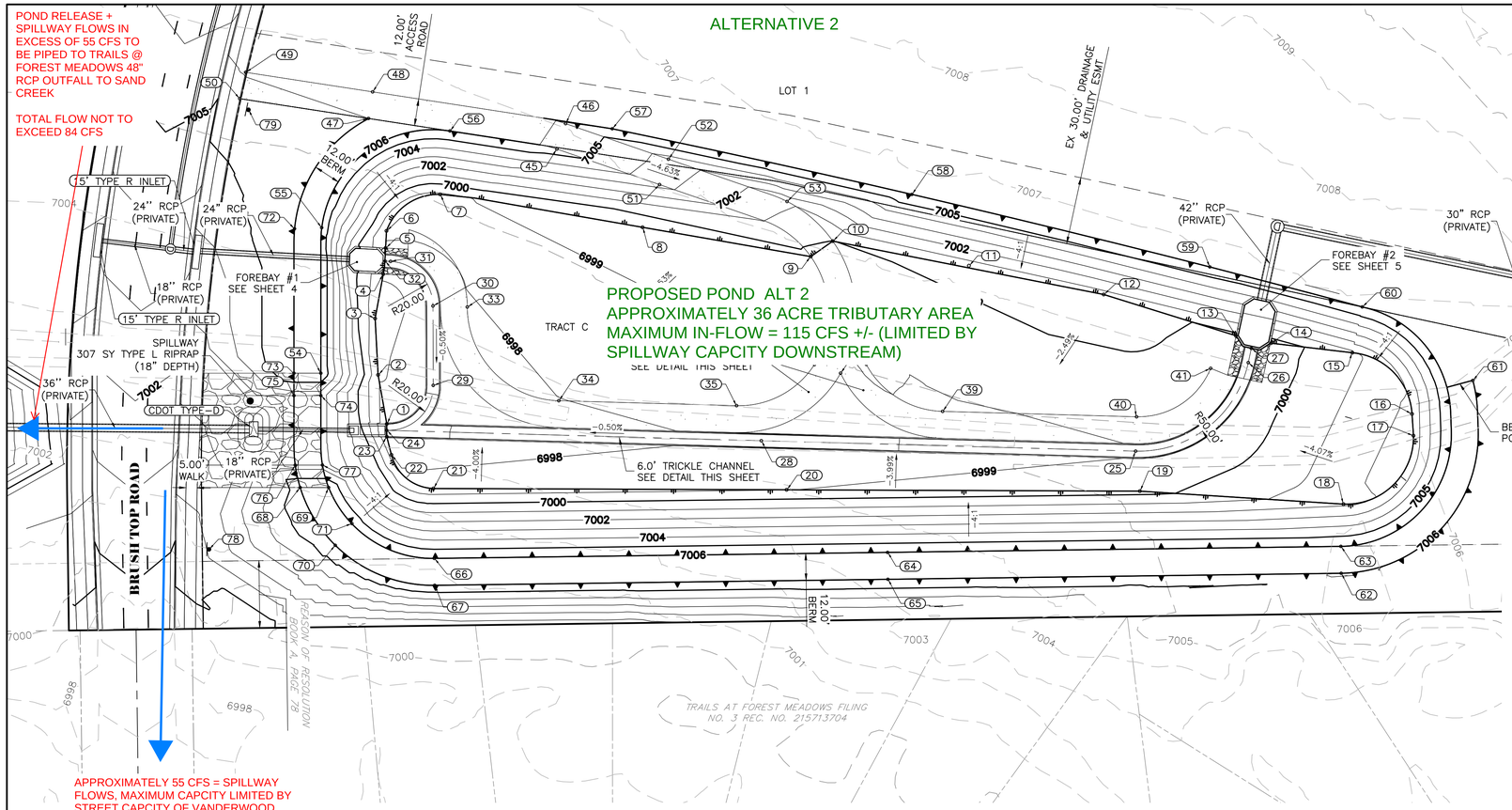
SCHMIDT SITE	
PROPOSED STORMWATER ROUTING	
JOB NO. 24013	SHEET 1
LOCATION: EPC/CS	
2026-11-06	

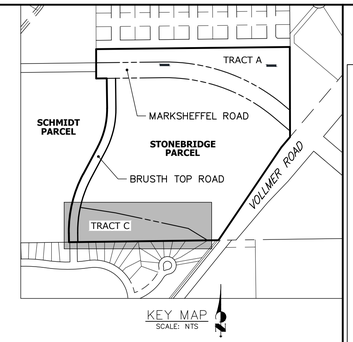
ALL TERRAIN ENGINEERING

POND RELEASE + SPILLWAY FLOWS IN EXCESS OF 55 CFS TO BE PIPED TO TRAILS @ FOREST MEADOWS 48" RCP OUTFALL TO SAND CREEK

TOTAL FLOW NOT TO EXCEED 84 CFS

ALTERNATIVE 2

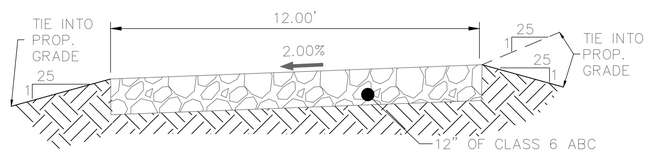




KEY MAP
SCALE: NTS

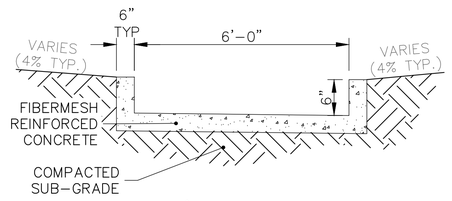
Structure Table				
#	DESC.	NORTHING	EASTING	ELEVATION
1	B.O.P	410129.0	231139.66	6996.86
2	B.O.P	410150.9	231135.78	6998.11
3	B.O.P	410176.0	231134.46	6998.44
4	B.O.P	410195.8	231138.09	6997.95
5	B.O.P	410207.5	231139.10	6997.95
6	B.O.P	410215.1	231139.52	6998.11
7	B.O.P	410231.4	231163.46	6998.84
8	B.O.P	410216.7	231253.83	6999.38
9	B.O.P	410203.6	231328.92	6999.74
10	B.O.P	410210.6	231338.74	6999.99
11	B.O.P	410199.6	231399.54	7000.51
12	B.O.P	410186.7	231459.70	7000.61
13	B.O.P	410168.3	231518.71	6999.84
14	B.O.P	410165.0	231534.40	6999.47
15	B.O.P	410160.8	231570.72	7001.08
16	B.O.P	410133.4	231597.32	7002.28
17	B.O.P	410123.7	231597.99	7002.41
18	B.O.P	410093.2	231566.74	7001.82
19	B.O.P	410099.0	231475.84	6999.62
20	B.O.P	410099.6	231318.15	6998.98
21	B.O.P	410100.2	231160.47	6998.35
22	B.O.P	410115.2	231141.73	6997.67
23	B.O.P	410123.3	231139.66	6996.86
24	BEGIN T.C. FL	410126.1	231139.66	6996.86
25	T.C. FL	410116.8	231473.95	6998.53
26	T.C. FL	410156.3	231524.23	6998.87
27	END T.C. FL	410162.7	231525.59	6998.91
28	T.C. FL	410121.5	231306.85	6997.69
29	T.C. FL	410146.2	231160.40	6997.02
30	T.C. FL	410181.6	231160.27	6997.19
31	T.C. FL	410201.5	231141.35	6997.34
32	END T.C. FL	410201.6	231138.89	6997.36
33	MAINT. ROAD	410181.2	231175.61	6997.93
34	MAINT. ROAD	410139.3	231216.44	6997.98
35	MAINT. ROAD	410137.1	231295.81	6998.37
36	MAINT. ROAD	410151.6	231342.24	6998.70
37	MAINT. ROAD	410155.6	231353.68	6999.12
38	MAINT. ROAD	410155.5	231330.55	6998.86
39	MAINT. ROAD	410134.6	231387.79	6998.83
40	MAINT. ROAD	410132.2	231474.38	6999.27

Structure Table				
#	DESC.	NORTHING	EASTING	ELEVATION
41	MAINT. ROAD	410153.8	231507.46	6999.57
43	MAINT. ROAD	410177.8	231336.93	6999.13
44	MAINT. ROAD	410177.7	231348.93	6999.27
45	MAINT. ROAD	410251.6	231215.59	7005.63
46	MAINT. ROAD	410263.0	231219.51	7005.80
47	MAINT. ROAD	410265.3	231131.49	7006.00
48	MAINT. ROAD	410277.1	231133.32	7006.18
49	MAINT. ROAD	410285.9	231076.69	7006.08
50	MAINT. ROAD	410274.1	231074.03	7005.76
51	MAINT. ROAD	410235.8	231261.45	7003.33
52	MAINT. ROAD	410247.1	231265.37	7003.66
53	MAINT. ROAD	410228.2	231318.34	7001.21
54	T.O.P	410151.6	231110.22	7006.00
55	T.O.P	410216.5	231110.61	7006.00
56	T.O.P	410259.7	231167.82	7006.00
57	T.O.P	410260.7	231240.30	7006.00
58	T.O.P	410231.4	231374.05	7006.00
59	T.O.P	410199.0	231507.08	7006.00
60	T.O.P	410181.2	231575.10	7006.00
61	T.O.P	410148.4	231624.48	7006.00
62	T.O.P	410062.4	231565.71	7006.00
63	T.O.P	410074.3	231565.55	7006.00
64	T.O.P	410071.7	231363.22	7006.00
65	T.O.P	410059.7	231363.38	7006.00
66	T.O.P	410069.0	231160.88	7006.00
67	T.O.P	410057.0	231161.04	7006.00
68	T.O.P	410100.6	231100.99	7006.00
69	T.O.P	410100.6	231113.70	7006.00
70	T.O.P	410074.8	231116.67	7005.99
71	T.O.P	410084.5	231124.11	7006.00
72	T.O.P	410216.1	231098.49	7006.00
73	T.O.P	410151.6	231098.22	7006.00
74	SPILLWAY	410141.6	231110.22	7003.53
75	SPILLWAY	410141.6	231098.22	7003.53
76	SPILLWAY	410110.6	231098.78	7003.53
77	SPILLWAY	410110.6	231110.92	7003.53
78	WARNING SIGN	410073.0	231060.26	7001.10
79	WARNING SIGN	410269.2	231077.87	7005.69



12' ACCESS ROAD TYPICAL SECTION

N.T.S.



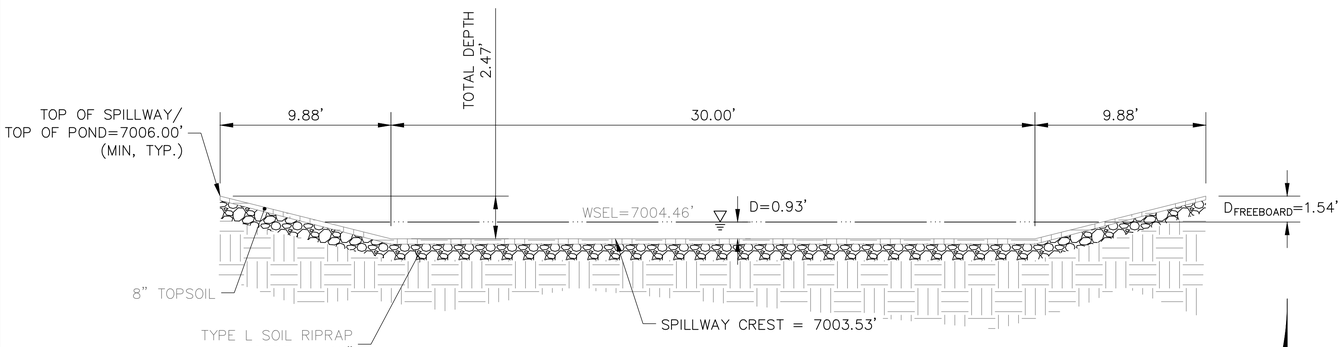
6.0' CONCRETE TRICKLE CHANNEL

SCALE: NTS

POND GRADING NOTES:

1. POND WARNING SIGNS TO BE INSTALLED AT LOCATIONS IDENTIFIED ABOVE. POND WARNING SIGNS SHALL BE 3 SQ. FT. AND SHALL READ:

WARNING
THIS AREA IS A STORMWATER FACILITY
AND IS SUBJECT TO PERIODIC FLOODING



EMERGENCY SPILLWAY SECTION

SCALE: NTS

30 15 0 30 60

ORIGINAL SCALE: 1" = 30'

811 Know what's below. Call before you dig.

THE LOCATIONS OF EXISTING ABOVE GROUND AND 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 ABOVE GROUND AND UNDERGROUND UTILITIES.

ENGINEER'S STATEMENT

PREPARED UNDER MY DIRECT SUPERVISION AND ON BEHALF OF ALL TERRAIN ENGINEERING

RYAN E. BURNS, P.E.
COLORADO P.E. 54412
FOR AND ON BEHALF OF JR ENGINEERING, LLC

DATE

ALL TERRAIN ENGINEERING

RYAN E. BURNS, PE
303.377.1666 - RBURNS@ALLTERRAINENG.COM

ANDREW G. JOVICEVIC, PE
530.391.1655 - AJOVICEVIC@ALLTERRAINENG.COM

PREPARED FOR:
TURKEY CANON QUARRY LLC
20 BOULDER CRESCENT STREET, SUITE 100
COLORADO SPRINGS, CO 80903
ATTN: JIM MORLEY
(719)
JMORLEY3870@AOL.COM

UNTIL SUCH TIME AS THESE DRAWIGS ARE APPROVED BY THE APPROPRIATE REVIEWING AGENCIES, ALL TERRAIN ENGINEERING APPROVES THEIR USE ONLY FOR THE PURPOSES DESIGNATED BY WRITTEN AUTHORIZATION.

JOB NO: 24013 LOCATION: EPC

REV	DESCRIPTION	DATE

PERMANENT BEST MANAGEMENT PLANS

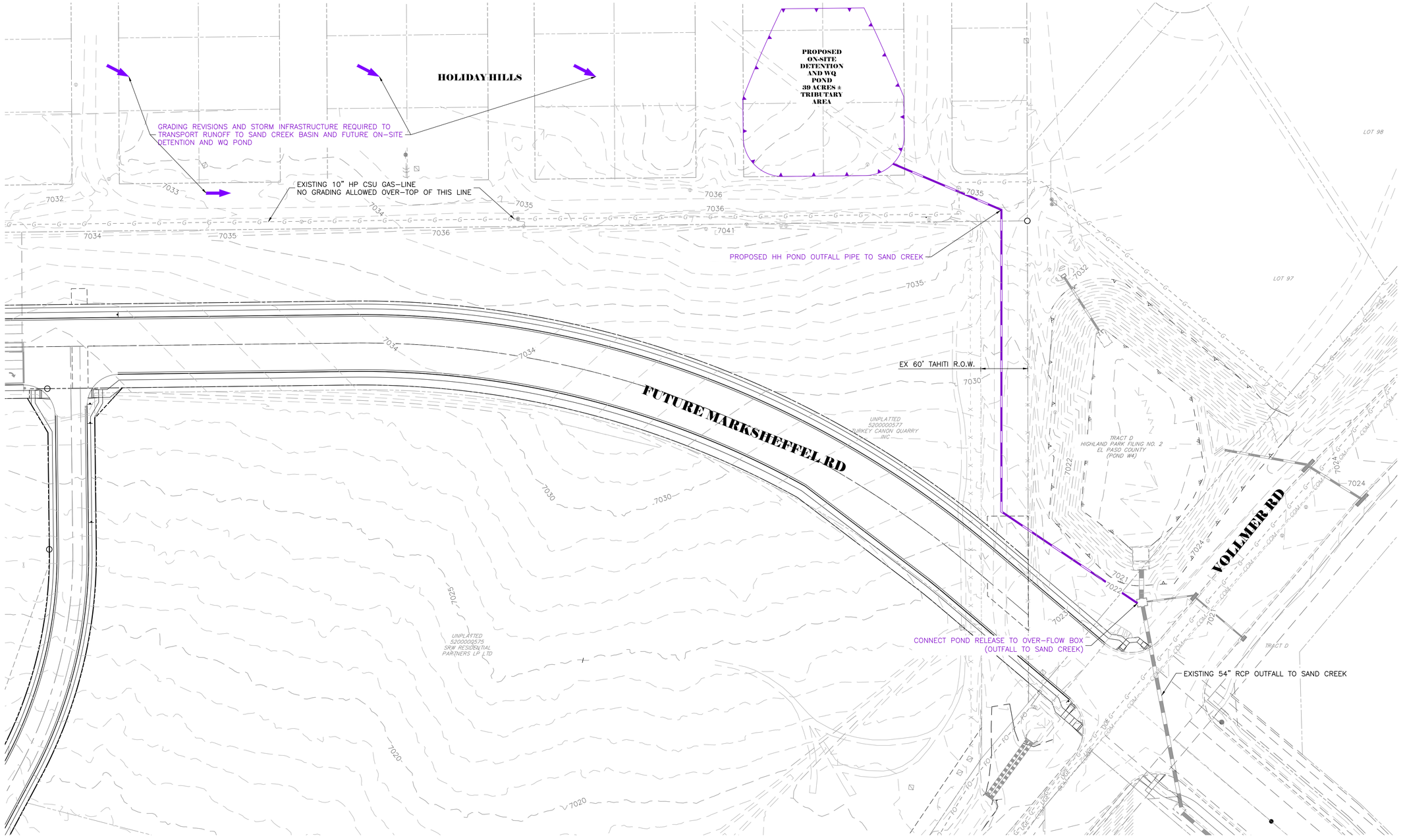
POND GRADING

DESIGN: REB
REVIEW: NQJ
DATE: 07/01/2024
H-SCALE: 1" = 30'
V-SCALE: 1" = 3'

SHEET 3 OF 6

HOLIDAY HILLS

FUTURE WQ/DETENTION AND OUTFALL PLAN



60 30 0 60 120

ORIGINAL SCALE: 1" = 60'

HOLIDAY HILLS	
FUTURE WQ/DETENTION AND OUTFALL PLAN	
JOB NO. 24013	SHEET
LOCATION: EPC	1
2026-08-18	

ALL TERRAIN ENGINEERING

MAX L. ROTHSCHILD, P.E
DIRECTOR OF TRANSPORTATION

MARK BRENTON
HIGHWAY ADMINISTRATOR

GEORGE MADRIL, L.S.
ENGINEERING ADMINISTRATOR

PHONE (303) 471-5774

EL PASO COUNTY

DEPARTMENT OF TRANSPORTATION

3170 CENTURY STREET
COLORADO SPRINGS, COLORADO 80907

May 4, 1977

P. J. Anderson
Director of Land Use
27 East Vermijo
Colo. Spgs., CO 80903

Dear P. J.,

We have inspected Azore Road, Bahama Drive, Capitol Road, Lido Drive, Panama Drive, Riveria Drive, Tahiti Drive in Holiday Hills No. 1. These roads can only be called "primitive roughed-in-trails" and are not up to El Paso County specifications. There are no drainage structures in evidence but, some will be required at the road intersections to properly drain the roads in the subdivision.

If we can be of further assistance please call on us.

Sincerely,

MLR

Max L. Rothschild, P. E.
Director of Transportation

By: Glentha Polok
Drainage Engineer

RECEIVED
By .....
MAY 4 1977
El Paso County
Land Use Department

RECEIVED
MAY 10 1996
Planning Dept.

SILVER PONDS SUBDIVISION FILING NO. 1

FINAL DRAINAGE REPORT

February 2, 1995
Revised May 5, 1996
Project No. 60572

PREPARED FOR:

The Campbell Corporation
4975 Austin Bluffs Parkway
Colorado Springs, CO 80918

PREPARED BY:

M.V.E., Inc.
1911 Lelaray St.
Colorado Springs, CO 80909

VI. DRAINAGE AND BRIDGE FEES

Drainage and bridge fees for the 78.36 acres of land being platted as Silver Ponds Subdivision Filing No. 1 located in the Cottonwood Creek major drainage basin are calculated below using 1996 interim rates on a per acre basis. We have used a one acre maximum lot size for the 24 residential lots plus 3.48 acres of commercial land for a grand total of 27.48 acres to calculate the fees owed.

Cottonwood Creek Drainage Fees		
27.48 acres @ $5,923.00 / acre	=	$ 162,764.04
Cottonwood Creek Bridge Fees		
27.48 acres @ $274.00 / acre	=	$ 7,529.52
Cottonwood Creek Land Fee		
27.48 acres @ $55.00 / acre	=	$ 1,511.40
Total Fees		$ 171,804.96
Less Cost of Public Improvements	=	($ 228,240.60)
FEES TO BE PAID		$ 0

PRELIMINARY/FINAL DRAINAGE REPORT

FOR

HIGHLAND PARK FILING NO. 2

EL PASO COUNTY, COLORADO

July 2000
(Revised September 2000)
(Revised May 2001)
(Revised February 2002)
(Revised June 2002)

24" CMP culvert at the roadway intersection. Flow then conveys via ditch flow to DP 6.

Design Point 6 –Flow from Design Point 5 and on-site sub-basins A-19-8 combine for a 5-year flow of 11.2 cfs and a 100-year flow of 30 cfs, which will be conveyed via a proposed 24" CMP culvert at the roadway intersection. Flow then conveys via ditch flow to DP 8.

Design Point 7 – Flow from Design Point 4 in addition to offsite basin O-17C(1/2) and on-site sub-basins A-19-6 and A-17-3 combine for a 5-year flow of 42.5 and a 100-year flow of 99.9cfs, which will be conveyed via a proposed 42" CMP culvert at the roadway intersection. Flow then conveys via ditch flow to DP 9.

Design Point 8 – Combined flow from Design Point 6 and sub-basin A-19-11 produce a 5-year flow of 11.2 cfs and a 100-year flow of 30cfs, which will be conveyed via a proposed 24" CMP culvert at the roadway intersection to an existing drainage swale. Flow then conveys via ditch flow to DP 9.

Off-site Design Points

Design Point 9 - Combined flows from Design Point 7, sub-basins A-17-2 and A19-7 and offsite basins O-A17C(1/2) and O-A17D produce a 5-year flow of 59.4 cfs and a 100-year flow of 144.0 cfs. This flow is conveyed primarily by ditch flow along Lochwinnoch and Vollmer Rd to a proposed 64"x43" arch CMP culvert at the roadway intersection. This flow will convey via the proposed improved ditch within Vollmer Road right of way to an existing 24" culvert at Tahiti Road within the Holiday Hills Subdivision being DP 10.

Design Point 10 – Runoff from DP 9 and DP 8 combines with sub-basin A-19-5 and A-19-6 for a 5-year flow of 80.6 cfs and a 100-year flow of 195.5 at a point offsite near Vollmer and Tahiti Road. The downstream end of the existing 24" was undetermined by field locates. The direction of this pipe appears to cross Tahiti Dr.. It is proposed to have the contractor remove the existing 24" and replace it with 2-48" cmp's. Currently the capacity of the 24" pipe is estimated to be 20.4 cfs with the balance of the flow overtopping Tahiti at Vollmer. Historically this culvert experiences 70.9/164.9 cfs. Under this overtopping condition it appears (from visual observations) as if most of the flow would follow the westerly ditch of Vollmer. This ditch flow continues to a point approximately ¾ of a mile to the south where 2-30" culverts exist. The Sand Creek DBPS calls out for 2 – 6'x10' cbc's at this location.

Design Point 11 - Combined flows from onsite basins A-20 and A-19-4 with a 5 year flow of 10.3 cfs and a 100 year flow of 25.3 cfs. This flow is conveyed via a ditch along existing Capital Road (Loch Fyne Ln) to an existing culvert at the end

of Holiday Hills SD and onto The Lakes Filing No. 2. Existing flow to this point is estimated to be 36.1/14.4 cfs. The developed flow is actually less due primarily to the redirection of flow by the addition of the internal roadway network. Flow will continue to flow onto The Lakes Filing No. 2 which is an open field. Any future development of this property will have to consider this flow in their storm water management plan.

Design Point 12 – The location of this DP is just north of the proposed Briargate Parkway extended. By the anticipated construction of Briargate Parkway it is very likely that drainage from subbasin O-A17E will be diverted from its historical course (within Sand Creek basin) to the design point as shown (i.e. in the Cottonwood Creek basin). The developed flow is estimated to be 54/23 cfs, with a tributary area of approximately 45 acres. The effects downstream, within Sand Creek basin, are a reduced flow which lessens the impact on proposed and existing facilities along Lochwinnoch Lane and Vollmer Road. The effects downstream, within Cottonwood Creek basin, are minimal since the diverted flow will flow directly to Cottonwood Creek. In addition, a regional detention facility is master planned (based on the Cottonwood Creek DBPS) just north of proposed Briargate Parkway which will lessen this impact further. Currently the tributary area at this point is 1600 acres. With the addition of 45 acres will increase the tributary area by 2.8%.

In the interim, it is proposed that an earthen channel (revegetated) be graded to direct present flow to Cottonwood Creek. See Filing 3 preliminary plan.

Prudent Line

Highland Park No. 2 proposes to adopt the prudent line method in its approach to improvements for the Cottonwood Creek drainage. The prudent line approach is applicable as it falls within selection criteria as outlined in the "Prudent Line Addendum for Unincorporated El Paso County Only", dated June 21, 2001. They are as follows:

- Sand Creek is located downstream from land areas that will have less than a cumulative of 15% impervious surface cover under future conditions. Density of the development and potential developments upstream (Black Forest) is and will be less than 1 unit per acre. See exhibit "A" in appendix.
- Sand Creek can adequately convey future 10 year events. The 10 year event conveys well within the existing banks. See hydrology and cross sections.
- Met with EPC officials and submitted preliminary prudent line calculations for input and acceptance of prudent line approach.

Other factors affecting the prudent line approach are:

O-A17D

O-A17C

O-A17A
(SEE FILING NO.3 MAP)

O-A17B

O-A19

A17

A-17-2

A-17-1

A-17-3

A-19-6

A-19-1

A-19-9

A-19-10

A-19-3

A-19-4

A-19-8

A-19-5

A19

A20

B-4-4

B-4-2

B-4-1

B-4-3

B-3-1

B-3-2

B-3-3

OBI-1

OBI-2

OBI-3

B4

B3

B6

R5

R6

PROPOSED DETENTION POND FROM COTTONWOOD CREEK DRAINAGE STUDY APPROX. 400' NORTH OF BASIN BOUNDARY

APPROX LOCATION 700' SOUTH OF THE PROPERTY BOUNDARY.

P.O.B

P.O.C.

S00°19'40"E
206.09'

S89°59'09"E 624.11'

N89°47'35"E
2692.92'

N00°07'10"E 1326.18'
BASIS OF BEARINGS

MAINTENANCE LINE (TYPICAL)

PRUDENT LINE (TYPICAL)

SAND CREEK DRAINAGE BOUNDARY

COTTON WOOD CREEK DRAINAGE BOUNDARY

LOCHWINNOCH ROAD

VOLLMER ROAD

DEAD TERRAIN CT.

WESTERN WAY

FEMA 100YR FLOODPLAIN

15' DRAIN. ESMT.

20' DRAIN. ESMT.

25' DRAIN. ESMT.

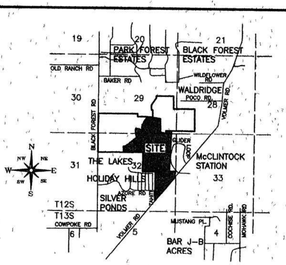
10' DRAIN. ESMT.

EXISTING 24" CULVERT UNDER VOLLMER TO BE REMOVED INSTALL TWO 48" CMPS

TO BE GRADED OUT BY OWNER / CONTRACTOR

64"x43" CMP ARCH.

VICINITY MAP
NO SCALE

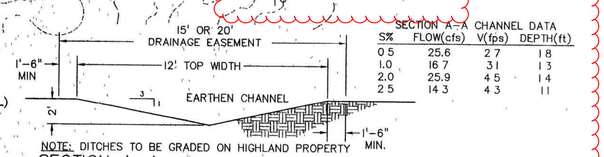


LEGEND

- FEMA 100 YR FLOOD PLAIN
- FILING NO 2 PROPERTY BOUNDARY
- DRAINAGE BASIN BOUNDARY
- BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOW DIRECTION
- PROPOSED CMP CULVERT, TABLE 7 CONTAINS SIZE
- PROPOSED BOX CULVERT, TABLE 7 CONTAINS SIZE
- BASIN DESIGNATION
- ON-SITE SUB BASIN DESIGNATION
- DESIGN POINT
- OFFSITE BASIN DESIGNATION

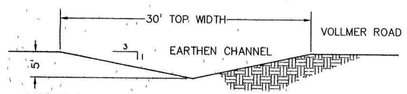
SECTION A-A CHANNEL DATA

S%	FLOW(cfs)	V(fps)	DEPTH(ft)
0 5	25.6	2 7	1 8
1.0	16 7	3 1	1 3
2.0	25.9	4 5	1 4
2 5	14 3	4 3	1 1



NOTE: DITCHES TO BE GRADED ON HIGHLAND PROPERTY

SECTION A-A
TYPICAL MIN. CROSS SECTION OF CHANNEL
NOT TO SCALE



SECTION B-B
TYPICAL MIN. CROSS SECTION OF CHANNEL
NOT TO SCALE

SCALE : 1" = 200'

PLAN REVISED MAR 13, 2002, BY:

LAW & MARIOTTI CONSULTANTS, INC.
CIVIL ENGINERING - LAND SURVEYING
619 N. Cascade Ave., Suite 206 Colorado Springs, CO 80903
719 442-1541 voice 719 442-1542 fax

L:\00-013 Highlands\DRAINAGE\drainage2.dwg Tue Jun 11 11:15:26 2002 PLM

LAW & MARIOTTI CONSULTANTS, INC.
CIVIL ENGINERING - LAND SURVEYING
619 N Cascade Ave , Suite 206 Colorado Springs, CO 80903
719 442-1541 voice 719 442-1542 fax

PREPARED FOR: LITTLE LONDON, L.L.C.
7075 CAMPUS DRIVE, SUITE 200
COLORADO SPRINGS, CO 80920-3164

PROJECT INFO: HIGHLAND PARK FILING NO. 2

DESIGNED BY: VGL
DRAWN BY: SMM
CHECKED BY: VGL

REVISIONS SYMBOL	REVISION	DATE	INITIAL

PLAN CONTROL CONSTRUCTION ACTIVITY	ISSUE DATE

DRAWING INFO: DRAINAGE PLAN

DATE: MAR 13, 2002
JOB NO: 00-13
SHEET: 1
SCALE: H AS
V SHOWN
DRAWING NO: DI
SHEETS: 2

MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO. 1 AND NO. 4

February 2006

Prepared for:

Morley Companies
15 North Nevada Avenue
Colorado Springs, CO 80903
(719) 471-1742

Prepared by:

ENGINEERING AND SURVEYING INC.

15 North Nevada Avenue
Colorado Springs, CO 80903
(719) 955-5485

Project #08-001

Basin Runoff Description

The "MDDP OS-1" basin refers to basin "OS-1" in the report prepared by Classic Consulting Engineers and Surveyors titled "Master Development Drainage Plan for Woodmen Heights Master Plan" dated June 2004. The MDDP cited that historic flows of Q5=65cfs and Q100=162cfs would be maintained in the future as discharge from a future detention facility "Alternative Site C" as outlined in the Sand Creek DBPS. Per the MDDP, it was inferred that the entire watershed would be transported to the future detention facility outfalling into our development (through our basin BB). ESI believes that a portion of this (50%) will actually be routed through Area 1 with the remainder being transported to our site via a roadside ditch on the west side of Vollmer Road to be picked up in a proposed system as described in the section below "Offsite and Roadways" within the Design Point 1 narrative. We have come to this decision based on the review of the existing topographic drainage patterns north of our development and from a report prepared by Law and Mariotti Consultants titled "Preliminary/Final Drainage Report for Highland Park Filing No. 2, July 2000, revised June 2002. A copy of said report elements pertaining to this site has been included with this report submittal per the request of City Engineering.

Surface Routing

On the north edge of the Forest Meadows site, along basins A, S, BB, II and PP, there is a berm which for the most part prevents flow from entering the site, with the exception of a few locations along said line which seem to allow some surface runoff to enter. The majority of the existing flows from basin MDDP OS-1 do not enter the site because of the existing aforementioned berm. Also, there is an existing large pit which collects this surface flow. The current owner (TST Construction) has verbally agreed to allow the berm and perimeter swales to pick up and redirect surface flows to collection points as described below. (See top of page 6). ESI and Morley Companies respectfully requests that a letter from TST Construction to this effect be provided to City Engineering prior to overlot grading north of Area 1. In the interim condition (until the MDDP OS-1 basin is developed), swales will be constructed along the northern boundary of Area 1 routing overland flows to a collection point (a depressed area which will be the confluence of the perimeter swales) where a proposed 36" RCP and flared end section will be constructed. ESI and Morley Companies are working with the owner of said land to determine the exact location of the swales and collection point, onsite or offsite.

Clogging Statement

Clogging is not anticipated at the entrance to the 36" RCP due to the large pipe size and flared end section. It is the responsibility of the Woodmen Heights Metropolitan District to ensure the inlet is clean of debris. At the time of detention pond construction, a trash rack is likely to be incorporated into the outlet structure design. An emergency overflow swale will be required within a drainage tract (*see Area 1 map*). The tract shall be graded to provide a trapezoidal channel with an 8' minimum bottom width, 3:1 side slopes, 3.0' minimum depth and a minimum slope of 2%. The capacity of which will be the 100 yr overflow value 243.9cfs with a freeboard value of ~1.0'. *Refer to Hydraulic Calculations in the appendix for computations.* Surface maintenance for the drainage tract shall be provided by the Woodmen Heights Metropolitan District.

this was not built

Pipe Routing/Pipe Capacity

The intercepted surface flows from basin MDDP OS-1 (Q5=34.0cfs, Q100=84.0cfs) are conveyed southerly to Breezewood Circle through a tract via pipe 106, a 36" RCP, to Breezewood Circle. Flows are then conveyed via pipe 106 southerly to Calthea Way, intersecting with pipe 109 (*described below*). The full flow capacity of pipe 106 is 73.9cfs assuming a 1.2% slope.

Design Point Flows

Design Points 4 & 4A (DP4 & DP4A) flows (Q5=24.7cfs, Q100=53.3cfs) are generated by basins II (Q5=7.1cfs, Q100=14.9cfs), basin JJ (Q5=4.4cfs, Q100=9.1cfs), basin KK (Q5=2.4cfs, Q100=5.1cfs), basin LL (Q5=4.1cfs, Q100=8.6cfs), basin MM (Q5=1.8cfs, Q100=4.7cfs), basin NN (Q5=2.9cfs, Q100=6.0cfs),

overtopping will occur into the adjacent properties. *Refer to "Knuckle Calculations" in the Hydraulic Calculations of the appendix for detailed calculations.* A rating curve was used to determine the various depths of the water with varying street grades. It was determined that no water would enter into adjacent properties during the 100 year storm event.

Clogging Statement
In the event of clogging or inlet failure, the runoff will overtop the roadway high point to the west and proceed to Forest Meadows Avenue via Calamint Place (*see Area 4 map*).

Pipe Routing/Pipe Capacity
The collected surface flows from design point 4 (DP4) are conveyed via a 30" RCP (pipe 106) south towards design point 4A (DP4A). The collected surface flows from design point 4A (DP4A) combine with those from pipe 106 are then conveyed via a 36" RCP (pipe 107) west to a manhole combining with flows from pipe 105 in Calamint Place. Flows from pipes 105 and 107 combine and are routed south to Forest Meadows Avenue via a 72" RCP (pipe 108). *Refer to "Offsite and Roadways" Pipe Routing/Pipe Capacity narratives for further routing information.* The flow in pipe 106 is Q5=17.4cfs and Q100=36.3cfs with a full flow capacity of 57.6cfs assuming a 2.0% slope. The flow in pipe 107 is Q5=34.9cfs and Q100=72.7cfs with a full flow capacity of 61.4cfs assuming a 0.9% slope. The flow in pipe 108 is Q5=194.2cfs and Q100=486.8cfs with a full flow capacity of 520.3cfs assuming a 1.5% slope.

this was not built

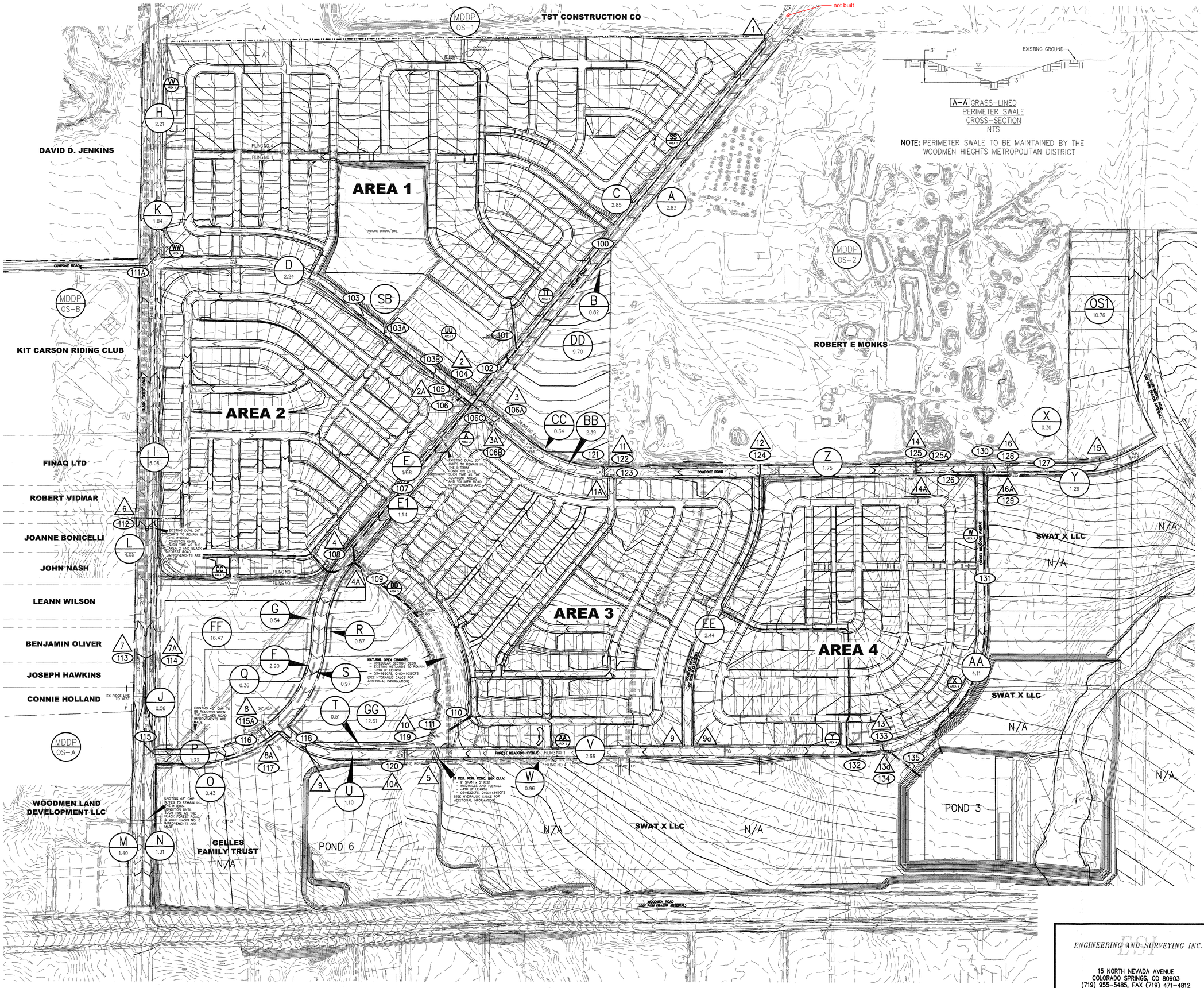
OFFSITE and ROADWAYS (Filing No. 1- 4 & Future Filings)
This portion of the site has been divided into 35 developed drainage basins which are described by each design point as follows:

Design Point Flows
Design Point 1 (DP1) flows (Q5=80.6cfs, Q100=195.5cfs) are generated by offsite basins approaching the Woodmen Heights development via a roadside ditch on the northwest side of Vollmer Road. A 48" flared end section collection point will be constructed immediately north of and adjacent to Area 1. Flow will be conveyed via a 48" RCP (pipe 100) towards Cowpoke Road. This flow value was established in the El Paso County "Preliminary/Final Drainage Report for Highland Park Filing No. 2, July 2000, revised June 2002, by Law and Mariotti Consultants, page 9 with a time of concentration value taken from the hydrologic data in the appendix of said report. This data has been included in the appendix in the Hydrologic Calculations section.

