

MASTER DEVELOPMENT DRAINAGE PLAN

For

MOUNTAIN VALLEY PRESERVE

6115, 6085 & 6005 Marksheffel Road, Colorado 80817

March 11, 2015

Revised September 1, 2015

Prepared For:

**CHEYENNE MOUNTAIN DEVELOPMENT
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DRAINAGE PLAN STATEMENTS

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 established criteria 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.


Tim D. McConnell, P.E. #33797



Seal

DEVELOPER'S STATEMENT

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

Cheyenne Mountain Development Company, LLC

BY:  _____ 10/6/15
Robert C. Irwin DATE

TITLE: Manager

ADDRESS: P.O. Box 60069
Colorado Springs, CO 80960-0069

CITY OF COLORADO SPRINGS

Filed in accordance with Section 7.7.906.C of the Code of the City of Colorado Springs, 2001, as amended.


For the CITY ENGINEER _____ 10/22/15
DATE

CONDITIONS:

I. INTRODUCTION

A. Purpose

The purpose of this report is to identify major drainage ways, detention areas, locations of culverts, open channels, drainage areas/patterns and runoff quantities which are tributary to Mountain Valley Preserve (MVP). Additionally, the report presents the ability to safely pass developed runoff to downstream drainage facilities.

B. Location and Description

The proposed Mountain Valley Preserve site is located within a portion of the Northwest Quarter of Section 16, Township 13 South, Range 65 West of the Sixth Prime Meridian, El Paso County, Colorado (see Vicinity Map in appendix). The site is located east of Marksheffel Road approximately 600 feet south of Dublin Blvd and contains approximately 37.40 acres.

The site is bounded on the north by Dublin Towne Centre, a future commercial site, on the east by single family residential (County, RR-5, Residential Rural), on the south by single family residential (County, RR-5, Residential Rural), and on the west by Marksheffel Road

The proposed Annexation calls for a change in zoning to PUD (Planned Unit Development) for single family residential development.

The proposed concept plan will provide for approximately 141 single family lots with residential roadways, two on-site stormwater quality (SWQ)/detention ponds and open space.

II. DRAINAGE DESIGN CRITERIA

The drainage analysis is performed in accordance with the current City of Colorado Springs/El Paso County ***Drainage Criteria Manual*** (DCM) and Urban Drainage and Flood Control District (UDFCD) ***Urban Storm Drainage Criteria Manual*** (USDCM).

Calculations were performed to determine existing and proposed runoff quantities during the 5- and 100-year storm for developed conditions using the Rational Method as required for basins containing less than 100 acres.

The Full Spectrum Method of the USDCM was used to determine the proposed detention ponds storage and release rates. As noted in the USDCM, the 100-year detention volume includes WQCV, so there is no need to add more volume for WQCV.

III. HYDROLOGY

A. Existing Drainage Conditions

The site lies within the Sand Creek Drainage Basin. Runoff for the north half of the site collects in a swale that carries it offsite to the east. Runoff for the south half of the site flows into a swale that carries it offsite at the southeast corner of the site. There is a high point at the midpoint of the site on the east side that divides the two existing on-site basins. Under existing conditions, storm runoff from the property flows off-site un-detained. Native grasses and vegetation cover the site. See existing conditions map in appendix.

The Sand Creek Drainage Basin Planning Study (DBPS) shows a proposed land use for the site as agricultural/ranchette (5 Ac+), 5-20% imperviousness. The existing site condition's imperviousness is within the DBPS noted range.

Basin A is a 17.37 acre basin located at the north half of the site. This basin area is designated as Pasture/Meadow. The basin includes a natural channel starting in the northwest corner of the basin and leaving the site midway on the east side of the basin. The 5-year storm flow is $Q_5=3.5$ cfs and the 100-year storm flow is $Q_{100}=27.0$ cfs.

Basin B is a 20.05 acre basin located at the south half of the site. This basin area is designated as Pasture/Meadow. This basin drains to an existing livestock pond near the southeast corner, where it fills and overtops, leaving the site via the spillway at the southeast corner of the site. The 5-year storm flow is $Q_5=3.5$ cfs and the 100-year storm flow is $Q_{100}=27.4$ cfs.

B. Proposed Drainage Conditions

The developed site has been divided into twenty one (21) on-site basins and seven (7) off-site basins that contribute runoff to the site. A description of each of the basins, design points and contributing runoff is provided below.

The existing off-site runoff from Banning Lewis Ranch Pond 93 is discharged from a 42" RCP storm sewer pipe north of the site, between Marksheffel Rd and Dublin Towne Centre and will be carried onto the proposed site via a channel on the west side of the site and into the onsite north Detention Pond 1. The Dublin Towne Centre detention pond will not be designed to detain or provide water quality capture volume for the off-site runoff. The developed peak runoff rates for Dublin Towne Centre are $Q_5=24.94$ cfs and $Q_{100}=42.09$ cfs. And the release rate from the pond will be 4.33 cfs and will discharge at the northwest corner of the MVP property into the same channel mentioned above.

Basin A is a 2.32 acre basin located at the north end of the site. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=2.9$ cfs and the 100-year storm flow is $Q_{100}=6.7$ cfs and flows to DP-1.

Design Point 1 (DP-1) is located at the north side of the intersection of Anders Ridge Lane and Ainsley Park Place where a cross pan will direct the flows southward across the intersection. These flows are $Q_5=2.9$ cfs and $Q_{100}=6.7$ cfs and flow to DP-2.

Basin B is a 0.61 acre basin located to the south and east of Basin A. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=0.8$ cfs and the 100-year storm flow is $Q_{100}=1.8$ cfs and flows to DP-2.

Design Point 2 (DP-2) is located at the south side of the intersection of Anders Ridge Lane and Ainsley Park Place where the runoff will continue in the gutter southward. These flows are $Q_5=3.6$ cfs and $Q_{100}=8.5$ cfs and flow to DP-7.

Basin OS1 is a 4.29 acre basin located offsite to the west of Marksheffel Rd north to the intersection with Dublin Blvd. This basin has areas classified as 1/8 acre or less Residential density, Pasture/Meadow, and Asphalt. The 5-year storm flow is $Q_5=7.0$ cfs and the 100-year storm flow is $Q_{100}=19.8$ cfs. Marksheffel Road is planned to be a 4 lane principal arterial now that the City has taken the project over from El Paso County. Runoff values noted above account for this proposed roadway widening. The preliminary roadway plans and draft final drainage report for Marksheffel Road Constitution to Dublin were referenced in the preparation of this report.

Existing runoff patterns for Marksheffel Road will be maintained (ie: no curb and roadside ditches). The proposed Mountain Valley Preserve development will maintain these historic flow patterns and account for collection of the runoff. The proposed improvements to Marksheffel Road will include curb & gutter, inlets, piping and water quality detention. The proposed Mountain Valley Preserve development accounts for these developed flows and will provide storm sewer connections for the outfall of these developed facilities.

Design Point 32 (DP-32) is located at existing dual 24" RCP culverts going under Marksheffel Rd to the east. These culverts capture the flows from Basin OS1 and the release from the pond in The Reserve at Indigo Ranch Filing No. 1. This pond is releasing at a rate of $Q_{100}=64.4$ cfs. Combined with the flows from Basin OS1, the 100-year storm flow is $Q_{100}=84.2$ cfs.

Basin OS3 is a 3.03 acre basin located offsite to the east of Marksheffel Rd north to the intersection with Dublin Blvd. The basin has areas classified as Pasture/Meadow and Asphalt. The 5-year storm flow is $Q_5=6.2$ cfs and the 100-year storm flow is $Q_{100}=16.1$ cfs. Marksheffel Road is planned to be a 4 lane principal arterial now that the City has taken the project over from El Paso County. Runoff values noted above account for this proposed roadway widening. The preliminary roadway plans and draft final drainage report for Marksheffel Road Constitution to Dublin were referenced in the preparation of this report.

Basin C is a 2.89 acre basin located at the northwest portion of the property. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=2.2$ cfs and the 100-year storm flow is $Q_{100}=10.4$ cfs and flows to DP-4 in a drainage swale.

Design Point 30 (DP-30) is located at the outfall of the pond in Dublin Towne Centre, the property immediately to the north. The release rate for this pond is $Q_{100}=4.33$ cfs. The 100-yr overflow rate is 42.1 cfs. The flows from this outfall will combine in the same channel as the outfall from DP-31 and be carried to DP-4.

Design Point 31 (DP-31) is located at the outfall of the 42" pipe coming from Pond 93 in Banning Lewis Ranch, just north of Dublin Blvd. The release rate for this pond is $Q_{100}=59.7$ cfs per

Addendum #1 to BLR Filing 2. These flows will be carried from DP-31 to DP-4 by a rip-rap lined channel. See Appendix A for cross section and calculations for this channel. Also per Addendum #1 to BLR Filing 2, MH1 in Dublin Blvd has a rate of 43.1 cfs. This, added with the pond release rate of 59.7 gives a 100-year overflow rate of 102.8 cfs. Per Addendum #1, the post-developmental inflow to Pond 93 is 362 cfs. This, added to the flows from MH1 (43.1 cfs) gives an emergency overflow rate of 405.1 cfs. Extension of the 42" RCP will be completed by the owner's of Dublin Towne Centre if required.

The 100 year flow rates described above and below reflect the designed 100 year flow rates for the storm sewer facilities as designed (ie: detention pond release rates, etc.). The emergency overflow rate describes the condition in which the designed stormwater facilities are already full or are damaged or plugged and allow the fully developed runoff to pass un-detained to downstream drainage facilities.

The proposed channel from DP-31 downstream to Toy Ranches to the east is proposed to be publicly maintained as it collects flows from numerous upstream developments and public right-of-way to include Marksheffel Road and Dublin Boulevard. This channel is also called-out in the Sand Creek DBPS as segment 62, a part of Tributary TR-1 to the East Fork of Sand Creek . A public channel with one reimbursable proposed check structure shown on the MVP property in this vicinity and another check structure is shown just downstream of MVP on Toy Ranches.

Design Point 4 (DP-4) is located at the entrance to a proposed 10' x 6' CBC going under Anders Ridge Lane and continuing in an open channel to the east, bypassing onsite north Detention Pond 1. It will capture all of the flows from DP-32, Basin OS3, Basin C, DP-30 and DP-31. These flows are $Q_5=106.1$ cfs and $Q_{100}=174.7$ cfs. By adding this flow to the emergency overflow rate of 405.1 cfs from Pond 93, the total emergency overflow rate of 579.8 cfs should be accounted for at this design point.

Basin D is a 1.63 acre basin located at the northwest portion of the property, between Basins A and C. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=3.0$ cfs and the 100-year storm flow is $Q_{100}=6.9$ cfs and flows to DP-5.

Design Point 5 (DP-5) is located at a 5' Type R sump inlet that will capture all of the flows from Basin D and DP-4. A 18" RCP pipe will carry the flows out of this inlet to DP-6. These flows are $Q_5=3.0$ cfs and $Q_{100}=6.9$ cfs.

Basin E is a 0.36 acre basin located just south of Basin D. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=0.8$ cfs and the 100-year storm flow is $Q_{100}=1.8$ cfs and flows to DP-6.

Design Point 6 (DP-6) is located at a 5' Type R sump inlet that will capture all of the flows from Basin E, DP-2 and DP-5. An 18" RCP pipe will carry the flows out of this inlet and into north Detention Pond 1. These flows are $Q_5=7.3$ cfs and $Q_{100}=17.1$ cfs.

Detention Pond 1 will be sized and designed per the full-spectrum detention method for the on-site flows tributary to the pond. The pond will not be in series with BLR Pond 93. The pond will be private, to be maintained by the Mountain Valley Preserve HOA or Metropolitan District.

Design Point 7 (DP-7) is located at the exit to the proposed 10' x 6' CBC going under Anders Ridge Lane noted in DP-4. A total runoff rate of 579.8 cfs will be realized at this point and continue in an open channel to the east, bypassing onsite north Detention Pond 1. The channel will be directed to the existing historic low flow path as it approaches the easterly end of the site. The homes and buildings of the downstream homeowners in Toy Ranches are typically set back a significant distance and elevated from the existing drainage swale. The emergency overflow should only have an impact on roadway and driveway crossings if the emergency flow is ever realized.

