

**FINAL DRAINAGE REPORT**  
**FOR**  
**FALCON RESERVE FILING NO. 1**  
**EARLY GRADING**  
**EL PASO COUNTY, COLORADO**

MAY 2025

Prepared for:

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Project #43-144

PCD Project # SP252 & P255

## DRAINAGE PLAN STATEMENTS

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

A circular red seal for a Colorado Registered Professional Engineer. The outer ring contains the text "COLORADO REGISTERED" at the top and "PROFESSIONAL ENGINEER" at the bottom. In the center, the name "VIRGIL A. SANCHEZ" is written in a blue cursive script. Below the name is the number "37160" in red, followed by the expiration date "05/15/25" in black. The seal is surrounded by a decorative border of small red dots.

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

ADDRESS: The Landhuis Company  
212 N. Wahstach Ave, Suite 301  
Colorado Springs, CO 80903

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

## CONDITIONS

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**FINAL DRAINAGE REPORT**  
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**PURPOSE**

This preliminary drainage report for Falcon Reserve Filing No. 1 is in support of a Preliminary Plan and rezone of the subject site. This report functions to identify the existing and proposed runoff patterns and recommend proposed drainage improvements which are intended to safely convey runoff through the proposed development, while minimizing impacts to downstream facilities and adjacent properties.

A Final Drainage Report for this site and Construction Drawings will be submitted concurrently with the Final Plat.

**GENERAL LOCATION**

The Falcon Reserve Filing No. 1 site is located in unincorporated El Paso County Colorado is located in the southeast quarter of the southeast quarter of Section 25, Township 12 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The parcel is bound to the north by existing single family residential Paint Brush Hills Filing No.4 and to the west by Liberty Grove Drive, to the south by existing Stapleton Road and to the east by existing Meridian Road. A Vicinity Map has been included in the appendix of this report.

**PROPERTY DESCRIPTION**

The Falcon Reserve Filing No.1 site consists of approximately 40 acres. The site is currently undeveloped. Existing ground cover consists of native or introduced grasses in fair condition. A dozen or so trees are located around the perimeter of the site. The existing site terrain generally slopes from northwest to southeast at approximately 3%. Existing roadside ditches are located along the south and east sides of the site.

The upper reach of the East Tributary of Falcon Basin flows southeast through the site. In the existing condition two detention ponds are located on the site; at the northeast and southwest corners of the site. A detention pond (Paint Brush Hills Pond No. 4) is located offsite just to the northwest corner of the site. Flows conveyed through and along the site are collected by an existing box culvert which travels underneath the intersection of Meridian and Stapleton roadways.

Telephone and gas lines are located along the north boundary, while cable and electric are located along the west property lines. Overhead utility lines and existing decorative wood fence are located along the south and east edges of the site. A sanitary sewer line runs along the eastern boundary of the site. No known irrigation facilities are located on the site.



The site is currently undeveloped and is currently zoned as Commercial Regional, “CR”, as identified by El Paso County and can be found under schedule number 5225400001. A rezone will be requested to develop this property into Residential Multi-Dwelling, “RM-12”.

## **SOILS**

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey data base indicates that the soils for this project watershed area have been delineated, as Columbine Gravelly Sandy Loam (14), Pring Coarse Sandy Loam, (71), and Stapleton Sandy Loam is characterized as Hydrologic Soil Types “A” and “B”. A Soils Map is provided in the appendix of this report.

## **FLOOD STATEMENT**

No portion of this site is within a designated F.E.M.A. floodplain as determined by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0551G dated (12/7/2018 not printed). Refer to the appendix of this report.

## **DRAINAGE BASINS**

Falcon Reserve Filing No.1 is located in the East Tributary of the Falcon Basin. The Falcon DBPS recommends that a channel with small drops structures with toe protection be installed across the site. A sub regional Pond SR6 is recommended to be constructed on the southeast corner of the site. In lieu of a sub-regional pond the existing ponds 1-3 will be upgraded to full spectrum ponds and an onsite full spectrum pond 4 will be constructed. A more in depth discussion of the existing ponds 1-3 that will be updated to full spectrum ponds and the proposed full spectrum pond 4 can be found in the Preliminary Drainage Report for Falcon Reserve Filing No 1 by M&S Civil Consultants, Inc.

## **PREVIOUS STUDIES**

The drainage basin area which encompasses Falcon Reserve Filing No.1 has been studied numerous times. Below is short outline of the assumptions regarding the lands of the subject site and those based upon the previously assembled and approved drainage reports and those that may include or be adjacent to the subject site.