Design Point Flows
Design Point 2 & 2A (DP2 & DP2A) flows (Q5=30.1cfs, Q100=67.5cfs) are generated by basins C (Q5=10.2cfs, Q100=19.1cfs), basin D (Q5=8.7cfs, Q100=16.3cfs), basin A1SS (Q5=4.7cfs, Q100=9.9cfs), basin A1TT (Q5=2.7cfs, Q100=5.6cfs) and basin A1UU (Q5=7.4cfs, Q100=24.2cfs).

Basin Runoff Description
Basins C, D, A1SS, A1TT and A1UU consist of single-family residential and roadway corridor development, streets, rooftops, landscaping areas and park development improvements.

Surface Routing
All unconcentrated sheet flow from uphill lots will be conveyed through the lower lots via side lot swales ("B", "Garden" and "Walkout" lots), and via rear & side lot swales ("A" lot) to the front of the lot intercepted by street curb and gutter. Basins C, D, A1SS, A1TT and A1UU flows combine and are conveyed to DP2 & DP2A via type 1 curb and gutter. *Refer to "Offsite and Roadways" Street Capacity Summary in the Hydraulic Calculations of the appendix for street capacity information.* Two 10' D-10-R sump inlets intercept (Q5=30.1cfs, Q100=67.5cfs).



OFFSITE & ROADWAY DESIGN POINT SUMMARY

Design Point	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	STRUCTURE
1	80.6	195.5	TO ENTER PROPOSED FES
2	12.6	35.1	10' D–10–R SUMP INLET
2A	20.1	39.1	10' D–10–R SUMP INLET
3	5.5	10.5	4' D–10–R SUMP INLET
3A	5.5	10.5	4' D–10–R SUMP INLET
4	6.3	11.9	–
4A	5.6	10.8	–
7	21.9	41.2	16' D–10–R SUMP INLET
7A	22.8	41.1	16' D–10–R SUMP INLET
8	18.8	35.9	8' D–10–R SUMP INLET
8A	8.2	15.6	8' D–10–R SUMP INLET
10	27.8	53.9	10' D–10–R SUMP INLET
10A	8.0	15.6	10' D–10–R SUMP INLET
11	5.4	10.6	4' D–10–R SUMP INLET
11A	5.4	10.4	4' D–10–R SUMP INLET
13	15.1	30.1	6' D–10–R SUMP INLET
13A	7.9	14.7	6' D–10–R SUMP INLET
14	3.9	7.2	4' D–10–R SUMP INLET
14A	3.9	7.2	4' D–10–R SUMP INLET
16	3.2	6.1	4' D–10–R SUMP INLET
16A	3.2	6.1	4' D–10–R SUMP INLET

OFFSITE & ROADWAY BASIN SUMMARY

BASIN	AREA (Acres)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
A	2.8	10.1	19.0
B	0.8	0.8	2.1
C	2.8	10.2	19.1
D	2.2	8.7	16.3
E	1.7	6.3	11.9
E1	1.4	4.8	9.1
F	0.9	12.8	24.0
G	0.5	0.6	1.4
H	0.9	8.7	16.3
I	0.9	17.3	32.5
J	0.6	0.6	1.5
K	1.8	7.2	13.6
L	4.1	14.5	27.2
M	1.4	6.2	11.6
N	1.3	5.8	10.8
O	0.4	0.5	1.2
P	1.2	5.6	10.5
Q	0.4	0.4	1.0
R	0.6	0.6	1.5
S	1.0	4.2	7.9
T	0.5	0.5	1.3
U	1.1	5.0	9.3
V	2.66	10.1	19.0
W	1.0	0.9	2.3
X	0.3	0.3	0.8
Y	1.3	5.6	10.5
Z	1.8	7.7	14.4
AA	4.1	15.6	29.4
BB	2.4	11.0	20.6
CC	0.3	0.4	0.9
DD	9.7	24.2	50.3
EE	2.4	9.7	18.2
FF	16.5	39.7	82.5
GG	12.6	30.2	62.7
OS1	10.7	26.3	54.6

OFFSITE AND ROADWAY BASINS STORM SEWER SUMMARY

PIPE RUN	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	PIPE SIZE
100	80.6	195.5	48" RCP
101	109.4	243.9	48" RCP
102	180.0	439.4	66" RCP
103	52.5	110.3	48" RCP
103A	40.1	71.4	30" RCP
103B	92.6	181.7	54" RCP
104	15.0	33.6	24" RCP
105	15.0	33.6	24" RCP
106	122.7	249.2	66" RCP
106A	5.5	10.5	24" RCP
106B	5.5	10.5	24" RCP
106C	10.9	21.0	30" RCP
107	324.0	711.1	84" RCP
108	140.9	304.1	84" RCP
109	464.9	1015.1	108" RCP
110	127.1	267.2	66" RCP
111	30.2	62.7	36" RCP
BOX	622.2	1345.1	3–9'X5'
112	41.0	96.0	54" RCP
113	22.0	40.4	30" RCP
114	22.0	40.4	30" RCP
115	44.0	80.9	42" RCP
115A	39.7	82.5	36" RCP
116	49.6	101.0	42" RCP
117	12.6	24.1	18" RCP
118	97.6	188.7	60" RCP
119	15.3	29.7	18" RCP
120	30.5	59.3	18" RCP
121	24.2	50.3	36" RCP
122	28.9	59.1	36" RCP
123	33.5	68.0	36" RCP
124	108.0	305.0	60" RCP
125	108.0	305.0	60" RCP
125A	111.8	312.2	60" RCP
126	115.7	319.4	66" RCP
127	26.3	54.6	36" RCP
128	3.2	6.1	18" RCP
129	3.2	6.1	18" RCP
130	31.7	65.0	36" RCP
131	147.3	384.5	72" RCP
132	194.2	486.8	72" RCP
133	11.0	21.5	30" RCP
134	11.0	21.5	30" RCP
135	216.1	529.7	84" RCP

ENGINEERING AND SURVEYING INC.
15 NORTH NEVADA AVENUE
COLORADO SPRINGS, CO 80903
(719) 955–5485, FAX (719) 471–4812

FOREST MEADOWS – OFFSITE & ROADWAYS

DRAINAGE MAP

PROJECT NO. 08–001		FILE: *\dwg\Dev. Plan\08001 – Drainage Plan	
DESIGNED BY: BES	SCALE	DATE: 1/5/06	
DRAWN BY: BVDP	HORIZ: 1"=100'	SHEET 1 OF 6	D1
CHECKED BY: VAS	VERT: N/A		

TST CONSTRUCTION CO



BASIN SUMMARY

BASIN	AREA (Acres)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
A	4.1	8.3	17.2
B	2.9	6.4	13.4
C	2.2	4.6	9.7
D	1.4	3.3	7.0
E	0.9	2.1	4.5
F	1.3	3.0	6.3
G	1.9	3.9	8.2
H	1.3	3.1	6.5
I	1.2	2.8	5.9
J	1.4	3.1	6.8
K	2.2	5.1	10.6
L	1.5	3.4	7.0
M	0.8	2.0	4.2
N	1.5	3.5	7.4
O	1.6	3.6	7.6
P	1.5	3.7	7.8
Q	0.8	1.0	2.6
R	9.3	40.1	71.4
S	4.3	8.2	17.2
T	1.9	3.9	8.2
U	1.3	2.8	5.8
V	0.9	0.9	2.3
W	0.9	2.3	4.7
X	2.3	4.7	9.9
Y	4.3	8.8	18.4
Z	1.0	2.4	5.0
AA	1.5	3.5	7.3
BB	2.8	5.6	11.8
CC	2.0	4.6	9.6
DD	1.0	2.3	4.9
EE	0.4	1.0	2.1
FF	2.0	4.5	9.3
GG	0.6	1.6	3.3
HH	2.6	5.7	12.0
II	3.4	7.1	14.9
JJ	2.0	4.4	9.1
KK	1.0	2.4	5.1
LL	1.8	4.1	8.6
MM	1.6	1.8	4.7
NN	1.3	2.9	6.0
OO	1.3	3.2	6.6
PP	4.0	5.1	11.3
QQ	1.0	2.4	5.0
RR	1.0	2.4	5.1
SS	2.0	4.7	9.9
TT	1.1	2.7	5.6
UU	6.4	7.4	24.2
VV	0.7	1.7	3.5
WW	0.2	0.6	1.2

1" = 100'

0 25 50 100 200

Scale in Feet

STORM SEWER SUMMARY

PIPE RUN	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	PIPE SIZE
100	15.2	31.9	24" RCP
101	15.2	31.9	24" RCP
102	30.5	63.9	48" RCP
103	13.3	28.0	18" RCP
104	13.3	28.0	30" RCP
105	52.5	110.3	48" RCP
106	34.0	84.0	36" RCP
107	12.4	26.6	30" RCP
108	12.4	26.6	30" RCP
109	24.7	53.3	36" RCP
110	58.7	137.3	48" RCP
111	25.3	53.3	18" RCP
112	84.1	190.6	54" RCP
113	109.4	243.9	54" RCP

DESIGN POINT SUMMARY

Design Point	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	STRUCTURE
1	13.3	27.9	10' D-10-R SUMP INLET
1A	18.9	38.2	10' D-10-R SUMP INLET
2	22.8	47.6	8' D-10-R SUMP INLET
2A	4.4	9.6	8' D-10-R SUMP INLET
4	20.7	44.2	6' D-10-R SUMP INLET
4A	7.5	16.4	6' D-10-R SUMP INLET
5	34.2	71.8	20' D-10-R SUMP INLET
5A	20.6	43.7	20' D-10-R SUMP INLET

LEGEND

- SB — SEDIMENT BASIN
- A / 2.00 — BASIN LABEL / ACREAGE
- 200 — PIPE REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- 6920 — EXISTING CONTOUR
- **6920** — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- MANHOLE
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE

KEY MAP
N.T.S.

A–A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

NOTE: 1. PROPOSED CONTOURS PROVIDED BY NOLTE AND ASSOCIATES DATED 11/7/05

2. PERIMETER SWALE TO BE MAINTAINED BY THE WOODMEN HEIGHTS METROPOLITAN DISTRICT

ENGINEERING AND SURVEYING INC.

15 NORTH NEVADA AVENUE
COLORADO SPRINGS, CO 80903
(719) 955-5485, FAX (719) 471-4812

FOREST MEADOWS – AREA 1

DRAINAGE MAP

PROJECT NO. 08-001		FILE: *\dwg\Dev. Plan\08001 – Drainage Plan	
DESIGNED BY:	BES	SCALE	DATE: 1/5/06
DRAWN BY:	BVDP	HORIZ: 1"=100'	SHEET 2 OF 6
CHECKED BY:	VAS	VERT: N/A	D2

TRAILS AT FOREST MEADOWS
FILING NO. 3
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

August 2015

Prepared for:

Rivers Development, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-029

OFFICE COPY

ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are co=on during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood lnsurance Rate Map (FIRM) Panel No. 08041C0529, effective date March 17, 1997, no portion of the site lies within a designated floodplain.

DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/E) Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

EXISTING DRAINAGE CONDITIONS

The overall site consists of 18.172 acres and is currently undeveloped, with the initial grading project proposed to disturb 18.172 acres for Filing No. 3 residential subdivision. Filing No.3 proposes 87 single family residential lots. The number of lots to be platted in the future filings to the west is unknown at this time. All of the streets, curb, gutter, sidewalk and utilities for the development of Vanderwood Road, Cedar Brush Court, Brush Top Road, and Creek Brush Drive, will be constructed in Filing No. 3 Vanderwood Road will be extended in the future filings of Trails at Forest Meadows.

As shown by the historic drainage map for "Trails at Forest Meadows Filing 2", included in the appendix, offsite historic flows, tributary to Vollmer (EX1 ~ Q5=66 cfs and Q100=300.7 cfs, EX2 ~ Q5=23 cfs and Q100=106 cfs, and EX3 ~ Q5=1.8 cfs and Q100=8.0 cfs, see Historic drainage map DP-1), have been estimated to reach proposed Vollmer Road infrastructure at the Dry Needle Place/Vollmer Road intersection and northerly boundary of Filing No. 2. It has been determined that due to limited roadside capacity along the West side of Vollmer Roadway much of this historic runoff may cross Vollmer prior to reaching DP3 (see proposed Drainage Conditions for addition discussion). No new developed flow will be introduced onto Vollmer Road, north of the intersection. Any new developed flows, south of the intersection, will be intercepted by 2-20' D-10-R inlets within the proposed Vollmer Road Section. It should be noted that upon the construction of the Sterling Ranch subdivision a large percentage of the historic flows, once reaching the subject site (north and west of Vollmer Road/ future Marksheffel Road) will be collected and conveyed in a proposed 54" RCP to Sand Creek.

Per review of the existing topographic drainage patterns, the off-site historic flows, north of the property (OSl, see Historic drainage map DP-1), are conveyed west by an existing berm and swale to an existing gravel borrow pit, as evident by the eroded embankment at the southeast comer of the gravel borrow pit and evaluation of grade during onsite visits. Per the "Master Development Drainage Plan for Woodmen Heights Master ·Plan" prepared by Classic Consulting Engineers and Surveyors, dated June 2004, it was inferred that the entire watershed (historic flows of Q5=65 cfs and Q100=162 cfs) would be transported to the future detention facility through our site. This report was amended by the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4" (MDDP) by Engineering and Surveying, Inc., dated February 2006, in which it states that 50% of the flow from OS1 (Q5=34 cfs, Q100==84 cfs) will be collected by a proposed concrete pipe and will be conveyed through and combined with the flows of Trails at Forest Meadows Filings to Sand Creek Regional Detention Facility No. 6. Per historic drainage patterns and per the "Preliminary/Final Drainage Report for Highland Park Filing No.2", prepared by Law and Mariotti Consultants, dated June 2002, the remainder of the flows will be transported via road side swale on the west side of Vollmer Road to the proposed drainage infrastructure in Vollmer Road. Any increase in flows due to future development of

Basin OS1 will require the construction of a proposed detention facility, as per the Sand Creek DBPS. Historic flows (EX4- Q5=5.1 cfs and Q100=22.9 cfs, see Historic drainage map DP-1) south of OS1, sheet flow to an existing abandoned road swale and outlet to a roadside swale on Black Forest Road. There are road side swales on either side of the abandoned road. Since topographic drainage patterns have been altered since the approval of the MDDP, existing historic flows have been diverted to the gravel borrow pit, Vollmer Road and Black Forest Road.

The site is tributary to Sand Creek Detention Basin No. 6. The stormwater infrastructure downstream of the subject site has already been constructed to the aforementioned detention pond. Specifically, flows initially intercepted at Design Point E3 are conveyed within the Vollmer Road Storm Sewer System which parallels the west side of Vollmer prior to out-falling (at the East Side of Vollmer Road) into a partially riprap lined channel. The existing channel, which parallels both the southwest and western edge of Forest Meadows Filing No. 1, directs runoff under Forest Meadows Avenue and into the existing Sand Creek Detention Pond No. 6. A rip rap plunge pool and energy dissipater aid to slow the incoming flows while the receiving facility provides both WQCV and detention for this development.

The site was originally studied in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report" (DBPS) prepared by Kiowa Engineering. This study was then updated in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report Technical Addendum" by Kiowa, revised October 1995.

It should be noted that the subject site was most currently studied in the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4, where the proposed land use had been revised to single-family residential development from previously planned commercial usage.

PROPOSED DRAINAGE CONDITIONS

The following is a description of the onsite basins, offsite bypass flows and the overall proposed drainage characteristics for the development of Trails at Forest Meadows Filing No.3. The following Design Points and Basins were determined using the Rational Method since each individual basin is less than 100 acres and the combined acreage at any Design Point is also less than 100 acres. This method offers a more conservative approach to calculating swale cross sections and storm drain. The proposed drainage design for this subdivision is typical for single family residential, consisting of; homes, landscaping, rear and side lot drainage swales, curb & gutter, streets, curb inlets, and pipes to convey developed flows downstream. Rear and side lot swales will be constructed to get developed flows to street curb and gutter.

Filing No.2 - Basins F2-F, F2-I and F2-J are located to the south of the subject site, in the central and east portions of the Filing 2 site. The flows from these basins were previously analyzed as part of "The Trails at Forest Meadows Filing No. 2 Preliminary/Final Drainage Report" (FDR2). Runoff produced within Basins F2-F, F2-I and F2-J flow to existing inlets in the Trails at Forest Meadows Filing No. 2 subdivision and have been accounted for.

Basin K is located in the northerly portion of the site and contains 0.92 acres of portions of single family residential lots and streets. Basin K has proposed design flows of 1.8 cfs for the minor storm event (5-Year) and 3.9 cfs for the major storm event (100-Year). Runoff from Basin K will flow, overland via side lot swales, to the curb and gutter of existing streets within Basin F2-F (Filing No. 2) to Design Point 1 (6.1 cfs/12.8 cfs), an existing 12' D-10-R inlet in a sump condition. See FDR2 Basin F for pipe conveyance information and over flow conditions. Pipe 2 and 3 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin L is located in the northerly portion of the site and contains 0.55 acres of rear yards of single family residential lots. Basin L has proposed design flows of 1.2 cfs for the minor storm event (5-Year) and 2.5 cfs for the major storm event (100-Year). Runoff from Basin L will flow, overland, to lots and tracts within Basin F2-J (Filing No. 2) and be conveyed, via side lot swales, to the curb and gutter of the adjacent streets to Design Point 5 (4.9 cfs/7.4 cfs). Runoff will be intercept at DP-5 via an existing at-grade 12' D-10-R inlet. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipes 5, 7, 8, 9 and 11- have been sized to accept these developed flows and do not exceed the pipe design flows determined within the FDR for Filing 2.

Basin M is located in the northeast portion of the site and contains 2.62 acres of single family residential lots, landscaping, and an asphalt roadway. Basin M has proposed design flows of 5.4 cfs for the minor storm event (5-Year) and 11.3 cfs for the major storm event (100-Year). Runoff from Basin M will flow, via side lot swales, to the curb and gutter and will be conveyed south to Design Point 10, a 10' D-10-R inlet in an at-grade condition. The inlet at Design Point 10 has been sized to accept flows from Basin M in the developed condition. Collected flows from Design Point 10 will be conveyed in an 18" RCP (Pipe 20) to Design Point II, a 12' D-10-R at-grade inlet.

Basin M-1 is located in the northeast portion of the site and contains 0.65 acres of single family residential lots and asphalt roadway. Basin M-1 has proposed design flows of 1.3 cfs for the minor storm event (5- Year) and 2.7 cfs for the major storm event (100-Year). Basin M-1 was part of a Basin Min FDR2 and is identified only to account for design flows to Design Point 6, an existing 8' D-10-R inlet in a sump condition. See FDR2 Basin M for pipe conveyance information and over flow conditions. Pipes 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin O is located in the northeast portion of the site and contains 0.70 acres of rear yards of single family residential lots and Tract G. Basin 0 has proposed design flows of 1.6 cfs for the minor storm event (5-Year) and 3.3 cfs for the major storm event (100-Year). The runoff from Basin 0 will flow overland thru Tract G via the side lot swales, to the curb and gutter of Aspen Brush Court, w/o crossing any lots within Filing 2. Runoff collected by the roadway continues southerly (down-gradient) to Design Point 5, an existing 12' D-10-R inlet in an at-grade condition. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipe 5, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin P is located in the northerly portion of the site and contains 2.14 acres of single family residential lots, landscaping, and an asphalt roadway. Basin P has proposed design flows of 4.2 cfs for the minor storm event (5-Year) and 8.8 cfs for the major storm event (100-Year). Runoff from Basin P will flow, via side lot swales, to the curb and gutter and then westward to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year). A temporary riprap pad will be constructed at the end of the proposed roadway to dissipate energy and prevent local scour. The existing diversion swale established with FDR2 (which previously directed runoff reaching this location to the south) will be abandoned by the construction of a new swale which will be to redirect runoff westward to the existing 48" RCP (Pipe 14). It should be noted that the majority of the existing swale along the western boundary of Filing No.2 remain in place to protect existing lots and serve as a secondary level of protection should the swale leading to pipe 14 fail. Pipes 14 and 3 have been sized to accept the contributing developed flows and do not exceed the pipe design flows in FDR2.

Basin Q is located in the northerly portion of the site and contains 3.66 acres of single family residential lots, landscaping, and proposed roadways. Basin Q has proposed design flows of 6.1 cfs for the minor storm event (5-Year) and 12.8 cfs for the major storm event (100-Year). Runoff from Basin Q will flow, via side lot swales, to the curb and gutter to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year), before continuing within the aforementioned swale to Pipe 14. A temporary sediment basin is recommended to be constructed upstream of Pipe 14, to aid in deterring sediment transport, while riprap protection will be placed immediately adjacent to the pipe entrance to protect the transition slope to the mouth of the pipe . A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin Q to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or

removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids to direct any potential runoff to the west. A proposed 3' wide sidewalk chase will be constructed to convey the minor runoff from Basin OS-3 and east third of Basin OS-2 into Brush Top Road. Limited flow from the north is anticipated reach Brush Top, with future development as a high point will be planned to be placed near the north boundary line.

It should be noted that the contours on the provided drainage map illustrate the potential for a low point or break in the existing offsite berm immediately to the north of Brush Top Road which would allow for flows from Basin OS-1 to reach Basin OS-2. M&S Civil Consultants traveled to the sight and evaluated the onsite conditions at this location and determined that the existing contours shown on the provided map are not entirely representative of the current conditions. M&S Civil further ascertained the existing swale/berm at this location maintains a positive grade to the west and is somewhere between 1.7 to 2.0 feet tall which should provide adequate temporary capacity to redirect the offsite flows to the west.

Refer to the existing condition section of this report, the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4", and Preliminary/Final Drainage Report for Highland Park Filing No.2" for additional information regarding offsite development in this area.

Basin R is located in the northerly portion of the site and contains 2.37 acres of single family residential lots, landscaping, and an asphalt roadway. Basin R has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basin R will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin R to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids in directing any potential runoff to west.

Basin S is located in the easterly portion of the site and contains 3.09 acres of single family residential lots, landscaping, and an asphalt roadway. Basin S has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basins will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north and northeast edges of the proposed filing within Basin S to ensure that on site property owners are protected from offsite flows (OS3). The existing offsite berm located on the adjacent property to the currently aids in directing flows around the majority of the northeast edge of the filing , but terminates prior to eastern boundary line and cannot be relied on in perpetuity for flood control. Flows reaching the onsite berm will be directed to a pair of proposed 4' sidewalk chases which will aid to discharge runoff to the curb and gutter of Vollmer Road.

Basin T is located in the easterly portion of the site and contains 1.73 acres of rear yards of single family residential lots. Basin T has proposed design flows of 4.0 cfs for the minor storm event (5-Year) and 8.4 cfs for the major storm event (100-Year). Runoff from Basin Twill flow, via side lot swales, to the curb and gutter in Vollmer Road to Design Point E3, an existing 12' D-10-R inlet, in an at-grade condition. The inlet at Design Point E3 has been sized to accept flows from Basin T, U and historic flows EX1 and EX2. Collected flows from Design Point E3 will be conveyed in an existing 30" RCP (pipe 10) to pipe 11, an existing 48" RCP. Combined flows in 9, 10 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin U is located in the easterly portion of the site and contains 1.23 acres of Vollmer Road asphalt and curb and gutter. Basin U has proposed design flows of 4.3 cfs for the minor storm event (5-Year) and 8.1 cfs for the major storm event (100-Year). Runoff from Basin U will flow, via curb and gutter to Design Point E3, an existing 20' D-10-R inlet, in an at-grade condition. The inlet at Design Point E3 has been sized to accept flows from Basin T, U and portions of historic flows from Basins EX1 and EX2 (capacity of ~ 30 cfs). Collected flows from Design Point E3 will be conveyed in an existing 30" RCP (pipe 10) to pipe 11, an existing 48" RCP. Combined flows in 9, 10 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. Additional discussion the runoff reaching Design Point 3 is discussed in upcoming paragraphs.

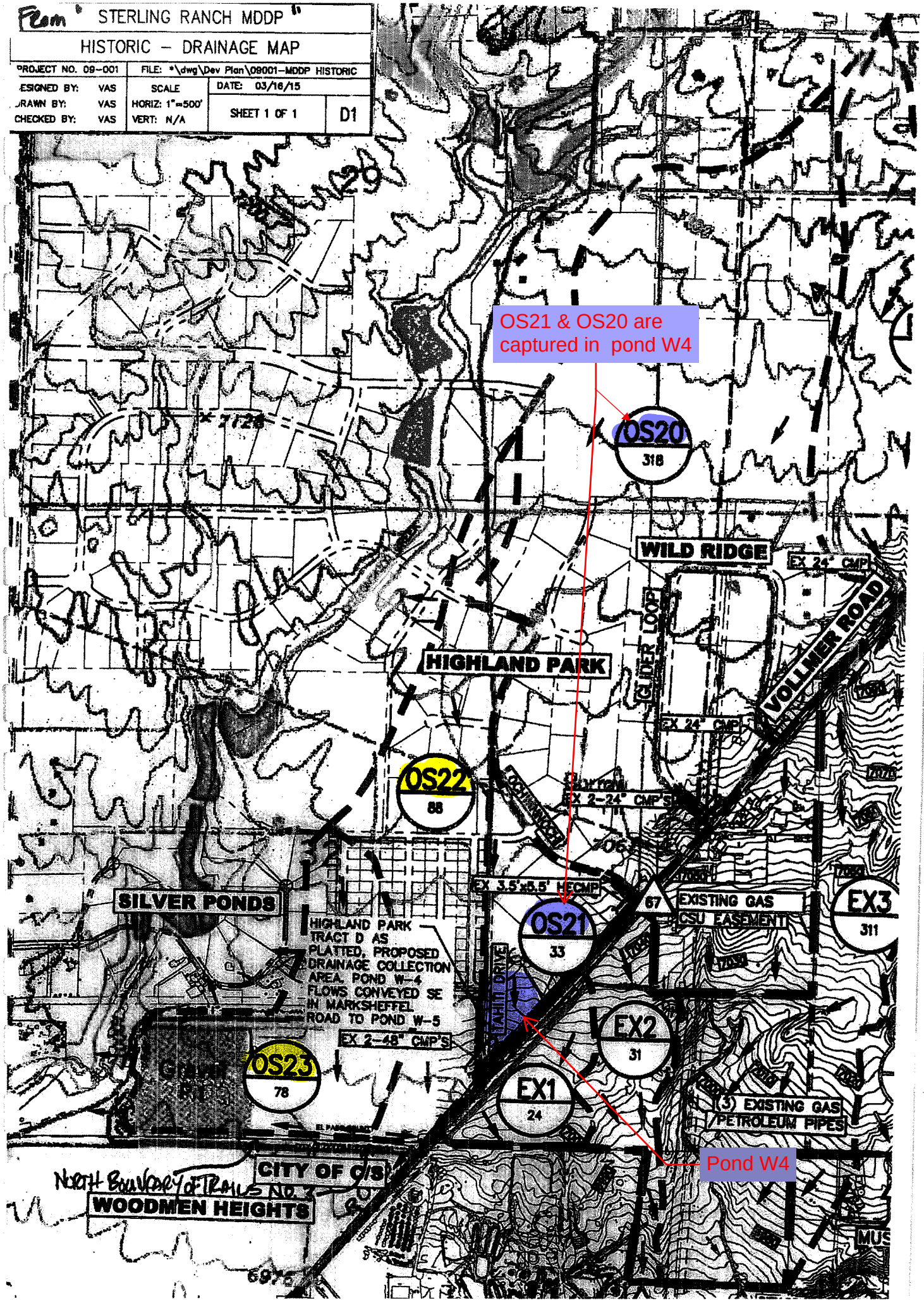
Basin OS2 is located off-site, in the northerly portion of the site and contains 1.22 acres of undeveloped land. Basin OS2 has undeveloped flows of 0.8 cfs for the minor storm event (5-Year) and 3.6 cfs for the major storm event (100-Year). Runoff from Basin OS2 will be directed around Basin Q, via the proposed perimeter berm to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year) and a proposed diversion swale. The diversion swale will route flows to an existing 48" RCP (pipe 14). Pipe 14 and 3 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. *Any increase in flows due to future development of Basin OS1/OS2 will require the construction of a proposed detention facility*, as per the Sand Creek DBPS.

Basin OS3 is located off-site, in the northerly portion of the site and contains 0.34 acres of undeveloped land. Basin OS3 has undeveloped flows of 0.2 cfs for the minor storm event (5-Year) and 1.0 cfs for the major storm event (100-Year). Runoff from Basin OS3 will be directed westward via the proposed perimeter berm to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year) and a proposed diversion swale. The aforementioned diversion swale will route flows to an existing 48" RCP (pipe 14).

Flows reaching **Design Point E3** are historic and tributary to Vollmer Road (EX1, EX2 and EX3, see Historic drainage map DP-1). A portion of these Historic (EX1 and EX2) and proposed flows (Basin T and U), will be routed into the existing Vollmer Road infrastructure at the north end of the Dry Needle Place/Vollmer Road intersection and the northerly boundary of Filing No. 2. If sufficient conveyance capacity were to exist within the Vollmer ROW to convey runoff from the historic upstream watersheds, flows rates as high as 87.8 cfs for the minor storm event (5- Year) and 388.7 cfs for the major storm event (100-Year) could be expected to reach Design Point E3. These calculated flows differ by 2 cfs in the 5-year event and 1 cfs in the 100- year event from those estimated within the FDR2 report. A field inspection of the existing roadside ditch and roadway was conducted by M&S Civil Consultants in the Early Summer of 2015 and the estimated conveyance capacity was determined using Bentley's FlowMaster program. Based upon the observed longitudinal slope and geometry, the capacity of the street/ditch section at the northern boundary was found to be as high as approximately 135 cfs, thereby limiting the maximum amount of upstream runoff which is able to reach the subject site and Design Point 3. Runoff upstream of the site, in excess of ditch capacity, is believed to intermittently overtop Vollmer Road continue east toward Sand Creek. Recent storms during the summer months of 2015 (June & July) have aided in additional sediment transport in the area, thus likely further decreasing the available conveyance capacity. In the proposed condition grading will occur along portions of the west side of Vollmer Road to add width to the existing roadway and a vertical curb and gutter section along the west side of the street. A proposed cross section was analyzed upstream of Design Point 3 which indicates an estimated street conveyance capacity of 131 cfs for the west side of Vollmer Road when ponding reaches a depth of 1' at the flowline.

A temporary radial asphalt curb with a riprap transition will be constructed at the confluence of the roadway section and the existing ditch, at the north end of the subdivision, to aid in directing runoff from the existing ditch to the proposed curb and guttered street section. The proposed improvements will be detailed in the street improvement plans for Trails at Forest Meadows Filing No. 3. The proposed improvements will be constructed within the right of way in a manner so that they do not impact lots or offsite property.

It should be noted that based upon the Preliminary Drainage Report of Sterling Ranch Phase 1, dated March 2015 by M&S Consultants, the construction of the Sterling Ranch Subdivision and Marksheffel Road will


STERLING RANCH MDDP
HISTORIC – DRAINAGE MAP
PROJECT NO. 09-001
FILE: *\dwg\Dev Plan\09001-MDDP HISTORIC
DESIGNED BY: VAS
DRAWN BY: VAS
CHECKED BY: VAS
SCALE
HORIZ: 1"=500'
VERT: N/A
DATE: 03/16/15
SHEET 1 OF 1
D1
OS21 & OS20 are captured in pond W4
OS20
318
WILD RIDGE
EX 24" CMP
VOLLMER ROAD
GLIDER LOOP
HIGHLAND PARK
EX 24" CMP
OS22
88
EX 2-24" CMP'S
EX 3.5'x5.5' HECMP
OS21
33
67
EXISTING GAS
CSU EASEMENT
EX3
311
SILVER PONDS
HIGHLAND PARK TRACT D AS PLATTED, PROPOSED DRAINAGE COLLECTION AREA. POND W-4 FLOWS CONVEYED SE IN MARKSHEFFEL ROAD TO POND W-5
EX 2-48" CMP'S
EX2
31
OS23
78
EX1
24
(3) EXISTING GAS PETROLEUM PIPES
Pond W4
CITY OF C/S
WOODMEN HEIGHTS

HISTORIC CONDITION

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5 (CFS)	Q_{100} (CFS)
EX–1	24	3	40
EX–2	31	3	45
EX–3	311	49	341
EX–4	330	71	353
EX–5	152	14	209
EX–6	1692	118	2168
EX–7	165	12	197
EX–8	42	4	64
EX–9	132	11	149
EX–10	450	48	474
EX–11	209	17	261
EX–12	40	5	65
EX–13	89	6	114
OS–20	318	61	310
OS–21	33	8	38
OS–22	88	18	91
OS–23	78	34	84

no downstream conveyance was planned or provided for OS-22

* NOTE: BASINS OS–22 & OS–23 NOT PART OF THIS REPORT. FLOWS FOLLOW HISTORIC PATTERNS ON THE WESTSIDE OF VOLLMER ROAD.

TRAILS @ FOREST MEADOWS PROVIDED 48" PIPE SIZED FOR THESE FLOWS BUT PROVIDED NO OVERFLOW PATH FOR REQUIRED ON-SITE POND

STERLING RANCH MDDP

HISTORIC – DRAINAGE MAP

ECT NO. 09–001	FILE: *\dwg\Dev Plan\09001–MDDP HISTORIC		
NED BY: VAS	SCALE	DATE: 03/16/15	
WN BY: VAS	HORIZ: 1"=500'		
CKED BY: VAS	VERT: N/A	SHEET 1 OF 1	D1

SIDEWALK CHASES

MGS Civil
Dun 7/29/15

Assumptions for Sizing of Sidewalk Chases

Assume chase can pass H = 0.5'

Chase @ Birch Top Road

Contributing Watersheds: 1/3 OS2 & OS3

Flow Rates OS2 = $\frac{3.6 \text{ CFS}}{3}$ + 1.0 = 2.2 CFS

Weir Eqn = $3.1 \times L \times H^{1.5} = Q$

$2.2 \text{ CFS} = 3.1 \times L \times 0.5^{1.5}$ = L = 2.1'

Install (1) 3' wide sidewalk chase →

Chase @ Birch Top Road.

Contributing watershed = Portion of Offsite Area EX2.

Approximate Basin Size = $500' \times 1200' \times 0.5 = \frac{300{,}000}{43560} = 6.9$ Ac.

Flow Rate = EX2 = 106.1 CFS Across 122 Ac. ≈ 1.0 CFS/Ac.

Use - 1.0 CFS/Ac. 7 Ac @ $\frac{1.0 \text{ CFS}}{\text{Ac}}$ = 7.0 CFS

Add 1/2 Ac of BASIN S

BASIN S = 3.09 Ac. @ 9.9 = 3.2 CFS/Ac

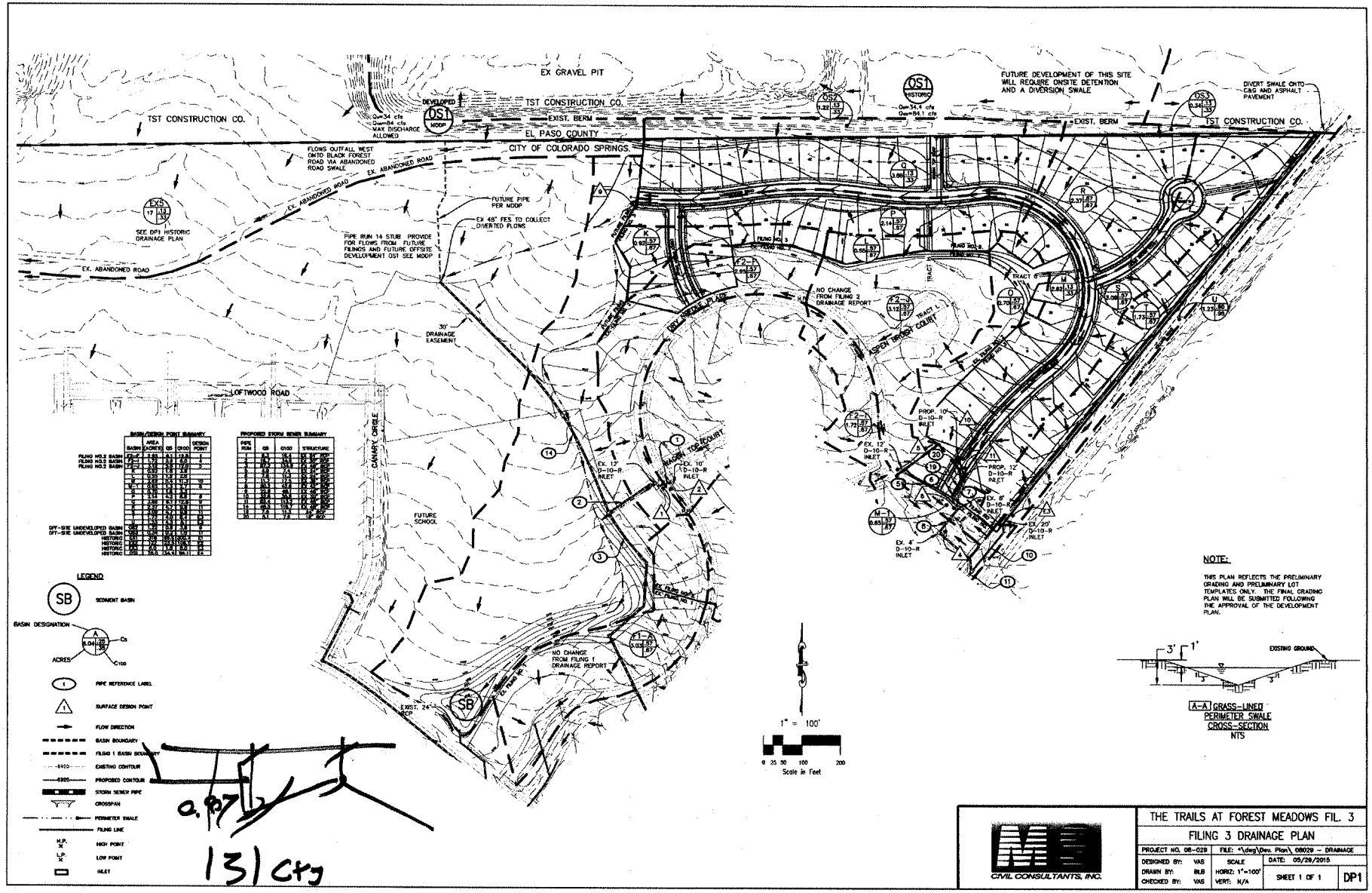
0.5 Ac × 3.2 CFS/Ac = 1.6 CFS

Total Flow = 7.0 CFS + 1.6 CFS = 8.6 CFS

Weir Eqn. = $3.1 \times L \times H^{1.5} = Q$

$8.6 = 3.1 \times L \times 0.5^{1.5}$ L = 8.3 ≈ 8.0

Install (2) 4' wide sidewalk chases →



BASIN/DESIGN POINT SUMMARY

	BASIN	AREA (ACRES)	Q5	Q100	DESIGN POINT
FILING NO.2 BASIN	OS-1	7.85	0.1	13.9	1
FILING NO.2 BASIN	FC-1	1.39	0.0	0.0	2
FILING NO.2 BASIN	FC-2	1.13	0.0	0.0	3
	A	0.04	0.0	0.1	1
	B	0.03	0.0	0.1	2
	C	0.86	0.2	2.5	3
	D	2.14	0.5	6.3	4
	E	0.57	0.1	1.7	5
	F	2.14	0.5	6.3	6
	G	0.86	0.2	2.5	7
	H	0.92	0.2	2.7	8
	I	0.06	0.0	0.2	9
	J	2.94	0.7	8.6	10
	K	0.92	0.2	2.7	11
	L	0.06	0.0	0.2	12
	M	2.82	0.7	8.3	13
	N	0.79	0.2	2.3	14
	O	3.08	0.7	9.1	15
	P	1.73	0.4	5.1	16
	Q	2.37	0.6	7.0	17
	R	2.37	0.6	7.0	18
	S	3.08	0.7	9.1	19
	T	1.73	0.4	5.1	20
	U	1.23	0.3	3.6	21
	V	0.34	0.1	1.0	22
OFF-SITE UNDEVELOPED BASIN	OS2	1.22	0.1	3.6	1
OFF-SITE UNDEVELOPED BASIN	OS3	0.34	0.1	1.0	2
HISTORIC	OS1	7.85	0.1	13.9	23
HISTORIC	OS2	1.22	0.1	3.6	24
HISTORIC	OS3	0.34	0.1	1.0	25
HISTORIC	OS4	4.15	1.8	8.20	26
HISTORIC	OS5	38.5	14.5	64.2	27

PROPOSED STORM SEWER SUMMARY

PIPE RUN	Q5	Q100	STRUCTURE
1	0.1	0.1	10' TYPE R INLET
2	0.2	0.3	10' TYPE R INLET
3	0.3	0.4	10' TYPE R INLET
4	0.5	0.7	10' TYPE R INLET
5	0.1	0.1	10' TYPE R INLET
6	0.1	0.1	10' TYPE R INLET
7	0.1	0.1	10' TYPE R INLET
8	0.1	0.1	10' TYPE R INLET
9	0.1	0.1	10' TYPE R INLET
10	0.1	0.1	10' TYPE R INLET
11	0.1	0.1	10' TYPE R INLET
12	0.1	0.1	10' TYPE R INLET
13	0.1	0.1	10' TYPE R INLET
14	0.1	0.1	10' TYPE R INLET
15	0.1	0.1	10' TYPE R INLET
16	0.1	0.1	10' TYPE R INLET
17	0.1	0.1	10' TYPE R INLET
18	0.1	0.1	10' TYPE R INLET
19	0.1	0.1	10' TYPE R INLET
20	0.1	0.1	10' TYPE R INLET
21	0.1	0.1	10' TYPE R INLET
22	0.1	0.1	10' TYPE R INLET
23	0.1	0.1	10' TYPE R INLET
24	0.1	0.1	10' TYPE R INLET
25	0.1	0.1	10' TYPE R INLET
26	0.1	0.1	10' TYPE R INLET
27	0.1	0.1	10' TYPE R INLET

LEGEND

- SB — SEDIMENT BASIN
- BASIN DESIGNATION — A, 0.04 ac, Cs, C100
- PIPE REFERENCE LABEL
- SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING 1 BASIN BOUNDARY
- 6410 — EXISTING CONTOUR
- 6395 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- PERIMETER SWALE
- FILING LINE
- H.P. — HIGH POINT
- L.P. — LOW POINT
- INLET

0.87

131 Cfs

NOTE:

THIS PLAN REFLECTS THE PRELIMINARY GRADING AND PRELIMINARY LOT TEMPLATES ONLY. THE FINAL GRADING PLAN WILL BE SUBMITTED FOLLOWING THE APPROVAL OF THE DEVELOPMENT PLAN.