Basin F is a 1.28 acre basin located just south of the north onsite Detention Pond 1. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=2.2$ cfs and the 100-year storm flow is $Q_{100}=5.2$ cfs and flows to DP-8.

Design Point 8 (DP-8) is located at a 5' Type R sump inlet that will capture all of the flows from Basin F. An 18" RCP pipe will carry the flows out of this inlet and into the north onsite Detention Pond 1.

Basin G is a 2.37 acre basin that includes the north onsite Detention Pond. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=1.7$ cfs and the 100-year storm flow is $Q_{100}=5.3$ cfs.

Design Point 9 (DP-9) is located at the bottom of the north onsite Detention Pond 1 and will capture all of the flows from DP-6, DP-8 and Basin G. These developed flows are $Q_5=11.2$ cfs and $Q_{100}=27.6$ cfs. Using Full Spectrum calculations for this pond, the release rate of the outlet structure is $Q_{100}=5.7$ cfs. The historic 100 year runoff rate from the site at this point is 27.0 csf per Historic Basin A. An 18" RCP pipe will carry the flows out of this outlet structure and will flow offsite to the existing natural drainage swale to the east. The required 100-year detention volume including WQCV is 1.08 acre-ft.

Basin H is a 1.62 acre basin located just south of Basin F. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=3.4$ cfs and the 100-year storm flow is $Q_{100}=7.9$ cfs and flows to DP-10.

Design Point 10 (DP-10) is located at a 5' Type R sump inlet that will capture all of the flows from Basin H. An 18" RCP pipe will carry the flows out of this inlet to DP-11.

Basin I is a 1.82 acre basin located in the center of the property, south and west of Basin H. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=3.3$ cfs and the 100-year storm flow is $Q_{100}=7.7$ cfs and flows to DP-11.

Design Point 11 (DP-11) is located at a 5' Type R sump inlet that will capture all of the flows from Basin I and DP-10. A 18" RCP pipe will carry the flows from this inlet. These flows are $Q_5=6.7$ cfs and $Q_{100}=15.7$ cfs and flows to DP-14.

Basin J is a 1.31 acre basin located in the center of the property, south of Basin I. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=2.2$ cfs and the 100-year storm flow is $Q_{100}=5.1$ cfs and flows to DP-12.

Design Point 12 (DP-12) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin J. An 18" RCP pipe will carry the flows from this inlet to DP-14.

Basin K is a 0.38 acre basin located in the center of the property, south of Basin J. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=0.8$ cfs and the 100-year storm flow is $Q_{100}=1.8$ cfs and flows to DP-13.

Design Point 13 (DP-13) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin K. An 18" RCP pipe will carry the flows from this inlet to DP-14.

Design Point 14 (DP-14) is located where the pipes combine from DP-11, DP-12 and DP-13. A 24" RCP pipe will carry the flows from this design point. These flows are $Q_5=8.8$ cfs and $Q_{100}=20.6$ cfs and flows to DP-17.

Basin L is a 1.07 acre basin located on a portion of the west lots of the property, south of Basin J. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=2.0$ cfs and the 100-year storm flow is $Q_{100}=4.6$ cfs and flows to DP-15.

Design Point 15 (DP-15) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin L. An 18" RCP pipe will carry the flows from this inlet and flows to DP-17.

Basin M is a 2.16 acre basin located east of Basin L. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=3.9$ cfs and the 100-year storm flow is $Q_{100}=9.2$ cfs and flows to DP-16.

Design Point 16 (DP-16) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin M. An 18" RCP pipe will carry the flows from this inlet to DP-17.

Design Point 17 (DP-17) is located where the pipes combine from DP-14, DP-15 and DP-16. A 30" RCP pipe will carry the flows from this design point. These flows are $Q_5=12.9$ cfs and $Q_{100}=30.1$ cfs and flows to DP-24.

Basin OS5 is a 2.19 acre basin located offsite to the east of Marksheffel Rd, south of Basin OS3. The basin has areas classified as Pasture/Meadow and Asphalt. The 5-year storm flow is $Q_5=2.7$ cfs and the 100-year storm flow is $Q_{100}=9.4$ cfs and sheet flows into Basin N where a drainage swale will carry the runoff to new storm drainage facilities. Marksheffel Road is planned to be a 4 lane principal arterial now that the City has taken the project over from El Paso County. Runoff values noted above account for this proposed roadway widening. The preliminary roadway plans and draft final drainage report for Marksheffel Road Constitution to Dublin were referenced in the preparation of this report.

Basin N is a 2.82 acre basin located on the west side of the property in the center, west of Basins J & L. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=2.6$ cfs and the 100-year storm flow is $Q_{100}=9.2$ cfs and flows in a drainage swale to DP-18.

Design Point 18 (DP-18) is located at a 24" culvert at Tarren Ave that will capture all of the flows from Basin OS5 and Basin N. These flows are $Q_5=5.4$ cfs and $Q_{100}=18.5$ cfs and flows to DP-20.

Basin OS6 is a 2.11 acre basin located offsite to the east of Marksheffel Rd, south of Basin OS5. The basin has areas classified as Pasture/Meadow and Asphalt. The 5-year storm flow is $Q_5=2.3$ cfs and the 100-year storm flow is $Q_{100}=7.9$ cfs and sheet flows into Basin O where a drainage swale will carry the runoff to new storm drainage facilities. Marksheffel Road is planned to be a 4 lane principal arterial now that the City has taken the project over from El Paso County. Runoff values noted above account for this proposed roadway widening. The preliminary roadway plans and draft final drainage report for Marksheffel Road Constitution to Dublin were referenced in the preparation of this report.

Basin O is a 1.72 acre basin located at the southwest portion of the property, south of Basin N. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=1.9$ cfs and the 100-year storm flow is $Q_{100}=6.1$ cfs and flows in a drainage swale to DP-19.

Design Point 19 (DP-19) is located at a 24" culvert at Tarren Ave that will capture all of the flows from Basin OS6 and Basin O. These flows are $Q_5=4.1$ cfs and $Q_{100}=13.9$ cfs.

Basin OS4 is a 7.71 acre basin located offsite to the west of Marksheffel Rd, south of Basin OS1. This basin has areas classified as 1/8 acre or less Residential density, Pasture/Meadow, and Asphalt. The 5-year storm flow is $Q_5=8.6$ cfs and the 100-year storm flow is $Q_{100}=24.4$ cfs that travels to DP-33. Marksheffel Road is planned to be a 4 lane principal arterial now that the City has taken the project over from El Paso County. Runoff values noted above account for this proposed roadway widening. The preliminary roadway plans and draft final drainage report for Marksheffel Road Constitution to Dublin were referenced in the preparation of this report.

Design Point 33 (DP-33) is located at existing dual 30" CMP culverts going under Marksheffel Rd to the east. These culverts capture all of the flows from Basin OS4 and the flows from a storm outfall from Indigo Ranch Filings No. 5 & 6. The storm outfall flows from Indigo Ranch are $Q_5=5.9$ cfs and $Q_{100}=12.3$ cfs. The total flows at this design point are $Q_5=14.5$ cfs and $Q_{100}=36.7$ cfs. This runoff will be collected by a new 36" RCP to be stubbed across Marksheffel Road from Mountain Valley Preserve with the Marksheffel Road project.

Design Point 20 (DP-20) is located where the pipes combine from DP-18, DP-19 and DP-33. A 42" RCP pipe will carry the flows from this design point. These flows are $Q_5=23.2$ cfs and $Q_{100}=70.5$ cfs and flow to DP-24.

Basin P is a 0.77 acre basin located east of Basin O. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=1.6$ cfs and the 100-year storm flow is $Q_{100}=3.7$ cfs and flow to DP-21.

Design Point 21 (DP-21) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin P. An 18" RCP pipe will carry the flows from this inlet to DP-23.

Basin Q is a 0.74 acre basin located east of Basin P. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=1.5$ cfs and the 100-year storm flow is $Q_{100}=3.4$ cfs and flow to DP-22.

Design Point 22 (DP-22) is located at a 5' Type R at-grade inlet that will capture all of the flows from Basin Q. An 18" RCP pipe will carry the flows from this inlet to DP-23.

Design Point 23 (DP-23) is located where the pipes combine from DP-21 and DP-22. An 18" RCP pipe will carry the flows from this design point. These flows are $Q_5=3.0$ cfs and $Q_{100}=6.9$ cfs and flow to DP-24.

Design Point 24 (DP-24) is located where the pipes combine from DP-17, DP-20 and DP-23. A 48" RCP pipe will carry the flows from this design point. These flows are $Q_5=36.4$ cfs and $Q_{100}=90.6$ cfs and flow to DP-27.

Basin R is a 1.29 acre basin located east of Basin M. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=2.7$ cfs and the 100-year storm flow is $Q_{100}=6.2$ cfs and flow to DP-25.

Design Point 25 (DP-25) is located at a 10' Type R sump inlet that will capture all of the flows from Basin R. A 24" RCP pipe will carry the flows from this inlet to DP-27.

Basin S is a 2.31 acre basin located on an east portion of the property, east of Basin R. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=4.0$ cfs and the 100-year storm flow is $Q_{100}=9.3$ cfs and flow to DP-26.

Design Point 26 (DP-26) is located at a 5' Type R sump inlet that will capture all of the flows from Basin S. An 18" RCP pipe will carry the flows from this inlet to DP-27.

Design Point 27 (DP-27) is located where the pipes combine from DP-24, DP-25 and DP-26. A 48" RCP pipe will carry the flows from this design point. These flows are $Q_5=40.9$ cfs and $Q_{100}=101.2$ cfs and flow to DP-28.

Basin T is a 0.47 acre basin located south of Basin R. This basin area has been classified at 1/8 acre or less Residential density. The 5-year storm flow is $Q_5=0.7$ cfs and the 100-year storm flow is $Q_{100}=2.3$ cfs.

Design Point 28 (DP-28) is located where at a 20' Type R sump inlet that captures the flows from Basin T and DP-27. A 48" RCP pipe will carry the flows from inlet to the onsite south Detention Pond 2. These flows are $Q_5=42.4$ cfs and $Q_{100}=103.3$ cfs.

Basin U is a 4.36 acre basin located in the southeast corner of the property and includes the onsite south Detention Pond 2. This basin has areas classified as 1/8 acre or less Residential density and Pasture/Meadow. The 5-year storm flow is $Q_5=4.1$ cfs and the 100-year storm flow is $Q_{100}=12.6$ cfs.

Basin OS7 is a 1.88 acre basin located offsite to the south of the property. This basin area has been classified as Pasture/Meadow. The 5-year storm flow is $Q_5=0.6$ cfs and the 100-year storm flow is $Q_{100}=4.6$ cfs which are accounted for in the design of South Pond 2. Development of the area encompassed by basin OS-7 may alter drainage patterns onto the Mountain Valley Preserve site and Basin U, but MVP is designed to accept historic flows.

Design Point 29 (DP-29) is located at the bottom of the south onsite Detention Pond 2 and will capture all of the flows from DP-28, Basin U and Basin OS7. These developed flows are $Q_5=47.2$ cfs and $Q_{100}=102.5$ cfs. Using Full Spectrum calculations for this pond, the release rate of the outlet structure is $Q_{100}=11.4$ cfs. A 24" RCP pipe will carry the flows out of this outlet structure and will flow offsite. The required 100-year detention volume including WQCV is 2.47 acre-ft. The pond will be private, to be maintained by the Mountain Valley Preserve HOA or Metropolitan District.

The historic 100 year runoff rate from the site at this point is 27.4 csf per Historic Basin B. The outlet channel will be directed to the existing historic low flow path as it approaches the southeasterly corner of the site. The homes and buildings of the downstream homeowners in Toy Ranches are typically set back a significant distance and elevated from the existing drainage swale. Since the release rate will be less than historic, there should be no downstream impacts.