“Falcon Drainage Basin Planning Study, Selected Plan Report Final – September 2015” prepared by Matrix Design Group.

- Identifies project area within East Tributary of Falcon Drainage Basin
  - Determines Historic, Existing, and Future Peak Flow Rates and Flow Volumes at NW corner of Stapleton Drive and Meridian Road (DP Jet 020) for 2, 5, 10, 100-year events.
    - 100-year historic flow 200 cfs
    - 100-year developed flow 390 cfs
- Identifies deficiencies of PBH Pond #4 (known as Pond 1 by M& S Civil), but doesn’t recommend reconstruction
- Identifies deficiencies (HW/D) of existing dual 6’x2.5 RCBC at Stapleton Dr/Meridan Rd

- Notes erosion along the southern boundary of parcel
- Recommends construction of small drop structures with toe protection across parcel.
- Recommends sub-regional detention pond to be constructed on subject site (SR6)
  - EURV + 100 outlet configuration
  - 100-year peak discharge of 200 cfs
- Recommends replacement of (2) 6'x2.5 RCBC w/ (2) 12'x4' RCBC through the intersection of Stapleton and Meridian Road
- Establishes costs for drainage improvements (to be discussed in detail).
  - Assumes 15% engineering and 20% contingencies

"Conceptual Drainage Analysis for Falcon Reserve, El Paso County, Colorado" prepared by Core Engineering Group, March 2014.

- Concept study that made recommendations of large scale drainage improvements based upon modifying Falcon Reserve Study. Doesn't provide a detailed on site analysis
- Provides a Peak flow rate comparison of KKBNA, Matrix and Core Engineering flow rates for proposed condition
- Recommends removal of Pond in NE corner of site, due to planned roadway entrance near location, with installation of 5'x5' RCBC or channel along east boundary
- Recommends no improvements to PBH Pond #4 (known as Pond 1 by M&S Civil) at NW corner of site.
- Recommended construction of channel along north property line to convey flows from aforementioned pond. Swale should be sized for pre-detained flows which can also coincide as an emergency spillway
- Recommends removal of Pond 3 and construction of 48" RCP along south boundary
- Recommends construction of the DBPS regional pond at the southeast corner of the site
- Estimates a volume of 23.87 acre-ft of storage and 5- and 100-year release rates of 43 and 195 cfs
- Does not make recommendation to replace existing of culvert crossing under Stapleton Drive

"Falcon Reserve Drainage Study" prepared by LDC Inc., February 2006.

- Concept study that made recommendations of large scale drainage improvements to accompany the proposed construction of 126 residential lots. Does not provide a detailed onsite analysis
- Recommends no improvements to PBH Pond #4 (known as Pond 1 by M&S Civil)
- Recommends removal of Pond 2 and Pond 3
- Recommends construction of a channel along north property line to convey flows from existing pond
- Recommends construction of 5'x5' RCBC or Channel along east boundary
- Recommends construction of 48" RCP along south boundary
- Recommends construction of the DBPS regional pond

"Master Development Drainage Plan, Falcon Reserve Filing No.1, prepared by MVE, Inc., September 12, 2000.

- MDDP study that made recommendations of large scale drainage improvements for the site based upon modifying the concepts within the previous KKBNA study
- Updates “Drainage Analysis for Paint Brush Hills Filing No. 4” by utilizing the currently required Type IIA Rainfall Distribution vs. the Type II
- Verifies volume deficiencies in Pond 1 NE corner of site (known as Pond 2 by M&S Civil), PBH Pond #4 (known as Pond 1 by M&S Civil), and Pond 3 (SW corner of site)
- Estimates “historic” peak flows of 69 cfs, 255 cfs, existing peak flows of 197 cfs and 452 cfs at the southeast corner of the site in the 5- and 100-year storm events respectively
- Estimates the culvert under Stapleton to have a capacity of 275 cfs before culvert headwater begins to encroach on the roadway shoulders. Calculates 100-year peak flow of 334 thru culvert with 118 cfs conveyed over the roadway thru the intersection
- Anticipates site to be comprised of 122 - 1/4 acre single family residential lots, with a 6.3 acre multi-family site
- Revises PBH Pond #4 (known as Pond 1 by M&S Civil) by realigning outlet pipe to proposed grasslined swale which with drop structure that skirts the northern boundary of the parcel
- Removes existing Ponds at NE and SW corners of site (Pond 2 and 3)
- Recommends construction of grasslined swale with drop structures along eastern boundary of site
- Recommends 48” storm sewer along southern boundary to convey flows from offsite and onsite areas easterly
- Recommends construction of 19 acre-foot Regional Detention Facility to be constructed in southeast corner of site, reducing developed flows of 248 and 564 cfs to 12 cfs and 167 cfs in the 5- and 100-year storm events respectively
- Per the report flows along the boundary of the site (rights of way, etc.) bypass pond and are allowed to freely discharge to the culvert under Stapleton Road