A-A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

CIVIL CONSULTANTS, INC.

THE TRAILS AT FOREST MEADOWS FIL. 3

FILING 3 DRAINAGE PLAN

PROJECT NO. 08-029	FILE: *\dcs\Dev. Plan\ 08029 - DRAINAGE		
DESIGNED BY: VAS	SCALE	DATE: 05/29/2015	
DRAWN BY: BLB	HORIZ: 1"=100'	SHEET 1 OF 1	DP1
CHECKED BY: VAS	VERT: N/A		

TRAILS AT FOREST MEADOWS
FILING NO. 4
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

April 2016

Prepared for:

Challenger Homes, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921
(719) 598-5192

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-032

Existing Drainage Plan DP-1 south of OS1 MDDP, sheet flow to an existing abandoned road swale and outlet to a roadside swale on Black Forest Road, DP EX1- Q_5=3.7 cfs and Q_{100}=16.7 cfs. There are road side swales on either side of the abandoned road. Historic flows **DP9-Q_5=10.2 cfs and Q_{100}=22.4 cfs, EX10- Q_5=1.5 cfs and Q_{100}=6.4 cfs, see Existing Drainage Plan DP-1, sheet flow to a temporary swale and outlet to an existing 48" RCP culvert, as described in the TFM 3 FDR, DP EX2- Q_5=11.5 cfs and Q_{100}=28.5 cfs. Historic flows EX8- Q_5=3.1 cfs and Q_{100}=13.3 cfs, see Existing Drainage Plan DP-1, sheet flow to existing Loftwood Road and is carried via curb and gutter to the existing drainage system on existing Canary Circle, DP EX3- Q_5=3.1 cfs and Q_{100}=13.3 cfs. Historic flows EX9- Q_5=1.7 cfs and Q_{100}=7.4 cfs, EX11- Q_5=1.5 cfs and Q_{100}=6.3 cfs, see Existing Drainage Plan DP-1, sheet flow to a temporary sediment basin, as described in the "Trails at Forest Meadows Filing No. 1 Final Drainage Report" by M&S Civil Consultants, Inc., DP EX4- Q_5=3.0 cfs and Q_{100}=13.4 cfs. Flows to the sediment basin donot exceed the flows (Q_5=6.3 cfs and Q_{100}=13.4 cfs) as described in the "Trails at Forest Meadows Filing No. 1 Final Drainage Report" by M&S Civil Consultants, Inc.,.

Historic flows OS6- Q_5=0.1 cfs and Q_{100}=0.6 cfs, EX6- Q_5=0.2 cfs and Q_{100}=0.6 cfs, DP EX5- Q_5=0.3 cfs and Q_{100}=1.2 see Existing Drainage Plan DP-1, is designated as tributary to the Cottonwood Creek Basin. The existing topography , as shown on Existing Drainage Plan DP-1, directs the runoff to the Sand Creek Basin. The drainage basin between Cottonwood Creek and Sand Creek will be re-dedicated to reflect this existing condition.

WATER QUALITY/DETENTION

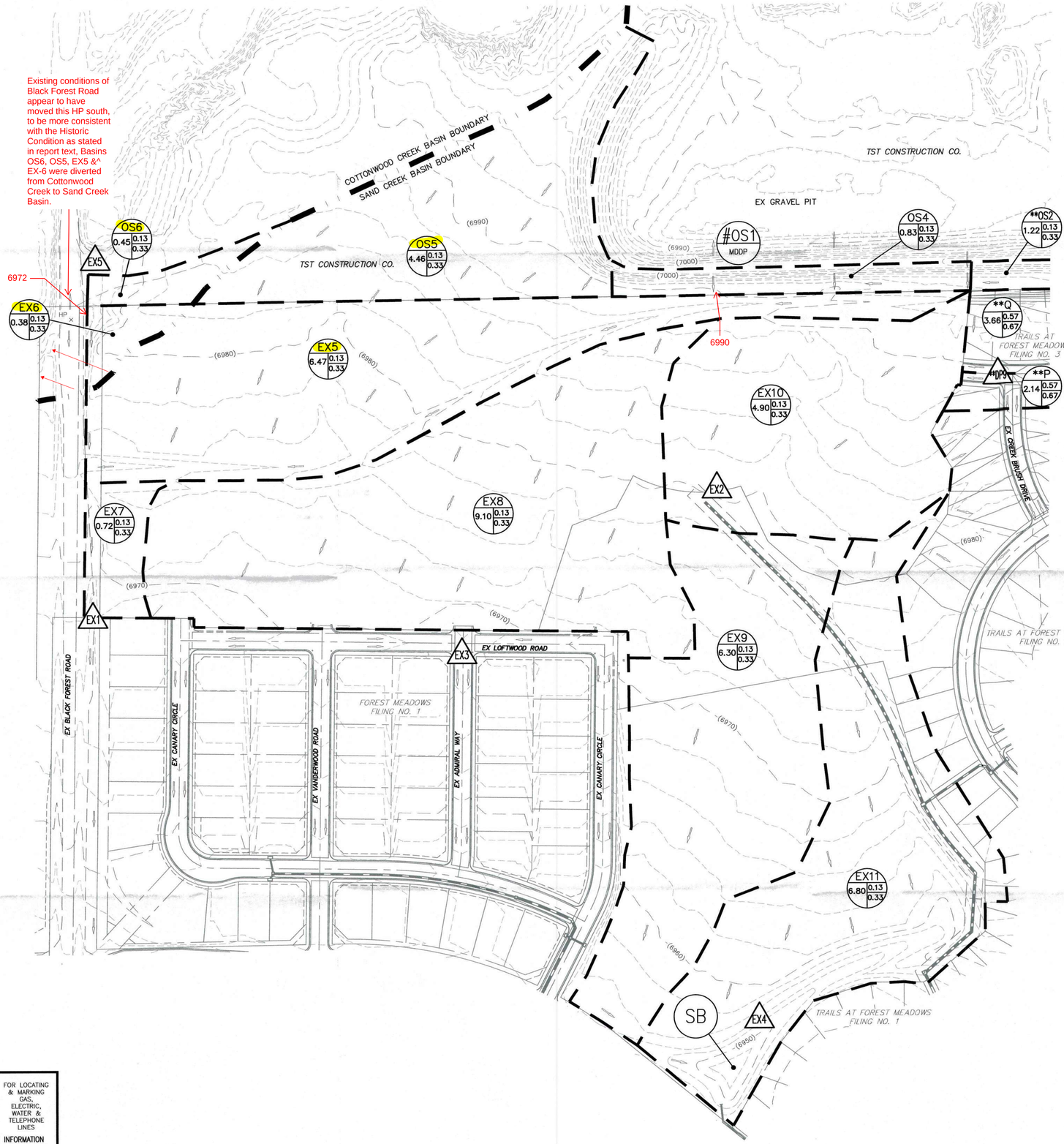
The majority of the site is tributary to Sand Creek Detention Basin No. 6. The stormwater infrastructure downstream of the subject site has already been constructed to the aforementioned detention pond. Flows are collected and conveyed within the Vollmer Road Storm Sewer System which parallels the west side of Vollmer prior to out-falling (at the East Side of Vollmer Road) into a partially riprap lined channel. The existing channel, which parallels both the southwest and western edge of Forest Meadows Filing No. 1, directs runoff under Forest Meadows Avenue and into the existing Sand Creek Detention Pond No. 6. A rip rap plunge pool and energy dissipater aid to slow the incoming flows while the receiving facility provides both WQCV and detention for this development.

The site was originally studied in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report" (DBPS) prepared by Kiowa Engineering. This study was then updated in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report Technical Addendum" by Kiowa, revised October 1995.

It should be noted that the subject site was most currently studied in the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4", where the proposed land use had been revised to single-family residential development from previously planned commercial usage.

PROPOSED DRAINAGE CONDITIONS

The following is a description of the onsite basins, offsite bypass flows and the overall proposed drainage characteristics for the development of Trails at Forest Meadows Filing No.4. The following Design Points and Basins were determined using the Rational Method since each individual basin is less than 100 acres and the combined acreage at any Design Point is also less than 100 acres. This method offers a more conservative approach to calculating swale cross sections and storm drain. The proposed drainage design for this subdivision is typical for single family residential, consisting of; homes, landscaping, rear and side lot drainage swales, curb & gutter, streets, curb inlets, and pipes to convey developed flows downstream. Rear and side lot swales will be constructed to get developed flows to street curb and gutter.



1" = 100'

0 50 100 200

Scale in Feet

LEGEND

- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- 6920 — EXISTING CONTOUR
- 6920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- BASIN DESIGNATION: Z / 25 / .25 / .35 / C5 / C100 / ACRES
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 — LOT NUMBER
- 2.5% — STREET GRADE W/DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
#OS1	78	34.4	84.1
**OS2	1.22	0.8	3.6
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
EX5	6.47	1.8	7.5
EX6	0.38	0.2	0.6
EX7	0.72	0.3	1.1
EX8	9.10	3.1	13.3
EX9	6.30	1.7	7.4
EX10	4.90	1.5	6.4
EX11	6.80	1.5	6.3
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9	10.2	22.4	**DP9Q,**DP9P
EX1	3.7	16.7	**OS2,OS4,OS5,EX5,EX7
EX2	11.5	28.5	**DP9,EX10
EX3	3.1	13.3	EX8
EX4	3.0	13.4	EX9,EX11
EX5	0.3	1.2	OS6,EX6

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

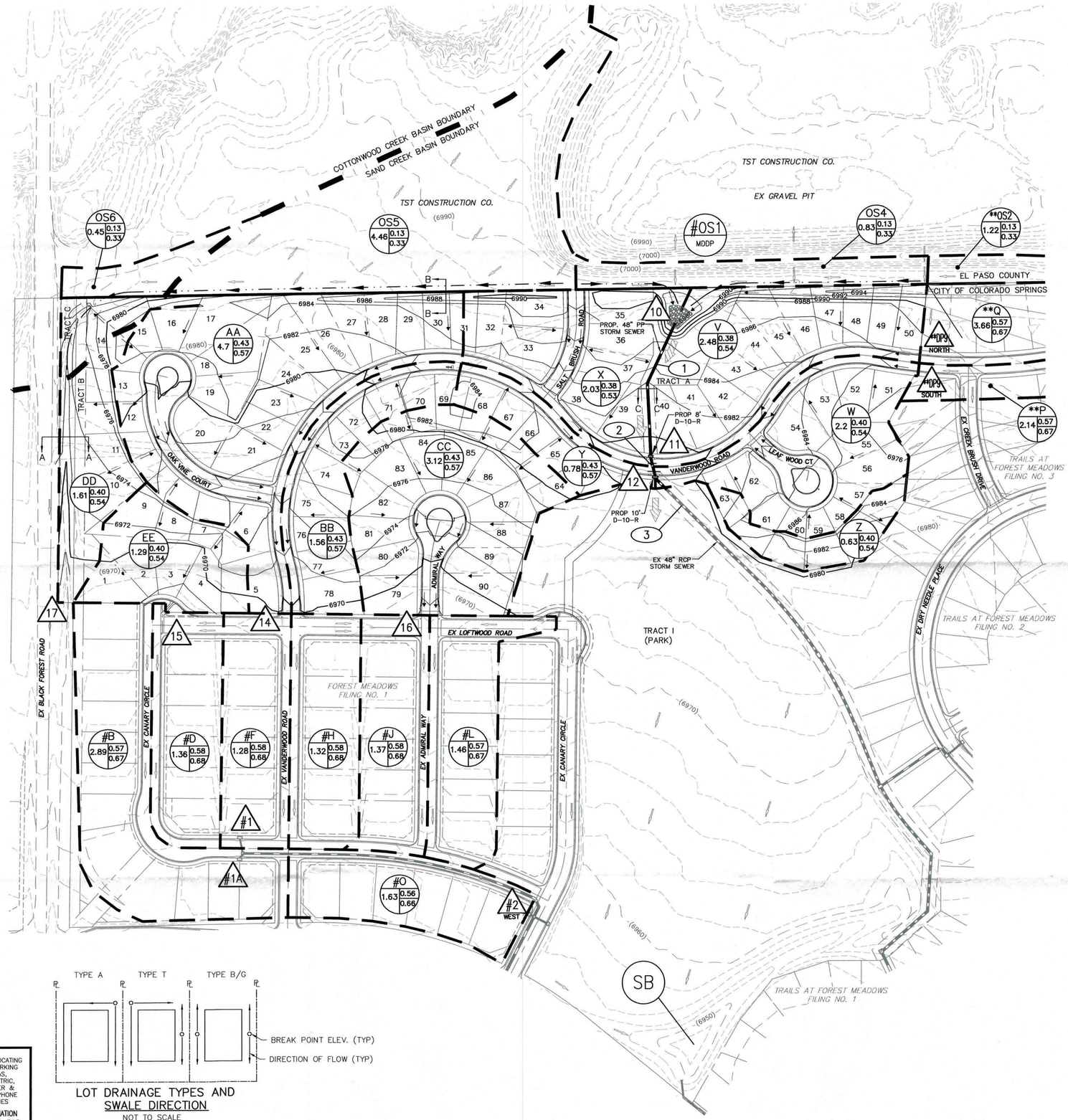
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

TRAILS AT FOREST MEADOWS FILING NO. 4

EXISTING DRAINAGE PLAN

PROJECT NO. 08-032
FILE: \dwg\Eng Exhibits\DP1.dwg
DESIGNED BY: ET
DRAWN BY: BB
CHECKED BY: ET
SCALE
HORIZ: 1"=100'
VERT: N/A
DATE: 3/28/16
SHEET 1 OF 2
DP1

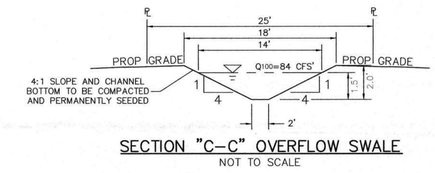


1" = 100'

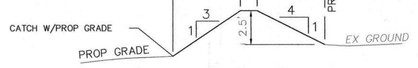
0 50 100 200
Scale in Feet

LEGEND

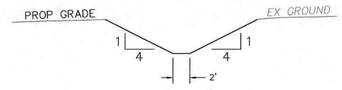
- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- -(6920)- EXISTING CONTOUR
- 6920 PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- BASIN DESIGNATION: Z / 25 / .25 / .35 / C5 / C100 / ACRES
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 — LOT NUMBER
- 2.5% — STREET GRADE W/DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT



SECTION "C–C" OVERFLOW SWALE
NOT TO SCALE



SECTION "B–B" BERM
NOT TO SCALE



SECTION "A–A" SWALE
NOT TO SCALE

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
V	2.48	3.2	7.6
W	2.20	3.1	7.1
X	2.03	2.7	6.4
Y	0.78	1.2	2.8
Z	0.63	1.2	2.7
AA	4.70	7.2	15.9
BB	1.56	2.4	5.3
CC	3.12	5.1	11.3
DD	1.61	2.6	5.8
EE	1.29	2.3	5.3
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
#OS1	78.0	34.4	84.1
**OS2	1.22	0.8	3.6
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8
#B	2.89	6.4	13.4
#D	1.36	3.3	7.0
#F	1.28	3.0	6.3
#H	1.32	3.1	6.5
#J	1.37	3.2	6.8
#L	1.48	3.4	7.0
#O	1.63	3.6	7.6

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9 NORTH	6.1	12.8	**DP9Q
**DP9 SOUTH	3.6	7.5	**DP9P
10	1.0	4.7	OS4,**OS2
11	11.0	25.2	**DP9Q,V,X
12	7.5	16.8	**DP9P,W,Y
11–12	18.1	41.1	**DP9Q,**DP9P,V,X,W,Y
14	9.4	22.1	AA,BB
15	2.3	5.3	EE
#1&#1A	22.9	50.7	AA,BB,EE,#B,#D,#F,,#H
16	5.0	11.9	CC
#2 WEST	12.9	28.2	CC,#J,#L,#O
17	4.2	14.5	OS5,OS6,DD

STORM SEWER SUMMARY			
PIPE RUN	Q5	Q100	PIPE SIZE
1	34.4	84.1	48" PP
2	41.3	100.0	48" PP
3	45.8	110.0	EX 48" RCP

LOT DRAINAGE TYPES AND SWALE DIRECTION
NOT TO SCALE

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
CIVIL CONSULTANTS, INC.

TRAILS AT FOREST MEADOWS FILING NO. 4

PROPOSED DRAINAGE PLAN

PROJECT NO. 08-032	FILE: \dwg\Eng Exhibits\DP2.dwg		
DESIGNED BY: ET	SCALE	DATE: 3/28/16	
DRAWN BY: BB	HORIZ: 1"=100'	SHEET 2 OF 2	DP2
CHECKED BY: ET	VERT: N/A		

NEW DOC

MASTER DEVELOPMENT DRAINAGE REPORT
FOR
STERLING RANCH FILING NOS. 1&2
AND
FINAL DRAINAGE REPORT FOR STERLING RANCH FILING NO. 1

EL PASO COUNTY, COLORADO

DECEMBER 2017

Prepared for:

SR Land, LLC
20 Boulder Crescent, Suite 210
Colorado Springs, CO 80903

Prepared by:

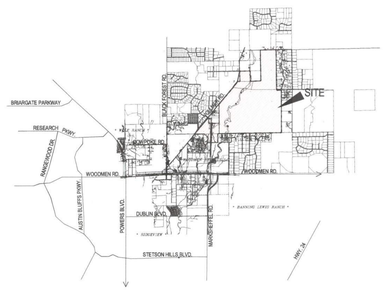
CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

RECEIVED VERSION
JAN 04 2018 1

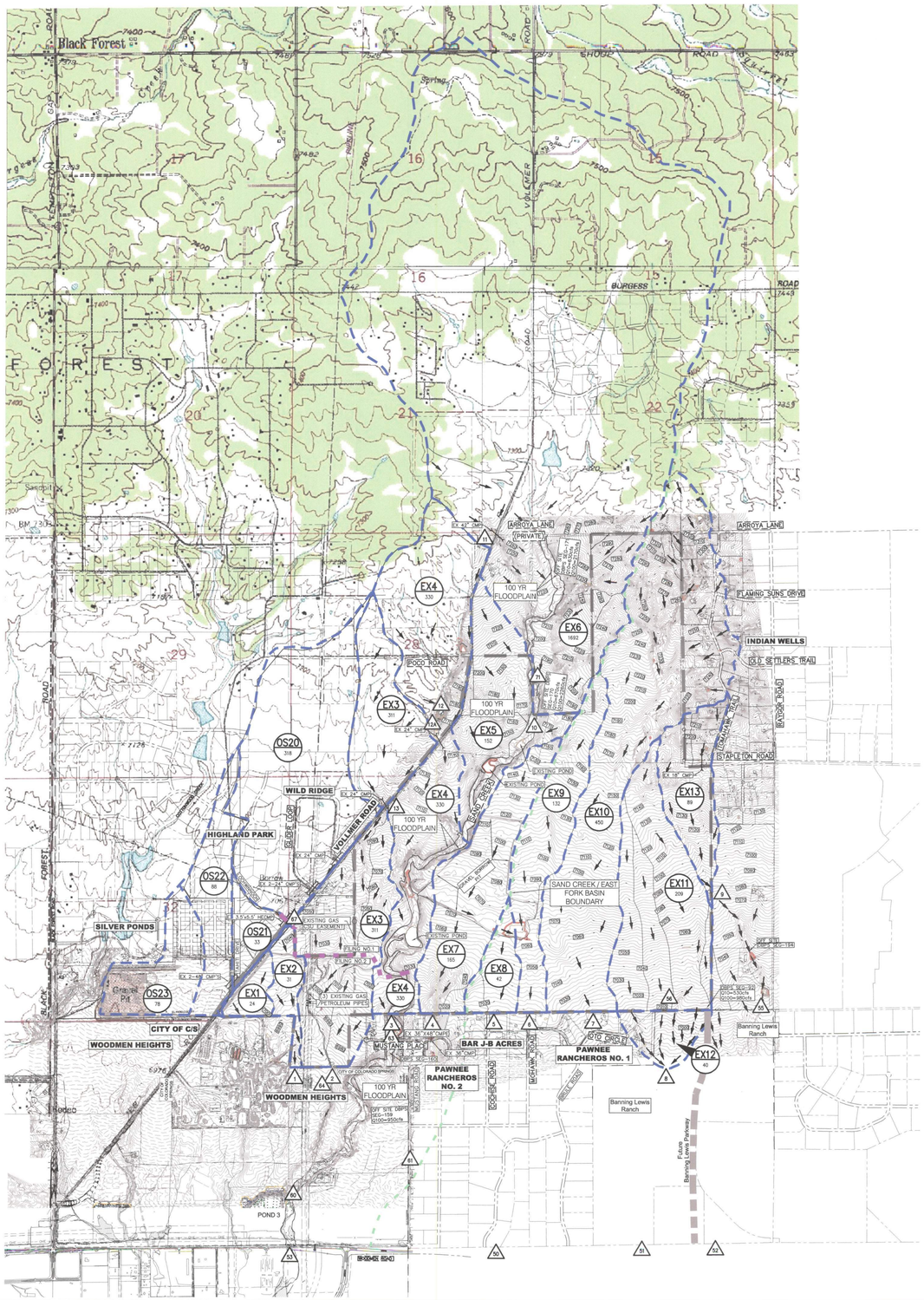
Project #09-002
DSD Project # SF-16-013

Keep

SF-16-013



STERLING RANCH
N.T.S.



HISTORIC CONDITION

BASIN SUMMARY

BASIN	AREA (ACRES)	Q_5 (CFS)	Q_{100} (CFS)
EX-1	24	3	40
EX-2	31	3	45
EX-3	311	49	341
EX-4	330	71	352
EX-5	152	14	209
EX-6	1692	118	2168
EX-7	165	12	197
EX-8	42	4	64
EX-9	132	11	149
EX-10	450	48	474
EX-11	209	17	261
EX-12	40	5	65
EX-13	89	6	114
OS-20	318	61	310
OS-21	33	8	38
OS-22	88	18	91
OS-23	78	34	84

* NOTE: BASIN S OS-22 & OS-23 NOT PART OF THIS REPORT. FLOWS FOLLOW HISTORIC PATTERNS ON THE WEST SIDE OF VOLLMER ROAD.

HISTORIC CONDITION

DESIGN POINTS

DESIGN POINT	SQ. MI.	Q_5 (CFS)	Q_{100} (CFS)	SQ. MI.	DBPS Q_{100}	DBPS DP/ID
1	0.09	5	84			
2	0.49	49	341	0.74	465	64
3	0.52	139	2610	4.33	2552	63
4	0.26	12	197			
5	0.07	4	64			
6	0.21	11	149			
7	0.70	48	474			
8	0.39	18	305			
9	0.14	6	114			
10	2.64	122	2245	3.27	2245	71
11	0.09	5	83			
12A	0.01	3	16			
12	0.27	10	200			
13	0.17	6	126			
				0.48	#	55
				0.53	1210	56
				5.38	2629	60

* NOTE: SQ. MI. ARE NOT CONSISTANT AT EACH DESIGN POINT DP-DBPS

1" = 1000'

0 250 500 1000 2000
Scale in Feet

LEGEND

- EX1 / 23.2 — EXISTING MDDP BASIN / ACREAGE
- E1 — EXISTING FLOW RELEASE POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING NO.1 & NO.2 DIVISION LINE
- PROPERTY BOUNDARY
- 6920 — EXISTING CONTOUR
- CULVERT PIPE

CIVIL CONSULTANTS, INC.
15 NORTH NEVADA AVENUE
COLORADO SPRINGS, CO 80903
(719) 955-5485, FAX (719) 471-4812

STERLING RANCH

HISTORIC – DRAINAGE MAP

PROJECT NO. 09-002		FILE: O:\\dwg\Eng Exhibits\MDDP HISTORIC	
DESIGNED BY:	VAS	SCALE	DATE: 2/6/17
DRAWN BY:	VAS	HORIZ: 1"=1000'	SHEET 1 OF 1
CHECKED BY:	VAS	VERT: N/A	

FINAL DRAINAGE REPORT
FOR
STERLING RANCH FILING NO. 2

Prepared For:
SR Land, LLC
20 Boulder Crescent, Suite 210
Colorado Springs, CO 80903

August 2021
Project No. 25188.01

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
719-593-2593

PCD File No. SF-20-015

STERLING RANCH
PONDS W4 & W5 TRIBUTARY AREA EXHIBIT

LEGEND

- MDDP BASINS
- POND W4 TRIBUTARY AREA
- POND W5 TRIBUTARY AREA
- HISTORIC DBPS SC/EFSC BNDRY LINE
- PROPOSED SC/EFSC BNDRY LINE
- BASIN DIVERSION AREA (EAST FORK SAND CREEK TO SAND CREEK) * ~267.3 AC

MDDP BASIN

DBPS BASIN

77
MDDP 1,468 CFS
DBPS 2,262 CFS
FEMA 2,600 CFS

71
MDDP 1,612 CFS
DBPS 2,260 CFS

POND FSD 17B

POND FSD 17A
Q100 OUT = 86.1 CFS

POND FSD 18
Q100 OUT = 69.6 CFS

POND 1
Q100 OUT = 103.1 CFS

POND 4
/FSD 12
Q100 OUT = 200.3 CFS

POND FSD 16
Q100 OUT = 156.4 CFS

POND FSD 14B

POND FSD 14A
Q100 OUT = 142.2 CFS

POND 8/
FSD 13
Q100 OUT = 47.2 CFS

POND FSD 11B
Q100 OUT = 69.5 CFS

POND W-4/
FSD 9

POND W-5/
FSD 6
Q100 OUT = 149.7 CFS

Q100 OUT = 289.90 CFS

63
MDDP 1,385 CFS
DBPS 2,630 CFS
FEMA 2,600 CFS

61
MDDP 1,620.1 CFS
FEMA 2,600 CFS

ASPEN VALLEY RD.
WHEATLAND DR.
VOLLMER ROAD
WHEATLAND DRIVE
BRIARGATE PARKWAY
STERLING RANCH ROAD
DINES BLVD
BYNUM DRIVE
BEAVERHEAD CIRCLE
ALZADA DRIVE
MARKSHEFFEL ROAD

HOMESTEAD AT STERLING RANCH FILING NO. 1
HOMESTEAD AT STERLING RANCH FILING NO.2
BRANDING IRON AT STERLING RANCH FILING NO.2
BRANDING IRON AT STERLING RANCH FILING NO. 1
AMENDED PLAT BARBARICK SUBDIVISION
UNPLATTED REC. NO. 217051682
PAWNEE RANCHEROS FILING NO. 2 PLAT BOOK U-2 PAGE 45
BAR J-B ACRES SECOND FILING PLAT BOOK A-2, PAGE 56
PAWNEE RANCHEROS FILING NO. 1 PLAT BOOK I-2, PAGE 28

PONDS W4 & W5 TRIBUTARY AREA EXHIBIT
STERLING RANCH
JOB NO. 25188.00
04-14-2021
SHEET 1 OF 1

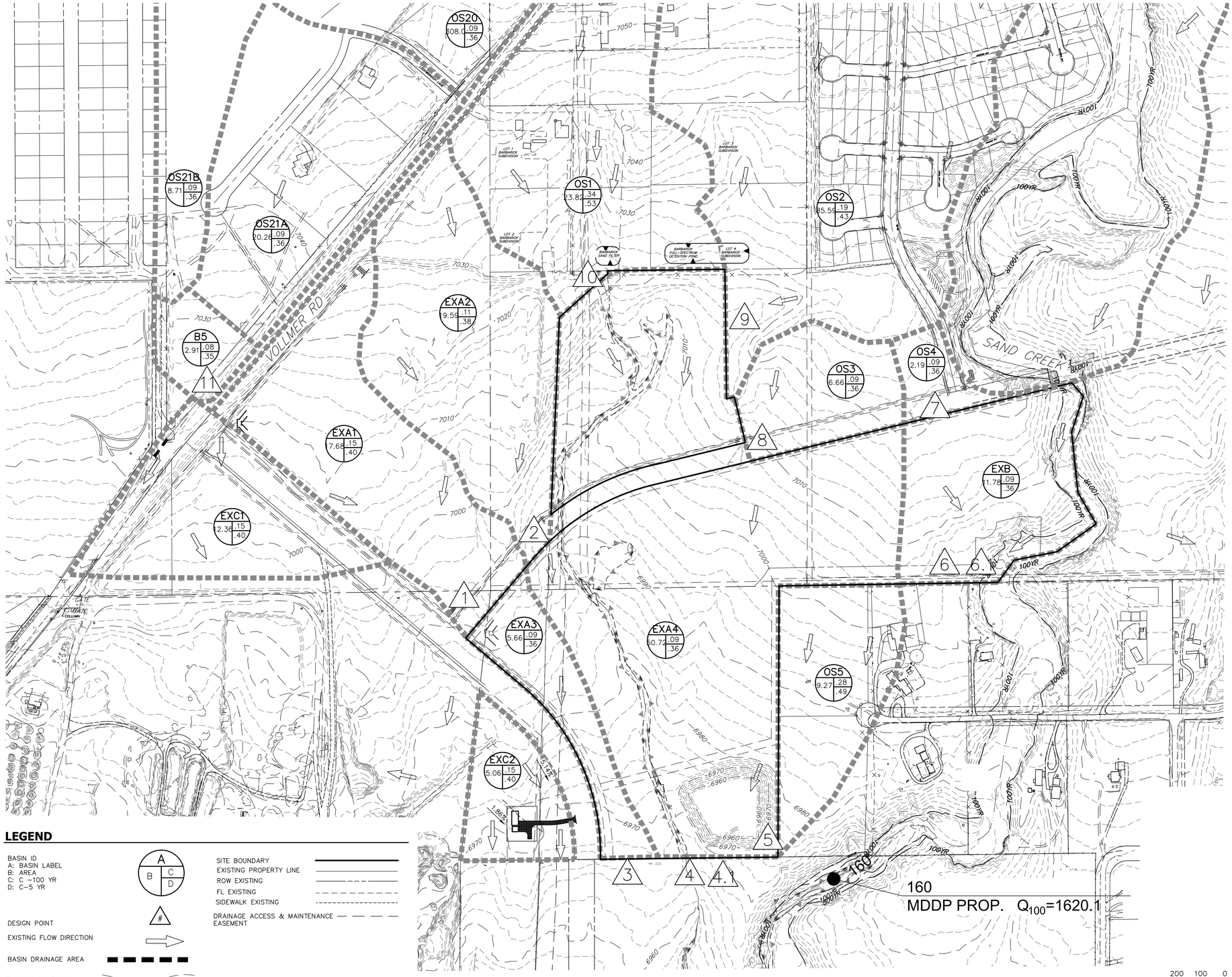
400 200 0 400 800
ORIGINAL SCALE: 1" = 400'

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

X:\2510000.all\2518800\Drawings\Presentations\2021-4-14 Ponds W4 & W5 Tributary Area.dwg, 24x36 Title Portrait, 6/23/2021 12:23:00 PM, FC

STERLING RANCH

EXISTING DRAINAGE MAP



DESIGN POINT		
DP	Q5 Total	Q100 Total
1	7.2	12.1
2	5.4	9.0
3	1.4	2.3
4	10.6	17.8
5	7.5	23.4
6	3.0	5.0
7	0.5	0.9
8	1.8	3.1
9	37.3	62.6
10	23.9	40.1
4.1	45.6	76.5
6.1	3.0	5.1
11	56.9	215.3

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA1	17.68	9%	0.15	0.40	25.4	7.2	12.1
EXA2	19.59	5%	0.11	0.38	31.5	5.4	9.0
EXA3	5.66	2%	0.09	0.36	26.4	1.4	2.3
EXA4	50.72	2%	0.09	0.36	33.2	10.6	17.8
EXC1	12.36	2%	0.09	0.36	22.0	3.3	5.5
EXC2	5.06	2%	0.09	0.36	20.6	1.4	2.3
EXB	11.78	2%	0.09	0.36	23.8	3.0	5.0
OS1	23.82	45%	0.34	0.53	22.4	23.9	40.1
OS2	85.59	18%	0.19	0.43	34.1	37.3	62.6
OS3	6.66	2%	0.09	0.36	20.3	1.8	3.1
OS4	2.19	2%	0.09	0.36	26.6	0.5	0.9
OS5	9.27	9%	0.28	0.49	22.8	7.5	23.4
B5	2.91	26%	0.79	1.19	5.0	11.8	19.9
OS20	308.00	9%	0.13	0.40	68.9	61.0	310.0
OS21A	20.26	12%	0.13	0.40	53.5	4.2	7.1
OS21B	8.71	12%	0.13	0.40	24.5	3.1	5.3

LEGEND

BASIN ID
A: BASIN LABEL
B: AREA
C: C –100 YR
D: C–5 YR

DESIGN POINT

EXISTING FLOW DIRECTION

BASIN DRAINAGE AREA

EXISTING CONTOURS 6100

SITE BOUNDARY

EXISTING PROPERTY LINE

ROW EXISTING

FL EXISTING

SIDEWALK EXISTING

DRAINAGE ACCESS & MAINTENANCE EASEMENT

200 100 0 200 400

ORIGINAL SCALE: 1" = 200'

STERLING RANCH FILING 2
EXISTING DRAINAGE MAP
JOB NO. 25188.00
04/19/21
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

FINAL DRAINAGE REPORT
FOR
SCHMIDT PARCEL EARLY GRADING

Prepared For:

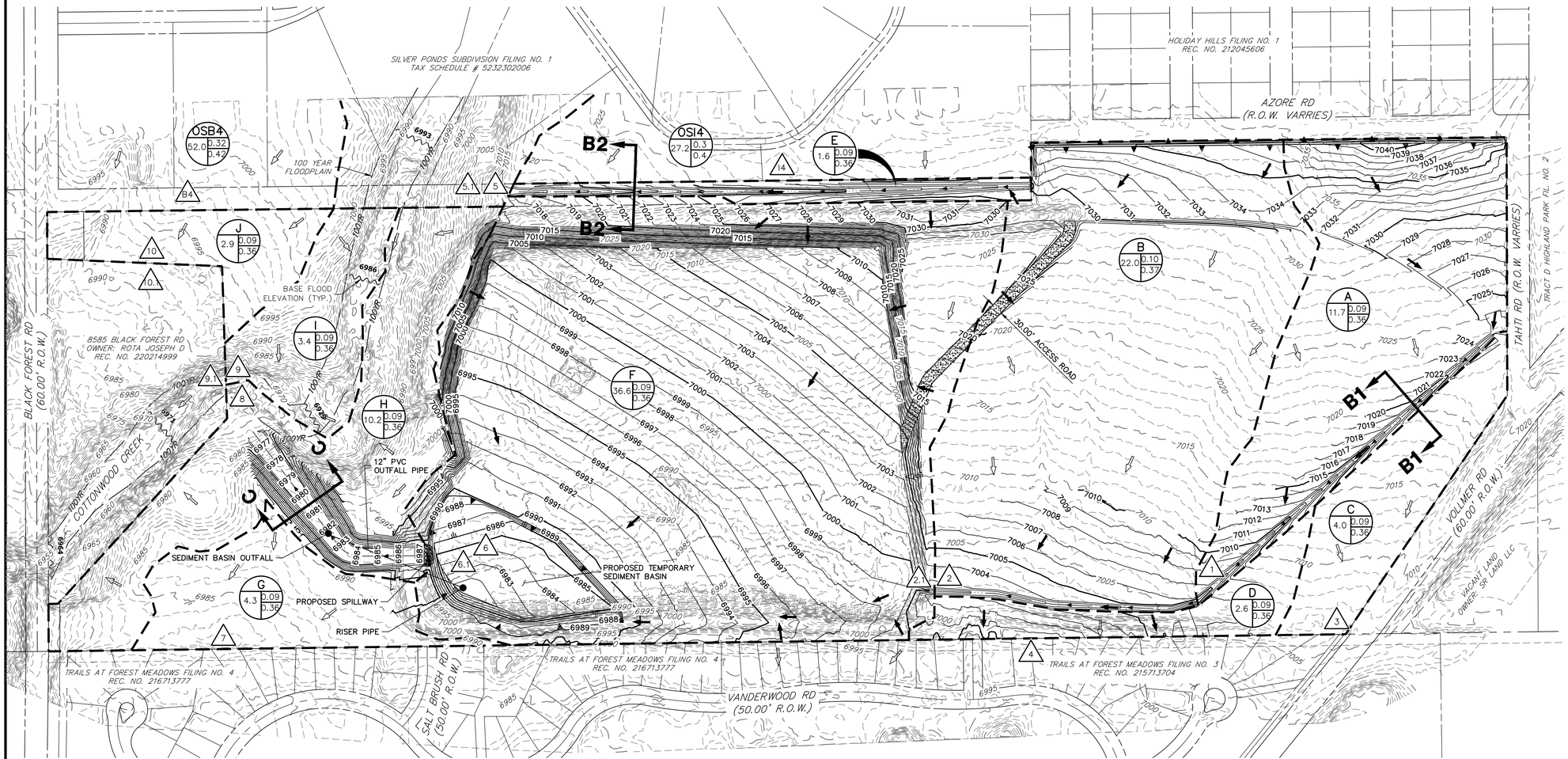
Turkey Canon Quarry, LLC
20 Boulder Crescent, Suite 200
Colorado Springs, CO 80903
(719) 491-3024

SEPTEMBER 2022
Project No. 25188.13

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive, Suite 235
Colorado Springs, CO 80919
719-593-2593

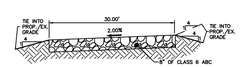
PCD Filing No.:
CDR-22-007

SCHMIDT PARCEL
PROPOSED DRAINAGE MAP



BASIN SUMMARY TABLE							
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	11.70	2%	0.09	0.36	46.2	1.9	13.0
B	22.00	4%	0.10	0.37	48.6	3.5	23.8
C	4.00	2%	0.09	0.36	34.6	0.8	5.5
D	2.60	2%	0.09	0.36	25.7	0.6	4.3
E	1.60	2%	0.09	0.36	53.2	0.2	1.6
F	36.60	3%	0.09	0.36	53.9	5.3	35.7
G	4.30	2%	0.09	0.36	25.7	1.1	7.1
H	10.20	2%	0.09	0.36	38.8	1.9	12.9
I	3.40	2%	0.09	0.36	38.7	0.6	4.3
J	2.90	2%	0.09	0.36	25.7	0.7	4.7
OSI4	27.16		0.30	0.40	29.2	19.0	44.2
OSB4	52.02		0.32	0.42	28.7	39.1	89.8

DESIGN POINT SUMMARY TABLE		
DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	1.9	13.0
2	3.5	23.8
2.1	5.3	36.2
3	0.8	5.5
4	0.6	4.3
5	0.2	1.5
5.1	13.2	30.5
6	5.3	35.7
6.1	10.1	68.7
7	1.0	7.0
8	1.9	12.7
9	0.6	4.2
9.1	2.6	18.7
10	0.7	4.7
10.1	43.1	97.9
B4	39.1	89.8
I4	19.0	44.2



30' GRAVEL MAINTENANCE ACCESS ROAD TYPICAL SECTION
N.T.S.