The previously prepared preliminary design plans for Marksheffel Road prepared by El Paso County identified two water quality/detention basins on the MVP property (one at each low point at the north and south end of the development, respectively). Since the City has now taken over the Marksheffel Road project as a regional PPRTA project, the roadway design will change from the preliminary County design to one providing for a smaller footprint. City design criteria for Marksheffel Road (principal arterial) requires 107 to 142 feet of right-of-way. With the proposed MVP development, a total of 160 feet of right-of-way will be available. Linear water quality/detention facilities will be a viable option for Marksheffel Road at the low points with the extra available right-of-way. In addition, the MVP owners have offered to share the proposed on-site development water quality detention facilities with the City if desired. In either case, the Marksheffel Road stormwater outfalls will be able to discharge onto the MVP development.

All proposed on-site storm sewer facilities (RCP, inlets, manholes, etc,) are to be public.

IV. FLOODPLAIN STATEMENT

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0545 F (March 1997) shows the site located within Zone X (area of minimal flood hazard, usually depicted on FIRM as above the 500-year flood level). A FIRM map is included in the appendix.

V. SOILS

The Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, shows the site is underlain by the Blakeland Loamy Sand, Hydrologic Soil Group 'A' and by Truckton sandy loam, Hydrologic Soil Group 'A'. A Soils map is included in the appendix.

VI. DRAINAGE FEES (2015)

Basin Name	Sand Creek		
DBPS Year	1995		
Drainage Fee/Acre	\$10,247	x 37.40 acres	= \$383,237.80
Bridge Fee/Acre	\$622	x 37.40 acres	= \$23,262.80
Pond Land Fee/Acre	\$1,070	x 37.40 acres	= \$41,018.00
Pond Facility Fee/Acre	\$3,005	x 37.40 acres	= \$112,387.00

Drainage, Bridge and Pond Fees are due at the time of final plat for the property.

VII. CONCLUSIONS

The Mountain Valley Preserve site contains 37.40 acres that is proposed to be annexed into the City of Colorado Springs and will be changed from RR-5 zoning to PUD for an anticipated single-family residential land use. Future development for the updated zoning will increase the site imperviousness and will require on-site stormwater facilities, and water quality and detention ponds to accommodate developed flows and meet City of Colorado Springs drainage criteria. Future development will discharge off-site in historic flow patterns at historic rates or less to prevent drainage problems to existing downstream facilities. This report is in conformance with the Sand Creek DBPS.

All drainage facilities described herein and shown on the included drainage plan are subject to change due to final design considerations.

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual and Urban Storm Drainage Criteria Manual. Supporting information is included in the Appendix. The recommendations contained herein are subject to the conditions set forth.

VIII. REFERENCES

1. City of Colorado Springs and El Paso County "Drainage Criteria Manual, Vol 1 & 2", May 2014.
2. Urban Drainage and Flood Control District (UDFCD) "Urban Storm Drainage Criteria Manual" (USDCM), Volume 1 & 2, June 2001, revised April 2008.
3. Urban Drainage and Flood Control District (UDFCD) "Urban Storm Drainage Criteria Manual" (USDCM), Volume 3, June 2001, revised April 2008.
4. FEMA Emergency Management Agency, Flood Insurance Rate Map, El Paso County Colorado and Incorporated Areas, Map Number 08041C0545 F, effective date March 17, 1997.
5. "Banning Lewis Ranch Filing No. 2 – Major Channels & Detention Basin Addendum No. 1 Final Drainage Report," prepared by TCB, September 2006.
6. "Indigo Ranch at Stetson Ridge Filing No. 5 & 6," prepared by Classic Communities, December 2009.
7. "The Reserve at Indigo Ranch Filing No. 1," prepared by Classic Consulting, August 2013.
8. "Dublin Towne Center, Master Development Drainage Plan," prepared by Drexel, Barrell & Co, June 2014.
9. "Marksheffel Road From Constitution Ave. to Dublin Rd. Draft Final Drainage Report," prepared by CH2M Hill, April 2007.
10. Natural Resources Conservation Service Web Soil Survey.
11. Sand Creek Drainage Basin Planning Study, prepared by Kiowa Engineering Corp., March 1996.

APPENDIX A

Vicinity Map

FEMA FIRM Map

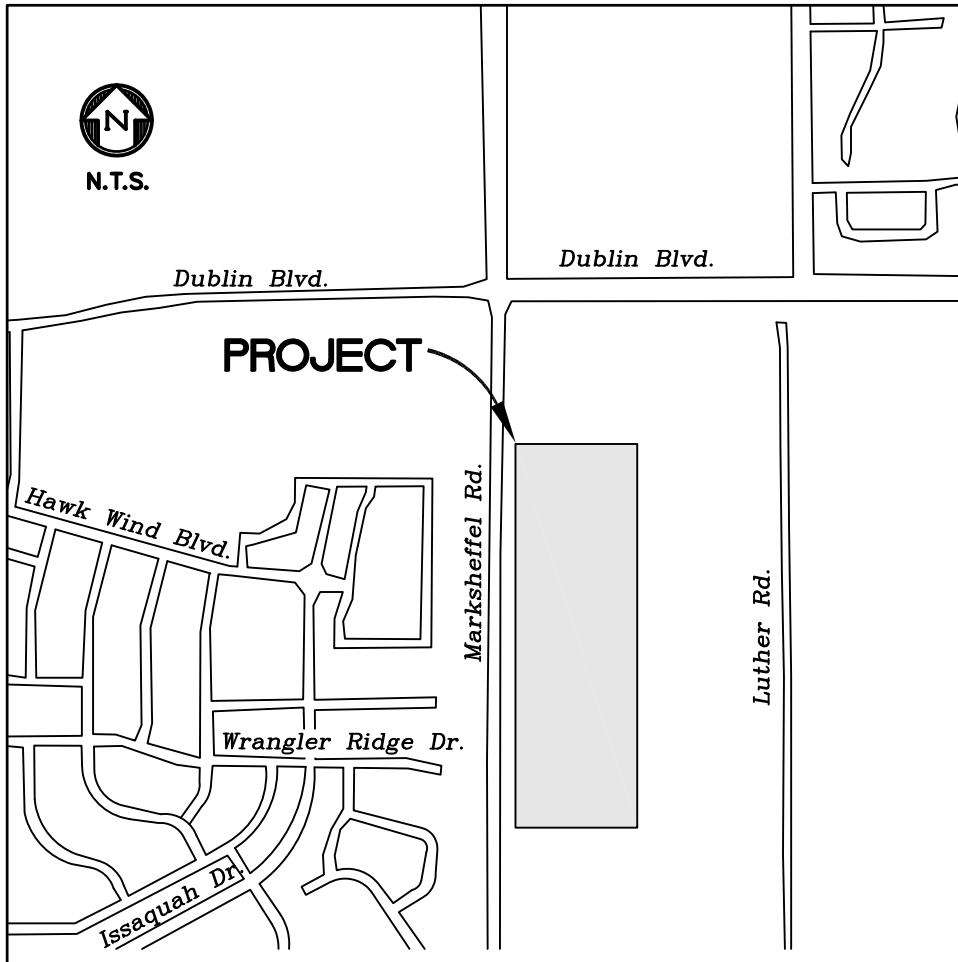
Soils Map

USACE non-jurisdictional letter

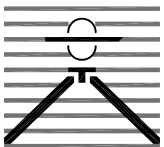
Existing Conditions Drainage Plan, Sheet DR-1

Proposed Conditions Drainage Plan, Sheet DR-2

Trapezoidal Channel Calculations & Cross-Section



VICINITY MAP
NOT TO SCALE



**MOUNTAIN VALLEY PRESERVE
VICINITY MAP**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:
06/2015

DWG. NO.

JOB NO:
20534-03CSCV

VMAP

SHEET 1 OF 1

Sand Creek

MARKSHEFFEL ROAD

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

ZONE X

JOINS PANEL 0537

17

EL PASO COUNTY UNINCORPORATED AREAS 080059

MALAGA DRIVE

LUTHER ROAD

16

SAYRES ROAD

ZONE X

Sand Creek East Fork Subtributary



6729

6724

6719

6714

6709

6704

6701

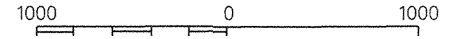
LA COSTA ROAD

LIMIT OF DETAILED STUDY

HUBER ROAD



APPROXIMATE SCALE IN FEET



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 545 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0545	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0545	F

MAP NUMBER
08041C0545 F

EFFECTIVE DATE:
MARCH 17, 1997



Federal Emergency Management Agency

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

Custom Soil Resource Report Soil Map



Map Scale: 1:5,860 if printed on A portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters


0 250 500 1000 1500 Feet

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



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)


Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot


 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water


 Perennial Water

 Rock Outcrop


 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole


 Slide or Slip


 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals


Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: El Paso County Area, Colorado
 Survey Area Data: Version 12, Sep 29, 2014

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

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

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

Map Unit Legend

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	18.1	19.5%
97	Truckton sandy loam, 3 to 9 percent slopes	74.4	80.5%
Totals for Area of Interest		92.4	100.0%



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
SOUTHERN COLORADO REGULATORY OFFICE

200 S. SANTA FE, SUITE 301
PUEBLO, COLORADO 81003

July 3, 2014

REPLY TO
ATTENTION OF:

Regulatory Division

SUBJECT: No Permit Required – Action No. SPA-2014-00194-SCO, Cheyenne Mountain Development Company, LLC's site in Colorado Springs, Colorado

Tim D. McConnell
Drexel, Barrell, & Co.
3 S. 7th Street
Colorado Springs, Colorado 80905

Mr. McConnell:

I am writing this letter in response to your June 17, 2014 e-mail request for a jurisdictional determination for the Cheyenne Mountain Development Co., LLC in El Paso County, Colorado. We have assigned Action No. SPA-2014-00194-SCO to this project. Please reference this number in all future correspondence concerning the project.

Based on the information provided, we have determined that the site is not jurisdictional thus a Department of the Army permit is not required since the site consists entirely of upland swale. However, it is incumbent upon you to remain informed of any changes in the Corps Regulatory Program regulations and policy as they relate to your project. If your plans change such that waters of the U.S. could be impacted by the proposed project, please contact our office for a reevaluation of permit requirements.