"Paintbrush Hills Filing No.4 Final Drainage Report, prepared by KKBNA, December 1986.

- Report evaluative drainage reaching the 109.40 acres located north and west of the subject site.
- Identified subject site for commercial use
- Established Ponds 1-3 which were to be constructed to detain runoff at the NE and SW corners of the future commercial area and one (Pond 2) to be constructed just to the NW of the subject site
- Estimated Historic and Developed 100-year flow rates at Stapleton of 316 cfs and 460 cfs
- Recommended construction of (3) 30” CMPs at 4.75% to convey the 5-year discharge under Stapleton Road

## **DRAINAGE CRITERIA**

Hydrology calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014 and the El Paso County Engineering Criteria Manual (ECM) as revised in July 2019.

## HYDROLOGIC CALCULATIONS

The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals. Basins were analyzed and delineated (see Existing Conditions Map & Proposed Conditions Map in the Appendix) in order to determine areas and C coefficients. Overland flow and channelized flow paths were analyzed for each sub-basin in order to determine times of concentration. Table 6-6 Volume 1 of DCM was used for corresponding runoff coefficients.

## HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the methods described in the El Paso County Storm Drainage Design Criteria manual along with the Urban Drainage and Flood Control District (UDFCD) manual. Manning's Equation was used for hydraulic analysis of swales and to determine the sizing of the existing storm sewer facilities. The pertinent data sheets are included in the appendix of this report.

## FOUR STEP PROCESS

**Step 1 Employ Runoff Reduction Practices** – Runoff will be reduced through the use of temporary sediment ponds and in the interim condition until the ground has been stabilized with vegetation.

**Step 2 Stabilize Drainageways** – Onsite Temporary Sediment Pond 5 will outfall into a proposed storm system at Design Point 17 will outfall into a riprap lined basin. The discharged runoff will be conveyed downstream by an existing dual box culvert that runs under the Meridian Road/Stapleton Road intersection and discharges to an existing swale southeast of the site. Runoff reaching the existing culvert have been restricted to less than the existing condition. As such the development of the subject site, it is not anticipated to have negative effect on the downstream drainageway.

**Step 3 Provide Water Quality Capture Volume** – The existing ponds (as shown in the drainage map by M&S Civil) Pond 1, Pond 2, and Pond 3 will be adequately resized and the existing culverts will remain in place to convey runoff. Five (5) temporary sediment basins are proposed and have been adequately sized to provide sedimentation collection from the site and maintain existing water quality levels.

**Step 4 Consider Need for Industrial and Commercial BMP's** – This submittal provides an early grading and erosion control plan with appropriate **BMP's** in place. The proposed project will use silt fence, vehicle tracking control pads, straw bale barriers, sediment basins, erosion control blanketing, inlet protection, mulching and reseeding, and other **BMP's** to mitigate the potential for erosion across the site.

## EXISTING DRAINAGE CHARACTERISTICS

The purposes of this document are to evaluate preliminary drainage design which aligns and yet varies from the previous concept studies and drainage basin planning studies for the area. Given the numerous times in which the existing facilities have been analyzed deemed to be considered insufficient M&S Civil will provide an existing conditions analysis and refer to the Concept Drainage Analysis Cover Letter prepared

by MS Civil Consultants, Inc., dated October 2021, for the evaluation of historic and existing condition flow rates. Refer to the appendix for hydrologic and hydraulic calculations and the existing conditions drainage map.

## **Existing Drainage Discussion**

### **Offsite Basin A1**

This offsite drainage **Basin A1** is approximately 29.5 acres in size and is located to the north and west of the subject site. **Basin A1** consists of existing Paint Brush Hills Filing No. 9 (single family residential lots) and portions of Londonderry Drive. The calculated runoff produced within this area totals approximately 24.5 cfs and 78.6 cfs in the 5 and 100-year events respectively. Storm water produced by the basin continues south and east through PBH Filings 4 and 5 via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 (**Design Point 1 (DP1)**), located within **Basin B4**.