LEGEND:

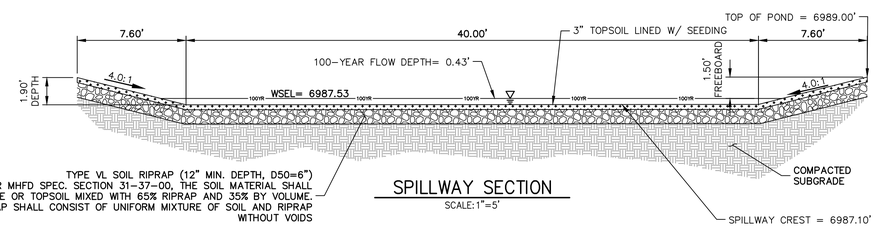
- 6000 — PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- -6000- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- PROPOSED SWALE
- PROPOSED TOP OF SLOPE/BERM

A = BASIN DESIGNATION
B = AREA IN ACRES
C = 5-YR RUNOFF COEFFICIENT
D = 100-YR RUNOFF COEFFICIENT

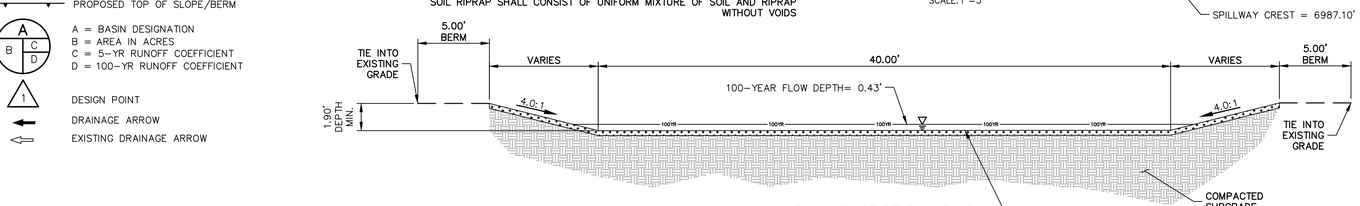
1 DESIGN POINT

DRAINAGE ARROW

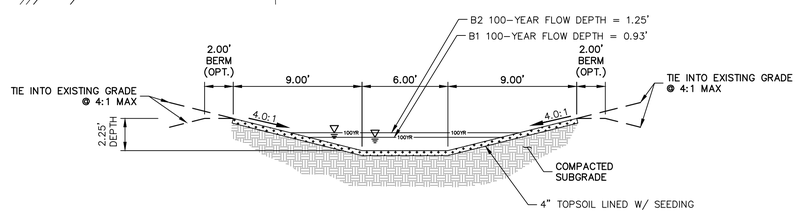
EXISTING DRAINAGE ARROW



SPILLWAY SECTION
SCALE: 1"=5'



SWALE SECTION C-C
SCALE: 1"=5'



SWALE SECTION B-B
SCALE: 1"=5'

PROPOSED DRAINAGE MAP
SCHMIDT PARCEL
JOB NO. 25188.13
09/02/2022
SHEET 1 OF 1

150 75 0 150 300
ORIGINAL SCALE: 1" = 150'

PCD FILE NO: CDR-22-007

J·R ENGINEERING
A Westrian Company
Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

X:\25100\00_all\25188.13\Drawings\Sheet Dwgs\Early Grading\Early Grading\25188.13DR.dwg, DR01, 9/2/2022 10:34:30 AM, CS

APPENDIX E – REFERENCE MATERIAL

RECEIVED
MAY 10 1996
Planning Dept.

SILVER PONDS SUBDIVISION FILING NO. 1

FINAL DRAINAGE REPORT

February 2, 1995
Revised May 5, 1996
Project No. 60572

PREPARED FOR:

The Campbell Corporation
4975 Austin Bluffs Parkway
Colorado Springs, CO 80918

PREPARED BY:

M.V.E., Inc.
1911 Lelaray St.
Colorado Springs, CO 80909

Table 3.1 - Developed Condition Hydrologic Data

5-year and 100-Year

Design Point	Included Basins	Cumulative Drainage Area (Ac)	5-yr Discharge (cfs)	100-yr Discharge (cfs)
1	OSA1	18.14	13.1	30.4
2	OSA2	8.72	7.0	16.3
3	OSA1 thru A3	29.05	20.5	47.7
4	OSA1 thru A4	31.04	24.3	53.6
5	OSB1	39.26	29.8	69.3
6	OSB1 thru B2	44.66	25.9	60.3
7	OSB1 thru B3	50.03	35.7	83.1
8	OSB1 thru B4	52.02	39.2	89.8
9	OSD1	8.26	7.9	18.4
10	OSD1 thru D2	19.95	24.1	52.9
11	D3	3.41	4.5	9.9
12	E1	4.24	5.5	12.1
13	F1	4.26	6.6	14.4
14	OSG1	6.66	7.0	16.4
15	OSG1 thru G2	9.22	10.5	24.0
16	OSH1	17.22	17.5	38.4
17	OSH1 thru H2	28.28	27.9	61.3
18	OSI1	3.67	3.3	7.8
19	OSI1 thru I2	11.05	7.9	18.4
20	I3	8.01	6.3	14.6
21	OSI1 thru I4	27.16	19.0	44.2
22	J1	4.19	3.0	6.9

M.V.E., Inc.
Colorado Springs, Colorado

Proj. No.: 60572 Project: SILVER PONDS Date: 1-31-96

DEVELOPED DISCHARGES
RAINFALL/RUNOFF ANALYSIS - RATIONAL METHOD

Design Point	Area (Ac)	C5	C100	Tc (min)	i5 (in/hr)	i100 (in/hr)	Q5 (cfs)	Q100 (cfs)
1	18.14	0.30	0.40	27.7	2.40	4.20	13.1	30.4
2	8.72	0.30	0.40	22.9	2.68	4.68	7.0	16.3
5	39.26	0.30	0.40	25.4	2.53	4.41	29.8	69.3
9	8.26	0.30	0.40	16.5	3.19	5.57	7.9	18.4
14	6.66	0.30	0.40	13.5	3.52	6.15	7.0	16.4
16	17.22	0.39	0.49	24.1	2.60	4.55	17.5	38.4
18	3.67	0.30	0.40	18.2	3.03	5.30	3.3	7.8
3	29.05	0.30	0.40	28.7	2.35	4.11	20.5	47.7
4	31.04	0.34	0.43	29.8	2.30	4.02	24.3	53.6
6	44.66	0.30	0.40	39.5	1.93	3.38	25.9	60.3
B3	5.37	0.30	0.40	26.7	2.45	4.29	4.0	9.2
7	50.03	0.30	0.40	28.2	2.38	4.15	35.7	83.1
8	52.02	0.32	0.42	28.7	2.35	4.11	39.2	89.8
D2	11.69	0.39	0.49	17.6	3.09	5.39	14.1	30.9
10	19.95	0.39	0.49	17.5	3.10	5.41	24.1	52.9
11	3.41	0.39	0.49	14.5	3.40	5.94	4.5	9.9
12	4.24	0.39	0.49	15.0	3.35	5.85	5.5	12.1
13	4.26	0.39	0.49	10.5	3.94	6.89	6.6	14.4
G2	2.56	0.39	0.49	13.1	3.57	6.24	3.6	7.8
15	9.22	0.33	0.43	14.0	3.46	6.04	10.5	24.0
H2	11.06	0.39	0.49	17.5	3.10	5.41	13.4	29.3
17	28.28	0.39	0.49	25.3	2.53	4.42	27.9	61.3
19	11.05	0.30	0.40	28.0	2.39	4.17	7.9	18.4
20	8.01	0.30	0.40	23.9	2.62	4.57	6.3	14.6
I4	8.10	0.30	0.40	23.1	2.67	4.66	6.5	15.1
21	27.16	0.30	0.40	29.2	2.33	4.07	19.0	44.2
22	4.19	0.30	0.40	28.8	2.35	4.10	3.0	6.9

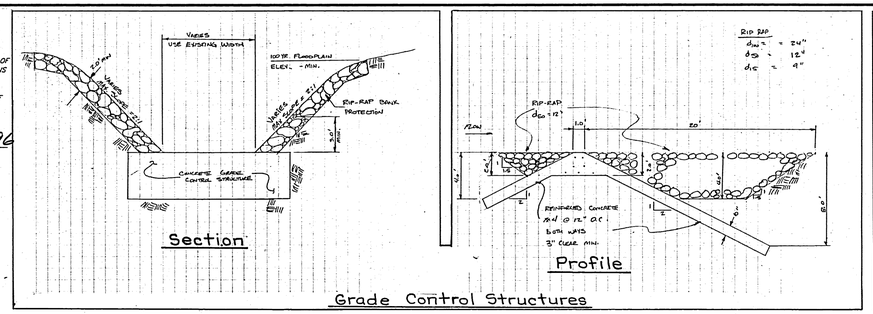
LEGEND

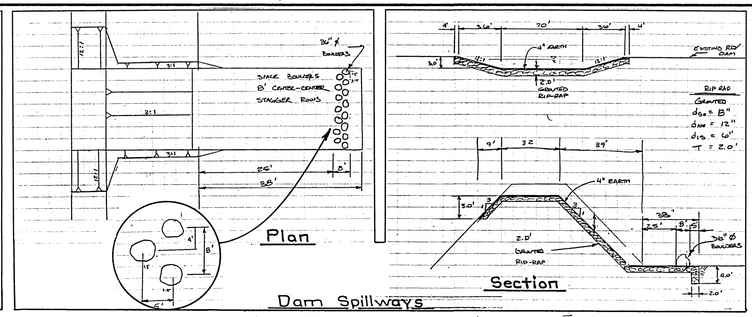
- EXISTING INDEX CONTOUR (7430)
- EXISTING INTERMEDIATE CONTOUR
- DRAINAGE BASIN BOUNDARY LINE
- SUBDIVISION BOUNDARY LINE
- SILT FENCE
- DRAINAGE DIRECTION ARROW
- 5 — DESIGN POINT DESIGNATION
- PROPOSED STORM DRAIN CULVERT
- E / 0.40 — DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA

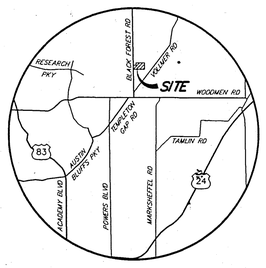
THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

REGISTERED 13348 PROFESSIONAL ENGINEER STATE OF COLORADO

CHARLES C. CROW, P.E. COLORADO NO. 13348 — DATE 5-6-96







VICINITY MAP

SCALE

100' 50' 0 50' 100' 200'

75' 25'

1"=100' 1:1200

SITE HYDROLOGY DATA

DESIGN POINT	INCL. BASINS	AREA (Ac)	Q_5 (cfs)	Q_{100} (cfs)
1	OSA1	18.14	13.1	30.4
2	OSA2	8.72	7.0	16.3
3	OSA1–A3	29.05	20.5	47.7
4	OSA1–A4	31.04	24.3	53.6
5	OSB1	39.26	29.8	69.3
6	OSB1–B2	44.66	25.9	60.3
7	OSB1–B3	50.03	35.7	83.1
8	OSB1–B4	52.02	39.2	89.8
9	OSD1	8.26	7.9	18.4
10	OSD1–D2	19.95	24.1	52.9
11	D3	3.41	4.5	9.9
12	E1	4.24	5.5	12.1
13	F1	4.26	6.6	14.4
14	OSG1	6.66	7.0	16.4
15	OSG1–G2	9.22	10.5	24.0
16	OSH1	17.22	17.5	38.4
17	OSH1–H2	28.28	27.9	61.3
18	OSI1	3.67	3.3	7.8
19	OSI1–I2	11.05	7.9	18.4
20	I3	8.01	6.3	14.6
21	OSI1–I4	27.16	19.0	44.2
22	J1	4.19	3.0	6.9

NOTE: SEE OFFSITE DRAINAGE BASIN MAP FOR OFFSITE BASINS (OS__)

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

Murray D. Stewart Jr. 5/9/96

MURRAY D. STEWART, JR., P.E. COUNTY ENGINEER

PROJECT: SILVER PONDS SUBDIVISION FILING NO. 1

TITLE: DRAINAGE IMPROVEMENT DETAILS

MONUMENT VALLEY ENGINEERS INC.
ENGINEERS • SURVEYORS
1911 LELARAY STREET
COLORADO SPRINGS, COLORADO 80909
PHONE (719) 635-5736

PROJ. NO. 60572
DRAWN: DRG
ENGINEER: DRG
CHECKED: CCC
SCALE: 1" = 100'
DATE: 3/18/96
REVISIONS:

NO.	DATE:	ITEM
1	5/7/96	ADD ESMTS, SILT FENCE & DETAIL

SHEET 1 OF 1

DRAWING NO. 60572008

DISK NO. 1516

PLANNING
KEVIN J. WALKER & ASSOCIATES
105 EAST VERMIJO AVE., SUITE 600 COLORADO SPRINGS, CO 80903 (719) 475-8345

SILVER PONDS FIL. 1











COTTONWOOD CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT
JULY 2019

Prepared for:

Department of Public Works
Water Resources Engineering

City of Colorado Springs
30 S. Nevada Ave
Colorado Springs, CO 80903

Prepared by:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

LEGEND

City Boundary

Major Reach

Fee Basin Outside DBPS

Hydrologic Basin Boundary

Major Subbasin Boundary

Subbasin Boundary

*** Recent Wetlands**

Palustrine Emergent Wetland (PEM)

Palustrine Scrub/Shrub Wetland

**** Historic Wetlands**

Palustrine Emergent Wetland (PEM)

Palustrine Scrub/Shrub Wetland (PSS)

Palustrine Forested Wetland (PFO)

Sources:
* CRHMP CDOW, 1990-1995
** National Wetlands Inventory, USFWS, 1970s

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

PINE CREEK

INTERSTATE 25

SOUTH PINE CREEK

FAIRFAX TRIBUTARY

WOLF RANCH TRIBUTARY

COTTONWOOD CREEK

AUSTIN BLUFFS TRIBUTARY

FEE BASIN OUTSIDE OF DRAINAGE BASIN

COTTONWOOD CREEK

RANGEWOOD TRIBUTARY

DUBLIN TRIBUTARY

MONUMENT CREEK

FIGURE 2-5
WETLANDS MAP
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\mxd\DBPS_ReportFigure_2_4_CottonwoodCreek_Wetlands_20171221.mxd, 12/21/2017, jeff_dants

LEGEND

City Boundary
Major Reach
Fee Basin Outside DBPS
Hydrologic Basin Boundary
Major Subbasin Boundary
Subbasin Boundary

*** Wildlife Habitat**

Migratory Bird Corridor 300ft
Elk Winter Concentration
Mule Deer
White Tailed Deer
Mountain Lion

* Source: Colorado Division of Wildlife. URS Corporation Fountain Creek Watershed Study, USACE, 2007

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

INTERSTATE 25
EXPLORER DR
BRIARGATE PKWY
DYNAMIC DR
CHARITY DR
RESEARCH PKWY
N UNION BLVD
AUSTIN BLUFFS PKWY
FAIRFAX TRIBUTARY
WOLF RANCH TRIBUTARY
OLD RANCH RD
COTTONWOOD CREEK
VOLLMER RD
JAMBOREE DR
SUMMERSET DR
MIRAGE DR
SOUTH PINE CREEK
AUSTIN BLUFFS TRIBUTARY
POWER BLVD
COWPOKE RD
TUTT BLVD
ACADEMY BLVD
E WOODMEN RD
LEXINGTON DR
BRIDLE PASS DR
BURYEA DR
GLEN ABBEY DR
TEMPLETON GAP RD
COTTONWOOD CREEK
DUBLIN BLVD
RANGEWOOD TRIBUTARY
MONTARBOR DR
RANGEWOOD DR
FLINTRIDGE DR
VICKERS DR
DUBLIN TRIBUTARY
MONUMENT CREEK
N NEVADA AVE
STETSON HILLS BLVD

FIGURE 2-6
WILDLIFE HABITAT
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\pls_projects\Cottonwood_Creek_DBPS_2017\activeaprx\DBPS_ReportFigure_2_5_CottonwoodCreek_Wildlife_and_Mig_Corridors_2019_07_01_DAP.mxd, 7/1/2019, Drew_Phillips

LEGEND

- City Boundary
- Major Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary

*** Threatened and Endangered Species**

- Preble's Meadow Jumping Mouse Block Clearance
- Preble's Meadow Jumping Mouse Block Clearance Zone

Sources:
* CFWS, October 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 2-7
PREBLE'S MEADOW JUMPING MOUSE BLOCK CLEARANCE ZONE COTTONWOOD CREEK & SOUTH PINE CREEK DBPS COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\activeapps\DBPS_ReportFigure_2_6_CottonwoodCreek_TE_Species_20171221.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Major Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary

*** Erosion Issues**

- Aggraded
- Degraded

Sources:
* Field observations 2007, updated 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

MATCH LINE

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 2-9
OBSERVED EROSION ISSUES
COTTONWOOD CREEK
& SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\arcmaps\DBPS_Report\Figure 2_8_CottonwoodCreek_Erosion_Issues_20190530.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
- ←Subbasin Area

*** Land Use**

- Civic
- Commercial
- Industrial
- Natural Open Space (Fair Condition)
- Natural Open Space (Poor Condition)
- Woods (Fair Condition)
- Park/Open Space (Fair Condition)
- Park/Open Space (Good Condition)
- ROW
- Condo/Townhome
- 25+ du/ac
- 12.0-24.99 du/ac
- 8.0-11.99 du/ac
- 3.5-7.99 du/ac
- 2.0-3.49 du/ac
- 0-1.99 du/ac
- 2.5 Acre Rural Residential
- 5 Acre Rural Residential
- 35 Acre Tract

Sources:
*COS Planning Department, 2017

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

FEE BASIN OUTSIDE OF DRAINAGE BASIN

Future Development Planned

Future Land Use - Cottonwood Creek

Land Use	% of Basin Area
0-1.99 du/ac	5.3%
12.0-24.99 du/ac	1.7%
2.0-3.49 du/ac	6.3%
2.5 ACRE RURAL RESIDENTIAL	7.6%
25+ du/ac	0.5%
3.5-7.99 du/ac	21.4%
35 ACRE TRACT	1.4%
5 ACRE RURAL RESIDENTIAL	8.7%
8.0-11.99 du/ac	2.8%
CIVIC	4.7%
COMMERCIAL	8.7%
CONDO/TOWNHOME	1.3%
INDUSTRIAL	1.8%
NATURAL OPEN SPACE (FAIR CONDITION)	8.6%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (GOOD CONDITION)	0.9%
ROW	13.5%
WOODS (FAIR CONDITION)	2.9%

Future Land Use - South Pine Creek

Land Use	% of Basin Area
0-1.99 du/ac	0.7%
12.0-24.99 du/ac	1.9%
2.0-3.49 du/ac	4.2%
25+ du/ac	0.0%
3.5-7.99 du/ac	29.4%
8.0-11.99 du/ac	2.3%
CIVIC	6.2%
COMMERCIAL	18.1%
CONDO/TOWNHOME	4.2%
INDUSTRIAL	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (FAIR CONDITION)	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	1.1%
ROW	20.8%

FIGURE 3-6
FUTURE CITY & COUNTY LAND USE
COTTONWOOD CREEK
& SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\activelayout\DBPS_Report\Figure_3_6_CottonwoodCreek_Land_Use_Future_20190530.mxd, 5/30/2019, Drew_Phillips

LEGEND

- City Boundary
- Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
  ←2-yr & 100-yr Flows
- Detention
- Junction

Source:

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

INTERSTATE 25

FEE BASIN OUTSIDE OF DRAINAGE BASIN

CC OUTLET

SPC OUTLET

FIGURE 3-12
HYDROLOGIC MODEL ELEMENTS
COTTONWOOD CREEK &
SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180628.mxd, 6/29/2018, jeff_donts

LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Local Erosion Issue
- Existing Crossing Deficiency
- Future Crossing Deficiency
- Storm Main (Size)
- Major Reach
- Reach Erosion Issue
- Existing Reach Capacity Deficiency

SCAP Identified Poor Condition Infrastructure

- Grade Control Structures
- Channel Banks
- Channel

* Information that became available after data procurement was complete was not incorporated.

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 4-7
DEFICIENCIES MAP
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_4-7_CottonwoodCreek_Deficiencies.mxd, 4/11/2019, jeff, dionis







SAND CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT

JANUARY 2021

Prepared for:

COLORADO SPRINGS
OLYMPIC CITY USA

STORMWATER ENTERPRISE

Prepared by:

Stantec

HDR Dewberry

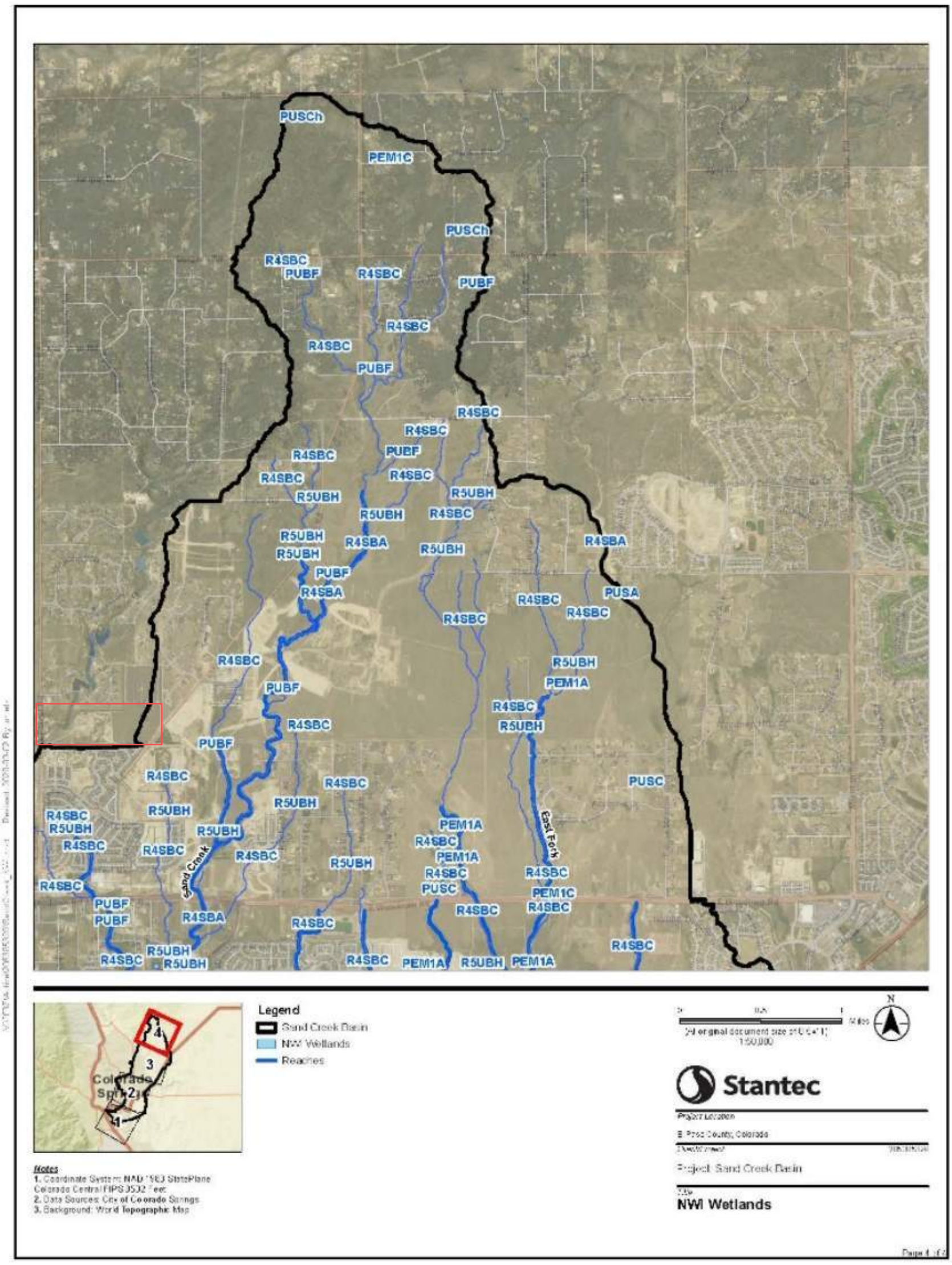


Figure 2-7: NWI Wetlands Located in Sand Creek Drainage Basin (Page 4)

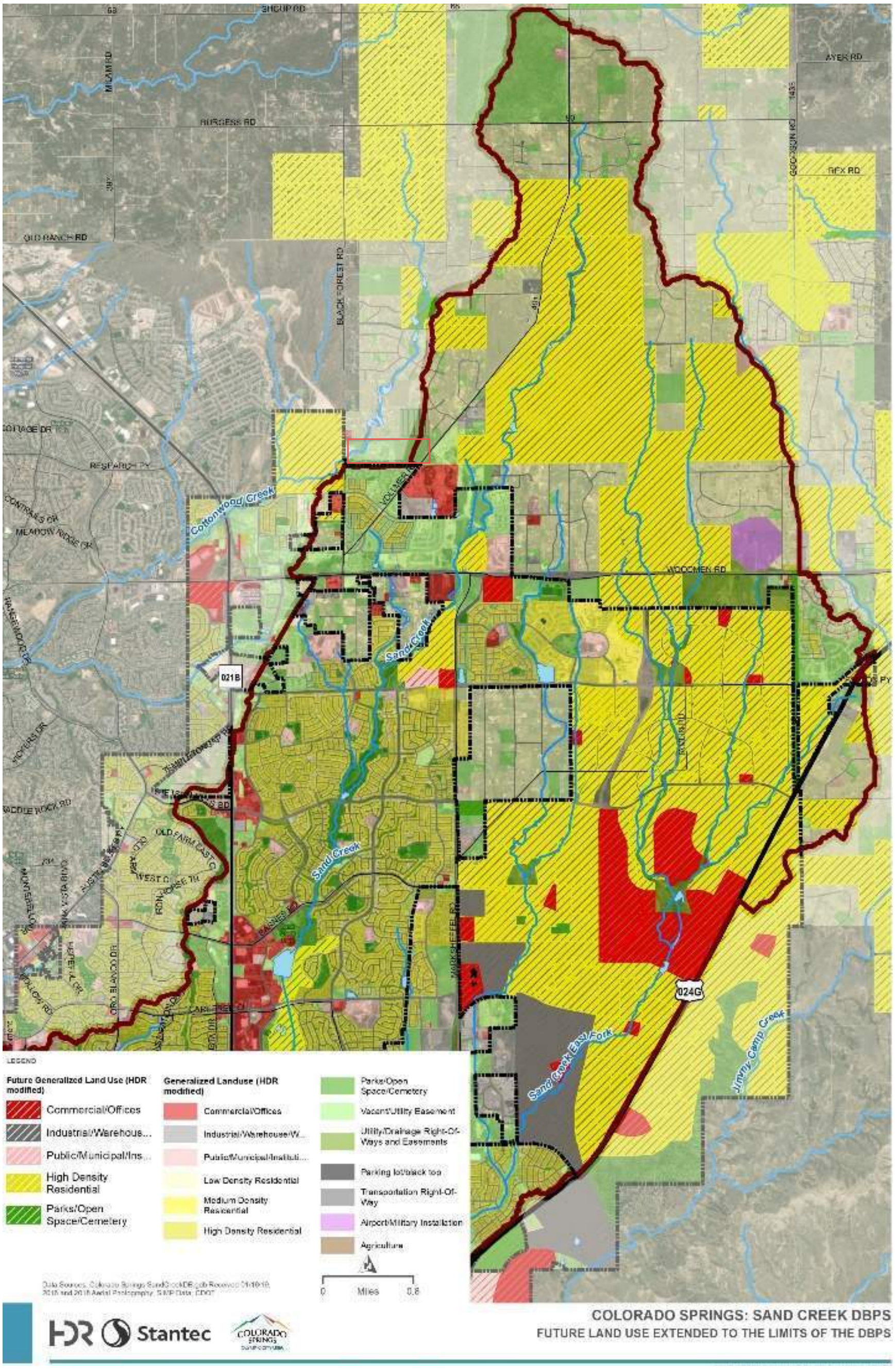


Figure 3-15. Future Land Use MapFuture Condition Model Results

Zone Map 523.32

- El Paso County -

Development Services Department

Zoning Designations

- RS-20000: Residential Suburban (20,000 sq. ft.)
- RS-6000: Residential Suburban (6,000 sq. ft.)
- RS-5000: Residential Suburban (5,000 sq. ft.)
- RM-12: Residential Multi-Dwelling (12 DU/acre)
- RM-30: Residential Multi-Dwelling (30 DU/acre)
- RR-0.5: Residential Rural (0.5 acres)
- RR-2.5: Residential Rural (2.5 acres)
- RR-5: Residential Rural (5 acres)
- R-T: Residential - Topographic
- MHP: Mobile Home Park
- MHP-R: Mobile Home Park, Rural
- MHS: Mobile Home Subdivision
- RVP: Recreational Vehicle Park
- F-5: Forest & Recreation (5 acres)
- PUD: Planned Unit Development
- CC: Commercial Community
- CR: Commercial Regional
- CS: Commercial Service
- I-2: Limited Industrial
- I-3: Heavy Industrial
- A-5: Agricultural (5 acres)
- A-35: Agricultural (35 acres)
- C-1: ** Commercial
- C-2: ** Commercial
- M: ** Industrial
- R-4: ** Planned Development

** Indicates an obsolete designation

Supporting Data

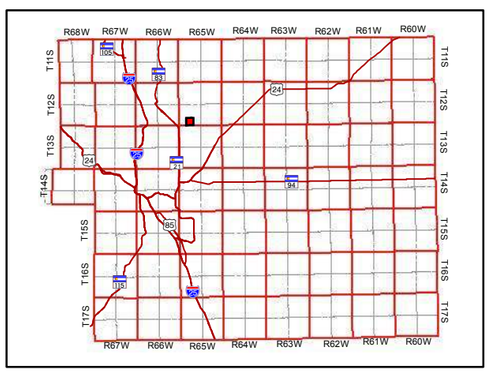
- Highways
- Major Roadways
- Creeks - Perennial
- Creeks - Intermittent
- Section Corner Nodes
- Sections
- Parcels
- Military
- Pike National Forest
- Incorporated Cities
- Zone Map Boundary
- Zoning Overlay
- Special Uses

600 300 0 600 Feet

1 inch = 600 feet

May 25, 2016

Vicinity Map



COPYRIGHT 2016 by the Board of County Commissioners, El Paso County, Colorado. All rights reserved. No part of this document or data contained hereon may be reproduced; used to prepare derivative products; or distributed without the specific written approval of the Board of County Commissioners, El Paso County, Colorado. This document was prepared from the best data available at the time of plotting and is for internal use only. El Paso County, Colorado, makes no claim as to the completeness or accuracy of the data contained hereon.

TRAILS AT FOREST MEADOWS
FILING NO. 3
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

August 2015

Prepared for:

Rivers Development, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-029

OFFICE COPY

ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are co=on during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood lnsurance Rate Map (FIRM) Panel No. 08041C0529, effective date March 17, 1997, no portion of the site lies within a designated floodplain.

DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/E) Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

EXISTING DRAINAGE CONDITIONS

The overall site consists of 18.172 acres and is currently undeveloped, with the initial grading project proposed to disturb 18.172 acres for Filing No. 3 residential subdivision. Filing No.3 proposes 87 single family residential lots. The number of lots to be platted in the future filings to the west is unknown at this time. All of the streets, curb, gutter, sidewalk and utilities for the development of Vanderwood Road, Cedar Brush Court, Brush Top Road, and Creek Brush Drive, will be constructed in Filing No. 3 Vanderwood Road will be extended in the future filings of Trails at Forest Meadows.

As shown by the historic drainage map for "Trails at Forest Meadows Filing 2", included in the appendix, offsite historic flows, tributary to Vollmer (EX1 ~ Q5=66 cfs and Q100=300.7 cfs, EX2 ~ Q5=23 cfs and Q100=106 cfs, and EX3 ~ Q5=1.8 cfs and Q100=8.0 cfs, see Historic drainage map DP-1), have been estimated to reach proposed Vollmer Road infrastructure at the Dry Needle Place/Vollmer Road intersection and northerly boundary of Filing No. 2. It has been determined that due to limited roadside capacity along the West side of Vollmer Roadway much of this historic runoff may cross Vollmer prior to reaching DP3 (see proposed Drainage Conditions for addition discussion). No new developed flow will be introduced onto Vollmer Road, north of the intersection. Any new developed flows, south of the intersection, will be intercepted by 2-20' D-10-R inlets within the proposed Vollmer Road Section. It should be noted that upon the construction of the Sterling Ranch subdivision a large percentage of the historic flows, once reaching the subject site (north and west of Vollmer Road/ future Marksheffel Road) will be collected and conveyed in a proposed 54" RCP to Sand Creek.

Per review of the existing topographic drainage patterns, the off-site historic flows, north of the property (OSl, see Historic drainage map DP-1), are conveyed west by an existing berm and swale to an existing gravel borrow pit, as evident by the eroded embankment at the southeast comer of the gravel borrow pit and evaluation of grade during onsite visits. Per the "Master Development Drainage Plan for Woodmen Heights Master ·Plan" prepared by Classic Consulting Engineers and Surveyors, dated June 2004, it was inferred that the entire watershed (historic flows of Q5=65 cfs and Q100=162 cfs) would be transported to the future detention facility through our site. This report was amended by the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4" (MDDP) by Engineering and Surveying, Inc., dated February 2006, in which it states that 50% of the flow from OS1 (Q5=34 cfs, Q100==84 cfs) will be collected by a proposed concrete pipe and will be conveyed through and combined with the flows of Trails at Forest Meadows Filings to Sand Creek Regional Detention Facility No. 6. Per historic drainage patterns and per the "Preliminary/Final Drainage Report for Highland Park Filing No.2", prepared by Law and Mariotti Consultants, dated June 2002, the remainder of the flows will be transported via road side swale on the west side of Vollmer Road to the proposed drainage infrastructure in Vollmer Road. Any increase in flows due to future development of

Basin OS1 will require the construction of a proposed detention facility, as per the Sand Creek DBPS. Historic flows (EX4- Q5=5.1 cfs and Q100=22.9 cfs, see Historic drainage map DP-1) south of OS1, sheet flow to an existing abandoned road swale and outlet to a roadside swale on Black Forest Road. There are road side swales on either side of the abandoned road. Since topographic drainage patterns have been altered since the approval of the MDDP, existing historic flows have been diverted to the gravel borrow pit, Vollmer Road and Black Forest Road.

The site is tributary to Sand Creek Detention Basin No. 6. The stormwater infrastructure downstream of the subject site has already been constructed to the aforementioned detention pond. Specifically, flows initially intercepted at Design Point E3 are conveyed within the Vollmer Road Storm Sewer System which parallels the west side of Vollmer prior to out-falling (at the East Side of Vollmer Road) into a partially riprap lined channel. The existing channel, which parallels both the southwest and western edge of Forest Meadows Filing No. 1, directs runoff under Forest Meadows Avenue and into the existing Sand Creek Detention Pond No. 6. A rip rap plunge pool and energy dissipater aid to slow the incoming flows while the receiving facility provides both WQCV and detention for this development.

The site was originally studied in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report" (DBPS) prepared by Kiowa Engineering. This study was then updated in the "Sand Creek Drainage Basin Planning Study Preliminary Design Report Technical Addendum" by Kiowa, revised October 1995.

It should be noted that the subject site was most currently studied in the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4, where the proposed land use had been revised to single-family residential development from previously planned commercial usage.

PROPOSED DRAINAGE CONDITIONS

The following is a description of the onsite basins, offsite bypass flows and the overall proposed drainage characteristics for the development of Trails at Forest Meadows Filing No.3. The following Design Points and Basins were determined using the Rational Method since each individual basin is less than 100 acres and the combined acreage at any Design Point is also less than 100 acres. This method offers a more conservative approach to calculating swale cross sections and storm drain. The proposed drainage design for this subdivision is typical for single family residential, consisting of; homes, landscaping, rear and side lot drainage swales, curb & gutter, streets, curb inlets, and pipes to convey developed flows downstream. Rear and side lot swales will be constructed to get developed flows to street curb and gutter.

Filing No.2 - Basins F2-F, F2-I and F2-J are located to the south of the subject site, in the central and east portions of the Filing 2 site. The flows from these basins were previously analyzed as part of "The Trails at Forest Meadows Filing No. 2 Preliminary/Final Drainage Report" (FDR2). Runoff produced within Basins F2-F, F2-I and F2-J flow to existing inlets in the Trails at Forest Meadows Filing No. 2 subdivision and have been accounted for.