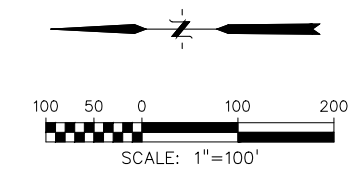
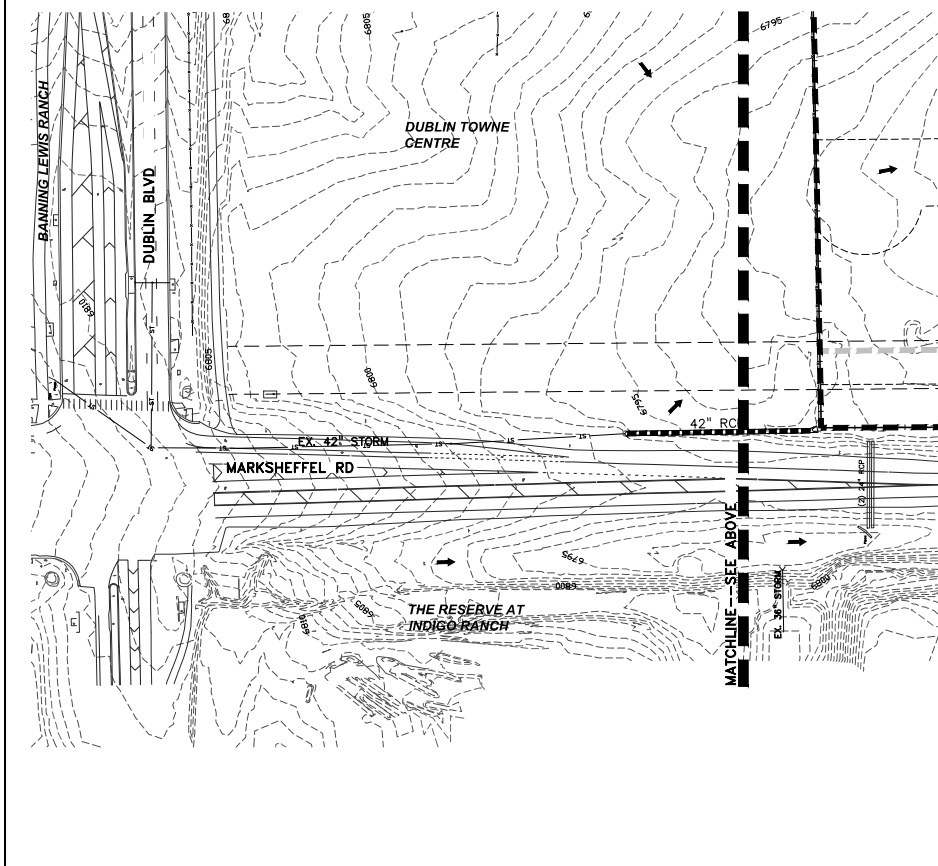
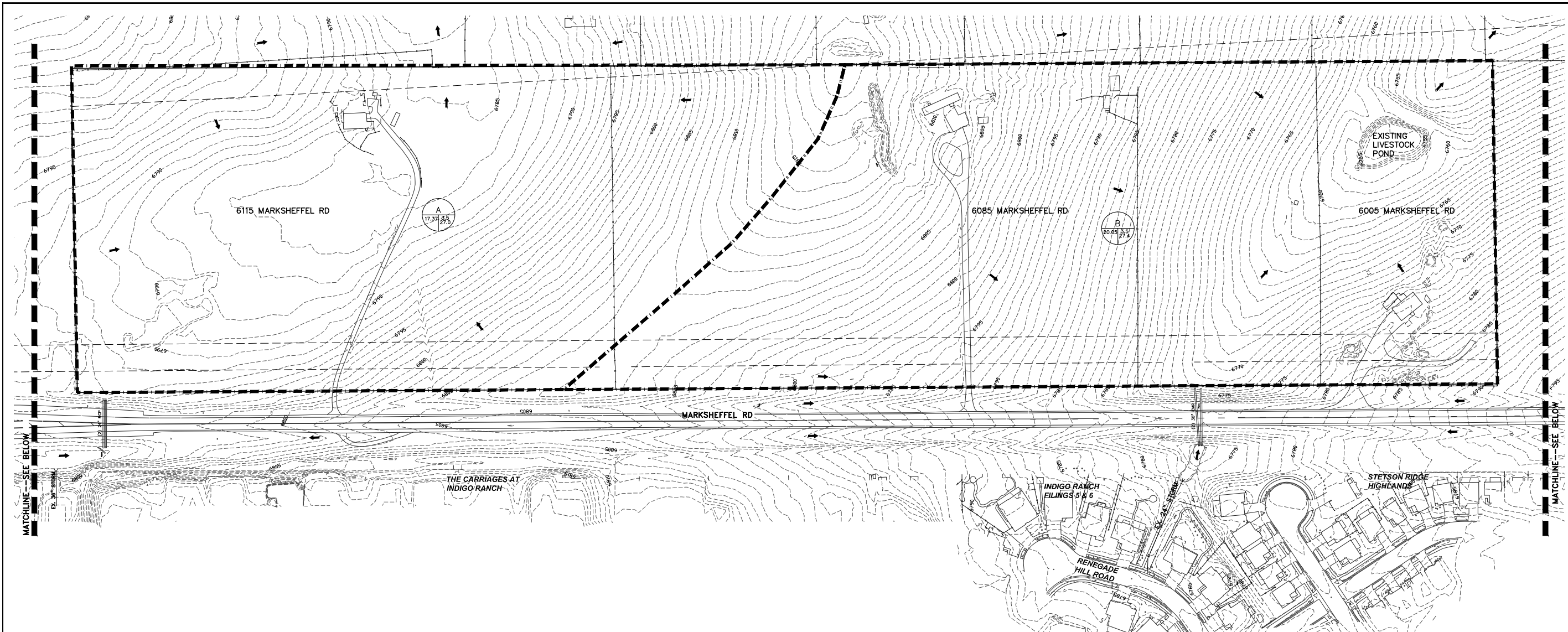
This decision is based on a preliminary jurisdictional determination (JD) that there may be waters of the United States on the project site. Preliminary JDs are advisory in nature and may not be appealed. An approved JD is an official Corps determination that "waters of the U.S." and/or "navigable waters of the U.S." are either present or absent on a particular site. An approved JD precisely identifies the limits of those waters on the project site determined to be jurisdictional under the CWA or RHA. If you wish, you may request that the USACE reevaluate this case and issue an approved JD. If you request an approved JD, you may not begin work until the approved JD, which may require coordination with the Environmental Protection Agency, is completed. Please contact me if you wish to request an approved JD for this case.

at 719-543-6915 or at van.a.truan@usace.army.mil.
At your convenience, please complete a Customer Service at Survey
http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

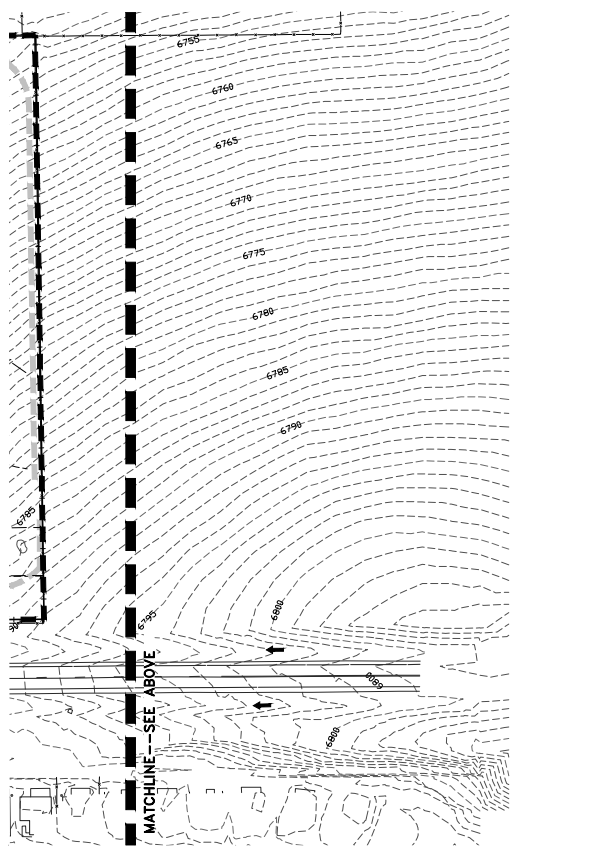


Van Truan
Chief, Southern Colorado
Regulatory Branch



LEGEND

- EX. MINOR CONTOUR
- - - 6800 - - - EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- - - 6800 - - - PR. MAJOR CONTOUR
- STORM DRAIN
- ROAD CENTERLINE
- CURB FLOWLINE
- R.O.W.
- - - EXIST. EASEMENT
- ▬ PR. TRAIL SYSTEM
- BASIN BOUNDARY
- ← FLOW DIRECTION
- △ DESIGN POINT
- AREA: A (2.32' 2.9' 6.3')
- Q5
- Q100



PREPARED BY:

DREXEL, BARRELL & CO.
 Engineers-Surveyors
 3 SOUTH 7TH STREET
 COLORADO SPGS, COLORADO 80905
 CONTACT: TIM D. McCONNELL, P.E.
 (719) 260-0887
 BOULDER • COLORADO SPRINGS
 GRAND JUNCTION

CLIENT:

CHEYENNE MOUNTAIN DEVELOPMENT COMPANY, LLC
 P.O. BOX 60069
 COLORADO SPRINGS, CO 80960
 (719) 475-7474
 CONTACT: ROBERT C. IRWIN

MOUNTAIN VALLEY PRESERVE CONCEPT PLAN
 6005, 6085 & 6115 N. MARKSHEFFEL ROAD
 COLORADO SPRINGS, COLORADO

ISSUE	DATE
INITIAL ISSUE	3/12/15
LATEST ISSUE	6/26/15
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TDM
FILE NAME:	DRAINAGE PLAN

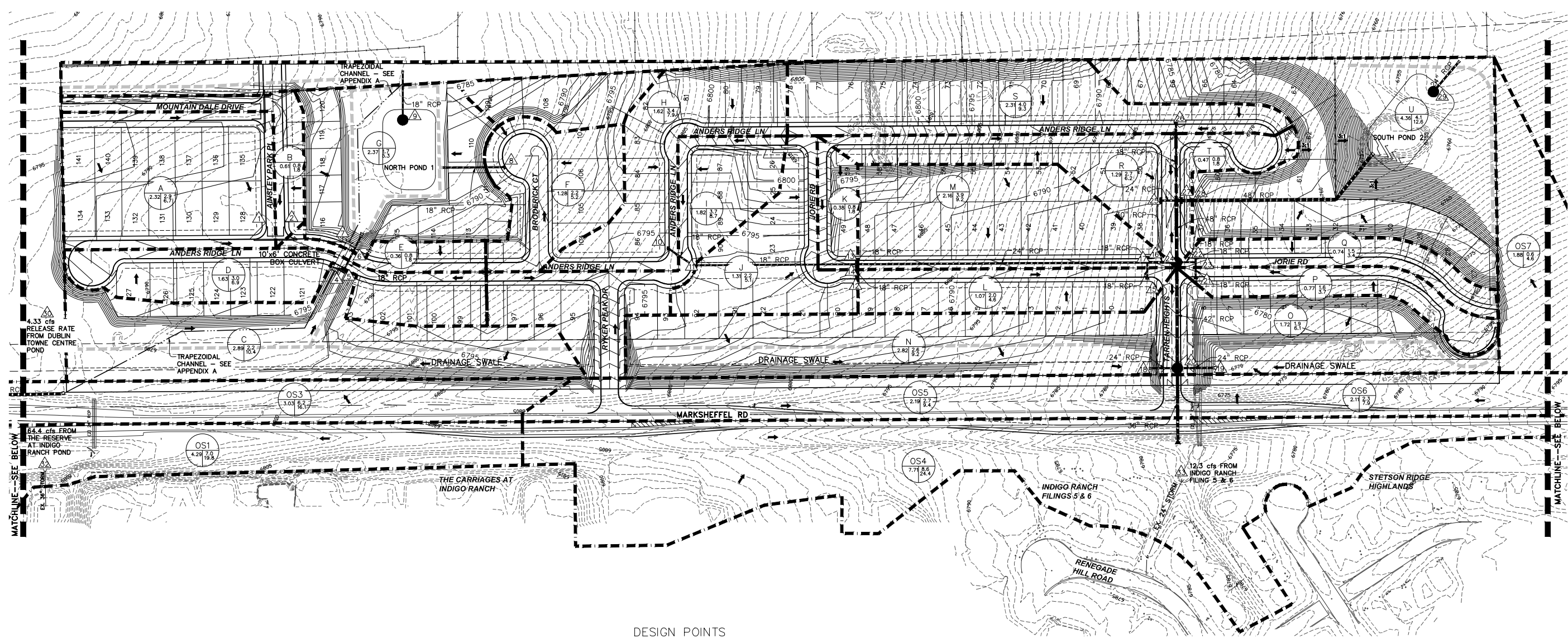
DRAWING SCALE:
 HORIZONTAL: 1"=100'
 VERTICAL: N/A

EXISTING DRAINAGE

PROJECT NO. 20534-03CSCV
 DRAWING NO.