### **Offsite Basin B1**

This offsite drainage **Basin B1** is approximately 49.26 acres in size and is located to the north and west of the subject site. **Basin B** consists of portions of existing Paint Brush Hills Filing No. 5, 13A (single family residential lots) and a portion of Falcon Middle School. The calculated runoff produced within this area totals approximately 31.4 cfs and 116.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1** and **B1** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 (**DP1**), located within **Basin B4**.

### **Offsite Basin B2**

This offsite drainage **Basin B2** is approximately 4.20 acres in size and is located to the north and west of the subject site. **Basin B2** consists of portions of existing Paint Brush Hills Filing No. 4, 5 (single family residential lots). The calculated runoff produced within this area totals approximately 3.9 cfs and 12.1 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1** and **B2** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 (**DP1**), located within **Basin B4**.

### **Offsite Basin B3**

This offsite drainage **Basin B3** is approximately 1.22 acres in size and is located to the north and west of the subject site. **Basin B3** consists of a small portion of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of Liberty Grove Drive and Cranston Drive. The calculated runoff produced within this area totals approximately 2.8 cfs and 5.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1, B2** and **B3** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 (**DP1**), located within **Basin B4**.

### **Offsite Basin B4**

This offsite drainage **Basin B4** is approximately 6.46 acres in size and is located to the north and west of the subject site. **Basin B4** consists of a small portion of existing Paint Brush Hills Filing No. 4 (single family

residential lots) and a portion of existing grass-lined swale and existing detention Pond 1. The calculated runoff produced within this area totals approximately 3.6 cfs and 16.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin A1, B1, B2, B3 and B4** combine and are routed via existing storm sewer systems and an existing grass-lined channel and outfall into existing detention Pond 1 (**DP1**), located within **Basin B4**. The cumulative flows reaching existing pond 1(**DP1**) are approximately 55.5 cfs and 192.4 cfs in the 5 and 100-year events respectively. These flows are routed via an existing 42" CMP culvert into **Basin E1** and ultimately to **Design Point 4 (DP4)**.

#### **Onsite Basin C**

This onsite drainage **Basin C** is approximately 2.13 acres in size and is located along the northern property line of the subject site. **Basin C** consists of portions of an existing swale and undeveloped land. The calculated runoff produced within this area totals approximately 0.9 cfs and 4.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin C** discharges to a small existing detention Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site.

#### **Offsite Basin C1**

This offsite drainage **Basin C1** is approximately 3.27 acres in size and is located to the north of the subject site. **Basin C1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 2.8 cfs and 10.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin C1** discharges to a small existing detention Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site.

#### **Offsite Basin C2**

This offsite drainage **Basin C2** is approximately 10.67 acres in size and is located to the north of the subject site. **Basin C2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 7.1 cfs and 24.8 cfs in the 5 and 100-year events respectively. Runoff from **Basin C2** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Flows from this inlet combine with flows from **Basin C3** and are conveyed via an existing 36" RCP storm sewer to an existing detention Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site.

#### **Offsite Basin C3**

This offsite drainage **Basin C3** is approximately 22.78 acres in size and is located to the north of the subject site. **Basin C3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 20.8 cfs and 59.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin C3** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Flows from this inlet combine with flows from **Basin C2** and are conveyed via an existing 30" RCP storm sewer to an existing detention Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site.

#### **Offsite Basin C4**

This offsite drainage **Basin C4** is approximately 21.69 acres in size and is located to the north of the subject site. **Basin C4** consists of portions of existing Paint Brush Hills Filing No. 4, 6, 7, 8, 9 (single family residential lots) and a portion of Londonderry Drive. The calculated runoff produced within this area totals approximately 18.0 cfs and 51.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin C4** is routed via curb and gutter to an existing grass-lined swale. Flows are conveyed by an existing 24" CMP to an existing detention Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site. The cumulative flows reaching existing pond 2 (**DP2**) are approximately 45.9 cfs and 138.2 cfs in the 5 and 100-year events respectively. These flows are routed via an existing 36" CMP culvert into **Basin F1** and ultimately to **Design Point 5 (DP5)**.