Basin K is located in the northerly portion of the site and contains 0.92 acres of portions of single family residential lots and streets. Basin K has proposed design flows of 1.8 cfs for the minor storm event (5-Year) and 3.9 cfs for the major storm event (100-Year). Runoff from Basin K will flow, overland via side lot swales, to the curb and gutter of existing streets within Basin F2-F (Filing No. 2) to Design Point 1 (6.1 cfs/12.8 cfs), an existing 12' D-10-R inlet in a sump condition. See FDR2 Basin F for pipe conveyance information and over flow conditions. Pipe 2 and 3 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin L is located in the northerly portion of the site and contains 0.55 acres of rear yards of single family residential lots. Basin L has proposed design flows of 1.2 cfs for the minor storm event (5-Year) and 2.5 cfs for the major storm event (100-Year). Runoff from Basin L will flow, overland, to lots and tracts within Basin F2-J (Filing No. 2) and be conveyed, via side lot swales, to the curb and gutter of the adjacent streets to Design Point 5 (4.9 cfs/7.4 cfs). Runoff will be intercept at DP-5 via an existing at-grade 12' D-10-R inlet. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipes 5, 7, 8, 9 and 11- have been sized to accept these developed flows and do not exceed the pipe design flows determined within the FDR for Filing 2.

Basin M is located in the northeast portion of the site and contains 2.62 acres of single family residential lots, landscaping, and an asphalt roadway. Basin M has proposed design flows of 5.4 cfs for the minor storm event (5-Year) and 11.3 cfs for the major storm event (100-Year). Runoff from Basin M will flow, via side lot swales, to the curb and gutter and will be conveyed south to Design Point 10, a 10' D-10-R inlet in an at-grade condition. The inlet at Design Point 10 has been sized to accept flows from Basin M in the developed condition. Collected flows from Design Point 10 will be conveyed in an 18" RCP (Pipe 20) to Design Point II, a 12' D-10-R at-grade inlet.

Basin M-1 is located in the northeast portion of the site and contains 0.65 acres of single family residential lots and asphalt roadway. Basin M-1 has proposed design flows of 1.3 cfs for the minor storm event (5- Year) and 2.7 cfs for the major storm event (100-Year). Basin M-1 was part of a Basin Min FDR2 and is identified only to account for design flows to Design Point 6, an existing 8' D-10-R inlet in a sump condition. See FDR2 Basin M for pipe conveyance information and over flow conditions. Pipes 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin O is located in the northeast portion of the site and contains 0.70 acres of rear yards of single family residential lots and Tract G. Basin 0 has proposed design flows of 1.6 cfs for the minor storm event (5-Year) and 3.3 cfs for the major storm event (100-Year). The runoff from Basin 0 will flow overland thru Tract G via the side lot swales, to the curb and gutter of Aspen Brush Court, w/o crossing any lots within Filing 2. Runoff collected by the roadway continues southerly (down-gradient) to Design Point 5, an existing 12' D-10-R inlet in an at-grade condition. See FDR2 Basin J for pipe conveyance information and over flow conditions. Pipe 5, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

Basin P is located in the northerly portion of the site and contains 2.14 acres of single family residential lots, landscaping, and an asphalt roadway. Basin P has proposed design flows of 4.2 cfs for the minor storm event (5-Year) and 8.8 cfs for the major storm event (100-Year). Runoff from Basin P will flow, via side lot swales, to the curb and gutter and then westward to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year). A temporary riprap pad will be constructed at the end of the proposed roadway to dissipate energy and prevent local scour. The existing diversion swale established with FDR2 (which previously directed runoff reaching this location to the south) will be abandoned by the construction of a new swale which will be to redirect runoff westward to the existing 48" RCP (Pipe 14). It should be noted that the majority of the existing swale along the western boundary of Filing No.2 remain in place to protect existing lots and serve as a secondary level of protection should the swale leading to pipe 14 fail. Pipes 14 and 3 have been sized to accept the contributing developed flows and do not exceed the pipe design flows in FDR2.

Basin Q is located in the northerly portion of the site and contains 3.66 acres of single family residential lots, landscaping, and proposed roadways. Basin Q has proposed design flows of 6.1 cfs for the minor storm event (5-Year) and 12.8 cfs for the major storm event (100-Year). Runoff from Basin Q will flow, via side lot swales, to the curb and gutter to Design Point 9 (accumulated flows 10.2 cfs-5 year, 22.4 cfs-100 year), before continuing within the aforementioned swale to Pipe 14. A temporary sediment basin is recommended to be constructed upstream of Pipe 14, to aid in deterring sediment transport, while riprap protection will be placed immediately adjacent to the pipe entrance to protect the transition slope to the mouth of the pipe . A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin Q to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or

removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids to direct any potential runoff to the west. A proposed 3' wide sidewalk chase will be constructed to convey the minor runoff from Basin OS-3 and east third of Basin OS-2 into Brush Top Road. Limited flow from the north is anticipated reach Brush Top, with future development as a high point will be planned to be placed near the north boundary line.

It should be noted that the contours on the provided drainage map illustrate the potential for a low point or break in the existing offsite berm immediately to the north of Brush Top Road which would allow for flows from Basin OS-1 to reach Basin OS-2. M&S Civil Consultants traveled to the sight and evaluated the onsite conditions at this location and determined that the existing contours shown on the provided map are not entirely representative of the current conditions. M&S Civil further ascertained the existing swale/berm at this location maintains a positive grade to the west and is somewhere between 1.7 to 2.0 feet tall which should provide adequate temporary capacity to redirect the offsite flows to the west.

Refer to the existing condition section of this report, the "Master Development Drainage Plan, Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4", and Preliminary/Final Drainage Report for Highland Park Filing No.2" for additional information regarding offsite development in this area.

Basin R is located in the northerly portion of the site and contains 2.37 acres of single family residential lots, landscaping, and an asphalt roadway. Basin R has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basin R will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north of the filing within Basin R to ensure that on site property owners are protected from offsite flows (OS1) should lack of maintenance or removal of the existing offsite berm occur. The combination of the existing grade north of the proposed berm and the berm itself aids in directing any potential runoff to west.

Basin S is located in the easterly portion of the site and contains 3.09 acres of single family residential lots, landscaping, and an asphalt roadway. Basin S has proposed design flows of 4.7 cfs for the minor storm event (5-Year) and 9.9 cfs for the major storm event (100-Year). Runoff from Basins will flow, via side lot swales, to the curb and gutter to Design Point 11, a 12' D-10-R inlet in an at-grade condition. The inlet at Design Point 11 has been sized to accept flows from Basin R, S and OS3 in the developed condition. Collected flows from Design Point 11 will be conveyed in a 24" RCP (pipe 19) to pipe 6, an existing 24" RCP stub. Pipe 6, 7, 8, 9 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2. A perimeter berm will be constructed (within a permanent drainage easement) along the north and northeast edges of the proposed filing within Basin S to ensure that on site property owners are protected from offsite flows (OS3). The existing offsite berm located on the adjacent property to the currently aids in directing flows around the majority of the northeast edge of the filing , but terminates prior to eastern boundary line and cannot be relied on in perpetuity for flood control. Flows reaching the onsite berm will be directed to a pair of proposed 4' sidewalk chases which will aid to discharge runoff to the curb and gutter of Vollmer Road.

Basin T is located in the easterly portion of the site and contains 1.73 acres of rear yards of single family residential lots. Basin T has proposed design flows of 4.0 cfs for the minor storm event (5-Year) and 8.4 cfs for the major storm event (100-Year). Runoff from Basin Twill flow, via side lot swales, to the curb and gutter in Vollmer Road to Design Point E3, an existing 12' D-10-R inlet, in an at-grade condition. The inlet at Design Point E3 has been sized to accept flows from Basin T, U and historic flows EX1 and EX2. Collected flows from Design Point E3 will be conveyed in an existing 30" RCP (pipe 10) to pipe 11, an existing 48" RCP. Combined flows in 9, 10 and 11 have been sized to accept these developed flows and do not exceed the pipe design flows in FDR2.

EX GRAVEL PIT

TST CONSTRUCTION CO.

DEVELOPED OS1 MDDP

Q=34 cfs
Q=84 cfs
MAX DISCHARGE ALLOWED

EXIST. BERM

EL PASO COUNTY
CITY OF COLORADO SPRINGS.

FLOWS OUTFALL WEST ONTO BLACK FOREST ROAD VIA ABANDONED ROAD SWALE

EX. ABANDONED ROAD

EX5 17 .13 .33

SEE DP1 HISTORIC DRAINAGE PLAN

FUTURE PIPE PER MDDP

EX 48" FES TO COLLECT DIVERTED FLOWS

PIPE RUN 14 STUB PROVIDE FOR FLOWS FROM FUTURE FILINGS AND FUTURE OFFSITE DEVELOPMENT OS1 SEE MDDP

30' DRAINAGE EASEMENT

OS2 1.22 .13 .33

OS1 HISTORIC
Q=34.4 cfs
Q100=84.1 cfs

FUTURE DEVELOPMENT OF THIS SITE WILL REQUIRE ONSITE DETENTION AND A DIVERSION SWALE

OS3 0.34 .13 .33

DIVERT SWALE ONTO C&G AND ASPHALT PAVEMENT

TST CONSTRUCTION CO.

EXIST. BERM

Q 3.68 .13 .33

R 2.37 .57 .67

P 2.14 .57 .67

K 0.92 .57 .67

L 0.55 .57 .67

F2-P 2.95 .57 .67

NO CHANGE FROM FILING 2 DRAINAGE REPORT

F2-O 3.12 .57 .67

O 0.70 .57 .67

M 2.63 .13 .33

S 3.09 .57 .67

T 1.73 .57 .67

U 1.23 .90 .95

TRACT G

TRACT L

ASPEN BRUSH COURT

DEX TWELVE PLACE

FUTURE FILING NO. 3

FILING NO. 3

FILING NO. 2

OFFWOOD ROAD

CANARY CIRCLE

FUTURE SCHOOL

F2-I 1.72 .57 .67

EX. 12' D-10-R INLET

PROP. 10' D-10-R INLET

PROP. 12' D-10-R INLET

EX. 8' D-10-R INLET

EX. 20' D-10-R INLET

EX. 4' D-10-R INLET

M-1 0.65 .57 .67

E3

NAGEL TOE COURT

EX. 10' D-10-R INLET

EX. 12' D-10-R INLET

F1-A 3.03 .57 .67

NO CHANGE FROM FILING 1 DRAINAGE REPORT

EX. FILING NO. 1

EX. FILING NO. 2

EXIST. 24" RCP

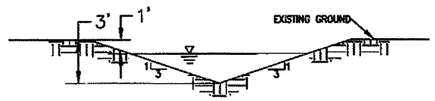
SB

1" = 100'

0 25 50 100 200
Scale in Feet

NOTE:

THIS PLAN REFLECTS THE PRELIMINARY GRADING AND PRELIMINARY LOT TEMPLATES ONLY. THE FINAL GRADING PLAN WILL BE SUBMITTED FOLLOWING THE APPROVAL OF THE DEVELOPMENT PLAN.



A-A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

BASIN/DESIGN POINT SUMMARY

BASIN	AREA (ACRES)	Q5	Q100	DESIGN POINT
FILING NO.2 BASIN F2-I	2.85	6.1	12.8	1
FILING NO.2 BASIN F2-J	1.72	2.9	6.0	2
FILING NO.2 BASIN F2-O	3.12	8.6	18.0	5
K	0.92	1.8	3.9	
L	0.55	1.0	2.5	
P	2.89	6.4	11.3	10
M-1	0.65	1.3	2.7	8
Q	3.70	1.8	9.3	
T	2.14	4.3	8.8	9
U	3.90	8.1	17.0	11
R	2.37	4.7	9.8	11
S	3.09	6.1	12.8	11
T	1.73	4.0	8.4	11
U	1.95	4.4	8.1	11
OFF-SITE UNDEVELOPED BASIN OS2	1.22	0.8	3.8	9
OFF-SITE UNDEVELOPED BASIN OS3	0.34	0.2	1.0	11
HISTORIC EX1	31.8	38.8	80.0	E1
HISTORIC EX2	1.27	2.4	5.1	E2
HISTORIC EX3	8.6	1.8	8.0	E3
HISTORIC OS1	28.0	34.4	84.1	E4

PROPOSED STORM SEWER SUMMARY

PIPE RUN	Q5	Q100	STRUCTURE
1	9.3	18.4	EX 24" RCP
2	15.7	34.3	EX 30" RCP
3	37.2	134.9	EX 42" RCP
5	4.8	7.4	EX 24" RCP
6	7.4	11.3	EX 24" RCP
7	11.7	17.8	EX 30" RCP
8	26.2	42.8	EX 42" RCP
9	22.9	68.1	EX 48" RCP
10	48.1	98.6	EX 42" RCP
11	82.4	113.9	EX 48" RCP
14	48.8	118.7	EX 48" RCP
19	7.6	11.3	24" RCP
20	8.1	7.8	18" RCP

LEGEND

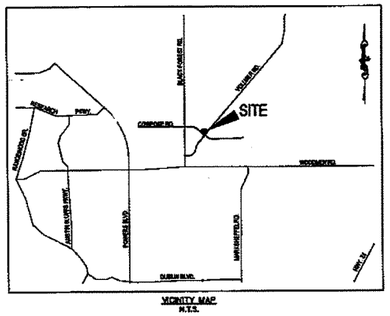
- SB — SEDIMENT BASIN
- BASIN DESIGNATION — A — 6.04 — .25/.35 — ACRES — C5/C100
- 1 — PIPE REFERENCE LABEL
- 1 — SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING 1 BASIN BOUNDARY
- 5920 — EXISTING CONTOUR
- 5920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- PERIMETER SWALE
- FILING LINE
- H.P. — HIGH POINT
- L.P. — LOW POINT
- INLET

CIVIL CONSULTANTS, INC.

THE TRAILS AT FOREST MEADOWS FIL. 3

FILING 3 DRAINAGE PLAN

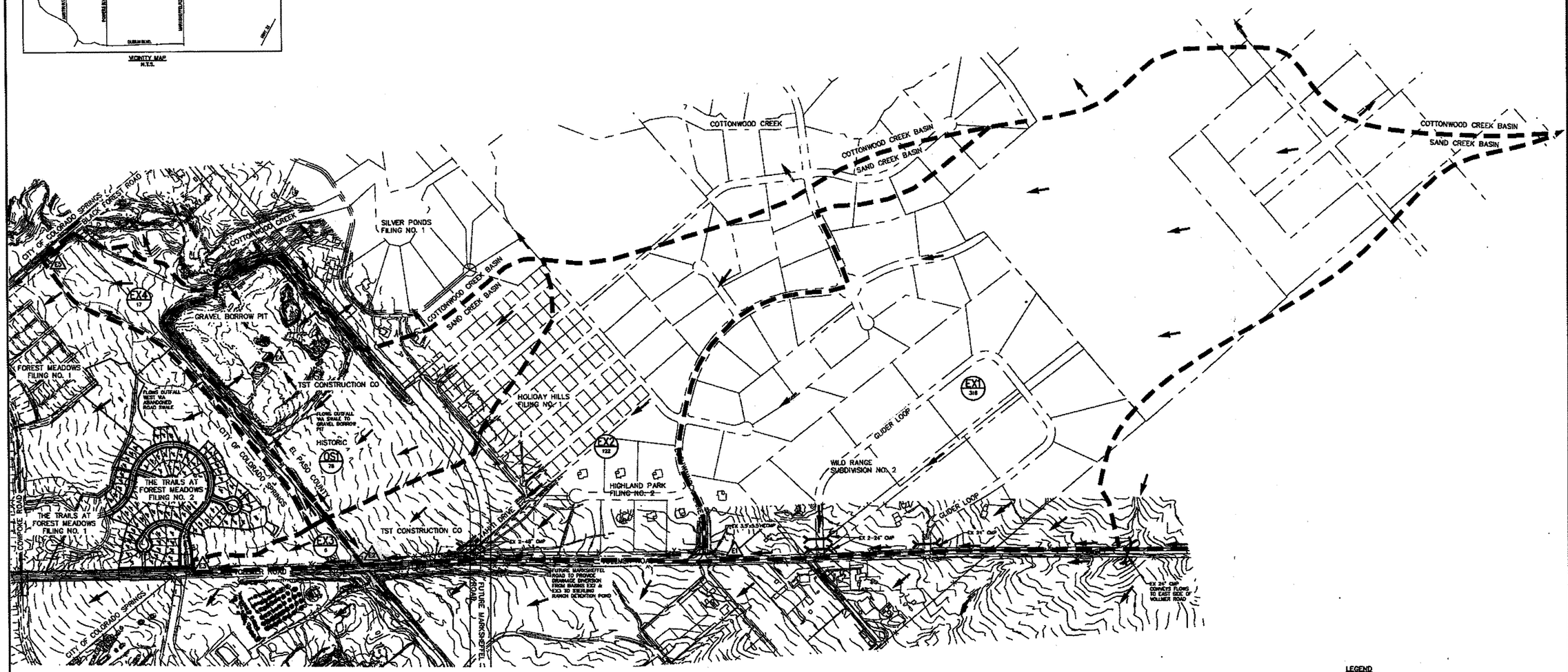
PROJECT NO. 08-025	FILE: *\dwg\Dev. Plan\ 08025 - DRAINAGE		
DESIGNED BY: VAS	SCALE	DATE: 04/09/2014	
DRAWN BY: BLB	HORIZ: 1"=100'	SHEET 2 OF 2	DP2
CHECKED BY: VAS	VERT: N/A		



VICINITY MAP
N.T.S.

HISTORIC BASIN SUMMARY			
BASIN	AREA (acres)	Q_5 (cfs)	Q_{100} (cfs)
EX1	318	66.6	300.7
EX2	122	23.5	106.1
EX3	6	1.8	8.0
OS1	78	34.4	84.1
EX5	17	5.1	22.9

HISTORIC SURFACE ROUTING SUMMARY			
DESIGN POINT	CONTRIBUTING BASINS/DESIGN POINTS	Q_5 (cfs)	Q_{100} (cfs)
E1	EX1	66.6	300.7
E2	EX2 & DP E1	84.7	382.6
E3	EX3 & DP E2	85.8	387.8
E4	OS1	34.4	84.1
E5	EX4	5.1	22.9



1" = 300

0 75 150 300 600
Scale in Feet

LEGEND

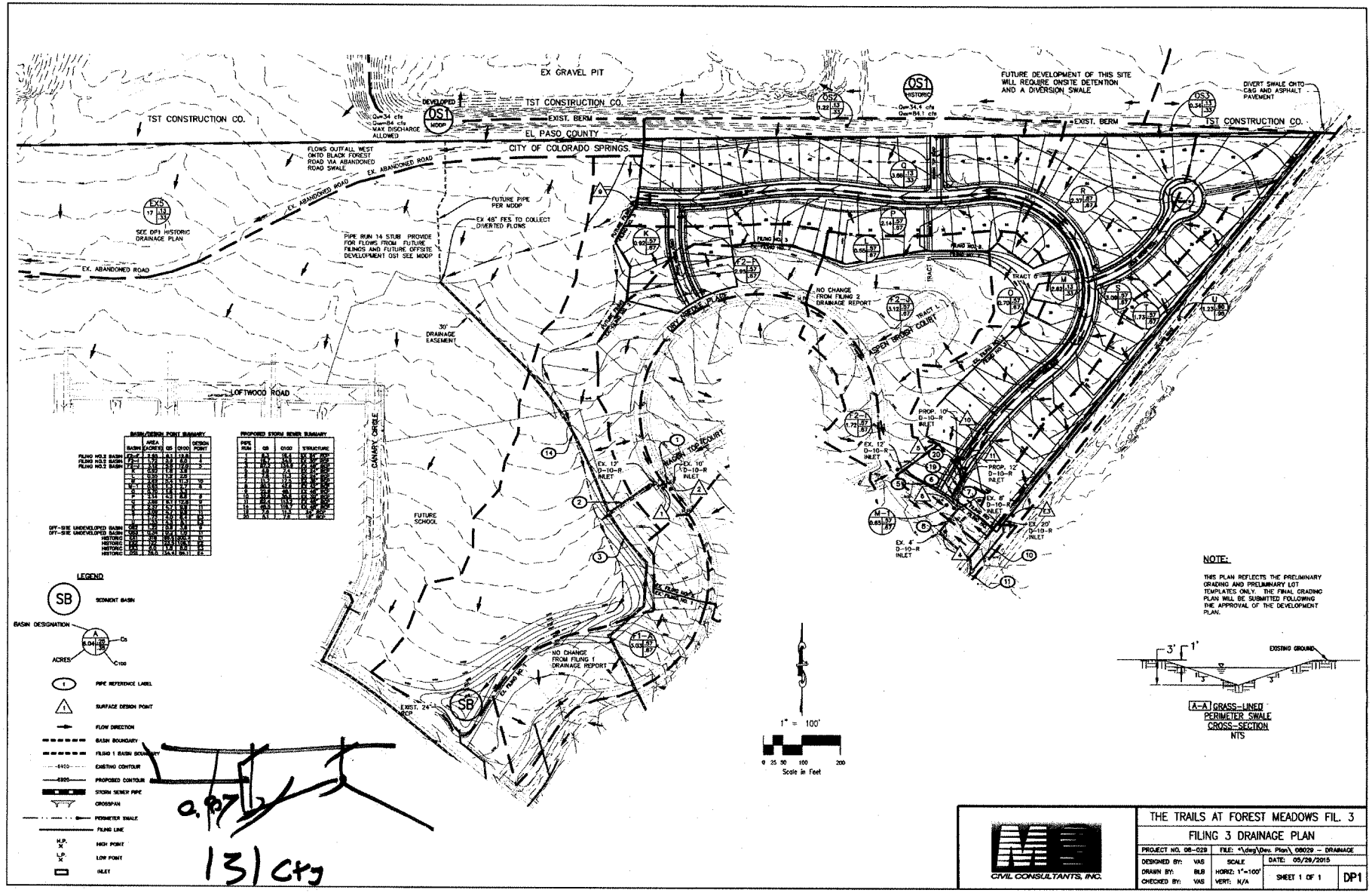
- EX1 / 33.2 — EXISTING MDDP BASIN / ACREAGE
- E1 — EXISTING FLOW RELEASE POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- 6060 — EXISTING CONTOUR
- CULVERT PIPE

CIVIL CONSULTANTS, INC.
E. PIKES PEAK AVE., STE 300
COLORADO SPRINGS, CO 80901
(719) 235-5249, FAX (719) 444-8427

THE TRAILS AT FOREST MEADOWS FIL. NO. 2

HISTORIC – DRAINAGE MAP

PROJECT NO. 08-025		FILE: *\dwg\Dev Plan\08-025-HISTORIC	
DESIGNED BY: ET	SCALE	DATE: 05/01/14	
DRAWN BY: ET	HORIZ: 1"=300'	SHEET 1 OF 2	DP1
CHECKED BY:	VERT: N/A		



BASIN/DESIGN POINT SUMMARY

	BASIN	AREA (ACRES)	Q5	Q100	DESIGN POINT
FILING NO.2 BASIN	OS-1	7.85	0.1	13.9	1
FILING NO.2 BASIN	FC-1	1.39	0.0	0.0	2
FILING NO.2 BASIN	FC-2	1.13	0.0	0.0	3
	A	0.04	0.0	0.1	1
	B	0.03	0.0	0.1	2
	C	0.86	0.2	2.5	3
	D	2.14	0.5	6.3	4
	E	0.57	0.1	1.7	5
	F	2.14	0.5	6.3	6
	G	0.86	0.2	2.5	7
	H	0.92	0.2	2.7	8
	I	0.06	0.0	0.2	9
	J	2.94	0.7	8.6	10
	K	0.92	0.2	2.7	11
	L	0.06	0.0	0.2	12
	M	2.82	0.7	8.3	13
	N	0.79	0.2	2.3	14
	O	3.08	0.7	9.1	15
	P	1.73	0.4	5.1	16
	Q	2.37	0.6	7.0	17
	R	2.37	0.6	7.0	18
	S	3.08	0.7	9.1	19
	T	1.73	0.4	5.1	20
	U	1.23	0.3	3.6	21
	V	0.34	0.1	1.0	22
OFF-SITE UNDEVELOPED BASIN	OS2	1.22	0.1	3.6	1
OFF-SITE UNDEVELOPED BASIN	OS3	0.34	0.1	1.0	2
HISTORIC	OS1	7.85	0.1	13.9	23
HISTORIC	OS2	1.22	0.1	3.6	24
HISTORIC	OS3	0.34	0.1	1.0	25
HISTORIC	OS4	4.15	1.8	8.20	26
HISTORIC	OS5	38.5	14.5	64.2	27

PROPOSED STORM SEWER SUMMARY

PIPE RUN	Q5	Q100	STRUCTURE
1	0.1	0.1	10' TYPE R INLET
2	0.2	0.3	10' TYPE R INLET
3	0.3	0.4	10' TYPE R INLET
4	0.5	0.7	10' TYPE R INLET
5	0.1	0.1	10' TYPE R INLET
6	0.1	0.1	10' TYPE R INLET
7	0.1	0.1	10' TYPE R INLET
8	0.1	0.1	10' TYPE R INLET
9	0.1	0.1	10' TYPE R INLET
10	0.1	0.1	10' TYPE R INLET
11	0.1	0.1	10' TYPE R INLET
12	0.1	0.1	10' TYPE R INLET
13	0.1	0.1	10' TYPE R INLET
14	0.1	0.1	10' TYPE R INLET
15	0.1	0.1	10' TYPE R INLET
16	0.1	0.1	10' TYPE R INLET
17	0.1	0.1	10' TYPE R INLET
18	0.1	0.1	10' TYPE R INLET
19	0.1	0.1	10' TYPE R INLET
20	0.1	0.1	10' TYPE R INLET
21	0.1	0.1	10' TYPE R INLET
22	0.1	0.1	10' TYPE R INLET
23	0.1	0.1	10' TYPE R INLET
24	0.1	0.1	10' TYPE R INLET
25	0.1	0.1	10' TYPE R INLET
26	0.1	0.1	10' TYPE R INLET
27	0.1	0.1	10' TYPE R INLET

LEGEND

- SB — SEDIMENT BASIN
- BASIN DESIGNATION — A, 0.04 ac, Cs, C100
- PIPE REFERENCE LABEL
- SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- FILING 1 BASIN BOUNDARY
- 6410 — EXISTING CONTOUR
- 6395 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- PERIMETER SWALE
- FILING LINE
- H.P. — HIGH POINT
- L.P. — LOW POINT
- INLET

0.87

131 Cfs

NOTE:

THIS PLAN REFLECTS THE PRELIMINARY GRADING AND PRELIMINARY LOT TEMPLATES ONLY. THE FINAL GRADING PLAN WILL BE SUBMITTED FOLLOWING THE APPROVAL OF THE DEVELOPMENT PLAN.

A-A GRASS-LINED PERIMETER SWALE CROSS-SECTION
NTS

CIVIL CONSULTANTS, INC.

THE TRAILS AT FOREST MEADOWS FIL. 3

FILING 3 DRAINAGE PLAN

PROJECT NO. 08-029	FILE: *\dcs\Dev. Plan\ 08029 - DRAINAGE		
DESIGNED BY: VAS	SCALE	DATE: 05/29/2015	
DRAWN BY: BLB	HORIZ: 1"=100'	SHEET 1 OF 1	DP1
CHECKED BY: VAS	VERT: N/A		

TRAILS AT FOREST MEADOWS FILING NO. 3

CITY OF COLORADO SPRINGS, EL PASO COUNTY, STATE OF COLORADO

STREET IMPROVEMENT PLANS

(INCLUDING STORM SEWER)

AUGUST 2015

GENERAL NOTES

1. ALL MATERIALS AND INSTALLATION PROCEDURES SHALL BE IN COMPLIANCE WITH THE CITY OF COLORADO SPRINGS, DEPARTMENT OF PUBLIC WORKS, SUBDIVISION POLICY MANUAL AND DIVISION "RULES FOR THE INSTALLATION OF SEWER MAINS AND SERVICES".
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE AND LOCATION OF ALL UNDERGROUND UTILITIES ALONG THE ROUTE OF THE WORK. THE OMISSION FROM OR THE INCLUSION OF UTILITY LOCATIONS ON THE PLANS IS NOT TO BE CONSIDERED AS THE NONEXISTENCE OF OR A DEFINITE LOCATION OF EXISTING UNDERGROUND UTILITIES.
3. THE CONTRACTOR WILL TAKE THE NECESSARY PRECAUTIONS TO PROTECT EXISTING UTILITIES FROM DAMAGE DUE TO THIS OPERATION. ANY DAMAGE TO THE UTILITIES WILL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, AND ANY SERVICE DISRUPTION WILL BE SETTLED BY THE CONTRACTOR.
4. CONCRETE USED IN CURB AND GUTTER, SIDEWALK, AND CROSSPAN CONSTRUCTION WILL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI AT 28 DAYS.
5. ALL BACKFILL, SUB-BASE, AND/OR BASE COURSE (CLASS 6) MATERIAL SHALL BE COMPACTED PER THE SOILS ENGINEER'S RECOMMENDATIONS.
6. ALL STATIONING IS CENTERLINE OF IMPROVEMENTS UNLESS OTHERWISE INDICATED. ALL ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE INDICATED AS TOP BACK OF CURB (TBC), ASPHALT (ASP), OR TOP OF INLET OR BOX (TOB).
7. ALL CURB RETURNS AND 10' EITHER SIDE OF CURB RETURNS SHALL BE 8" VERTICAL CURB, CITY OF COLORADO SPRINGS TYPE 1 CURB WITH AND ADDITIONAL 10' OF TRANSITION TO 6" RAMP CURB. CITY OF COLORADO SPRINGS MODIFIED TYPE 5 CURB, UNLESS OTHERWISE INDICATED.
8. PEDESTRIAN RAMPS SHALL BE INSTALLED AT INTERSECTIONS AS SHOWN AND CONFORM TO THE CITY OF COLORADO SPRINGS, DEPARTMENT OF PUBLIC WORKS STANDARDS AND SPECIFICATIONS.
   NOTE: WIDTH OF PEDESTRIAN RAMPS MUST MATCH WIDTH OF SIDEWALK.
9. IF A DISCREPANCY OCCURS BETWEEN THE CONSTRUCTION DOCUMENTS AND THE CITY OF COLORADO SPRINGS STANDARD SPECIFICATIONS, THE ENGINEER WILL BE NOTIFIED IMMEDIATELY FOR RESOLUTION.
10. THE CONTRACTOR SHALL SECURE ALL APPLICABLE LICENSES AND PERMITS TO COMPLETE THE CONSTRUCTION IN COMPLIANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS.
11. CONTRACTOR TO OBTAIN COPIES OF THE SOILS REPORT FROM THE GEOTECHNICAL ENGINEER AND TO BE KEPT ON-SITE DURING ALL EARTHWORK OPERATIONS.

CONCRETE: CONCRETE REINFORCEMENT:

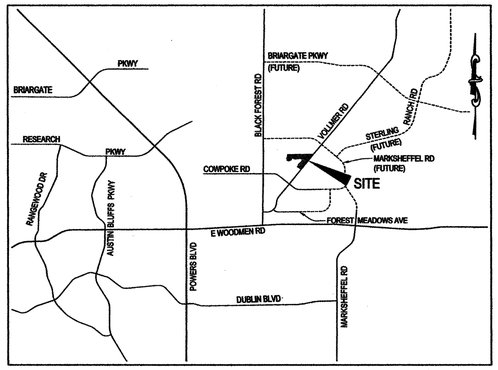
1. ALL CAST IN PLACE CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE YIELD STRENGTH OF 4,000 PSI UNLESS OTHERWISE NOTED. HIGHER COMPRESSIVE STRENGTH CONCRETE IS ACCEPTABLE TO ACHIEVE EARLY CONCRETE STRENGTH THAT MAY BE DEEMED NECESSARY TO MEET CONSTRUCTION SCHEDULING PRIORITIES.
2. ALL CAST IN PLACE CONCRETE REINFORCEMENT SHALL HAVE A MINIMUM TENSILE YIELD STRENGTH OF 6,000 PSI UNLESS OTHERWISE NOTED, AND CONFORMANCE WITH CITY OF COLORADO SPRINGS SPECIFICATIONS, SECTION 603.
3. CONCRETE TESTING SHALL BE IN CONFORMANCE WITH CITY OF COLORADO SPRINGS SPECIFICATIONS, SECTION 506.

STORM SEWER NOTES:

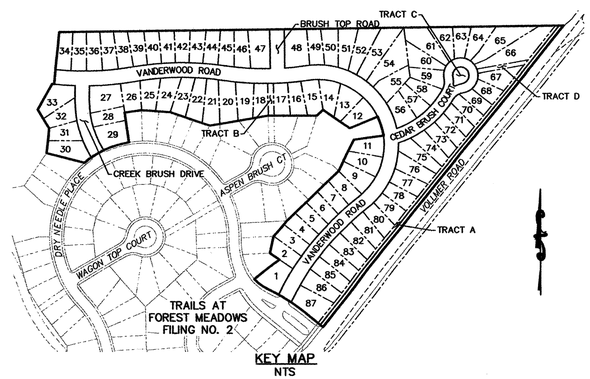
1. CONSTRUCT AND INSTALL D-10-R INLETS PER CITY OF COLORADO SPRINGS SHEET D-10-R 1, 2, AND 3.
2. CONSTRUCT AND INSTALL TYPE I MANHOLES PER CITY OF COLORADO SPRINGS SHEETS D-20A (1) AND D-20D (4).
3. THE MINIMUM CLASS OF REINFORCED CONCRETE PIPE SHALL BE CLASS III.

TRAFFIC ENGINEERING GENERAL NOTES:

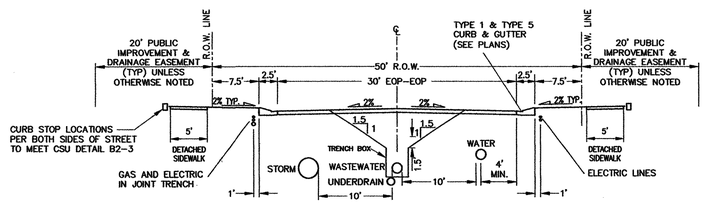
1. CALL BEFORE EXCAVATING, CONTRACTOR SHALL VERIFY LOCATION OF UNDERGROUND UTILITIES.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY MONUMENTATION AND/OR BENCHMARKS WHICH WILL BE DISTURBED OR DESTROYED BY CONSTRUCTION. SUCH POINTS SHALL BE REFERENCED AND REPLACED WITH APPROPRIATE MONUMENTATION BY A REGISTERED CIVIL ENGINEER AUTHORIZED TO PRACTICE LAND SURVEYING.
3. APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT HAS BEEN ISSUED.
4. THE APPROVAL OF THESE PLANS OR ISSUANCE OF A PERMIT BY THE CITY OF COLORADO SPRINGS DOES NOT AUTHORIZE THE SUBDIVIDER AND OWNER TO VIOLATE ANY FEDERAL, STATE, OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NEW, TEMPORARY AND EXISTING TRAFFIC SIGNS FROM THE START OF THE CONSTRUCTION PROJECT UNTIL ACCEPTANCE BY CITY TRAFFIC ENGINEERING.
6. ALL TRAFFIC SIGNS, PAVEMENT MARKINGS, AND TRAFFIC SIGNALS SHALL MEET OR EXCEED M.T.U.C.D. STANDARDS.
7. THE CONTRACTOR SHALL NOT REMOVE ANY EXISTING SIGNS, PAVEMENT MARKINGS OR TRAFFIC SIGNALS DURING THE PROJECT WITHOUT SIGNED AUTHORIZATION OF THE CITY TRAFFIC ENGINEERING INSPECTOR ASSIGNED TO THE PROJECT.
8. CONTRACTOR SHALL PREPARE A DETAILED TRAFFIC CONTROL PLAN, SUBMIT TO CITY TRAFFIC ENGINEERING FOR APPROVAL, AND OBTAIN APPROPRIATE PERMITS IN ACCORDANCE WITH THE "TRAFFIC CONTROLS FOR STREET CONSTRUCTION, UTILITY WORK AND MAINTENANCE OPERATIONS", M.U.T.C.D. SUPPLEMENT FOR THE CITY OF COLORADO SPRINGS. AUGUST 1992.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK ZONE TRAFFIC CONTROL. CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING, INSTALLING AND MAINTAINING THE TEMPORARY TRAFFIC CONTROL DEVICES THROUGHOUT THE DURATION OF THE PROJECT.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NEW, TEMPORARY, AND EXISTING TRAFFIC SIGNAL MODIFICATIONS.



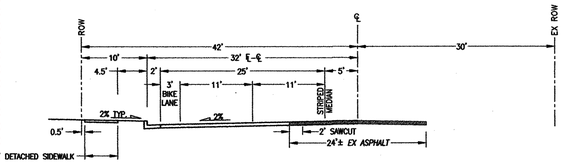
VICINITY MAP
N.T.S.



KEY MAP
NTS



TYPICAL RESIDENTIAL STREET
SCALE: NTS



TYPICAL MINOR ARTERIAL
STREET/UTILITY SECTION (VOLLMER ROAD)
SCALE: NTS

AGENCIES

OWNER:	CHALLENGER HOMES, INC. 13570 NORTHGATE ESTATES DRIVE COLORADO SPRINGS, CO 80921 ROGER MILLER (719) 598-5192 ROGER@MYCHALLENGERHOMES.COM
CIVIL ENGINEER:	M & S CIVIL CONSULTANTS, INC. 20 BOULDER CRESCENT, SUITE 110 COLORADO SPRINGS, CO 80903 VIRGIL A. SANCHEZ P.E. (719) 955-5485
ENGINEERING DIVISION:	CITY OF COLORADO SPRINGS 30 S. NEVADA AVE., SUITE 401 COLORADO SPRINGS, CO 80903 ELIZABETH NIJKAMP, P.E. (719) 385-5410
TRAFFIC ENGINEERING:	CITY OF COLORADO SPRINGS 30 S. NEVADA AVE., SUITE 401 COLORADO SPRINGS, CO 80903 KATHLEEN KRAGER (719) 385-7628
DEVELOPMENT SERVICES:	COLORADO SPRINGS UTILITIES 1521 HANCOCK EXPRESSWAY COLORADO SPRINGS, CO 80903 AL JUVERA (719) 668-8769
GAS DEPARTMENT:	COLORADO SPRINGS UTILITIES 7710 DURANT DR. COLORADO SPRINGS, CO 80920 TIM WENDT (719) 668-3556
ELECTRIC DEPARTMENT:	COLORADO SPRINGS UTILITIES 7710 DURANT DR. COLORADO SPRINGS, CO 80920 SARAH LABARRE (719) 668-4933
COMMUNICATIONS:	QWEST COMMUNICATIONS (U.N.C.C. LOCATORS) (800) 922-1987 AT&T (LOCATORS) (719) 635-3674

DETAILED DRAINAGE CONSTRUCTION PLANS AND SPECIFICATIONS ENGINEER'S STATEMENT:

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS."