DR-1

SHEET: 1 OF 2

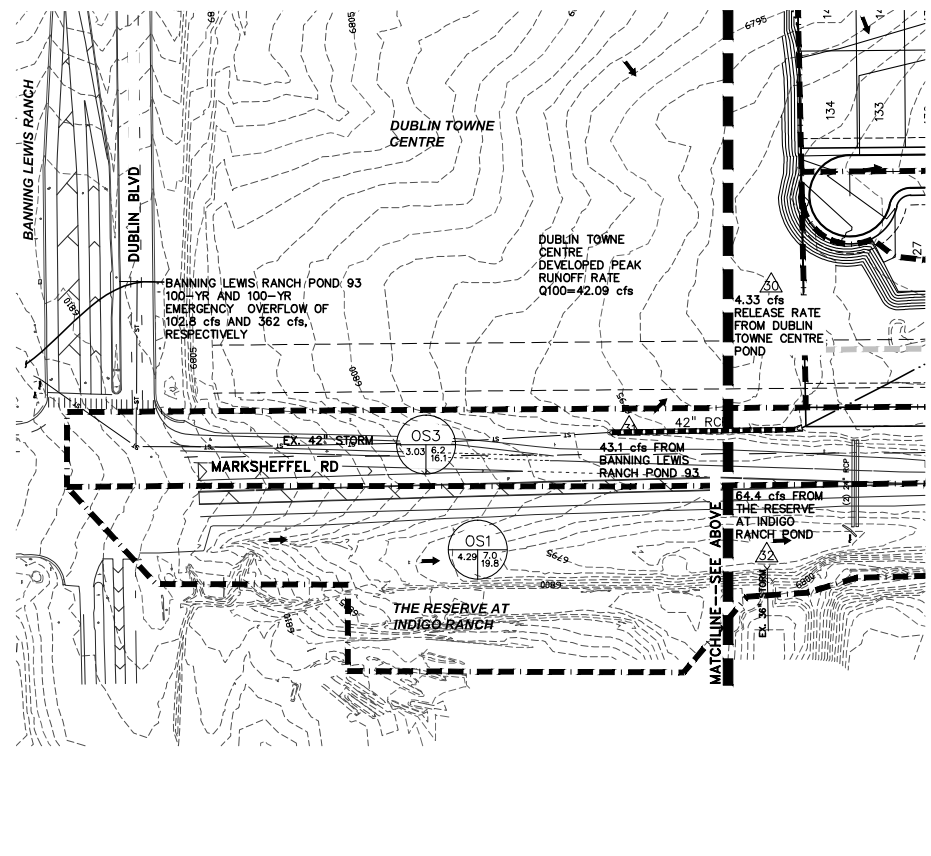


PREPARED BY:

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 BOULDER • COLORADO SPRINGS
 GRAND JUNCTION

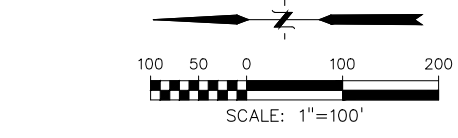
CLIENT:
CHEYENNE MOUNTAIN DEVELOPMENT COMPANY, LLC
 P.O. BOX 60069
 COLORADO SPRINGS, CO 80960
 (719) 475-7474
 CONTACT: ROBERT C. IRWIN

MOUNTAIN VALLEY PRESERVE CONCEPT PLAN
 6005, 6085 & 6115 N. MARKSHEFFEL ROAD
 COLORADO SPRINGS, COLORADO

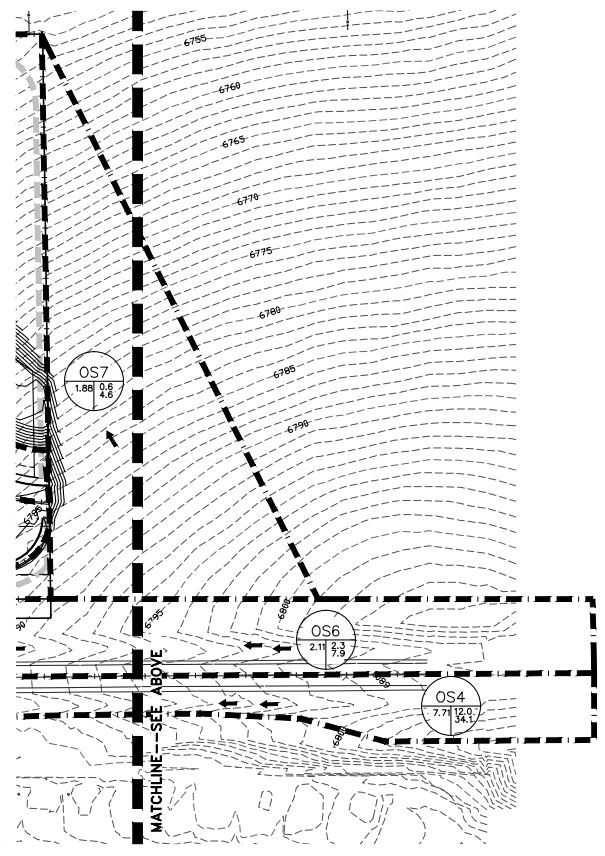


DESIGN POINTS

POINT	Q5 (cfs)	Q100 (cfs)	POINT	Q5 (cfs)	Q100 (cfs)
DP-1	2.9	6.7	DP-26	4.0	9.3
DP-2	3.6	8.5	DP-27	40.9	101.2
DP-3	NOT	USED	DP-28	42.4	103.3
DP-4	106.1	174.7	DP-29	47.2	120.5
TOTAL EMERGENCY OVERFLOW= 579.8					
DP-5	3.0	6.9	DP-30	4.33	RELEASE RATE
DP-6	7.3	17.1	DP-31	59.7	
DP-7	106.1	579.8	EMERGENCY OVERFLOW= 579.8		
DP-8	2.2	5.2	DP-32	33.6	84.2
DP-9	11.2	27.6	DP-33	14.5	36.7
DP-10	3.4	7.9			
DP-11	6.7	15.7			
DP-12	2.2	5.1			
DP-13	0.8	1.8			
DP-14	8.8	20.6			
DP-15	2.0	4.6			
DP-16	3.9	9.2			
DP-17	12.9	30.1			
DP-18	5.4	18.5			
DP-19	4.1	13.9			
DP-20	23.2	70.5			
DP-21	1.6	3.7			
DP-22	1.5	3.4			
DP-23	3.0	6.9			
DP-24	36.4	90.6			
DP-25	2.7	6.2			



- LEGEND**
- EX. MINOR CONTOUR
 - - - - - EX. MAJOR CONTOUR
 - PR. MINOR CONTOUR
 - - - - - PR. MAJOR CONTOUR
 - STORM DRAIN
 - ROAD CENTERLINE
 - CURB FLOWLINE
 - R.O.W.
 - EXIST. EASEMENT
 - PR. TRAIL SYSTEM/POND ACCESS
 - BASIN BOUNDARY
 - ← FLOW DIRECTION
 - △ DESIGN POINT
 - AREA
 - BASIN
 - Q5
 - Q100



ISSUE	DATE
INITIAL ISSUE	3/12/15
LATEST ISSUE	6/26/15
DESIGNED BY:	SBN
DRAWN BY:	SBN
CHECKED BY:	TM
FILE NAME:	DRAINAGE PLAN

DRAWING SCALE:
 HORIZONTAL: 1"=100'
 VERTICAL: N/A

PROPOSED DRAINAGE PLAN

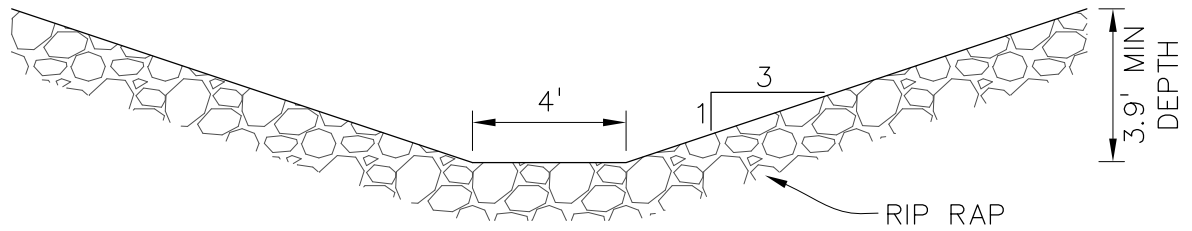
PROJECT NO. 20534-03CSCV
 DRAWING NO.

DR-2

SHEET: 2 OF 2

Flowmaster calculations

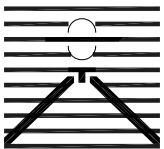
Trapezoidal Channel	
Manning's Coefficient	0.03
Channel slope	0.012 ft/ft
Left side slope	0.33 ft/ft
Right side slope	0.33 ft/ft
Bottom width	4.0 ft
Discharge	563.2 cfs
Required depth	3.97 ft



TRAPEZOIDAL CHANNEL

FROM DP-31 TO DP-4

SCALE: 1"=5'



**MOUNTAIN VALLEY PRESERVE
CHANNEL DETAIL**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:
6/26/15

DWG. NO.

JOB NO:
20534-03

CH-1

SHEET 1 OF 1

APPENDIX B

Existing Conditions Hydrology
Proposed Conditions Hydrology
Proposed Detention Pond Sizing

Existing Conditions Hydrology

PROJECT INFORMATION								
PROJECT:	Mountain Valley Preserve							
PROJECT NO:	20534-03							
DESIGN BY:	SBN			Drexel, Barrell & Co.				
REV. BY:	TDM							
AGENCY:	City of Colorado Springs							
REPORT TYPE:	Preliminary							
Soil Type:	A							
EXISTING CONDITIONS				C2*	C5*	C10*	C100*	% IMPERV
1/8 acre or less Residential					0.45		0.59	65
Pasture/Meadow					0.08		0.35	0
Asphalt					0.90		0.96	100
*C-Values and Basin Imperviousness based on Table 6.6, City of Colorado Springs "Drainage Criteria Manual"								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
		ACRE	C2	C5	C10	C100		
A	1/8 acre or less Residential	0.00		0.45		0.59	65	
	Pasture/Meadow	17.37		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.08		0.35	0%	
TOTAL A		17.37						
B	1/8 acre or less Residential	0.00		0.45		0.59	65	
	Pasture/Meadow	20.05		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.08		0.35	0%	
TOTAL B		20.05						
TOTAL SITE		37.42		0.08		0.35	0.0%	

PROJECT INFORMATION

PROJECT: Mountain Valley Preserve
 PROJECT NO: 20534-03
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: City of Colorado Springs
 REPORT TYPE: Preliminary

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			CONCENTRATED TIME (t_i)				TIME OF CONCENTRATION t_c			FINAL t_c
BASIN	DESIGN PT:	C_5	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_i	COMP.		MINIMUM	
			Ac	Ft	%	Min	Ft	%	FPS	Min	t_c		t_c	Min
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)*	(10)	(11)	(12)	(13)	(14)
A		0.08	17.37	357	3.9	22.9	714	0.5	2.1	5.6	28.5		5.0	28.5
B		0.08	20.05	906	4.9	33.8	559	3.3	5.5	1.7	35.5		5.0	35.5

PROJECT INFORMATION

PROJECT: Mountain Valley Preserve
 PROJECT NO: 20534-03
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: City of Colorado Springs
 REPORT TYPE: Preliminary



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING CONDITIONS RUNOFF 5 YR STORM P1= **1.50**

BASIN (S)	DIRECT RUNOFF							
	DESIGN POINT	AREA	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A			17.37	0.08	28.5	1.39	2.49	3.5
B			20.05	0.08	35.5	1.60	2.20	3.5

PROJECT INFORMATION

PROJECT: Mountain Valley Preserve
 PROJECT NO: 20534-03
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: City of Colorado Springs
 REPORT TYPE: Preliminary



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING CONDITIONS RUNOFF 100 YR STORM P1= **2.67**

BASIN (S)	DIRECT RUNOFF							
	DESIGN POINT	AREA	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A			17.37	0.35	28.5	6.08	4.44	27.0
B			20.05	0.35	35.5	7.02	3.91	27.4

Proposed Conditions Hydrology

PROJECT INFORMATION								
PROJECT:	Mountain Valley Preserve							
PROJECT NO:	20534-03							
DESIGN BY:	SBN							
REV. BY:	TDM							
AGENCY:	City of Colorado Springs							
REPORT TYPE:	Preliminary							
Soil Type:	A							
PROPOSED CONDITIONS								
				C2*	C5*	C10*	C100*	% IMPERV
1/8 acre or less Residential					0.45		0.59	65
Pasture/Meadow					0.08		0.35	0
Asphalt					0.90		0.96	100
*C-Values and Basin Imperviousness based on Table 6.6, City of Colorado Springs "Drainage Criteria Manual"								
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
		ACRE	C2	C5	C10	C100		
A	1/8 acre or less Residential	2.32		0.45		0.59	65	
	Pasture/Meadow	0.00		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.45		0.59	65%	
TOTAL A		2.32						
B	1/8 acre or less Residential	0.61		0.45		0.59	65	
	Pasture/Meadow	0.00		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.45		0.59	65%	
TOTAL B		0.61						
C	1/8 acre or less Residential	0.55		0.45		0.59	65	
	Pasture/Meadow	2.34		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.15		0.40	12%	
TOTAL C		2.89						
D	1/8 acre or less Residential	1.63		0.45		0.59	65	
	Pasture/Meadow	0.00		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.45		0.59	65%	
TOTAL D		1.63						
E	1/8 acre or less Residential	0.36		0.45		0.59	65	
	Pasture/Meadow	0.00		0.08		0.35	0	
	Asphalt	0.00		0.90		0.96	100	
	WEIGHTED AVERAGE			0.45		0.59	65%	
TOTAL E		0.36						



Drexel, Barrell & Co.