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

9/16/15
DATE

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

SHEET INDEX

SHEET 1	TITLE SHEET
SHEET 2	PLAN & PROFILE - VANDERWOOD ROAD
SHEET 3	PLAN & PROFILE - VANDERWOOD ROAD
SHEET 4	PLAN & PROFILE - CEDAR BRUSH COURT
SHEET 5	PLAN & PROFILE - CREEK BRUSH DRIVE & BRUSH TOP ROAD
SHEET 6	PLAN & PROFILE - VOLLMER ROAD
SHEET 7	VANDERWOOD ROAD STORM DRAIN AND INLETS
SHEET 8	SIGNAGE AND STRIPING PLAN

PROJECT DATUM
VERTICAL - NATIONAL GEODETIC VERTICAL DATUM 1929 (NGVD29)
HORIZONTAL - NORTH AMERICAN DATUM 1983 (NAD83)
CONTROL - COLORADO STATE PLANE CENTRAL ZONE

STATEMENT:

THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN; THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY. RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STREET DESIGN:
REVIEW:
TRAFFIC ENGINEERING: _____ DATE: _____
CURB & GUTTER: _____ DATE: 9/18/15
FINAL REVIEW: _____ DATE: _____
DRAINAGE DESIGN:
DRAINAGE REVIEW: _____ DATE: _____
FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

* FULL DEPTH ASPHALT

SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐
Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

ASPHALT THICKNESS:
AC Surface _____
AC Base _____
AGG. BASE THICKNESS:
Class 6 _____
Class 5 _____
Class 2 _____

REVISIONS: NO. | DATE: | BY: | DESCRIPTION:

APPR'D. BY: | DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

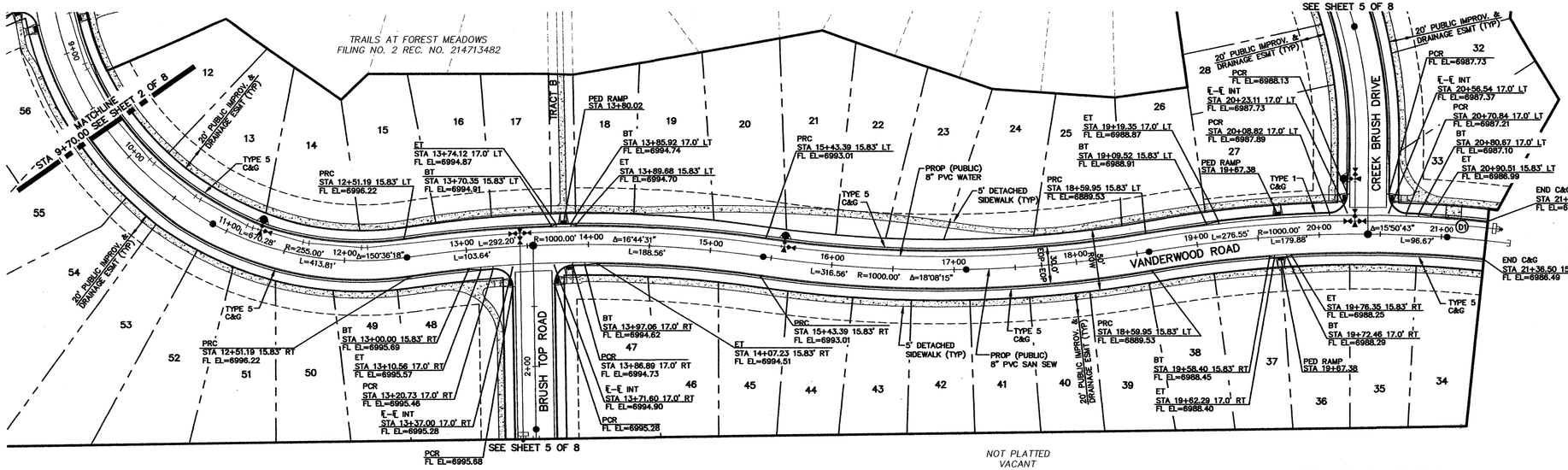
CAUTION

TRAILS AT FOREST MEADOWS FILING NO. 3
STREET IMPROVEMENT PLANS COVER SHEET
PROJECT NO. 08-029 | FILE: \dwg\Cons...Drgs...\Street Improv...\SI01.dwg
DESIGNED BY: GW | SCALE
DRAWN BY: BB | HORIZ: N/A
CHECKED BY: VAS | VERT: N/A
DATE: 8-05-15
SHEET 1 OF 8
SI01

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
M & S CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

21326.20



VANDERWOOD ROAD (VR)

1" = 50'

0 25 50 100

Scale in Feet

STREET ABBREVIATIONS

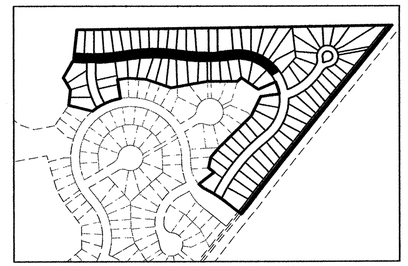
VR	VANDERWOOD ROAD
VR-2	VOLLMER ROAD
CBC	CEDAR BRUSH COURT
BTR	BRUSH TOP ROAD
CBD	CREEK BRUSH DRIVE
DNP	DRY NEEDLE PLACE

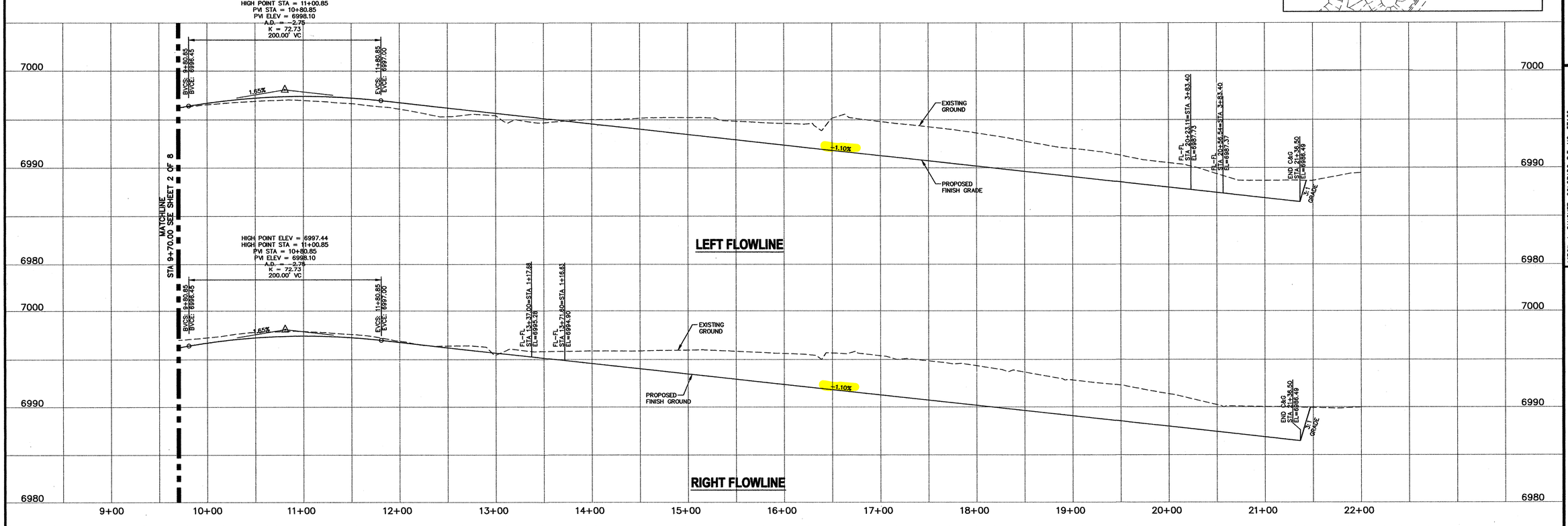
NOTES:

1. ALL CURB RETURN RADIUS SHALL BE 15.00'. CURB RETURNS WILL ALWAYS USE TYPE 1 VERTICAL CURB. WHEN TRANSITIONING FROM RAMP CURB TO VERTICAL CURB A 20 FOOT TRANSITION SHALL BE USED AS FOLLOWS: BEGINNING AT THE P.T.C.R., TEN FEET OF VERTICAL CURB AND 10 FEET OF TRANSITION SECTION.
2. ALL SIDEWALKS SHALL BE 5' WIDE AND DETACHED UNLESS OTHERWISE STATED.
3. ALL CROSS PANS SHALL BE CITY STANDARD D-7 (6' PAN) AS SHOWN.
4. ALL PED RAMPS LOCATED AT INTERSECTIONS SHALL BE CITY STD D-8A AND ALL MID STREET PED RAMPS SHALL BE CITY STD D-8D.
5. DRIVEWAYS FOR LOTS 1, 33, 75, & 87 SHALL BE PER CITY STANDARD D-16

SPECIAL DRIVEWAY LOCATIONS

LOT 33 (D1) 16' DRIVEWAY CUT
STA 20+98.87, 15.83' LT
STA 21+14.62, 15.83' LT





20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CIVIL CONSULTANTS, INC.

TRAILS AT FOREST MEADOWS FILING NO. 3

STREET IMPROVEMENT PLANS ~ VANDERWOOD ROAD

PROJECT NO. 06-029	FILE: \dwg\Cons...Drwn...\STREET IMPR...\SI03.dwg		SI03
DESIGNED BY: GW	SCALE	DATE: 8-05-15	SHEET 3 OF 8
DRAWN BY: BB	HORIZ: 1"=50'		
CHECKED BY: VAS	VERT: 1"=5'		

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPRO. BY:	DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

STATEMENT:

THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN; THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY. RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STREET DESIGN:

REVIEW:

TRAFFIC ENGINEERING: _____ DATE: _____

CURB & GUTTER: [signature] DATE: 9/18/15

FINAL REVIEW: [signature] DATE: 10/29/15

DRAINAGE DESIGN:

DRAINAGE REVIEW: _____ DATE: _____

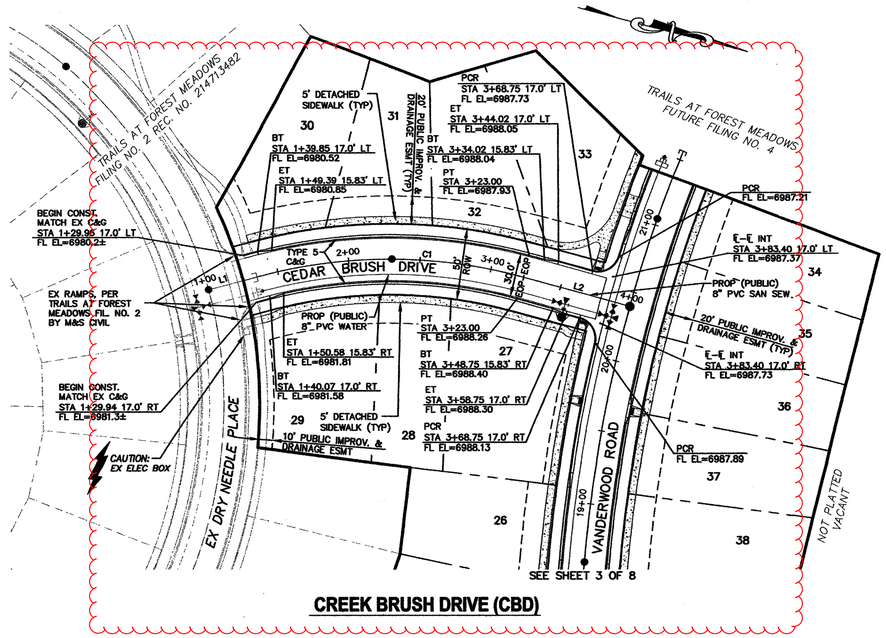
FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

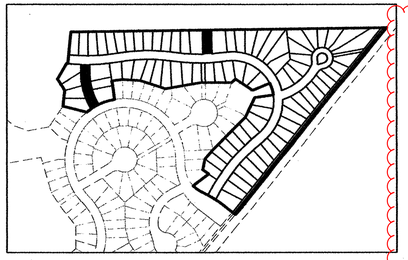
SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐
Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

" FULL DEPTH ASPHALT

ASPHALT THICKNESS: 4"
AC Surface
AC Base
AGG. BASE THICKNESS: 6"
Class 6
Class 5
Class 2



CREEK BRUSH DRIVE (CBD)



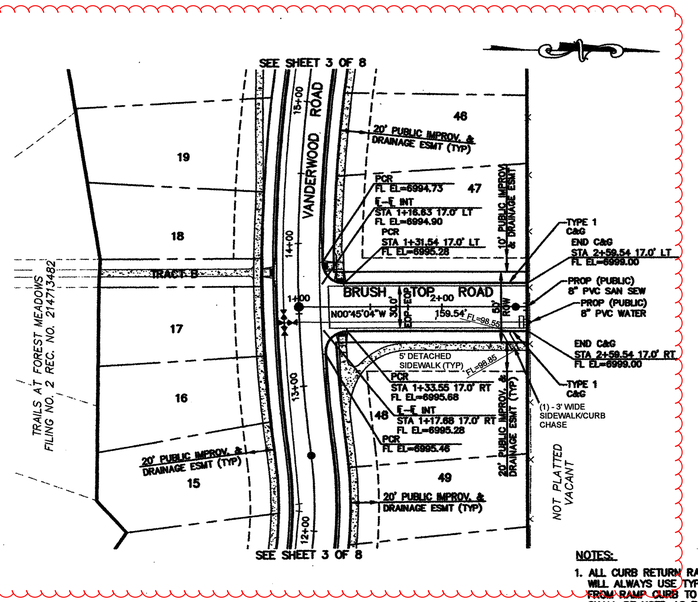
LINE TABLE		
LINE	LENGTH	BEARING
L1	37.44'	N29°53'25"W
L2	77.26'	N00°29'11"E

CURVE TABLE			
CURVE	DELTA	RADIUS	LENGTH
C1	30°22'38"	350.00	185.56'

1" = 50'

0 25 50 100

Scale in Feet



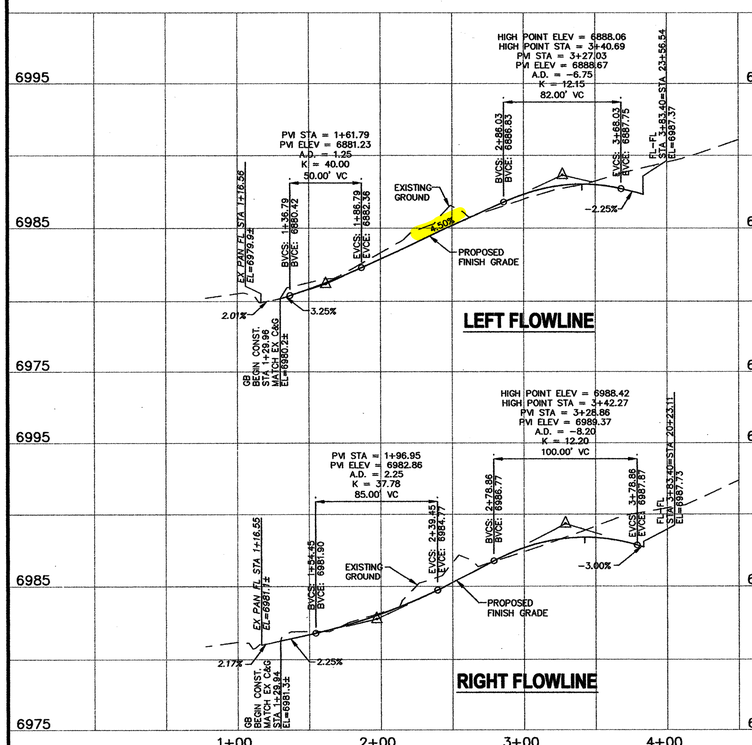
BRUSH TOP ROAD (BTR)

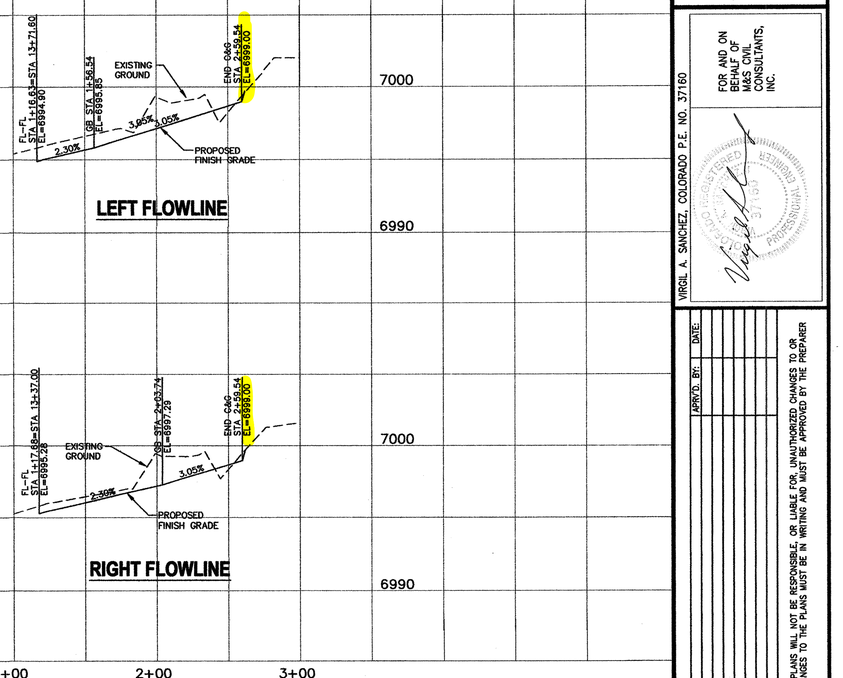
STREET ABBREVIATIONS

VR	VANDERWOOD ROAD
VR-2	VOLLMER ROAD
CBC	CEDAR BRUSH COURT
BTR	BRUSH TOP ROAD
CBD	CREEK BRUSH DRIVE
DNP	DRY NEEDLE PLACE

NOTES:

1. ALL CURB RETURN RADIUS SHALL BE 15.00'. CURB RETURNS WILL ALWAYS USE TYPE I VERTICAL CURB. WHEN TRANSITIONING FROM RAMP CURB TO VERTICAL CURB A 20 FOOT TRANSITION SHALL BE USED AS FOLLOWS: BEGINNING AT THE P.T.C.R., TEN FEET OF VERTICAL CURB AND 10 FEET OF TRANSITION SECTION.
2. ALL SIDEWALKS SHALL BE 5' WIDE AND DETACHED UNLESS OTHERWISE STATED.
3. ALL CROSS PANS SHALL BE CITY STANDARD D-7 (6' PAN) AS SHOWN.
4. ALL PED RAMPS LOCATED AT INTERSECTIONS SHALL BE CITY STD D-8A AND ALL MID STREET PED RAMPS SHALL BE CITY STD D-8D.
5. DRIVEWAYS FOR LOTS 1, 33, 75, & 87 SHALL BE PER CITY STANDARD D-16





STATEMENT:

THE CITY OF COLORADO SPRINGS RECOGNIZES THE DESIGN ENGINEER AS HAVING RESPONSIBILITY FOR THE DESIGN; THE CITY HAS LIMITED ITS SCOPE OF REVIEW ACCORDINGLY. RESUBMITTAL REQUIRED IF CONSTRUCTION HAS NOT COMMENCED WITHIN 180 DAYS AFTER REVIEW DATE.

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STREET DESIGN:
REVIEW:
TRAFFIC ENGINEERING: _____ DATE: -
CURB & GUTTER: _____ DATE: 9/18/15
FINAL REVIEW: _____ DATE: 10/29/15

DRAINAGE DESIGN:
DRAINAGE REVIEW: _____ DATE: _____
FILED IN ACCORDANCE WITH SECTION 7-7-906 OF COLORADO SPRINGS CODE 2001, AS AMENDED.

DESIGN DATA:

SIDEWALKS: WIDTH 5'
LOCATION: Attached ☐ Detached ☐ CENTERED IN 5' EASEMENT
CURB TYPE 1 ☒
CURB TYPE 5 ☒
ROW WIDTH 50' EOP-EOP 30'
STREET TYPE RES HVEEM

" FULL DEPTH ASPHALT
ASPHALT THICKNESS: 6"
AC Surface ____
AC Base ____
AGG. BASE THICKNESS: 11"
Class 6 6
Class 5 ____
Class 2 ____

TRAILS AT FOREST MEADOWS FILING NO. 3

STREET IMPROVEMENT ~ CREEK BRUSH CT/BRUSH TOP RD

PROJECT NO. 08-029 | FILE: \dwg\Cons...Drwn.\Street Improv...\SI05.dwg | DESIGNED BY: GW | DRAWN BY: BB | CHECKED BY: VAS | DATE: 8-05-15 | SCALE HORIZ: 1"=50' VERT: 1"=5' | SHEET 5 OF 8 | SI05

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:	NO.	DATE:	BY:	DESCRIPTION:	APPRVD. BY:	DATE:

THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

TRAILS AT FOREST MEADOWS
FILING NO. 4
FINAL DRAINAGE REPORT

AMENDMENT TO:
MASTER DEVELOPMENT DRAINAGE PLAN UPDATE FOR WOODMEN HEIGHTS AND FINAL DRAINAGE REPORT FOR FOREST MEADOWS FILING NO.1AND NO.4

April 2016

Prepared for:

Challenger Homes, Inc.
13530 Northgate Estates Drive, Suite 200
Colorado Springs, CO 80921
(719) 598-5192

Prepared by:

CIVIL CONSULTANTS, INC.
20 Boulder Crescent, Suite 110
Colorado Springs, CO 80903
(719) 955-5485

Project #08-032

ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0529, effective date March 17, 1997, no portion of the site lies within a designated floodplain.

DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres.

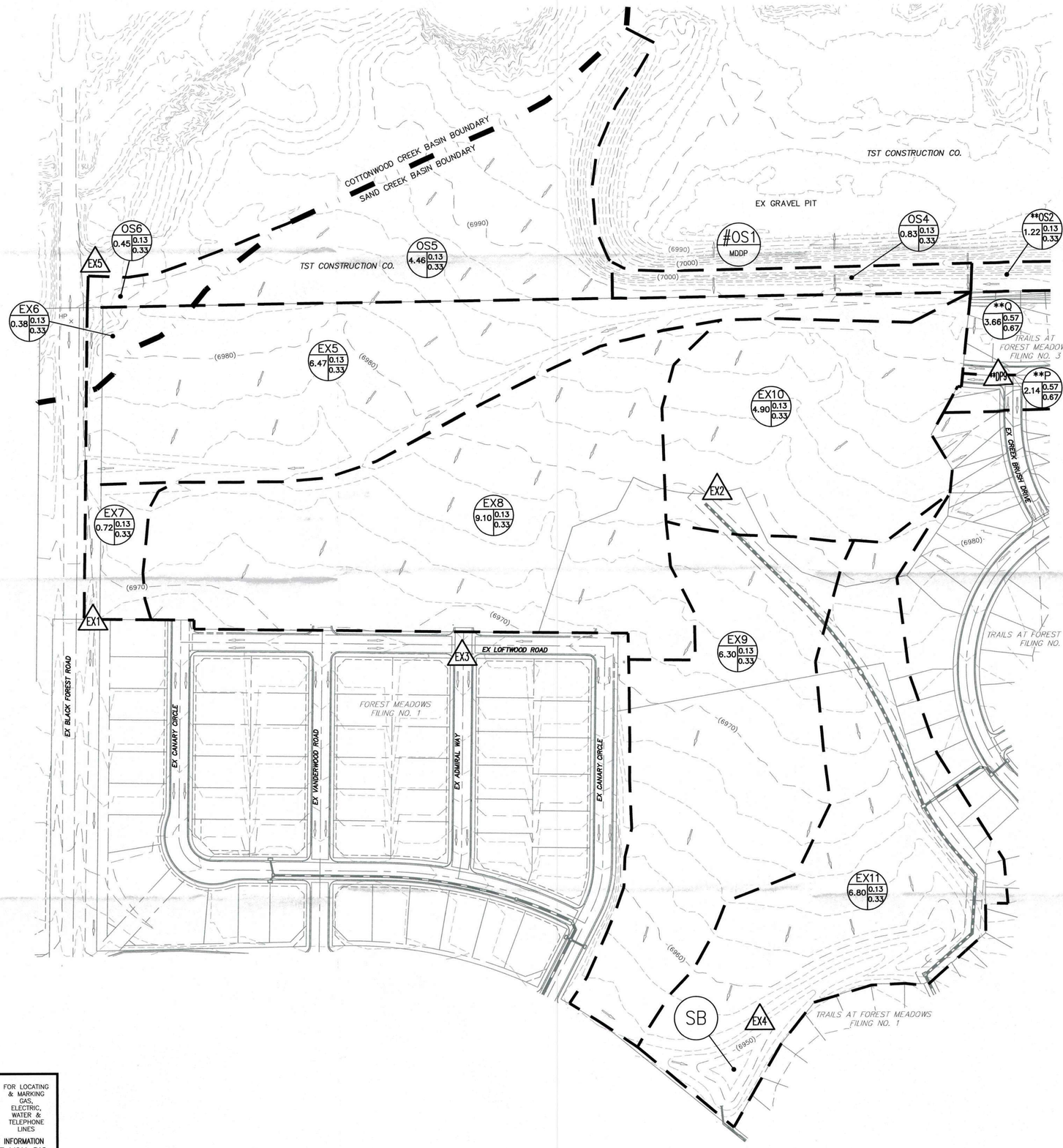
EXISTING DRAINAGE CONDITIONS

The overall site consists of 20.514 acres and is currently undeveloped, with the initial grading project proposed to disturb 20.514 acres for Filing No. 4 residential subdivision. Filing No.4 proposes 90 single family residential lots. All of the streets, curb, gutter, sidewalk and utilities for the development of Vanderwood Road, Oak Vine Court, Salt Brush Road, Leaf Wood Court and Admiral Way, will be constructed in Filing No. 4.

In order to compare past studies, a portion of the drainage basins within this study are denoted by asterisks. The drainage basins labels preceded (or followed) by an single hashtag (#) are referencing watersheds previously illustrated and/or described within the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 & No.4" (MDDP), by Classic Consulting Engineers, & Surveyors, dated February 2006. Those drainage basins labels preceded (or followed) by two asterisks (**) are referencing watersheds previously illustrated and/or described within the "Trails at Forest Meadows Filing No. 3 Final Drainage Report"(TFM 3 FDR), by M&S Civil Consultants, Inc., dated September 2015.

Per review of the existing topographic drainage patterns, the off-site historic flows, north of the property (OSl), are conveyed west by an existing berm and swale to an existing gravel borrow pit, as evident by the eroded embankment at the southeast comer of the gravel borrow pit and evaluation of grade during onsite visits. Per the "Master Development Drainage Plan for Woodmen Heights Master ·Plan" prepared by Classic Consulting Engineers and Surveyors, dated June 2004, it was inferred that the entire watershed (historic flows of Q5=65 cfs and Q100=162 cfs) would be transported to the future detention facility through our site. This report was amended by the "Master Development Drainage Plan Update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No.1 and No. 4" (MDDP) by Engineering and Surveying, Inc., dated February 2006, in which it states that 50% of the flow from OS1 (Q5=34 cfs, Q100==84 cfs) will be collected by a proposed concrete pipe and will be conveyed through and combined with the flows of Trails at Forest Meadows Filings to Sand Creek Regional Detention Facility No. 6. Per historic drainage patterns and per the "Preliminary/Final Drainage Report for Highland Park Filing No.2", prepared by Law and Mariotti Consultants, dated June 2002, which is referenced in the MDDP, the remainder of the flows will be transported via road side swale on the west side of Vollmer Road to the proposed drainage infrastructure in Vollmer Road. The flows on Vollmer Road were addressed in the "Trails at Forest Meadows Filing No. 3 Final Drainage Report"(TFM 3 FDR). Any increase in flows due to future development of Basin OS1 will require the construction of a proposed detention facility, as per the Sand Creek DBPS.

In the interim, Historic flows **OS2-Q_5=0.8 cfs and Q_{100}=3.6 cfs, OS4-Q_5=0.4 cfs and Q_{100}=1.8 cfs, OS5-Q_5=2.1 cfs and Q_{100}=9.0 cfs, EX5- Q_5=1.8 cfs and Q_{100}=7.5 cfs, EX7- Q_5=0.3 cfs and Q_{100}=1.1 cfs, see



1" = 100'

0 50 100 200

Scale in Feet

LEGEND

- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- 6920 — EXISTING CONTOUR
- 6920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET

BASIN DESIGNATION: Z | 25 | .25 / .35 | C5 / C100 (ACRES)

- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 — LOT NUMBER
- 2.5% — STREET GRADE W/DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
#OS1	78	34.4	84.1
**OS2	1.22	0.8	3.6
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
EX5	6.47	1.8	7.5
EX6	0.38	0.2	0.6
EX7	0.72	0.3	1.1
EX8	9.10	3.1	13.3
EX9	6.30	1.7	7.4
EX10	4.90	1.5	6.4
EX11	6.80	1.5	6.3
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9	10.2	22.4	**DP9Q,**DP9P
EX1	3.7	16.7	**OS2,OS4,OS5,EX5,EX7
EX2	11.5	28.5	**DP9,EX10
EX3	3.1	13.3	EX8
EX4	3.0	13.4	EX9,EX11
EX5	0.3	1.2	OS6,EX6

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

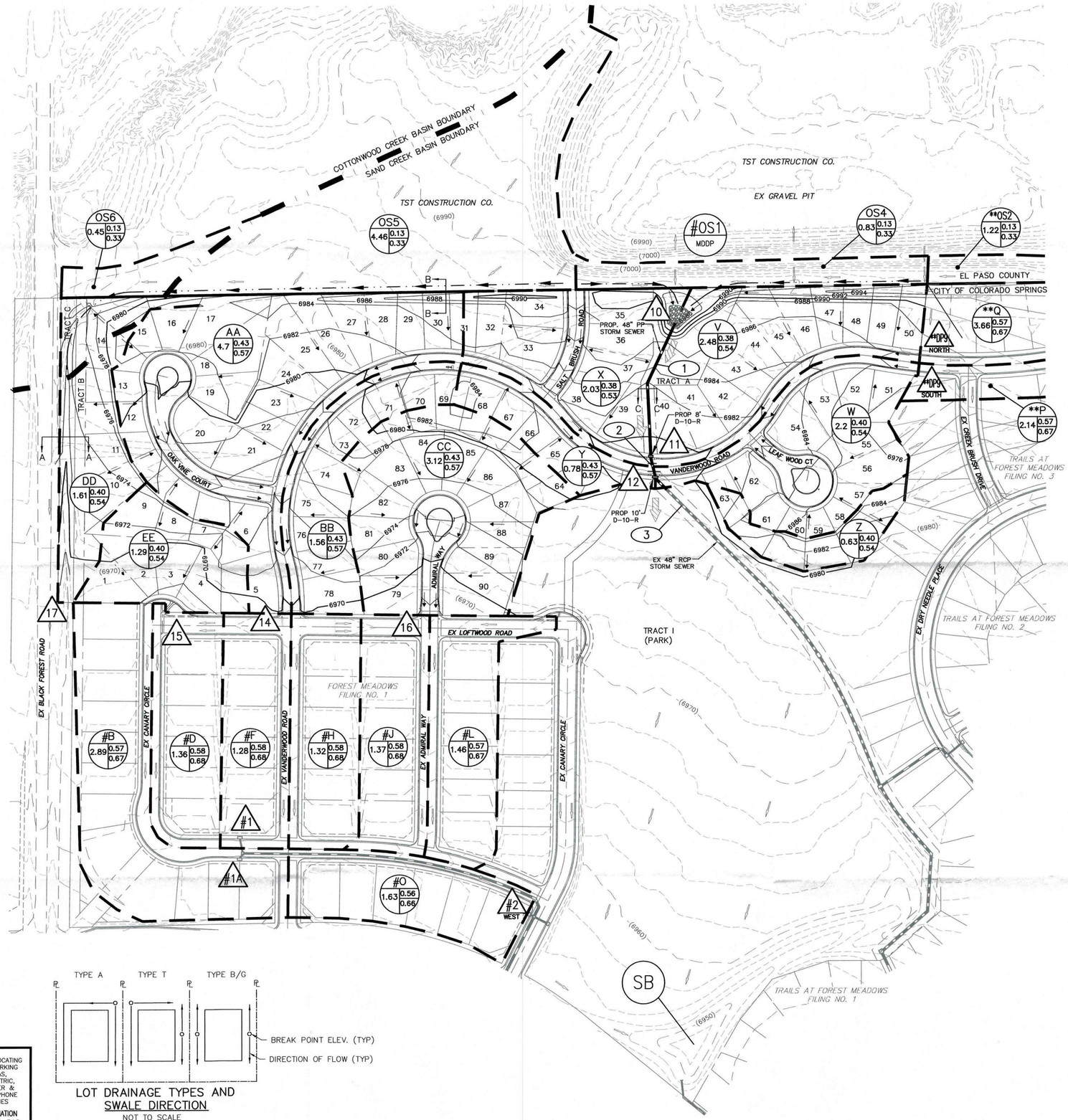
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

TRAILS AT FOREST MEADOWS FILING NO. 4

EXISTING DRAINAGE PLAN

PROJECT NO. 08-032
FILE: \dwg\Eng Exhibits\DP1.dwg
DESIGNED BY: ET
DRAWN BY: BB
CHECKED BY: ET
SCALE
HORIZ: 1"=100'
VERT: N/A
DATE: 3/28/16
SHEET 1 OF 2
DP1

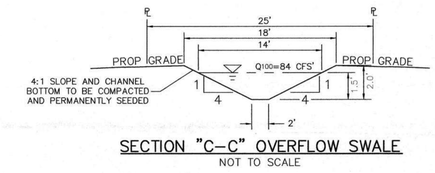


1" = 100'

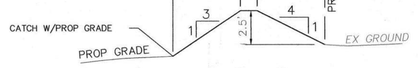
0 50 100 200
Scale in Feet

LEGEND

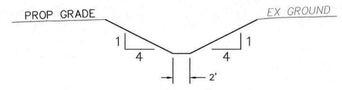
- SB — SEDIMENT BASIN
- 200 — PIPE RUN REFERENCE LABEL
- 2A — SURFACE DESIGN POINT
- BASIN BOUNDARY
- -(6920)- EXISTING CONTOUR
- 6920 PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- BASIN DESIGNATION: Z / 25 / .25 / .35 / C5 / C100 / ACRES
- EXISTING FLOW DIRECTION ARROW
- EMERGENCY OVERFLOW DIRECTION
- FLOW DIRECTION
- FLARED END SECTION
- PERIMETER SWALE
- FILING LINE
- 11 — LOT NUMBER
- 2.5% — STREET GRADE W/DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT



SECTION "C–C" OVERFLOW SWALE
NOT TO SCALE



SECTION "B–B" BERM
NOT TO SCALE



SECTION "A–A" SWALE
NOT TO SCALE

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q5	Q100
V	2.48	3.2	7.6
W	2.20	3.1	7.1
X	2.03	2.7	6.4
Y	0.78	1.2	2.8
Z	0.63	1.2	2.7
AA	4.70	7.2	15.9
BB	1.56	2.4	5.3
CC	3.12	5.1	11.3
DD	1.61	2.6	5.8
EE	1.29	2.3	5.3
OS4	0.83	0.4	1.8
OS5	4.46	2.1	9.0
OS6	0.45	0.1	0.6
#OS1	78.0	34.4	84.1
**OS2	1.22	0.8	3.6
**P	2.14	4.2	8.8
**Q	3.66	6.1	12.8
#B	2.89	6.4	13.4
#D	1.36	3.3	7.0
#F	1.28	3.0	6.3
#H	1.32	3.1	6.5
#J	1.37	3.2	6.8
#L	1.48	3.4	7.0
#O	1.63	3.6	7.6

DESIGN POINT SUMMARY			
DESIGN POINT	Q5	Q100	BASIN
**DP9 NORTH	6.1	12.8	**DP9Q
**DP9 SOUTH	3.6	7.5	**DP9P
10	1.0	4.7	OS4,**OS2
11	11.0	25.2	**DP9Q,V,X
12	7.5	16.8	**DP9P,W,Y
11–12	18.1	41.1	**DP9Q,**DP9P,V,X,W,Y
14	9.4	22.1	AA,BB
15	2.3	5.3	EE
#1&#1A	22.9	50.7	AA,BB,EE,#B,#D,#F,,#H
16	5.0	11.9	CC
#2 WEST	12.9	28.2	CC,#J,#L,#O
17	4.2	14.5	OS5,OS6,DD

STORM SEWER SUMMARY			
PIPE RUN	Q5	Q100	PIPE SIZE
1	34.4	84.1	48" PP
2	41.3	100.0	48" PP
3	45.8	110.0	EX 48" RCP

LOT DRAINAGE TYPES AND SWALE DIRECTION
NOT TO SCALE

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485
CIVIL CONSULTANTS, INC.

TRAILS AT FOREST MEADOWS FILING NO. 4

PROPOSED DRAINAGE PLAN

PROJECT NO. 08-032	FILE: \dwg\Eng Exhibits\DP2.dwg		
DESIGNED BY: ET	SCALE	DATE: 3/28/16	
DRAWN BY: BB	HORIZ: 1"=100'	SHEET 2 OF 2	DP2
CHECKED BY: ET	VERT: N/A		

URS
CONSULTANTS
MAKING
TECHNOLOGY
WORK™



Cottonwood Creek Drainage Basin Planning Study

City of Colorado Springs and El Paso County

APPENDIX B

SUPPORTING DOCUMENTATION

JUNE 9, 1994

COTTONWOOD CREEK DBPS - TABLE 3

CHANNEL & CULVERT RECOMMENDATIONS

REACH	HEC-1 FLOW w/det. (CFS)	CHANNEL OR CULVERT LENGTH(FT)	EXISTING IMPROVEMENT	RECOMMENDED IMPROVEMENT	TOTAL BOTTOM WIDTH (FT)	TOTAL DEPTH (FT)
21 TO DESIGN POINT 20	11,173	1,800	NATURAL	NATURAL EXCEPT PROVIDE BURIED RIPRAP & GRADE CONTROL AT I-25 BRIDGES ONLY (500'& 2 DROPS)	50	14.0
20 TO DESIGN POINT 19	11,112	2,400	NATURAL	NATURAL EXCEPT PROVIDE GABION WALLS & GRADE CONTROL AT BRIDGES (600') & PORTIONS OF SOUTH BANK (1,550')	40	15.0
19 TO DESIGN POINT 19.2	11,127	1,500	NATURAL	NATURAL EXCEPT PROVIDE GABION WALLS & GRADE CONTROL FOR PORTIONS OF SOUTH BANK (300') & NORTH BANK (500')	40	15.0
19.2 TO DESIGN POINT 19.1	11,127	700	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	40	16.0
19.1 TO DESIGN POINT 18	11,127	1,200	F.LINED	NO IMPROVEMENT REQUIRED	80	12.0
18 TO DESIGN POINT 18.1	10,000	400	P.LINED	NO IMPROVEMENT REQUIRED	115	12.0
18.1 TO DESIGN POINT 17	10,000	2,000	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 12 DROPS)	115	12.0
17 TO DESIGN POINT 17.2	9,837	1,000	P.LINED	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 5 DROPS)	115	12.0
17.2 TO DESIGN POINT 17.1	9,837	1,100	P.LINED	NO IMPROVEMENT REQUIRED	115	9.0
17.1 TO DESIGN POINT 16	9,837	1,000	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 2 DROPS)	100	11.0
16 TO DESIGN POINT 15	9,416	2,500	P.LINED	LOWER CHANNEL BOTTOM BY NATURAL EROSION WITH PHASED BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	150	6.0
15 TO DESIGN POINT 14	8,790	1,400	P.LINED	INCREASE DEPTH OF BURIED RIPRAP LINING ON NORTH SIDE & GRADE CONTROL (WITH 4 DROPS)	150	7.5
14 TO DESIGN POINT 14.1	8,598	1,300	P.LINED	NO IMPROVEMENT REQUIRED	200	8.0
14.1 TO DESIGN POINT 13	8,598	1,000	P.LINED	INCREASE DEPTH OF BURIED RIPRAP LINING ON NORTH SIDE	200	6.5
13 TO DESIGN POINT 13.2	4,702	2,000	P.LINED	NEED BURIED RIPRAP LINING ON SOUTH SIDE & GRADE CONTROL (WITH 3 DROPS)	200	5.0
13.2 TO DESIGN POINT 13.1	4,702	1,100	P.LINED	NEED BURIED RIPRAP LINING ON SOUTH SIDE & GRADE CONTROL (WITH 3 DROPS)	105	7.0
13.1 TO DESIGN POINT 12	4,702	2,300	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 5 DROPS)	105	7.0
12 TO DESIGN POINT 11	4,026	5,500	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 16 DROPS)	80	8.0
11 TO DESIGN POINT 10	3,008	1,100	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 3 DROPS)	80	6.5
10 TO DESIGN POINT 9	2,531	1,800	NATURAL	NATURAL BOTTOM WITH BURIED RIPRAP BANKS & GRADE CONTROL (WITH 4 DROPS)	80	6.5
9 TO DESIGN POINT 8	2,332	3,000	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 10 DROPS)	80	6.5
8 TO DESIGN POINT 7	1,715	3,500	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 12 DROPS)	80	5.0
7 TO DESIGN POINT 6	854	3,500	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 9 DROPS)	50	4.5
6 TO DESIGN POINT 5	673	7,000	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 12 DROPS)	50	4.0
5 TO DESIGN POINT 4	870	3,000	VEG. LINING	GRADE CONTROL (7 DROPS)	50	4.0
4 TO DESIGN POINT 3	467	3,500	VEG. LINING	GRADE CONTROL (12 DROPS)	20	4.5
3 TO DESIGN POINT 2	335	3,500	VEG. LINING	GRADE CONTROL (11 DROPS)	20	4.0
2 TO DESIGN POINT 1	114	2,300	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 5 DROPS)	20	3.0
T4B TO DESIGN POINT 19G	528	1,700	STORM/NAT.	STORM SEWER FROM EXISTING 48" CMP OUTLET DOWNSTREAM TO MAIN CHANNEL	72" RCP	N/A
19E TO DESIGN POINT 19F	1,560	2,400	CONCRETE	NO IMPROVEMENT REQUIRED	12	6.0
19D TO DESIGN POINT 19E	1,285	3,400	CONCRETE	NO IMPROVEMENT REQUIRED	13	6.0
19B TO DESIGN POINT 19C	810	2,800	CONCRETE	NO IMPROVEMENT REQUIRED	5	5.0
Q1 TO DESIGN POINT 19A	390	2,200	72" PIPE	PARALLEL PIPE (1,650')	36" RCP	N/A
T4A TO DESIGN POINT 18A	260	1,200	48" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
17A TO DESIGN POINT 17	312	1,000	66" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
T2 TO DESIGN POINT 17A	205	1,200	NATURAL	STORM SEWER	48" RCP	N/A
P2 TO DESIGN POINT 16C	368	2,300	48" PIPE	NO IMPROVEMENT REQUIRED	N/A	N/A
M4 TO DESIGN POINT 16B	492	2,400	P.LINED	NO IMPROVEMENT REQUIRED	N/A	N/A
M3 TO DESIGN POINT 16	291	1,400	36" PIPE	PARALLEL PIPE (1,250')	30" RCP	N/A
M1 TO DESIGN POINT 14C	513	3,000	48" PIPE	PARALLEL PIPE (2,000')	48" RCP	N/A
O1 TO DESIGN POINT 14B	426	3,700	48" PIPE	PARALLEL PIPE (2,600')	48" RCP	N/A
L1 TO DESIGN POINT 14A	371	1,700	42" PIPE	PARALLEL PIPE (1,700')	36"/42" RCP	N/A
J1 TO DESIGN POINT 13S	425	3,100	42" PIPE	PARALLEL PIPE	48" RCP	N/A
13Q TO DESIGN POINT 13R	1,058	750	NATURAL	NATURAL BOTTOM WITH GRASS/SHRUB BANKS & GRADE CONTROL (WITH 1 DROP)	75	4.0

COTTONWOOD CREEK DBPS - TABLE 4
BRIDGE RECOMMENDATIONS

LOCATION	HEC-1 FLOW w/det. (CFS)	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT
CDOT BRIDGES			
I-25 (DP 21)	11,173	BRIDGE, T=137,B=113,D=18	REPL. BRIDGES (8 LANES), 2 @ 70' WIDE X 140' LONG
I-25 (DP 31)	5,613	BRIDGE, T=189,B=39,D=43	REPL. BRIDGES (8 LANES), 2 @ 70' WIDE X 190' LONG
CITY BRIDGES			
CORPORATE DRIVE (DP 21)	11,173	BRIDGE, T=123,B=61,D=15.8	NO IMPROVEMENT REQUIRED
VINCENT DRIVE (DP 20)	11,112	BRIDGE, T=209,B=53,D=33.5	REPL. BRIDGE (6 LANE ART.), 107' WIDE BY 210' LONG
CURRENT ACCESS RD (DP 20)	11,112	HORSESHOE - 2 @ 22' x 22'	NO IMPROVEMENT REQUIRED
ACADEMY BLVD (DP 18)	10,000	CBC - 5 @ 20' x 9'	NO IMPROVEMENT REQUIRED
UNION BLVD (DP 16)	9,416	CBC - 7 @ 12' x 6'	REPL. BRIDGE (6 LANE ART.), 107' WIDE BY 150' LONG
RANGEWOOD DRIVE (DP 13)	7,844	CM ARCH - 4 @ 25.5' x 13'	NO IMPROVEMENT REQUIRED
WOODMEN ROAD (DP 12)	4,026	BRIDGE - 118' x 22'	REPL. BRIDGE (8 LANE ART.), 143' WIDE BY 200' LONG
AUSTIN BLUFFS (DP 12)	4,026	N/A	REPL. BRIDGE (8 LANE ART.), 143' WIDE BY 200' LONG
POWERS BLVD (DP 9)	2,332	N/A	TRIPLE 10' X 9' CBC (360')
DUBLIN BLVD (DP 13O)	2,414	CMP - 2 @ 132"	ADD PARALLEL 108" CMP
AUSTIN BLUFFS (DP 13J)	3,686	CMP - 2@120"	QUADRUPLE 12' X 9' CBC
RESEARCH PKWY (DP 8G)	1,632	N/A	TRIPLE 14' X 6' CBC
PINE CREEK RD (DP 31)	5,613	BRIDGE, T=185,B=45,D=41	NO IMPROVEMENT REQUIRED
OLD RAILOAD GRADE (DP 31)	5,613	HORSESHOE - 2 @ 25' x 21'	NO IMPROVEMENT REQUIRED
ACADEMY BLVD N (DP SUM13)	2,586	CBC - 10' x 6'	REPLACE WITH TRIPLE 12' X 9' CBC
COUNTY BRIDGES			
BLACK FOREST ROAD (DP 7)	854	BRIDGE, T=40,B=26,D=17	REPL. BRIDGE (5 LANE ART.), 70' WIDE BY 110' LONG

COTTONWOOD CREEK DBPS
RESULTS OF BASIN INVENTORY

TABLE 8

REACH	EXISTING PROTECTION	AVAILABLE/ ADDITIONAL CAPACITY	EROSION CONSIDERATIONS	WETLAND CONSIDERATIONS	WILDLIFE CONSIDERATIONS	COMPATIBILITY W/ UTILITIES	LAND USE COMPATIBILITY	LAND AVAILABILITY	MULTI-USE OPPORTUNITIES	CAPITAL COST PER ALTERNATIVE	MAINTENANCE CONSIDERATIONS PER ALTERNATIVE	SAFETY OR FLOOD PROTECTION CONSIDERATIONS	COMMENTS	CONCLUSIONS
DES. PT. 9 TO DES. PT. 10	NATURAL OR VEGETATED CHANNEL 80 ft + 10:1, 1:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 10 TO 20 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	PROPOSED MAJOR UTILITY MAIN ON NORTH SIDE OF CHANNEL NEEDS TO BE CONSIDERED IN FINAL DESIGN AND ROW REQUIREMENTS	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK PLANNED UTILITY CORRIDOR	FULL LINING = $ 447,000 PARTIAL LINING = $ 313,000 NATURAL = $ [illegible]	MAINTENANCE OF ALTERNATIVE A IS NOT PRACTICAL DUE TO HIGH VELOCITIES AND EROSION = OTHER ALTERNATIVES ARE ACCEPTABLE	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 8 TO DES. PT. 9	NATURAL OR VEGETATED CHANNEL 80 ft + 10:1, 3:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 10 TO 20 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	PROPOSED MAJOR UTILITY MAIN ON NORTH SIDE OF CHANNEL NEEDS TO BE CONSIDERED IN FINAL DESIGN AND ROW REQUIREMENTS	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK PLANNED UTILITY CORRIDOR	FULL LINING = $ 734,000 PARTIAL LINING = $ 469,000 NATURAL = $ 1,882,000	MAINTENANCE OF ALTERNATIVE A IS NOT PRACTICAL DUE TO HIGH VELOCITIES AND EROSION = OTHER ALTERNATIVES ARE ACCEPTABLE	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 7 TO DES. PT. 8	NATURAL OR VEGETATED CHANNEL 80 ft + 10:1, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES MIXED IN ROCK	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED TRAIL CORRIDOR PLANNED LINEAR PARK	FULL LINING = $ 740,000 PARTIAL LINING = $ 500,000 NATURAL = $ 886,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	HIGH VELOCITIES ANTICIPATED - NATURAL ALTERNATIVE MAY NOT BE PRACTICAL SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 6 TO DES. PT. 7	NATURAL OR VEGETATED CHANNEL 80 ft + 10:1, 3:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES MIXED IN ROCK	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 1,120,000 PARTIAL LINING = $ 1,837,000 NATURAL = $ 1,746,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 5 TO DES. PT. 6	NATURAL OR VEGETATED CHANNEL 80 ft + 10:1, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE BOTTOM SIDE-SLOPES MIXED IN ROCK	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 1,148,000 PARTIAL LINING = $ 840,000 NATURAL = $ 1,750,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS	RURAL TYPE SETTING	USE ALTERNATIVE B USE ALTERNATIVE A
DES. PT. 4 TO DES. PT. 5	NATURAL OR VEGETATED CHANNEL 30 ft + 8:1, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 347,000 PARTIAL LINING = $ 484,000 NATURAL = $ 797,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	SLOPE RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 3 TO DES. PT. 4	NATURAL OR VEGETATED CHANNEL 20 ft + 8:1, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 728,000 PARTIAL LINING = $ 526,000 NATURAL = $ 1,316,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 2 TO DES. PT. 3	NATURAL OR VEGETATED CHANNEL 20 ft + 5 TO 8:1, 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 510,000 PARTIAL LINING = $ 456,000 NATURAL = $ 451,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 1 TO DES. PT. 2	NATURAL OR VEGETATED CHANNEL 20 ft + 4 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY NOT JURISDICTIONAL WETLANDS PRESENT CONTACT WITH CORPS OF ENGR. REPRESENTATIVE MAY SURVEY	MOST LIKELY NOT JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 180,000 PARTIAL LINING = $ 242,000 NATURAL = $ 290,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. 5A TO DES. PT. 5	NATURAL OR VEGETATED CHANNEL 20 ft + 8 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MOST LIKELY JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT ARE PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 333,000 PARTIAL LINING = $ 416,000 NATURAL = $ 366,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES	RURAL TYPE SETTING	USE ALTERNATIVE A
DES. PT. B2 TO DES. PT. 6A	NATURAL OR VEGETATED CHANNEL 20 ft + 8 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	MOST LIKELY JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN STAGE	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 438,000 PARTIAL LINING = $ 914,000 NATURAL = $ 876,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE ALTERNATIVE B
DES. PT. C2 TO DES. PT. 8A	NATURAL OR VEGETATED CHANNEL 20 ft + 4 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 233,000 PARTIAL LINING = $ 476,000 NATURAL = $ 799,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE A COMBINATION OF STREETS/STORM SEWER OR STREETS/ROADSIDE DITCH
DES. PT. 8A TO DES. PT. 8B	NATURAL OR VEGETATED CHANNEL 40 ft + 4 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	PARK OR OPEN SPACE LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY	PLANNED OPEN SPACE	FULL LINING = $ 817,000 PARTIAL LINING = $ 809,000 NATURAL = $ 1,326,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	STEEP EXISTING SLOPES - DROPS LESS THAN 300 FT APART VELOCITY RANGE IS ACCEPTABLE FOR ALL ALTERNATIVES 100YR. RUNOFF > 500 CFS		USE ALTERNATIVE B
DES. PT. 8C TO DES. PT. 8D	NATURAL OR VEGETATED CHANNEL 40 ft + 8 TO 2:1 SIDE-SLOPE	CAPACITY AVAILABLE FOR FULL FLOW THROUGH HYDROLOGY VELOCITY= 5 TO 10 FPS	MODERATELY ERODABLE SOIL BOTTOM AND SIDE-SLOPES	LIKELY SOME JURISDICTIONAL WETLANDS ARE PRESENT DETAILED STUDY REQUIRED AT FINAL DESIGN TO DETERMINE EXTENT OF WETLANDS	MAY BE JURISDICTIONAL WILDLIFE CORRIDORS OR HABITAT PRESENT	NO EXISTING OR PROPOSED MAJOR UTILITY MAINS ANTICIPATED	RESIDENTIAL LAND USES NEXT TO FACILITY	ADJACENT PROPERTY UNDEVELOPED NEXT TO FACILITY		FULL LINING = $ 614,000 PARTIAL LINING = $ 776,000 NATURAL = $ 1,196,000	SIMILAR MAINTENANCE CONSIDERATIONS FOR ALL THREE ALTERNATIVES	100YR. RUNOFF 500 CFS = PRACTICAL ALTERNATIVES ARE STORM SEWER SYSTEM OR ROADSIDE DITCHES		USE A COMBINATION OF STREETS/STORM SEWER OR STREETS/ROADSIDE DITCH

NOTE: FINAL RECOMMENDATIONS ARE INCLUDED IN THE DBPS AND REFLECT MINOR CHANGES DUE TO COMMENTS AND/OR MORE DETAILED EVALUATION.

URS CONSULTANTS
MAKING TECHNOLOGY WORK

COTTONWOOD CREEK DBPS - TABLE 12

SUBBASIN TIME OF CONCENTRATION DATA

DATE 18-May-92

		OVERLAND			STREET			PIPE			CHANNEL			ADDED TIMES	USING OVERALL Tc		ACTUAL Tc PICKED	
BASIN	"C"	S(%)	L(FT)	t(MIN)	L(FT)	V(FPS)	t(MIN)	L(FT)	V(FPS)	t(MIN)	L(FT)	V(FPS)	t(MIN)	TOTAL T(MIN)	TOTAL L(MI)	TOTAL T(MIN)	USE T(MIN)	LAG (HR)
A1	0.25	5.0	750	25.0	600	3.0	3.3		7.0	0.0	3800	5.0	12.7	41.0	0.98	17.8	41.0	0.41
A2	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	35.7	0.80	15.3	35.7	0.36
A3	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	37.0	0.87	16.4	37.0	0.37
A4	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	31.7	0.80	12.7	31.7	0.32
A5	0.25	6.0	500	20.0	600	3.0	3.3		7.0	0.0	3600	5.0	12.0	35.3	0.89	15.5	35.3	0.35
A6	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	34.0	0.87	14.4	34.0	0.34
A7	0.25	5.0	500	22.0	600	3.0	3.3		7.0	0.0	3100	5.0	10.3	35.7	0.80	15.3	35.7	0.36
A8	0.25	4.0	500	24.0	600	3.0	3.3		7.0	0.0	3500	5.0	11.7	39.0	0.87	17.8	39.0	0.39
A9	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3200	5.0	10.7	33.0	0.81	13.6	33.0	0.33
A10	0.25	6.0	500	20.0	600	3.0	3.3		7.0	0.0	4000	5.0	13.3	36.7	0.97	16.5	36.7	0.37
A11	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2300	5.0	7.7	29.0	0.64	10.8	29.0	0.29
A12	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2300	5.0	7.7	29.0	0.64	10.8	29.0	0.29
A13	0.25	4.0	500	24.0	600	3.0	3.3		7.0	0.0	2600	5.0	8.7	36.0	0.70	15.1	36.0	0.36
B1	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2800	5.0	9.3	30.7	0.74	12.0	30.7	0.31
B2	0.25	8.0	500	18.0	600	3.0	3.3		7.0	0.0	2700	7.5	6.0	27.3	0.72	11.8	27.3	0.27
B3	0.25	5.0	300	16.0	600	3.0	3.3		7.0	0.0	2800	7.5	6.2	25.6	0.70	13.8	25.6	0.26
B4	0.25	5.0	300	16.0	600	3.0	3.3		7.0	0.0	5000	10.0	8.3	27.7	1.12	19.8	27.7	0.28
B5	0.90	5.0	100	10.0	600	3.0	3.3	750	7.0	1.8	2300	10.0	3.8	19.0	0.71	14.0	19.0	0.19
B6	0.55	4.0	100	10.0	600	3.0	3.3	1650	7.0	3.9	2000	10.0	3.3	20.6	0.82	17.1	20.6	0.21
B7	0.55	3.0	100	10.0	600	3.0	3.3	8550	7.0	20.4		10.0	0.0	33.7	1.75	34.1	34.1	0.34
B8	0.55	3.0	100	10.0	600	3.0	3.3	6000	7.0	14.3		10.0	0.0	27.6	1.27	26.6	27.6	0.28
B9	0.60	3.0	100	10.0	600	3.0	3.3	3000	7.0	7.1	7000	10.0	11.7	32.1	2.03	38.2	38.2	0.38
C1	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	3500	10.0	5.8	28.2	0.87	14.4	28.2	0.28
C2	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	2400	10.0	4.0	26.3	0.66	11.6	26.3	0.26
C3	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	4300	10.0	7.2	29.5	1.02	16.3	29.5	0.30
C4	0.25	7.0	500	19.0	600	3.0	3.3		7.0	0.0	5000	10.0	8.3	30.7	1.16	17.9	30.7	0.31
C5	0.25	4.0	500	24.0	600	3.0	3.3	6000	7.0	14.3	700	10.0	1.2	42.8	1.48	26.8	42.8	0.43
C6	0.50	3.0	100	10.0	600	3.0	3.3	3600	7.0	8.6	2000	10.0	3.3	25.2	1.19	25.4	25.4	0.25
C7	0.50	5.0	100	10.0	600	3.0	3.3	4500	7.0	10.7	3000	10.0	5.0	29.0	1.55	25.5	29.0	0.29

COTTONWOOD CREEK DBPS - TABLE 13
URS PROJECT NUMBER 49209
SUMMARY OF ALTERNATIVE CONSTRAINTS

AREA 5

COTTONWOOD CREEK MAIN CHANNEL
BLACK FOREST ROAD TO EAST SIDE OF THE BASIN

100-YEAR FLOW RANGES FROM LOW TO 1,500 CFS
100-YEAR VELOCITY RANGES FROM 5 TO 8 FPS

DESCRIPTION

The existing channel in this area transitions from the deeply incised channel characteristic of area 4 to numerous small tributaries in the Black Forest area. The channel varies in width from 20 to 80 feet. The capacity is available to handle the 100-year storm. This area predominantly has herbaceous wetlands where they are present with some shrub wetlands. The potential for wetlands is high with a significant amount of open water but it has been grazed and disturbed. The wildlife habitat has realtively high beta diversity along the channel but is not very significant away from the channel. The land uses planned for this area transition from urban residential densities by Black Forest Road to rural five acre lot densities in the Colorado Black Forest. The soils in this area include some sandstone and claystone outcrops with the majority being glacial deposits. The area in the forest will be difficult to maintain with heavy construction equipment since there is limited access available.

ALTERNATIVE	ADVANTAGES OF ALTERNATIVE	DISADVANTAGES OF ALTERNATIVE
ALTERNATIVE A	The right-of-way is available for this type of channel since the planned densities are low Limited permitting involved - only for bridges, grade control where needed, isolated bank protection and maintenance considerations Limited mitigation required only for any new bridges planned	Downcutting of the streambed and bank erosion may be a problem High maintenance costs may be involved due to the erodable nature of the soils and the access difficulties
ALTERNATIVE B	Minimal right-of-way requirements beyond the existing channel width Use of drop structures could actually enhance the diversity of the wetland types and wildlife habitat Able to control erosion problems that are occurring May be able to improve aesthetics with this treatment	May require some removal and replacement of existing vegetation Some onsite mitigation may be required Some disturbance of wetlands will occur during construction May have some problems with actually constructing this type of facility in the forest area
ALTERNATIVE C/D		This alternative was eliminated due the the difficulties with construction and mitigation

RECOMMENDATIONS

For this area the recommended solution is a combination of alternatives A and B. Alternative B would be used mostly in the westerly portion of the basin in order to transition from the reach downstream and alternative A would be used for the remainder of the area.

COTTONWOOD CREEK DBPS - TABLE 16 SHEET 3 OF 19

RATIONAL METHOD - SUBBASIN HYDROLOGIC DATA - PLATTED AREAS

DATE: 18-May-92

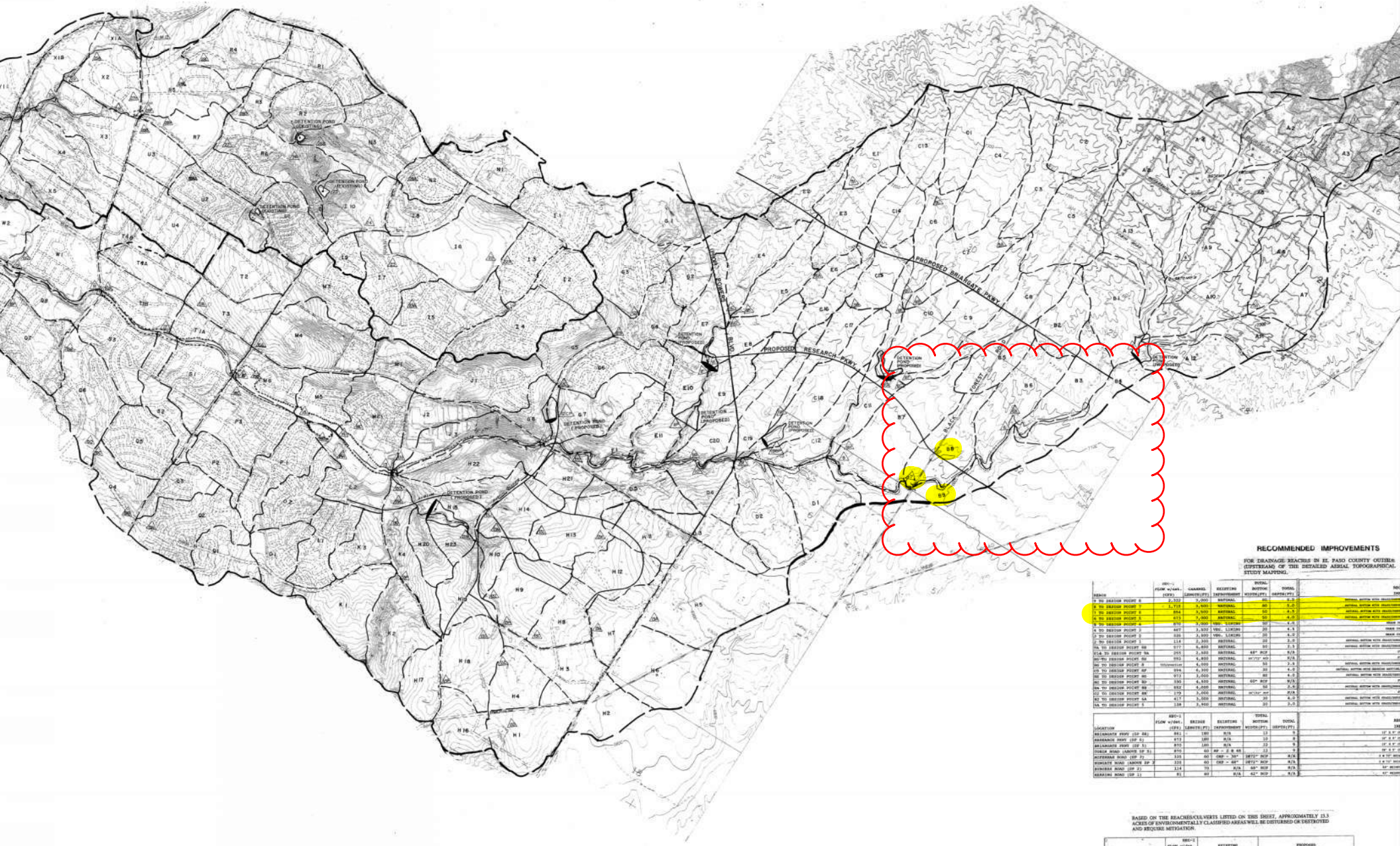
BASIN	HYDROLOGIC SOIL TYPE	PARKS	AVERAGE LAND USE TYPE AND AREA IN ACRES										OVERALL VALUES	
			COMMER OR BUSIN	INDUST	RESID 1/8 AC	RESID 1/6 AC	RESID 1/4 AC	RESID 1/3 AC	RESID 1/2 AC	RESID 1 AC	RESID 5 AC	SCHOOL /CHUR	AREA AC/SM	C
B6	B		0.0		0.0	0.0	9.9						9.9	0.58
	C												0.015	
	D													
B7	B				0.0	0.0	0.0				0.0	0.0	0.0	N/A
	C				0.0	0.0	0.0						0.000	
	D													
B8	B		0.0			0.0							0.0	N/A
	C												0.000	
	D													
B9	B												21.6	0.65
	C					0.0	21.6						0.034	
	D													
C1	B						0.0			38.1	0		38.1	0.40
	C												0.060	
	D													
C2	B									0.0	0.0		0.0	N/A
	C												0.000	
	D													
C3	B						0.0			0.0	2.0		2.0	0.20
	C												0.003	
	D													
C4	B						0.0			0.0	2.0	0.0	2.0	0.20
	C												0.003	
	D													
C5	B						0.0			0.0	37.2		37.2	0.20
	C												0.058	
	D													

COTTONWOOD CREEK DBPS - TABLE 17 SHEET 3 OF 19

RATIONAL METHOD - SUBBASIN HYDROLOGIC DATA - UNPLATTED AREAS

DATE: 18-May-92

BASIN	HYDROLOGIC SOIL TYPE	PARKS	AVERAGE LAND USE TYPE AND AREA IN ACRES										OVERALL VALUES	
			COMMER OR BUSIN	INDUST	RESID 1/8 AC	RESID 1/6 AC	RESID 1/4 AC	RESID 1/3 AC	RESID 1/2 AC	RESID 1 AC	RESID 5 AC	SCHOOL /CHUR	AREA AC/SM	C
B6	B		11.5		24.5	46.3	25.0						107.3	0.65
	C												0.168	
	D													
B7	B				13.5	104.3	21.6				6.4	6.4	190.1	0.63
	C				5.6	28.6	3.7						0.297	
	D													
B8	B		39.4			62.4							101.8	0.73
	C												0.159	
	D													
B9	B												86.4	0.71
	C					64.8	21.6						0.135	
	D													
C1	B						15.6			33.7	17.9		67.2	0.39
	C												0.105	
	D													
C2	B									12.1	86.2		98.3	0.22
	C												0.154	
	D													
C3	B						27.1			49.0	25.5		101.6	0.40
	C												0.159	
	D													
C4	B						53.2			68.8	13.2	5.9	141.1	0.46
	C												0.220	
	D													
C5	B						54.9			45.7	7.8		108.4	0.47
	C												0.169	
	D													



RECOMMENDED IMPROVEMENTS

FOR DRAINAGE REACHES IN EL PASO COUNTY OUTSIDE (UPSTREAM) OF THE DETAILED AERIAL TOPOGRAPHICAL STUDY MAPPING.

REACH	100-YR. FLOW w/det. (CFS)	CHANNEL LENGTH(FT)	EXISTING IMPROVEMENT	TOTAL BOTTOM WIDTH(FT)	TOTAL DEPTH(FT)	REC
9 TO DESIGN POINT 6	2,332	3,000	NATURAL	80	4.0	NATURAL BOTTOM WITH SIDESLOPES
8 TO DESIGN POINT 7	1,716	3,900	NATURAL	80	5.0	NATURAL BOTTOM WITH SIDESLOPES
7 TO DESIGN POINT 8	854	3,500	NATURAL	50	4.5	NATURAL BOTTOM WITH SIDESLOPES
6 TO DESIGN POINT 5	673	7,000	NATURAL	50	4.0	NATURAL BOTTOM WITH SIDESLOPES
5 TO DESIGN POINT 4	870	3,000	VEG. LINING	50	4.5	GRASS
4 TO DESIGN POINT 3	467	1,920	VEG. LINING	20	4.5	GRASS
2 TO DESIGN POINT 3	335	3,500	VEG. LINING	20	4.0	GRASS
3 TO DESIGN POINT 1	114	3,300	NATURAL	20	3.0	NATURAL BOTTOM WITH SIDESLOPES
9A TO DESIGN POINT 9B	977	4,800	NATURAL	50	3.5	NATURAL BOTTOM WITH SIDESLOPES
9C& TO DESIGN POINT 9A	295	2,500	NATURAL	48" RCP	N/A	-
9D TO DESIGN POINT 9A	350	4,800	NATURAL	36"CMP	N/A	-
9E TO DESIGN POINT 9	Tributary	4,000	NATURAL	50	3.0	NATURAL BOTTOM WITH SIDESLOPES
9F TO DESIGN POINT 9F	994	6,300	NATURAL	30	4.0	NATURAL BOTTOM WITH SIDESLOPES
9G TO DESIGN POINT 9G	973	3,000	NATURAL	80	4.0	NATURAL BOTTOM WITH SIDESLOPES
9H TO DESIGN POINT 9D	390	4,500	NATURAL	48" RCP	N/A	-
9A TO DESIGN POINT 9B	852	4,000	NATURAL	50	3.0	NATURAL BOTTOM WITH SIDESLOPES
9J TO DESIGN POINT 8A	179	3,000	NATURAL	36"CMP	N/A	-
9J TO DESIGN POINT 6A	417	3,000	NATURAL	30	4.0	NATURAL BOTTOM WITH SIDESLOPES
9A TO DESIGN POINT 5	158	3,900	NATURAL	30	3.0	NATURAL BOTTOM WITH SIDESLOPES

LOCATION	SEC-1 FLOW w/det. (CFS)	BRIDGE LENGTH(FT)	EXISTING IMPROVEMENT	TOTAL BOTTOM WIDTH(FT)	TOTAL DEPTH(FT)	REC
RESEARCH PKWY (DP 8E)	861	180	N/A	13	9	13' X 9' C
RESEARCH PKWY (DP 6)	673	180	N/A	10	8	10' X 8' C
BRIARGATE PKWY (DP 5)	870	180	N/A	23	9	23' X 9' C
FORGE ROAD (ABOVE DP 5)	870	60	60' - 2 @ 48	13	9	28' X 9' C
HOFFMAN ROAD (DP 3)	335	60	CRP - 35°	2872" RCP	N/A	3 @ 72" RCP
SUNCATE ROAD (ABOVE DP 2	335	60	CRP - 45°	2872" RCP	N/A	3 @ 72" RCP
BUNGESS ROAD (DP 2)	114	70	N/A	48" RCP	N/A	48" RCP
HERRING ROAD (DP 1)	81	60	N/A	42" RCP	N/A	42" RCP

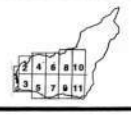
BASED ON THE REACHES/CULVERTS LISTED ON THIS SHEET, APPROXIMATELY 13.3 ACRES OF ENVIRONMENTALLY CLASSIFIED AREAS WILL BE DISTURBED OR DESTROYED AND REQUIRE MITIGATION.

LOCATION	SEC-1 FLOW w/det. (CFS)	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT
CITY BRIDGES			
RESEARCH PKWY.(DP 8E)	1,433	N/A	TRIPLE 14' X 9' CBC
COUNTY BRIDGES			
BLACK FOREST ROAD (DP 7)	834	BRIDGE, 9'+2.5'+9'	REPLACE BOX 3 SPAN MATERIAL, 70' X 110'

LEGEND:

- A1 SUB-BASIN DESIGNATION
- △ DESIGN POINT
- MAJOR BASIN BOUNDARY
- SUB-BASIN BOUNDARY

SHEET INDEX:



MAPPING:

LANDMARK MAPPING

ENGINEER:

URS CONSULTANTS
MAKING TECHNOLOGY WORK
1042 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80906
(719)634-6699

PROJECT:

COTTONWOOD CREEK
OVERALL BASIN MAP
SCALE 1" = 1000'

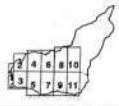


ON THIS FIGURE.

LEGEND:

- RESIDENTIAL < 1/8 AC
- RESIDENTIAL = 1/8 AC
- RESIDENTIAL = 1/4 AC
- RESIDENTIAL = 1/3 AC
- RESIDENTIAL = 1/2 AC
- RESIDENTIAL = 1 AC
- RESIDENTIAL = 2 1/2 AC
- RESIDENTIAL = 5 AC
- OFFICE, COMMERCIAL
- INDUSTRIAL, GOVERNMENT
- SCHOOL & CHURCH
- PARK
- AIR FORCE ACADEMY
- PUBLIC OPEN SPACE

SHEET INDEX:



MAPPING:

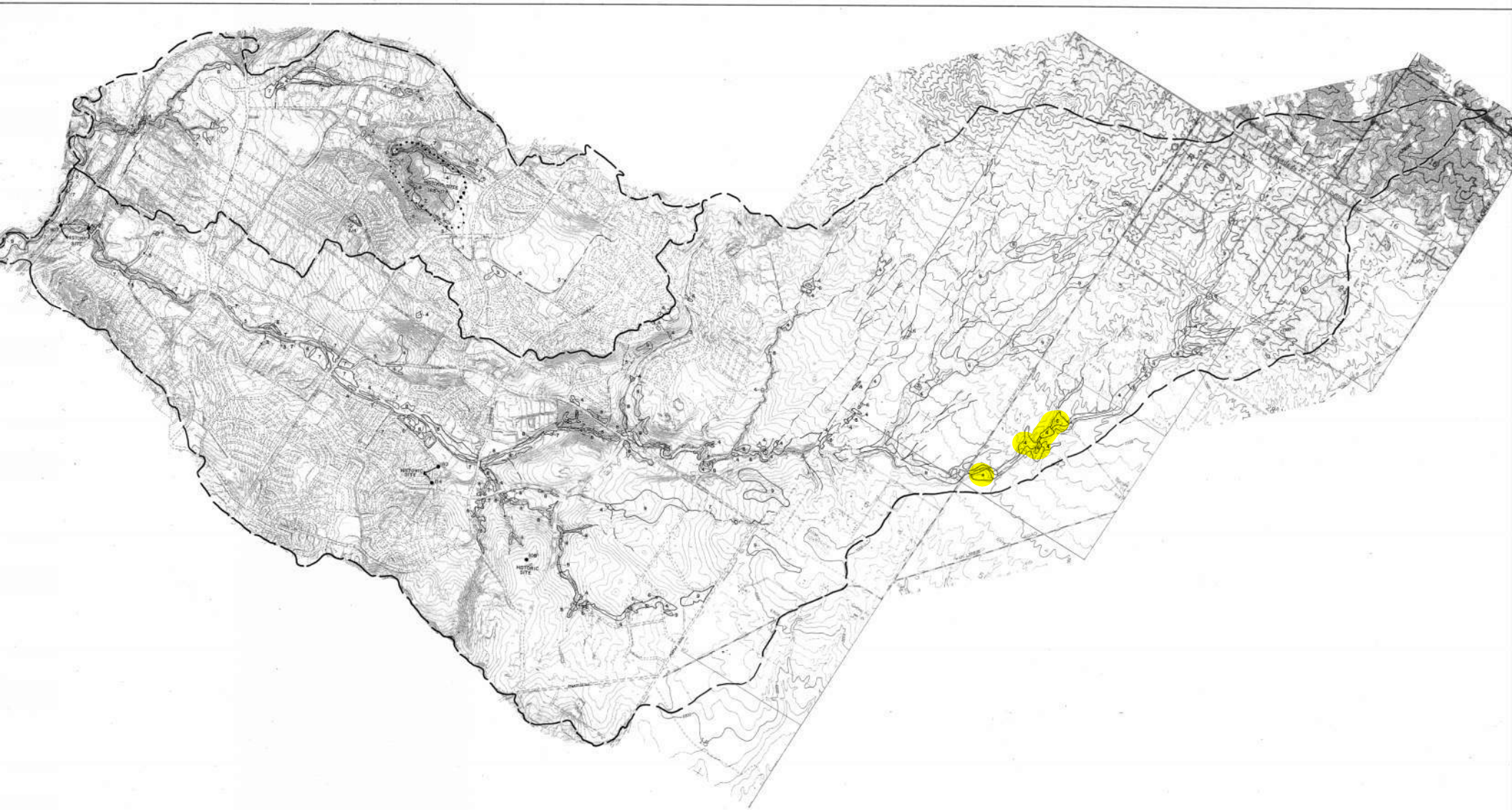
LANDMARK MAPPING

ENGINEER:

URS CONSULTANTS
MAKING TECHNOLOGY WORK
1040 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80905
(719)634-6699

PROJECT:

COTTONWOOD CREEK
LAND USE PLAN
SCALE 1" = 1000'

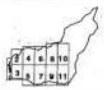


NOTE: CULTURAL/HISTORICAL INVENTORIES ARE ALSO SHOWN ON THIS FIGURE.

LEGEND:
1 AGRICULTURAL CHANNEL – drainage transecting pastures and fields
2 BACKWATER WETLAND – expanded areas of drainage above obstructions
3 ENGINEERED FLOODWAY – concrete lined channels
4 HERBACEOUS WETLAND – marshes, pondmargins and protected places along channels
5 MODIFIED CHANNEL – channelized, eroded (earth bottom)
6 OPEN WATER – ponds, reservoirs (excludes flowing channel)
7 RIPARIAN FOREST – cottonwood and conifers along channel
8 SHRUB WETLAND – willow in and along channel (no tree overstory)
9 PRAIRIE SWALE – low lying grassy and weedy depressions along drainages

NOTE: Drainageways that are not classified have been inventoried but were not considered to be significant in terms of vegetation or wildlife habitat. Examples of this are bare bank & bottom channels, channels incised in rock, or soil, or fully non-modelsheets (storm sewer,etc.)