F	1/8 acre or less Residential	1.28		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL F		1.28					
G	1/8 acre or less Residential	1.20		0.45		0.59	65
	Pasture/Meadow	1.17		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.27		0.47	33%
TOTAL G		2.37					
H	1/8 acre or less Residential	1.62		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL H		1.62					
I	1/8 acre or less Residential	1.77		0.45		0.59	65
	Pasture/Meadow	0.05		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.44		0.58	63%
TOTAL I		1.82					
J	1/8 acre or less Residential	1.31		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL J		1.31					
K	1/8 acre or less Residential	0.38		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL K		0.38					
L	1/8 acre or less Residential	1.07		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL L		1.07					
M	1/8 acre or less Residential	2.16		0.45		0.59	65
	Pasture/Meadow	0.00		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
TOTAL M		2.16					

N	1/8 acre or less Residential	1.14	0.45	0.59	65
	Pasture/Meadow	1.68	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.23	0.45	26%
TOTAL N		2.82			
O	1/8 acre or less Residential	0.81	0.45	0.59	65
	Pasture/Meadow	0.91	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.25	0.46	31%
TOTAL O		1.72			
P	1/8 acre or less Residential	0.77	0.45	0.59	65
	Pasture/Meadow	0.00	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.45	0.59	65%
TOTAL P		0.77			
Q	1/8 acre or less Residential	0.74	0.45	0.59	65
	Pasture/Meadow	0.00	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.45	0.59	65%
TOTAL Q		0.74			
R	1/8 acre or less Residential	1.29	0.45	0.59	65
	Pasture/Meadow	0.00	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.45	0.59	65%
TOTAL R		1.29			
S	1/8 acre or less Residential	2.31	0.45	0.59	65
	Pasture/Meadow	0.00	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.45	0.59	65%
TOTAL S		2.31			
T	1/8 acre or less Residential	0.47	0.45	0.59	65
	Pasture/Meadow	0.00	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.45	0.59	65%
TOTAL T		0.47			
U	1/8 acre or less Residential	2.38	0.45	0.59	65
	Pasture/Meadow	1.98	0.08	0.35	0
	Asphalt	0.00	0.90	0.96	100
	WEIGHTED AVERAGE		0.28	0.48	35%
TOTAL U		4.36			

OS1	1/8 acre or less Residential	0.75		0.45		0.59	65
	Pasture/Meadow	2.55		0.08		0.35	0
	Asphalt	0.99		0.90		0.96	100
	WEIGHTED AVERAGE			0.33		0.53	34%
TOTAL OS1		4.29					
OS3	1/8 acre or less Residential	0.00		0.45		0.59	65
	Pasture/Meadow	1.81		0.08		0.35	0
	Asphalt	1.22		0.90		0.96	100
	WEIGHTED AVERAGE			0.41		0.60	40%
TOTAL OS3		3.03					
OS4	1/8 acre or less Residential	3.09		0.45		0.59	65
	Pasture/Meadow	3.73		0.08		0.35	0
	Asphalt	0.89		0.90		0.96	100
	WEIGHTED AVERAGE			0.32		0.52	38%
TOTAL OS4		7.71					
OS5	1/8 acre or less Residential	0.00		0.45		0.59	65
	Pasture/Meadow	1.75		0.08		0.35	0
	Asphalt	0.44		0.90		0.96	100
	WEIGHTED AVERAGE			0.24		0.47	20%
TOTAL OS5		2.19					
OS6	1/8 acre or less Residential	0.00		0.45		0.59	65
	Pasture/Meadow	1.70		0.08		0.35	0
	Asphalt	0.41		0.90		0.96	100
	WEIGHTED AVERAGE			0.24		0.47	19%
TOTAL OS6		2.11					
OS7	1/8 acre or less Residential	0.00		0.45		0.59	65
	Pasture/Meadow	1.88		0.08		0.35	0
	Asphalt	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.08		0.35	0%
TOTAL OS7		1.88					
TOTAL SITE		55.51		0.34		0.52	42.3%

PROJECT INFORMATION

PROJECT: Mountain Valley Preserve
 PROJECT NO: 20534-03
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: City of Colorado Springs
 REPORT TYPE: Preliminary



RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t _i)			CONCENTRATED TIME (t _i)				PIPE TRAVEL TIME (t _p)				TIME OF CONCENTRATION t _c			FINAL t _c
BASIN	DESIGN PT.	C _s	AREA	LENGTH	SLOPE	t _i	LENGTH	SLOPE	VEL.	t _i	LENGTH	SLOPE	VEL.	t _i	COMP.		MINIMUM	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)*	(10)	(7)	(8)	(9)*	(10)	(11)	(12)	(13)	(14)
			Ac	Ft	%	Min	Ft	%	FPS	Min	Ft	%	FPS	Min	t _c		t _c	Min
A		0.45	2.32	280	0.7	22.9	285	0.8	5.2	0.9	0	0.0	0.0	0.0	23.8		5.0	23.8
B		0.45	0.61	39	2.0	6.0	226	0.9	5.6	0.7	0	0.0	0.0	0.0	6.7		5.0	6.7
DP-2						22.9				0.9	34	0.5	2.8	0.2	24.0		5.0	24.0
C		0.15	2.89	25	17.0	3.5	683	1.3	10.3	1.1	0	0.0	0.0	0.0	4.6		5.0	5.0
D		0.45	1.63	92	2.0	9.3	369	0.7	4.9	1.3	0	0.0	0.0	0.0	10.5		5.0	10.5
E		0.45	0.36	43	2.0	6.3	230	1.0	5.9	0.7	0	0.0	0.0	0.0	7.0		5.0	7.0
F		0.45	1.28	135	2.0	11.2	198	1.0	5.9	0.6	0	0.0	0.0	0.0	11.8		5.0	11.8
G		0.27	2.37			22.9				0.9	185	0.5	2.8	1.1	24.9		5.0	24.9
H		0.45	1.62	121	10.5	6.1	410	2.2	8.7	0.8	0	0	0.0	0.0	6.9		5.0	6.9
I		0.44	1.82	84	2.0	9.0	381	0.9	5.6	1.1	0	0	0.0	0.0	10.1		5.0	10.1
J		0.45	1.31	179	2.0	12.9	101	2.2	8.7	0.2	0	0	0	0	13.1		5.0	13.1
K		0.45	0.38	59	2.0	7.4	252	4.6	12.5	0.3	0	0	0	0	7.7		5.0	7.7
DP-14						9.0				1.1	304	0.5	2.8	1.8	12.0		5.0	12.0
L		0.45	1.07	76	2.0	8.4	508	0.7	4.9	1.7	0	0	0	0	10.1		5.0	10.1
M		0.45	2.16	180	6.9	8.6	516	0.7	4.9	1.8	0	0	0	0	10.3		5.0	10.3
DP-17						9.0				1.1	857	0.5	2.8	5.2	15.3		5.0	15.3
N		0.23	2.82	104	6.8	8.8	936	1.6	11.4	1.4	0	0	0	0	10.1		5.0	10.1
O		0.25	1.72	92	5.6	8.5	440	3.5	16.9	0.4	0	0	0	0	9.0		5.0	9.0
DP-20						8.8				1.4	55	0.5	2.8	0.3	10.5		5.0	10.5

P		0.45	0.77	38	2.0	5.9	474	0.7	4.9	1.6	0	0	0	0	7.6		5.0	7.6
Q		0.45	0.74	45	2.0	6.5	544	0.7	4.9	1.9	0	0	0	0	8.3		5.0	8.3
DP-23						6.5				1.9	9	0.5	2.8	0.1	8.4		5.0	8.4
DP-24						9.0				1.1	913	0.5	2.8	5.5	15.6		5.0	15.6
R		0.45	1.29	40	2.0	6.1	690	2.5	9.3	1.2	0	0	0	0	7.3		5.0	7.3
S		0.45	2.31	118	2.0	10.5	708	2.1	8.5	1.4	0	0	0	0	11.9		5.0	11.9
DP-27						9.0				1.1	1028	0.5	2.8	6.2	16.3		5.0	16.3
T		0.45	0.47	38	2.0	5.9	336	1.2	6.4	0.9	0	0	0	0	6.8		5.0	6.8
DP-28						9.0				1.1	1096	0.5	2.8	6.6	16.7		5.0	16.7
U		0.28	4.36			6.1				0.8	1483	0.5	2.8	9.0	15.9		5.0	15.9
OS1		0.33	4.29	45	12.3	4.2	793	1.2	7.1	1.9	0	0	0	0.0	6.0		5.0	6.0
OS3		0.41	3.03	27	3	4.6	392	2.3	9.9	0.7	0	0	0	0.0	5.3		5.0	5.3
OS4		0.32	7.71	198	3.5	13.5	1081	2.5	10.3	1.8	0	0	0	0.0	15.2		5.0	15.2
OS5		0.24	2.19	26	14.6	3.3	1116	2.6	10.5	1.8	0	0	0	0.0	5.1		5.0	5.1
OS6		0.24	2.11	50	5.1	6.6	790	2.8	10.9	1.2	0	0	0	0.0	7.8		5.0	7.8
OS7		0.08	1.88	100	6.1	10.4	388	8.1	9.4	0.7	0	0	0	0.0	11.1		5.0	11.1

PROJECT INFORMATION

PROJECT: Mountain Valley Preserve
 PROJECT NO: 20534-03
 DESIGN BY: SBN
 REV. BY: TDM
 AGENCY: City of Colorado Springs
 REPORT TYPE: Preliminary



Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED CONDITIONS		RUNOFF		5 YR STORM					P1=	1.50		
BASIN (S)	DESIGN POINT	AREA	AREA (AC)	DIRECT RUNOFF					n	Slope (ft/ft)	Calculated Pipe Dia	Used Pipe
				RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)				
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	DP-1		2.32	0.45	23.8	1.04	2.75	2.9				
B			0.61	0.45	24.0	0.27	2.74	0.8				
DP-1 + B	DP-2							3.6				
OS1			4.29	0.33	6.0	1.43	4.86	7.0				
OS1 + POND RELEASE (26.6 CFS)	DP-32							33.6				
OS3			3.03	0.41	5.3	1.24	5.03	6.2				
C			2.89	0.15	5.0	0.43	5.10	2.2				
DP-32 + DP-30 (4.33 cfs) + DP-31 (59.7 cfs) + OS3 + C	DP-4							106.1				
D	DP-5		1.63	0.45	10.5	0.73	4.02	3.0				
E			0.36	0.45	7.0	0.16	4.65	0.8				
E + DP-2 + DP-5	DP-6							7.3				
DP-4	DP-7							106.1				
F	DP-8		1.28	0.45	11.8	0.58	3.85	2.2				
G			2.37	0.27	24.9	0.63	2.68	1.7				
North Pond Inlet (DP-6 + DP-8 + G)	DP-9							11.2				
H	DP-10		1.62	0.45	6.9	0.73	4.66	3.4				