SHEET INDEX:



MAPPING: LANDMARK MAPPING

ENGINEER: URS CONSULTANTS
MAKING TECHNOLOGY WORK
1040 SOUTH EIGHTH STREET
COLORADO SPRINGS, CO. 80906
(719)634-6699

PROJECT:
COTTONWOOD CREEK DRAINAGE BASIN PLANNI
ENVIRONMENTAL INVENTORY
SCALE: 1 =1000' CONTOUR INTERVAL=2'
FIGURE 5 SHEET











COTTONWOOD CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT
JULY 2019

Prepared for:

Department of Public Works
Water Resources Engineering

City of Colorado Springs
30 S. Nevada Ave
Colorado Springs, CO 80903

Prepared by:

Matrix DESIGN GROUP
AN EMPLOYEE-OWNED COMPANY

LEGEND

- City Boundary
- Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
  ←2-yr & 100-yr Flows
- Detention
- Junction

Source:

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

INTERSTATE 25

FEE BASIN OUTSIDE OF DRAINAGE BASIN

CC OUTLET

SPC OUTLET

FIGURE 3-12
HYDROLOGIC MODEL ELEMENTS
COTTONWOOD CREEK &
SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180628.mxd, 6/29/2018, jeff_donts







SAND CREEK DRAINAGE BASIN PLANNING STUDY

FINAL REPORT

JANUARY 2021

Prepared for:

COLORADO SPRINGS
OLYMPIC CITY USA

STORMWATER ENTERPRISE

Prepared by:

Stantec

HDR Dewberry

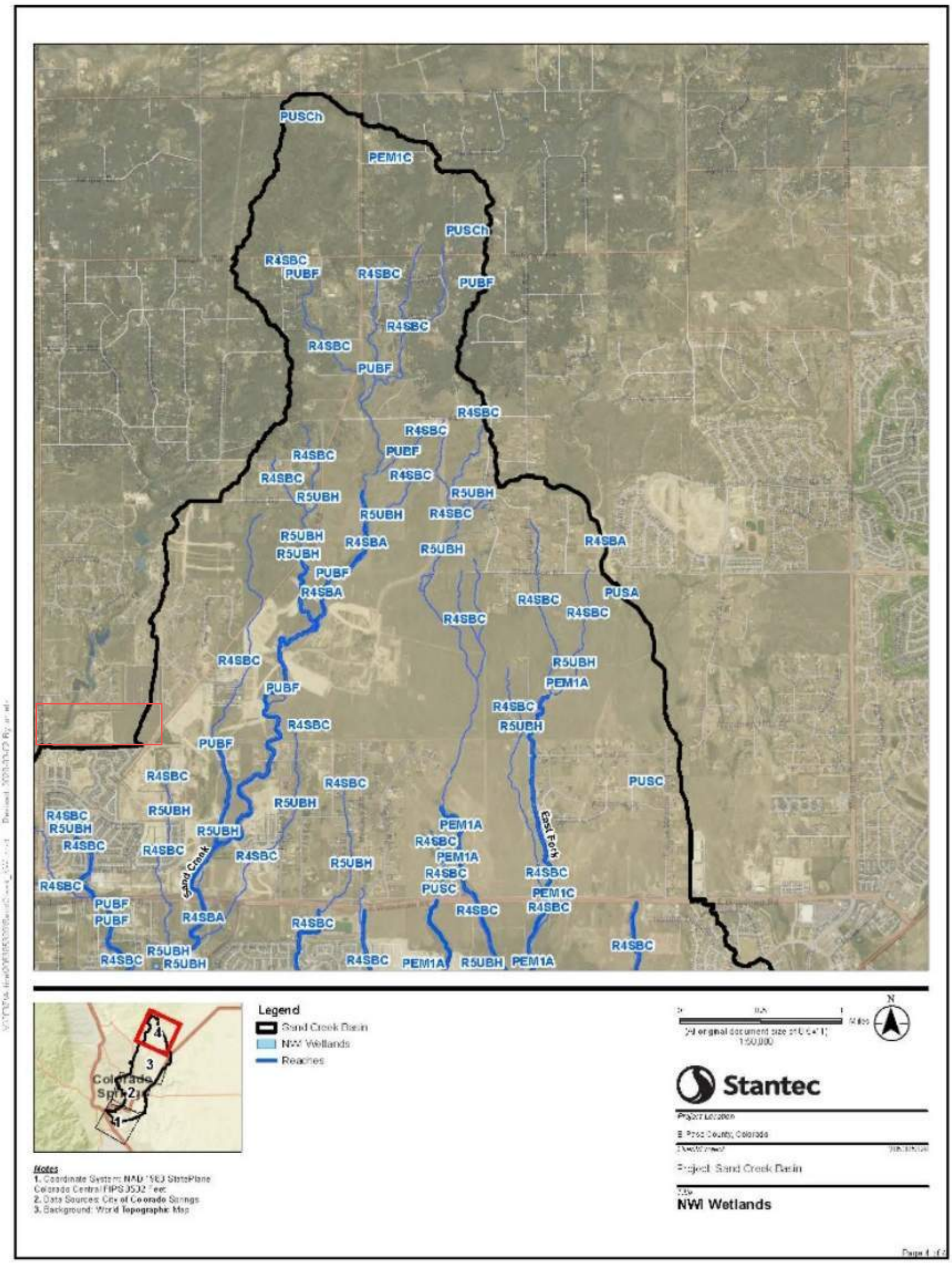


Figure 2-7: NWI Wetlands Located in Sand Creek Drainage Basin (Page 4)

MASTER DEVELOPMENT DRAINAGE PLAN AMENDMENT FOR STERLING RANCH

Prepared For:
SR Land, LLC
20 Boulder Crescent, 2nd Floor
Colorado Springs, CO 80903
(719) 491-3024

March 29th, 2023
Project No. 25188.04

Prepared By:
JR Engineering, LLC
5475 Tech Center Drive
Colorado Springs, CO 80919
(303)-267-6240
Contact: Mike Bramlett, PE

PURPOSE

This document is an amendment to the approved Master Development Drainage Plan (MDDP) for Sterling Ranch. The purpose of this MDDP Amendment report is to:

1. Amend the approved MDDP to account for completed and planned on-site development within Sterling Ranch, including detention from completed filings.
2. Document all differences between the analysis and conclusions reached in the MDDP and this Amendment.
3. Provide analysis and conceptual design information for the on-line Detention Pond at Sterling Ranch Road (PNDW3).
4. This amendment is not intended to address drainage and bridge fees or credits for DBPS improvements. Subsequent submittals will address this.

GENERAL LOCATION AND DESCRIPTION

Location

Sterling Ranch, known as "the site" from herein, is a parcel of land located in Section 27, 28, 33 and 34, Township 12 South, and Section 4, Township 13 South, Range 65 West of the 6th Principal Meridian in El Paso County, Colorado. To the west the site is bound by Vollmer Road. To the north and east, the site is bounded by undeveloped land. To the south, the site is bound by the Pawnee Rancheros and Woodmen Heights developments. A vicinity map is presented in Appendix A.

Description of Property

Sterling Ranch is 1444 acres and is a Planned Unit Development to be built in multiple phases. The site is currently in various stages of development, with portions already in construction, with others unoccupied and undeveloped. The existing ground cover is sparse vegetation and open space, typical of a Colorado rolling range land condition. In general, the site slopes from north to south and the existing drainageways follow this topography.

Per a NRCS web soil survey of the area, the site is made up of Type A and B soils. Type A soils cover roughly 65% of the site while Type B soils cover the remaining 35% of the site. Group A soils have a high infiltration rate when thoroughly wet. Type B soils have a moderate infiltration when thoroughly wet. Type D soils have a very slow infiltration rate when thoroughly wet and have a high shrink-swell potential. A NRCS soil survey map has been presented in Appendix A.

Floodplain Statement

Based on the FEMA FIRM Map numbers 08041C0533G and 08041C0535G, dated December 7, 2018, the site lies within Zone AE and Zone X of the Sand Creek floodplain. Zone AE is defined as area subject to inundation by the 1-percent-annual-chance flood event. Zone X is defined as area outside the Special Flood Hazard Area (SFHA) and higher than the elevation of the 0.2-percent-annual-chance (or 500-year) flood. All proposed development within the site occurs in Zone X. The current FIRM Map has been presented in Appendix A.

DRAINAGE BASINS AND SUBBASINS

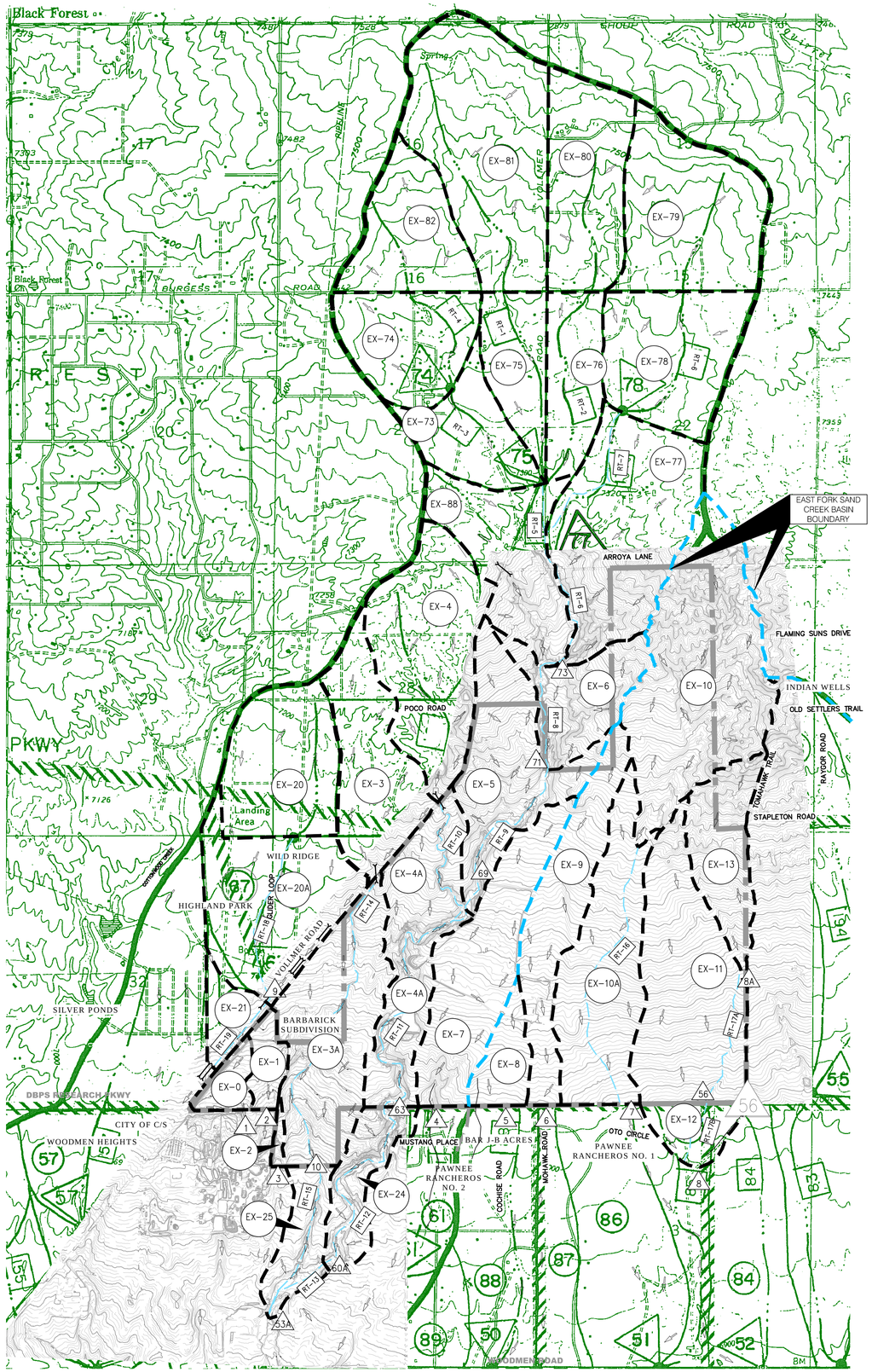
Major Basin Descriptions

The site lies within two major drainage basins: the Sand Creek Drainage Basin and the East Fork of Sand Creek Drainage Basin. Both Basins have been previously studied firstly in the 1996 Drainage Basin Planning Study (DBPS) and again in the 2018 Sterling Ranch MDDP by M&S, and finally in the 2021 DBPS by Stantec which has not been adopted by the El Paso County.

The Sand Creek Drainage Basin covers approximately 22 square miles and begins approximately five miles northeast of the Town of Falcon and travels approximately 15 miles to the southeast. The majority of the area within the basin is undeveloped and is characterized as rolling range land typically associated with Colorado's semi-arid climates. Anticipated land use for the basin includes residential, industrial, agricultural and commercial development. Residential developments will range from 0.125 – 5 acre lots with a mix of low, medium and high density developments.

As part of its drainage research, JR Engineering reviewed the following drainage studies and reports:

- Sand Creek Drainage Basin Study prepared by Kiowa in 1996
- Upper Sand Creek Basin Drainage Study prepared by Wilson in 2011
- Sand Creek Drainage Basin Study prepared by Stantec in 2021
- Sterling Ranch Master Development Drainage Plan prepared by M&S in 2018
- Sterling Ranch Filing 1 Final Drainage report prepared by M&S in 2016
- Upper Sand Creek Basin Detention Evaluation Report by Wilson in 2009
- Branding Iron at Sterling Ranch Filing 1 Drainage Report prepared by M&S in 2018
- Branding Iron at Sterling Ranch Filing 2 Drainage Report prepared by M&S in 2020
- Sterling Ranch East Preliminary Drainage Report prepared by Classic Consultants in 2022



0 600 1200 2400

Scale in Feet

LEGEND

BASIN ID – SC3–77

DESIGN POINT – 87

REACH IDENTIFIER – RT–17A

BASIN BOUNDARY –

EAST FORK SAND CREEK BASIN BOUNDARY –

FLOW DIRECTION –

BASIN SUMMARY

BASIN	CN	AREA (ACRES)	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)
EX–0	62	23.8	0.037	5.0	8.2	13.0	19.6	25.7	32.2
EX–1	62	25.7	0.040	4.8	7.9	12.4	18.7	24.5	30.9
EX–2	62	5.5	0.009	1.1	1.8	2.8	4.3	5.6	7.1
EX–3	62	136.8	0.214	22.0	36.4	57.6	86.9	114.0	143.1
EX–3A	61	188.1	0.294	28.3	47.4	75.7	115.1	152.2	192.6
EX–4	62	192.0	0.300	30.1	49.9	79.1	119.5	157.0	197.3
EX–4A	62	151.5	0.237	24.7	40.8	64.4	97.0	127.2	160.1
EX–5	62	153.9	0.240	24.2	40.0	63.4	95.9	125.9	158.2
EX–6	62	90.2	0.141	15.3	25.5	40.1	60.7	79.9	100.5
EX–7	56	165.0	0.258	11.6	21.5	37.5	60.9	83.1	107.4
EX–8	45	42.0	0.066	0.5	1.7	4.5	9.4	14.5	20.5
EX–9	54	131.9	0.206	12.2	23.9	43.1	70.9	97.0	125.2
EX–10	60	270.7	0.423	32.7	56.0	91.1	140.1	185.9	236.1
EX–10A	41	179.3	0.280	0.6	2.2	7.3	17.4	29.1	43.1
EX–11	43	209.3	0.327	18.0	29.8	47.7	73.4	98.3	126.1
EX–12	51	39.5	0.062	2.2	5.1	10.1	17.7	25.1	33.3
EX–13	55	89.3	0.139	7.7	15.2	27.1	44.2	60.5	78.4
EX–20	62	143.4	0.224	25.4	42.1	66.7	100.7	132.3	166.2
EX–20A	64	179.7	0.281	32.2	51.9	80.5	119.8	155.9	194.6
EX–21	65	33.3	0.052	8.6	13.5	20.7	30.5	39.4	49.0
EX–24	59	63.1	0.099	9.5	16.6	27.5	42.9	57.4	73.0
EX–25	43	54.4	0.085	0.3	1.5	4.8	10.7	17.2	25.1
EX–73	63	90.0	0.141	16.4	26.4	41.3	62.1	81.3	102.0
EX–74	63	119.7	0.187	22.3	36.5	57.3	85.9	112.3	140.7
EX–75	63	79.3	0.124	13.1	21.5	33.7	50.5	66.1	82.8
EX–76	63	86.4	0.135	14.2	23.1	36.4	54.6	71.4	89.6
EX–77	62	230.6	0.360	34.7	56.9	90.6	137.5	180.9	227.7
EX–78	63	155.6	0.243	28.1	45.3	70.6	106.2	139.1	174.5
EX–79	63	189.0	0.295	34.9	57.0	89.5	134.3	175.6	220.1
EX–80	63	147.7	0.231	27.3	44.3	69.6	104.5	136.8	171.4
EX–81	62	262.9	0.411	42.6	70.2	111.0	167.4	219.6	275.7
EX–82	62	117.8	0.184	20.0	33.2	52.8	80.0	105.1	132.3
EX–88	62	139.2	0.217	22.2	36.7	58.0	87.6	115.0	144.4

DESIGN POINT SUMMARY (PEAK FLOW)

DESIGN POINT	AREA (SQ MI)	Q_2 (CFS)	Q_5 (CFS)	Q_{10} (CFS)	Q_{25} (CFS)	Q_{50} (CFS)	Q_{100} (CFS)	LOCATION
DP–74	0.371	39.3	65.3	104.8	158.9	209.1	262.8	
DP–75	1.413	141.2	235.1	376.6	566.6	750.9	950.5	
DP–78	0.538	59.7	98.4	154.0	232.6	306.2	385.3	
DP–73	2.528	225.9	380.7	618.0	957.0	1260.4	1582.3	
DP–71	2.669	229.3	388.9	629.7	978.8	1277.3	1637.9	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	253.0	434.8	707.7	1100.0	1453.3	1870.4	
DP–63	3.446	251.4	430.7	713.1	1113.2	1496.2	1911.5	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	36.5	56.0	106.4	162.9	220.6	287.2	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	55.3	94.3	150.3	227.7	299.5	380.5	VOLLMER/TAHITI DRIVE
DP–9	0.505	52.8	88.8	142.1	214.2	281.0	351.4	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	7.7	15.2	27.1	44.2	60.5	78.4	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	24.2	45.1	77.8	124.4	169.5	220.9	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	32.4	57.1	97.3	156.1	213.8	277.9	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	12.2	23.9	43.1	70.9	97.0	125.2	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.5	1.7	4.5	9.4	14.5	20.5	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	11.6	21.5	37.5	60.9	83.1	107.4	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	1.1	1.8	2.8	4.3	5.6	7.1	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	4.8	7.9	12.4	18.7	24.5	30.9	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	5.0	8.2	13.0	19.6	25.7	32.2	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	247.7	430.2	707.1	1113.0	1496.6	1913.5	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	23.2	42.5	71.9	115.6	157.4	202.9	STERLING RANCH SOUTHERN BNDRY
DP–53A	4.138	262.1	454.0	763.2	1196.5	1609.8	2061.5	SAND CREEK AND POND 3

DESIGN POINT SUMMARY (VOLUME)

DESIGN POINT	AREA (SQ MI)	V_2 (AC–FT)	V_5 (AC–FT)	V_{10} (AC–FT)	V_{25} (AC–FT)	V_{50} (AC–FT)	V_{100} (AC–FT)	LOCATION
DP–74	0.371	5.9	9.0	13.6	19.8	25.5	31.6	
DP–75	1.413	22.7	34.5	51.7	75.4	97.1	120.5	
DP–78	0.538	8.9	13.5	20.1	29.3	37.7	46.7	
DP–73	2.528	40.4	61.5	92.1	134.3	173.1	214.9	
DP–71	2.669	42.5	64.9	97.1	141.6	182.5	226.6	STERLING RANCH NORTHERN BNDRY
DP–69	3.209	50.7	77.4	116.1	169.4	218.6	271.4	
DP–63	3.446	54.1	82.5	123.8	180.8	233.3	289.9	STERLING RANCH SOUTHERN BNDRY
DP–10	0.508	7.6	11.7	17.6	25.8	33.4	41.6	COLORADO SPRINGS/EL PASO BNDRY
DP–9A	0.557	9.3	14.1	21.1	30.7	39.4	48.8	VOLLMER/TAHITI DRIVE
DP–9	0.505	8.4	12.7	19.0	27.6	35.5	44.0	VOLLMER/LOCHWINNOCH LN
DP–8A	0.139	1.3	2.1	3.4	5.2	7.0	8.9	D/S STERLING RANCH EASTERN BNDRY
DP–8	0.528	4.4	7.0	11.1	16.8	22.3	28.4	D/S STERLING RANCH SOUTHERN BNDRY
DP–7	0.703	6.1	10.0	15.9	24.3	32.4	41.3	STERLING RANCH SOUTHERN BNDRY
DP–6	0.206	2.4	4.0	6.3	9.6	12.7	16.0	STERLING RANCH SOUTHERN BNDRY
DP–5	0.066	0.2	0.4	0.8	1.4	1.9	2.6	STERLING RANCH SOUTHERN BNDRY
DP–4	0.258	2.6	4.2	6.7	10.2	13.5	17.2	STERLING RANCH SOUTHERN BNDRY
DP–3	0.009	0.1	0.2	0.3	0.5	0.6	0.8	STERLING RANCH SOUTHERN BNDRY
DP–2	0.040	0.6	0.9	1.4	2.1	2.7	3.4	STERLING RANCH SOUTHERN BNDRY
DP–1	0.037	0.6	0.9	1.3	1.9	2.5	3.1	STERLING RANCH SOUTHERN BNDRY
DP–60A	3.545	55.3	84.4	126.4	184.8	238.5	296.6	FUTURE MARKSHEFFEL X–ING
DP–56	0.466	4.0	6.3	9.9	14.9	19.8	25.1	SAND CREEK AND POND 3
DP–53A	4.138	63.0	96.4	144.7	211.8	273.9	340.9	SAND CREEK AND POND 3

EFSC DBPS DESIGN POINT SUMMARY (PEAK FLOW)

DBPS DESIGN POINT	AREA (SQ MI)	Q_{10} (CFS)	Q_{100} (CFS)
DP–50	0.32	47.0	195.7
DP–51 (BASIN 86)	0.33	17.7	74.1
DP–52	1.67	80.5	456.5
DP–56	0.79	63.6	265.0

Values reported from SCDBPS
(DP 50, 51, 52 Not analyzed as a part of this study)
DBPS Reach 85(Basin91)=Q10=28.8cfs Q100=115.2cfs

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES

FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1–800–922–1987

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

2018 STERLING RANCH MDDP

EXISTING HYDROLOGIC CONDITIONS MAP

PROJECT NO. 09–002
FILE: \dwg\Eng Exhibits\2018–MDDP–ExistCondWSWkMap.dwg
DESIGNED BY: DLM
DRAWN BY: DLM
CHECKED BY: VAS
SCALE
HORIZ: NTS
VERT: NTS
DATE: 08–22–18

DM1

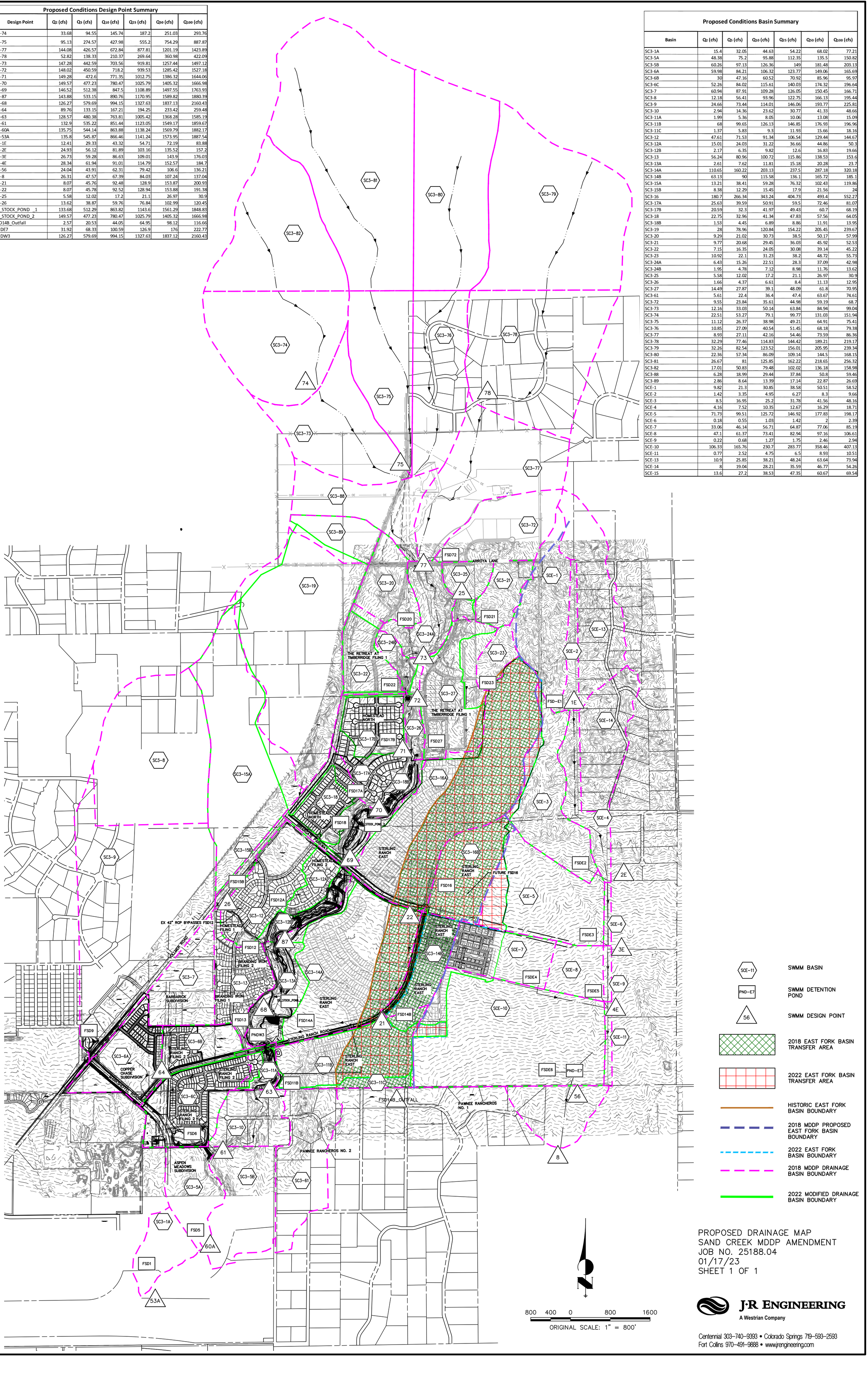
File: Q:\09002A\Sterling Ranch District\dwg\Eng Exhibits\2018 MDDP\2018–MDDP–ExistCondWSWkMap.dwg Printstamp: 11/13/2018 1:52 PM

Proposed Conditions Design Point Summary

Design Point	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DP-74	33.68	94.55	145.74	187.2	251.03	293.76
DP-75	95.13	274.57	427.98	555.2	754.29	887.87
DP-77	144.08	426.57	672.84	877.81	1201.19	1423.89
DP-78	52.82	138.33	210.37	269.64	360.98	422.09
DP-73	147.28	442.59	703.56	919.81	1257.44	1497.12
DP-72	148.02	450.59	718.2	939.53	1285.42	1527.18
DP-71	149.28	472.6	771.35	1012.75	1386.32	1644.06
DP-70	149.57	477.23	780.47	1025.79	1405.32	1666.98
DP-69	146.52	512.38	847.5	1108.89	1497.55	1763.93
DP-87	143.88	533.15	890.76	1170.95	1589.82	1880.39
DP-68	126.27	579.69	994.15	1327.63	1837.13	2160.43
DP-64	89.76	133.15	167.21	194.25	233.42	259.48
DP-63	128.57	480.38	763.81	1005.42	1368.28	1585.19
DP-61	132.9	535.22	851.44	1123.05	1549.17	1859.67
DP-60A	135.75	544.14	863.88	1138.24	1569.79	1882.17
DP-53A	135.8	545.87	866.46	1141.24	1573.95	1887.54
DP-1E	12.41	29.33	43.32	54.71	72.19	83.88
DP-2E	24.93	56.12	81.89	103.16	135.52	157.2
DP-3E	26.73	59.28	86.63	109.01	143.9	176.03
DP-4E	28.34	61.94	91.01	114.79	152.57	184.7
DP-56	24.04	43.91	62.31	79.42	106.6	136.21
DP-8	26.31	47.57	67.39	84.03	107.24	137.04
DP-21	8.07	45.76	92.48	128.9	153.87	200.93
DP-22	8.07	45.78	92.52	128.94	153.88	191.38
DP-25	5.58	12.02	17.2	21.1	26.97	30.9
DP-26	13.62	38.87	59.76	76.84	102.99	120.45
EX_STOCK_POND__1	133.68	512.29	863.82	1143.6	1561.29	1848.83
EX_STOCK_POND_2	149.57	477.23	780.47	1025.79	1405.32	1666.98
FSD14B_Outfall	2.57	20.53	44.05	64.95	98.12	116.66
PNDE7	31.92	68.33	100.59	126.9	176	222.77
PNDW3	126.27	579.69	994.15	1327.63	1837.12	2160.43

Proposed Conditions Basin Summary

Basin	Q_2 (cfs)	Q_5 (cfs)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
SC3-1A	15.4	32.05	44.63	54.22	68.02	77.21
SC3-5A	48.38	75.2	95.88	112.35	135.5	150.82
SC3-5B	60.26	97.13	126.36	149	181.48	203.13
SC3-6A	59.98	84.21	106.32	123.77	149.06	165.69
SC3-6B	30	47.16	60.52	70.92	85.96	95.97
SC3-6C	52.26	84.02	115.61	140.03	174.32	196.64
SC3-7	60.94	87.91	109.28	126.05	150.45	166.71
SC3-8	12.18	56.41	93.96	122.75	166.13	195.44
SC3-9	24.66	73.44	114.01	146.06	193.77	225.81
SC3-10	2.94	14.36	23.62	30.77	41.33	48.66
SC3-11A	1.99	5.36	8.05	10.06	13.08	15.09
SC3-11B	68	99.65	126.13	146.85	176.93	196.96
SC3-11C	1.37	5.83	9.3	11.93	15.66	18.16
SC3-12	47.61	71.53	91.34	106.54	129.44	144.67
SC3-12A	15.01	24.03	31.22	36.66	44.86	50.3
SC3-12B	2.17	6.35	9.82	12.6	16.83	19.66
SC3-13	56.24	80.96	100.72	115.86	138.53	153.6
SC3-13A	2.61	7.62	11.81	15.18	20.28	23.7
SC3-14A	110.65	160.22	203.13	237.5	287.18	320.18
SC3-14B	63.13	90	115.58	136.1	165.72	185.1
SC3-15A	13.21	38.41	59.28	76.32	102.43	119.86
SC3-15B	8.38	12.29	15.45	17.9	21.56	24
SC3-16	180.7	266.34	343.24	404.73	493.4	552.27
SC3-17A	25.63	39.59	50.91	59.5	72.46	81.07
SC3-17B	20.59	32.3	41.97	49.43	60.7	68.19
SC3-18	22.75	32.96	41.34	47.83	57.56	64.05
SC3-18B	1.53	4.45	6.89	8.86	11.91	13.95
SC3-19	28	78.96	120.84	154.22	205.45	239.67
SC3-20	9.29	21.02	30.73	38.5	50.17	57.99
SC3-21	9.77	20.68	29.45	36.03	45.92	52.53
SC3-22	7.15	16.35	24.05	30.08	39.14	45.22
SC3-23	10.92	22.1	31.23	38.2	48.72	55.73
SC3-24A	6.43	15.26	22.51	28.3	37.09	42.98
SC3-24B	1.95	4.78	7.12	8.98	11.76	13.62
SC3-25	5.58	12.02	17.2	21.1	26.97	30.9
SC3-26	1.66	4.37	6.61	8.4	11.13	12.95
SC3-27	14.49	27.87	39.1	48.09	61.8	70.95
SC3-61	5.61	22.4	36.4	47.4	63.67	74.61
SC3-72	9.55	23.84	35.61	44.98	59.19	68.7
SC3-73	12.16	33.03	50.14	63.84	84.94	99.04
SC3-74	22.51	53.27	79.1	99.77	131.03	151.94
SC3-75	11.12	26.37	38.98	49.21	64.91	75.41
SC3-76	10.85	27.09	40.54	51.45	68.18	79.38
SC3-77	8.93	27.11	42.16	54.46	73.59	86.36
SC3-78	32.29	77.46	114.83	144.42	189.21	219.17
SC3-79	32.26	82.54	123.52	156.01	205.95	239.34
SC3-80	22.36	57.34	86.09	109.14	144.5	168.15
SC3-81	26.67	81	125.85	162.22	218.65	256.32
SC3-82	17.01	50.83	79.48	102.02	136.18	158.98
SC3-88	6.28	18.99	29.44	37.84	50.8	59.46
SC3-89	2.86	8.64	13.39	17.14	22.87	26.69
SCE-1	9.82	21.3	30.85	38.58	50.51	58.52
SCE-2	1.42	3.35	4.95	6.27	8.3	9.66
SCE-3	8.5	16.95	25.2	31.78	41.56	48.16
SCE-4	4.16	7.52	10.35	12.67	16.29	18.71
SCE-5	71.73	99.51	125.72	146.92	177.83	198.17
SCE-6	0.18	0.55	1.03	1.42	2	2.39
SCE-7	33.06	46.14	56.71	64.87	77.06	85.19
SCE-8	47.1	61.37	73.41	82.94	97.16	106.61
SCE-9	0.22	0.68	1.27	1.75	2.46	2.94
SCE-10	106.33	165.76	230.7	283.77	358.46	407.13
SCE-11	0.77	2.52	4.75	6.5	8.93	10.51
SCE-13	10.9	25.85	38.21	48.24	63.64	73.94
SCE-14	8	19.04	28.21	35.59	46.77	54.26
SCE-15	13.6	27.2	38.53	47.35	60.67	69.54



PROPOSED DRAINAGE MAP
SAND CREEK MDDP AMENDMENT
JOB NO. 25188.04
01/17/23
SHEET 1 OF 1

J·R ENGINEERING
A Westrian Company

Centennial 303-740-9393 • Colorado Springs 719-593-2593
Fort Collins 970-491-9888 • www.jrengineering.com

APPENDIX F – DRAINAGE MAPS

SCHMIDT PARCEL

EXISTING CONDITIONS DRAINAGE MAP



BASIN SUMMARY TABLE

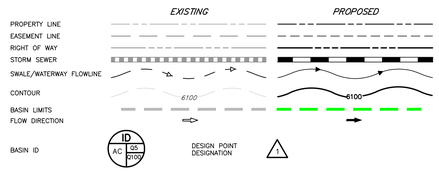
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EXA	0.25	2%	0.09	0.36	51.8	0.0	0.3
EXB	1.51	16%	0.18	0.42	34.8	0.6	2.4
EXC	11.55	2%	0.09	0.36	44.5	2.0	13.2
EXD	21.78	3%	0.10	0.36	48.7	3.7	23.3
EXE	3.96	2%	0.09	0.36	31.9	0.9	5.7
EXF	2.58	2%	0.09	0.36	27.1	0.6	4.1
EXG	39.67	2%	0.09	0.36	62.7	4.9	32.9
EXH	6.67	2%	0.09	0.36	26.6	1.6	10.7
EXI	10.29	2%	0.09	0.36	27.3	2.4	16.3
EXJ	0.33	2%	0.09	0.36	25.7	0.1	0.5
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

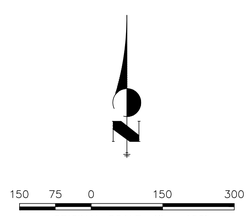
Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.0	0.3
2	0.6	2.4
3	2.0	13.2
4	3.7	23.3
4.1	5.5	35.6
5	0.9	5.7
6	0.6	4.1
7	4.9	32.9
7.1	9.2	60.8
8	1.6	10.7
9	2.4	16.3
10	0.1	0.5
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.





SCHGMIDT PARCEL

EXISTING CONDITIONS DRAINAGE MAP

JOB NO. 24013 | SHEET 1

LOCATION: EPC

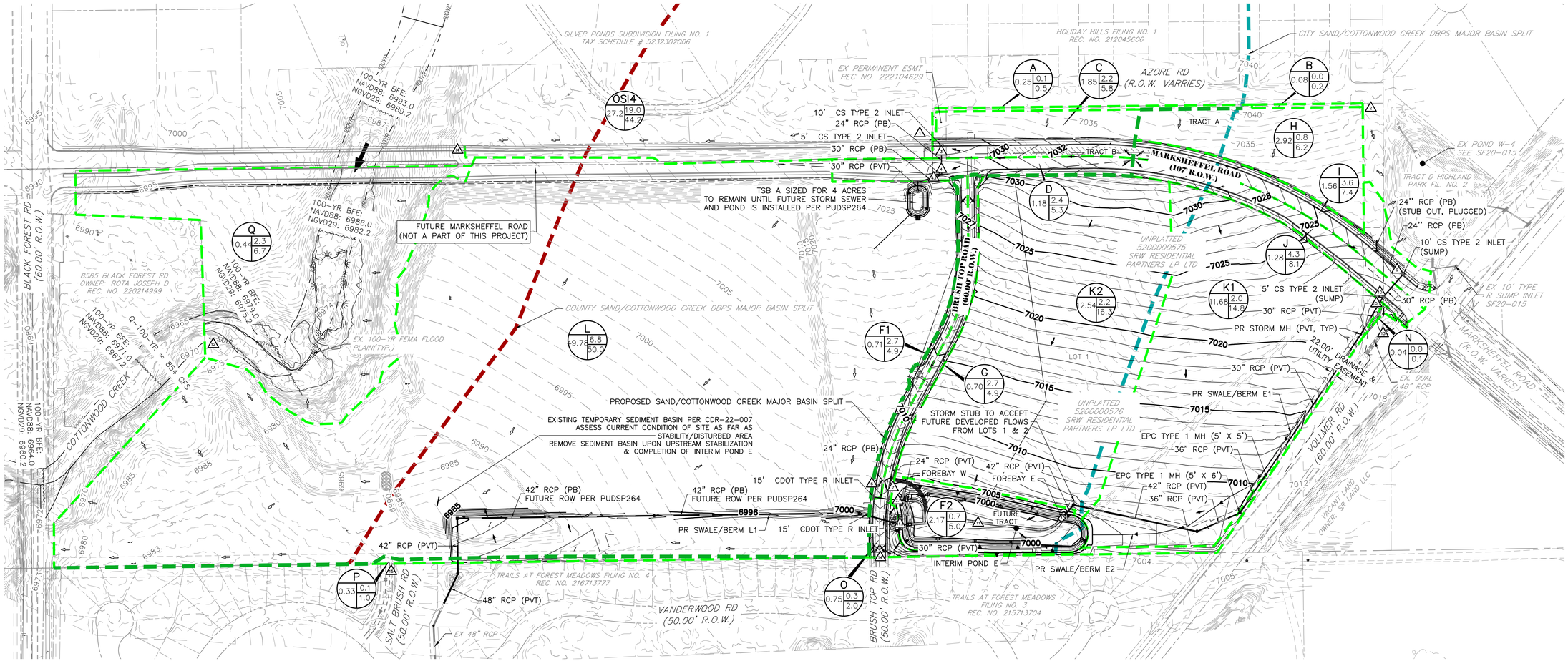
2026-11-06

ALL TERRAIN ENGINEERING

PCD FILE NO: CDR-2413

SCHMIDT PARCEL

PROPOSED CONDITIONS DRAINAGE MAP



	EXISTING	PROPOSED
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
CONTOUR	6100	6100
BASIN LIMITS		
FLOW DIRECTION		

BASIN ID: ID | AC | SD DTOC

DESIGN POINT DESIGNATION: 1

BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	0.25	0%	0.08	0.35	18.2	0.1	0.5
B	0.08	0%	0.08	0.35	8.1	0.0	0.2
C	1.85	31%	0.34	0.54	15.5	2.2	5.8
D	1.18	54%	0.52	0.68	11.5	2.4	5.3
F1	0.70	93%	0.84	0.92	7.4	2.7	4.9
F2	2.17	0%	0.08	0.35	11.7	0.7	5.0
G	0.71	94%	0.85	0.92	8.2	2.7	4.9
H	2.92	0%	0.08	0.35	14.0	0.8	6.2
I	1.56	62%	0.59	0.73	11.9	3.6	7.4
J	1.28	87%	0.79	0.88	9.1	4.3	8.1
K1	11.68	0%	0.08	0.35	37.3	2.0	14.8
K2	12.54	0%	0.08	0.35	36.0	2.2	16.3
L	49.78	0%	0.08	0.35	50.1	6.8	50.0
N	0.04	0%	0.08	0.35	5.0	0.0	0.1
O	0.75	0%	0.08	0.35	8.0	0.3	2.0
P	0.33	0%	0.08	0.35	5.0	0.1	1.0
Q	10.44	0%	0.08	0.35	25.5	2.3	16.7
OSI4	27.16	-	0.30	0.40	29.2	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	0.1	0.5
2	0.0	0.2
3	2.2	5.8
4	2.4	5.3
4.1	4.3	10.4
6	2.7	4.9
7	2.7	4.9
7.1	5.3	9.6
9	4.2	13.1
10	4.3	8.1
10.1	7.8	19.9
11	11.8	50.0
11.1	0.1	4.6
12	10.4	65.6
13	0.0	0.1
14	0.3	2.0
15	0.1	1.0
I4	19.0	44.2

Values in BLUE indicate they are from the "Silver Ponds Subdivision Filing No. 1 Final Drainage Report", by M.V.E. Inc. revised May 5th, 1996.

N

150 75 0 150 300

ORIGINAL SCALE: 1" = 150'

SCHMIDT PARCEL

PROPOSED CONDITIONS DRAINAGE MAP

JOB NO. 24013 | SHEET 1

LOCATION: EPC

2026-10-23

ALL TERRAIN ENGINEERING