I			1.82	0.44	10.1	0.80	4.08	3.3				
I + DP-10	DP-11							6.7				
J	DP-12		1.31	0.45	13.1	0.59	3.68	2.2				
K	DP-13		0.38	0.45	7.7	0.17	4.49	0.8				
DP-11 + DP-12 + DP-13	DP-14		5.13	0.45	12.0	2.31	3.82	8.8				
L	DP-15		1.07	0.45	10.1	0.48	4.08	2.0				
M	DP-16		2.16	0.45	10.3	0.97	4.05	3.9				
DP-14 + DP-15 + DP-16	DP-17		8.36	0.45	15.3	3.76	3.43	12.9				
OS5			2.19	0.24	5.1	0.54	5.08	2.7				
N			2.82	0.23	10.1	0.65	4.08	2.6				
OS5 + N	DP-18							5.4				
OS6			2.11	0.24	7.8	0.51	4.48	2.3				
OS4			7.71	0.32	15.2	2.49	3.44	8.6				
OS4 + EX. DEVELOPMENT DISCHARGE (5.9 CFS)	DP-33							14.5				
O			1.72	0.25	9.0	0.44	4.27	1.9				
O + OS6	DP-19							4.1				
DP-18 + DP-19 + DP-33	DP-20		16.55	0.26	10.5	4.30	4.03	23.2				
P	DP-21		0.77	0.45	7.6	0.35	4.53	1.6				
Q	DP-22		0.74	0.45	8.3	0.33	4.38	1.5				
DP-21 + DP-22	DP-23		1.51	0.45	8.4	0.68	4.37	3.0				
DP-17 + DP-20 + DP-23	DP-24		26.42	0.34	15.6	8.98	3.40	36.4				
R	DP-25		1.29	0.45	7.3	0.58	4.57	2.7				
S	DP-26		2.31	0.45	11.9	1.04	3.83	4.0				
DP-24 + DP-25 + DP-26	DP-27		30.02	0.35	16.3	10.51	3.33	40.9				
T			0.47	0.45	16.7	0.21	3.29	0.7				
T + DP-27	DP-28		30.49	0.36	16.3	10.98	3.33	42.4				
U			4.36	0.28	15.9	1.23	3.37	4.1				
OS7			1.88	0.08	11.1	0.15	3.93	0.6				
South Pond Inlet (U + DP-28 + OS7)	DP-29							47.2				

PROJECT INFORMATION

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RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED CONDITIONS RUNOFF 100 YR STORM P1= **2.67**

BASIN (S)	DIRECT RUNOFF								TOTAL RUNOFF			
	DESIGN POINT	AREA	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)	n	Slope (ft/ft)	Calculated Pipe Dia	Used Pipe
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A	DP-1		2.32	0.59	23.8	1.37	4.90	6.7	0.016	0.005	1.56	18" RCP
B			0.61	0.59	24.0	0.36	4.88	1.8				
DP-1 + B	DP-2							8.5	0.016	0.005	1.71	18" RCP
OS1			4.29	0.53	6.0	2.29	8.64	19.8				
OS1 + POND RELEASE (64.4 CFS)	DP-32							84.2	0.016	0.005	4.03	42" RCP
OS3			3.03	0.60	5.3	1.80	8.95	16.1				
C			2.89	0.40	5.0	1.14	9.09	10.4				
DP-32 + DP-30 (4.33 cfs) + DP-31 (59.7 cfs) + OS3 + C	DP-4							174.7	0.016	0.005	5.30	10'x6' box
D	DP-5		1.63	0.59	10.5	0.96	7.16	6.9	0.016	0.005	1.58	18" RCP
E			0.36	0.59	7.0	0.21	8.27	1.8				
E + DP-2 + DP-5	DP-6							17.1	0.016	0.005	2.22	18" RCP
DP-4	DP-7							174.7				
F	DP-8		1.28	0.59	11.8	0.76	6.85	5.2	0.016	0.005	1.42	18" RCP
G			2.37	0.47	24.9	1.12	4.78	5.3				
North Pond Inlet (DP-6 + DP-8 + G)	DP-9							27.6				

North Pond Outlet	DP-9							5.7	0.016	0.005	1.47	18" RCP
H	DP-10	1.62	0.59	6.9	0.96	8.30	7.9	0.016	0.005	1.66	18" RCP	
I		1.82	0.58	10.1	1.06	7.27	7.7					
I + DP-10	DP-11						15.7	0.016	0.005	2.15	24" RCP	
J	DP-12	1.31	0.59	13.1	0.77	6.54	5.1	0.016	0.005	1.41	18" RCP	
K	DP-13	0.38	0.59	7.7	0.22	8.00	1.8	0.016	0.005	0.95	18" RCP	
DP-11 + DP-12 + DP-13	DP-14	5.13	0.59	12.0	3.03	6.80	20.6	0.016	0.005	2.38	24" RCP	
L	DP-15	1.07	0.59	10.1	0.63	7.26	4.6	0.016	0.005	1.35	18" RCP	
M	DP-16	2.16	0.59	10.3	1.27	7.21	9.2	0.016	0.005	1.76	18" RCP	
DP-14 + DP-15 + DP-16	DP-17	8.36	0.59	15.3	4.93	6.11	30.1	0.016	0.005	2.74	30" RCP	
OS5		2.19	0.47	5.1	1.03	9.03	9.4					
N		2.82	0.45	10.1	1.26	7.27	9.2					
OS5 + N	DP-18						18.5	0.016	0.005	2.28	24" RCP	
OS6		2.11	0.47	7.8	0.99	7.97	7.9					
OS4		7.71	0.52	15.2	3.98	6.12	24.4					
OS4 + EX. DEVELOPMENT DISCHARGE (12.3 CFS)	DP-33						36.7	0.016	0.005	2.95	36" RCP	
O		1.72	0.46	9.0	0.80	7.60	6.1					
O + OS6	DP-19						13.9	0.016	0.005	2.05	24" RCP	
DP-18 + DP-19 + DP-33	DP-20	16.55	0.49	10.5	8.11	7.18	70.5	0.016	0.005	3.77	42" RCP	
P	DP-21	0.77	0.59	7.6	0.45	8.06	3.7	0.016	0.005	1.25	18" RCP	
Q	DP-22	0.74	0.59	8.3	0.44	7.80	3.4	0.016	0.005	1.21	18" RCP	
DP-21 + DP-22	DP-23	1.51	0.59	8.4	0.89	7.79	6.9	0.016	0.005	1.59	18" RCP	
DP-17 + DP-20 + DP-23	DP-24	26.42	0.49	15.6	12.95	6.05	90.6	0.016	0.005	4.14	48" RCP	
R	DP-25	1.29	0.59	7.3	0.76	8.14	6.2	0.016	0.005	1.52	18" RCP	
S	DP-26	2.31	0.59	11.9	1.36	6.82	9.3	0.016	0.005	1.76	18" RCP	
DP-24 + DP-25 + DP-26	DP-27	30.02	0.5	16.3	15.01	5.92	101.2	0.016	0.005	4.32	48" RCP	
T		0.47	0.59	6.8	0.28	8.33	2.3					
T + DP-27	DP-28	30.49	0.51	16.7	15.55	5.85	103.3	0.016	0.005	4.35	48" RCP	
U		4.36	0.48	15.9	2.10	6.01	12.6					
OS7		1.88	0.35	11.1	0.66	7.00	4.6					
South Pond Inlet (DP-28 + U + OS7)	DP-29						120.5					
South Pond Outlet	DP-29						11.4	0.016	0.005	1.91	24" RCP	

Proposed Detention Pond Sizing

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: Mountain Valley Preserve
Basin ID: North Detention Pond 1

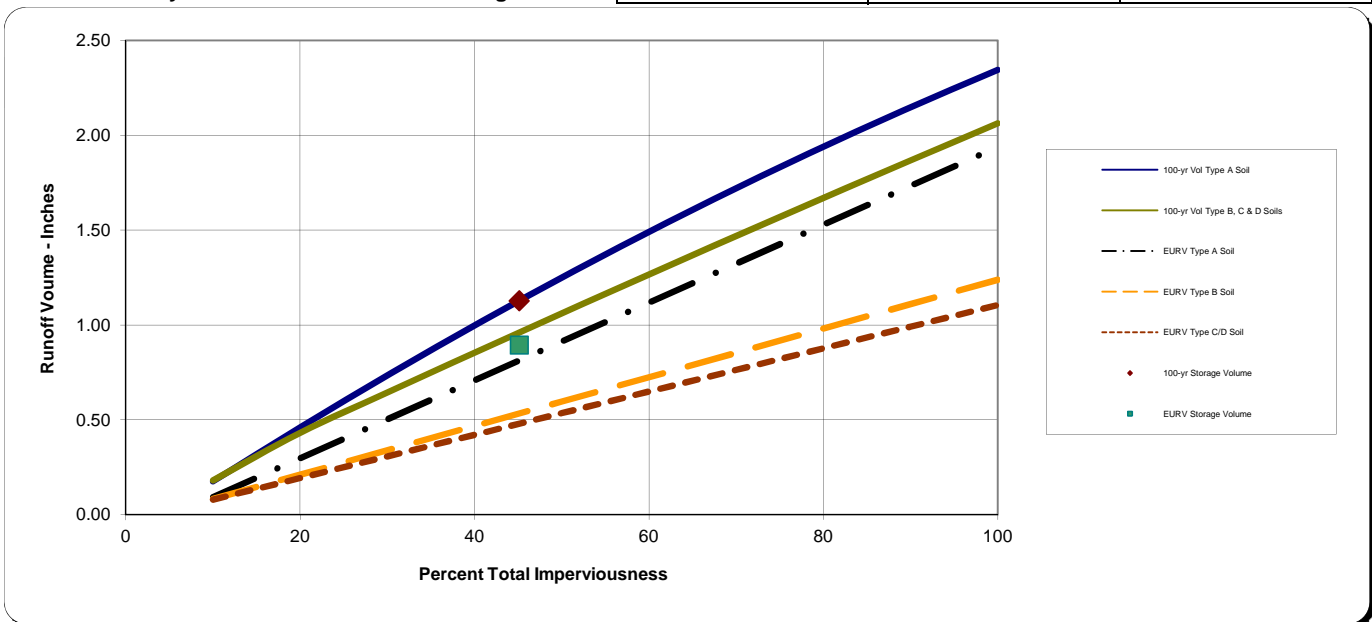
* User input data shown in blue.

Area of Watershed (acres)	11.46	
Subwatershed Imperviousness	45.1%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	▼
Effective Imperviousness ¹	45.1%	
Hydrologic Soil Type	Percentage of Area	Area (acres)
Type A	100.0%	11.5
Type B	0.0%	0.0
Type C or D	0.0%	0.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		Decay Coefficient-- α
Initial-- f_i	Final-- f_o	
5	1.0	0.0007
Detention Volumes ^{2,5}		
(watershed inches)	(acre-feet)	Maximum Allowable Release Rate, cfs ³
0.89	0.85	Design Outlet to Empty EURV in 72 Hours
1.13	1.08	5.73

Excess Urban Runoff Volume⁴

100-year Detention Volume Including WQCV⁵



Notes:

- 1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).
- 2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.
- 3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.
- 4) EURV approximates the difference between developed and pre-developed runoff volume.
- 5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: Mountain Valley Preserve
Basin ID: South Detention Pond 2

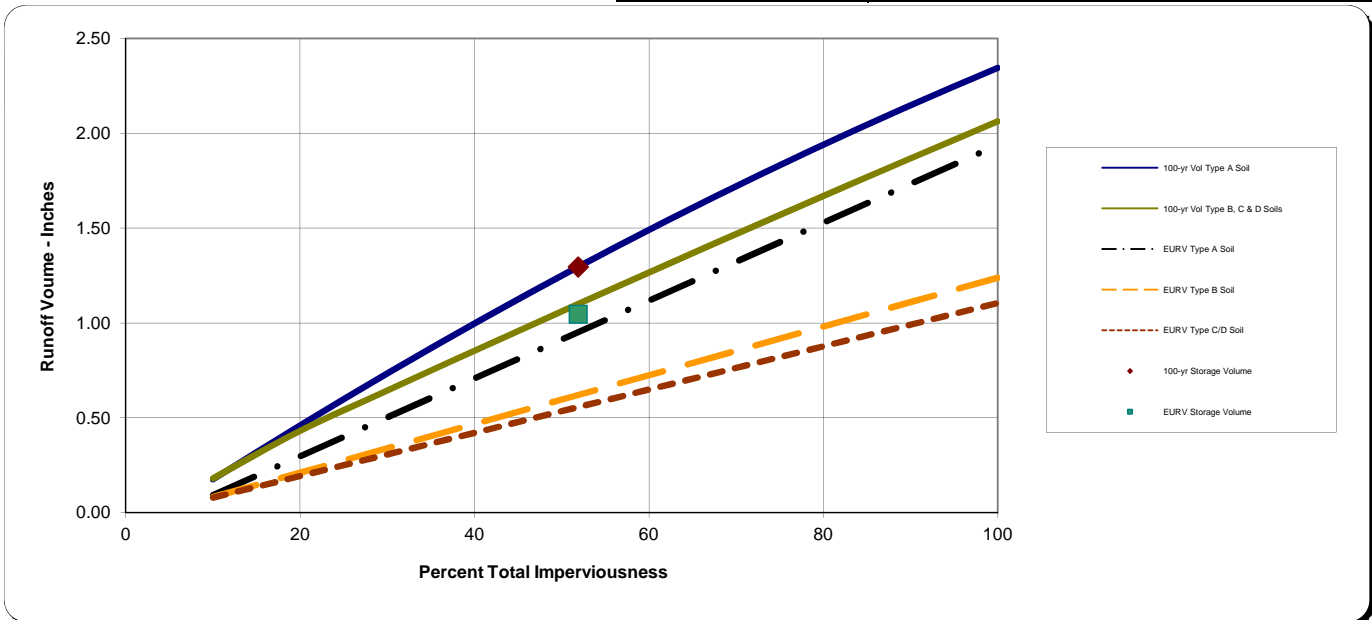
* User input data shown in blue.

Area of Watershed (acres)	22.84	
Subwatershed Imperviousness	51.9%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0 ▼
Effective Imperviousness ¹	51.9%	
Hydrologic Soil Type	Percentage of Area	Area (acres)
Type A	100.0%	22.8
Type B	0.0%	0.0
Type C or D	0.0%	0.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		Decay Coefficient-- α
Initial-- f_i	Final-- f_o	
5	1.0	0.0007
Detention Volumes ^{2,5}		
(watershed inches)	(acre-feet)	Maximum Allowable Release Rate, cfs ³
1.05	1.99	Design Outlet to Empty EURV in 72 Hours
1.30	2.47	11.42

Excess Urban Runoff Volume⁴

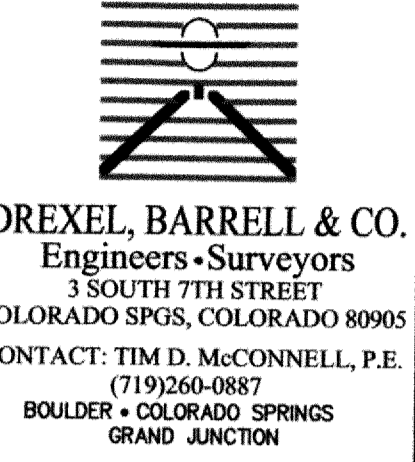
100-year Detention Volume Including WQCV⁵



Notes:

- 1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).
- 2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.
- 3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.
- 4) EURV approximates the difference between developed and pre-developed runoff volume.
- 5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

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MOUNTAIN VALLEY PRESERVE CONCEPT PLAN
6005, 6085 & 6115 N. MARKSHEFFEL ROAD
COLORADO SPRINGS, COLORADO

ISSUE	DATE
INITIAL ISSUE	3/12/15
LATEST ISSUE	6/26/15

DESIGNED BY: SBN
DRAWN BY: SBN
CHECKED BY: TM
FILE NAME: DRAINAGE PLAN

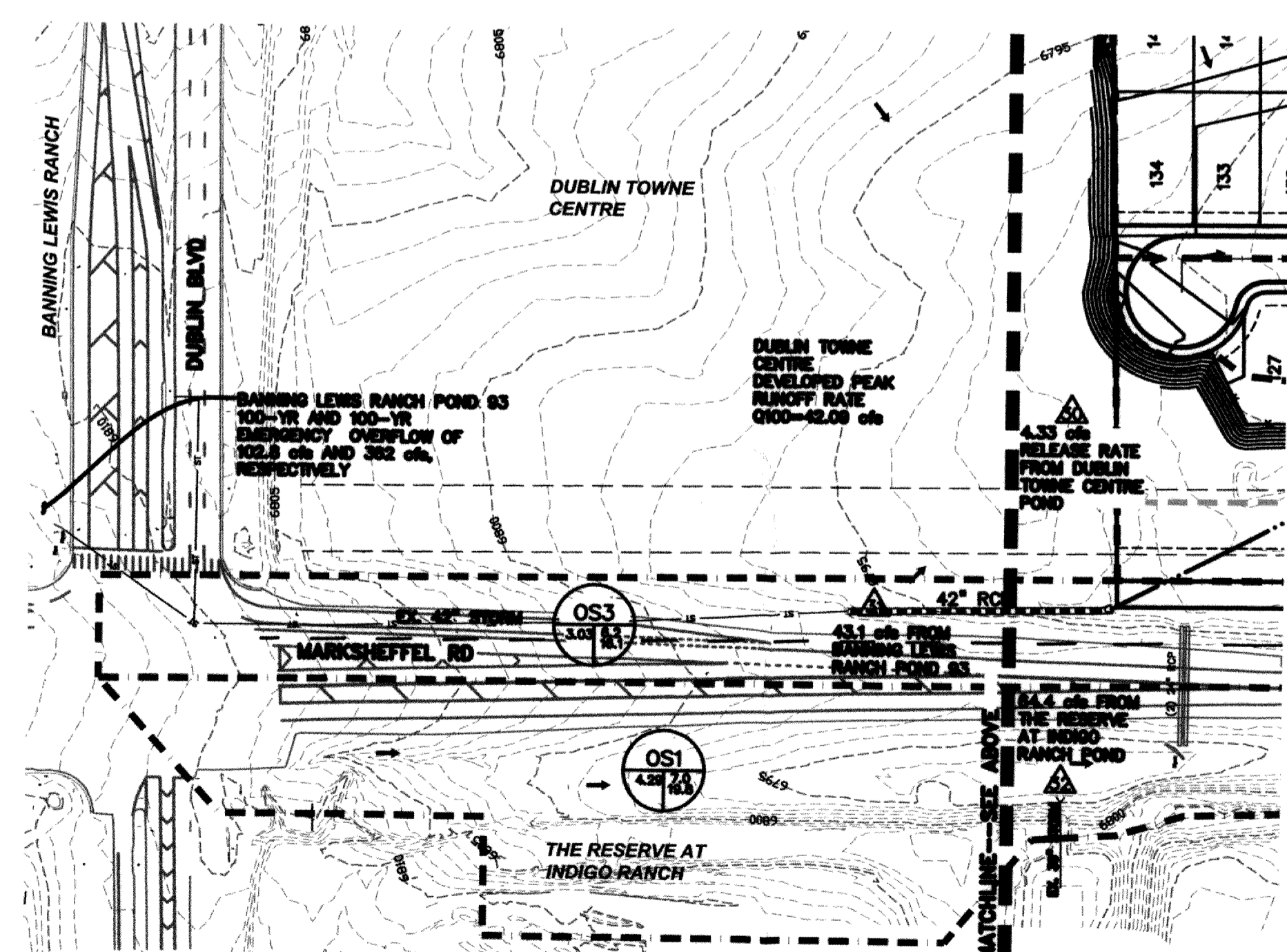
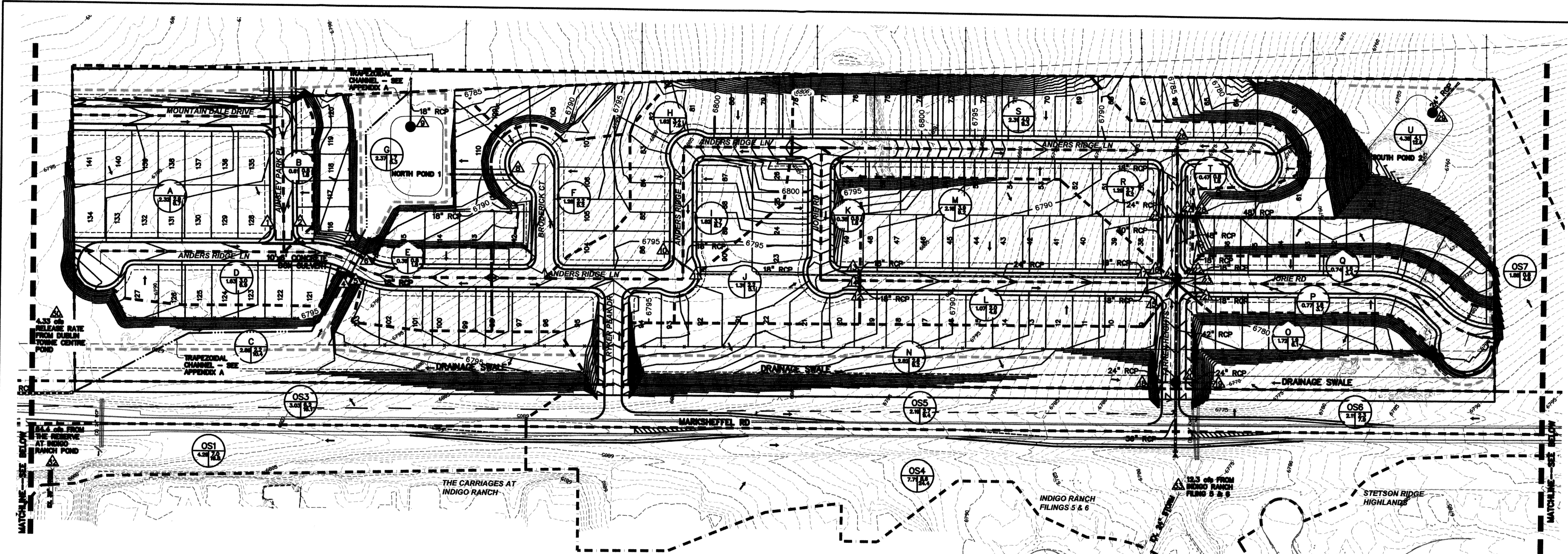
DRAWING SCALE:
HORIZONTAL: 1"=100'
VERTICAL: N/A

PROPOSED DRAINAGE PLAN

PROJECT NO. 20534-03CSCV
DRAWING NO.

DR-2

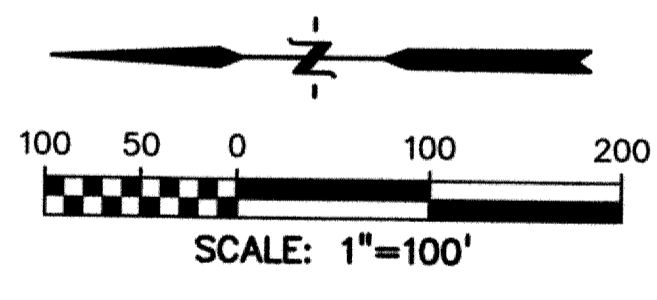
SHEET: 2 OF 2



DESIGN POINTS

POINT	Q5 (cfs)	Q100 (cfs)	POINT	Q5 (cfs)	Q100 (cfs)
DP-1	2.9	6.7	DP-26	4.0	9.3
DP-2	3.6	8.5	DP-27	40.9	101.2
DP-3	NOT USED		DP-28	42.4	103.3
DP-4	106.1	174.7	DP-29	47.2	120.5
TOTAL EMERGENCY OVERFLOW=		579.8	DP-30		4.33
DP-5	3.0	6.9	DP-31		59.7
DP-6	7.3	17.1	EMERGENCY OVERFLOW= 579.8		
DP-7	106.1	579.8	DP-32	33.6	84.2
DP-8	2.2	5.2	DP-33	14.5	36.7
DP-9	11.2	27.6			
DP-10	3.4	7.9			
DP-11	6.7	15.7			
DP-12	2.2	5.1			
DP-13	0.8	1.8			
DP-14	8.8	20.6			
DP-15	2.0	4.6			
DP-16	3.9	9.2			
DP-17	12.9	30.1			
DP-18	5.4	18.5			
DP-19	4.1	13.9			
DP-20	23.2	70.5			
DP-21	1.6	3.7			
DP-22	1.5	3.4			
DP-23	3.0	6.9			
DP-24	36.4	90.6			
DP-25	2.7	6.2			

RELEASE RATE



LEGEND

- EX. MINOR CONTOUR
- EX. MAJOR CONTOUR
- PR. MINOR CONTOUR
- PR. MAJOR CONTOUR
- STORM DRAIN
- ROAD CENTERLINE
- CURB FLOWLINE
- R.O.W.
- EXST. EASEMENT
- PR. TRAIL SYSTEM/POND ACCESS
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- Q5
- Q100