#### **Offsite Basin D1**

This offsite drainage **Basin D1** is approximately 16.01 acres in size and is located to the west of the subject site. **Basin D1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 12.1 cfs and 42.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin D1** is routed via curb and gutter to an existing 10' Type R inlet, located north of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D2, D3, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. Flowby will continue south along Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

#### **Offsite Basin D2**

This offsite drainage **Basin D2** is approximately 10.14 acres in size and is located to the west of the subject site. **Basin D2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals approximately 7.2 cfs and 25.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin D2** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D3, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

#### **Offsite Basin D3**

This offsite drainage **Basin D3** is approximately 9.30 acres in size and is located to the west of the subject site. **Basin D3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and a small portion of the Falcon Middle School. The calculated runoff produced within this area totals approximately 6.1 cfs and 22.3 cfs in the 5 and 100-year events respectively. Runoff from **Basin D3** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D2, D5** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. Flowby will continue

east and south along Waterbury Drive and Liberty Drive to an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

#### **Offsite Basin D4**

This offsite drainage **Basin D4** is approximately 9.36 acres in size and is located to the west of the subject site. **Basin D4** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and portions of the Stapleton Drive. The calculated runoff produced within this area totals approximately 9.4 cfs and 26.9 cfs in the 5 and 100-year events respectively. Runoff from **Basin D4** is routed via a roadside ditch running along existing Stapleton Drive to an existing 24" RCP culvert which crosses under Liberty Drive. The flow prior to entering the existing 24" RCP culvert will combine with flowby from **Basins D1, D2, D3, D5** via an existing 15' curb cut and be conveyed by the existing 24" RCP culvert to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. For the existing condition it is assumed the existing 15' curbcut will capture all the flow. Analysis will be provided in the proposed drainage condition.

#### **Offsite Basin D5**

This offsite drainage **Basin D5** is approximately 0.09 acres in size and is located to the west of the subject site. **Basin D5** consists of a small portion of the existing Liberty Drive/Waterbury Drive intersection. The calculated runoff produced within this area totals approximately 0.4 cfs and 0.7 cfs in the 5 and 100-year events respectively. Runoff from **Basin D5** is routed via crossspan and curb and gutter to an existing 10' Type R inlet, located south of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **Basins D1, D2, D3** and be conveyed by existing storm sewer infrastructure to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. Flowby will continue south along Liberty Drive to an existing 15' wide curbcut, prior to the Liberty Drive/Stapleton Drive intersection. The flowby will combine with flows from **Basin D4** and be conveyed by the existing 36" RCP culvert to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site.

#### **Offsite Basin D6**

This offsite drainage **Basin D6** is approximately 2.05 acres in size and is located to the west of the subject site. **Basin D6** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of the east half of existing Liberty Drive. The calculated runoff produced within this area totals approximately 2.8 cfs and 7.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin D6** is routed via curb and gutter to an existing 15' curbcut, located prior to the Liberty Drive/Stapleton Drive intersection. The flow will be conveyed by the existing 15' curbcut to an existing detention Pond 3 (**Design Point 3 (DP3)**), located to the southwest corner of the site. The cumulative flows reaching existing pond 3 (**DP3**) are approximately 34.8 cfs and 114.4 cfs in the 5 and 100-year events respectively. These flows are routed via an existing culvert into **Basin F2** and ultimately to **Design Point 5 (DP5)**. For the existing condition it is assumed the existing 15' curbcut will capture all the flow. Analysis will be provided in the proposed drainage condition.



### **Onsite Basin E1**

This drainage **Basin E1** includes runoff from the proposed 36.10-acre Falcon Reserve Filing No.1 residential subdivision. The calculated runoff produced within this area totals approximately 13.6 cfs and 74.0 cfs in the 5 and 100-year events respectively. Runoff from **Basin E1** will be conveyed by sheet flow and various swales to the southeast corner of the property. The cumulative flows from **Basin E1** and **DP1** reaching the southeast corner of the site (**DP4**) are approximately 59.8 cfs and 228.0 cfs in the 5 and 100-year events respectively. These flows are routed to **Design Point 5 (DP5)**, via natural topography.

### **Onsite/Offsite Basin F1**

This drainage basin **F1** is approximately 3.13 acres and includes runoff from the periphery of Falcon Reserve Filing No.1 residential subdivision and the adjacent roadway corridors (Meridian Road). The calculated runoff produced within this area totals approximately 4.6 cfs and 10.2 cfs in the 5 and 100-year events respectively. Runoff from **Basin F1** will be conveyed via existing roadside ditches to the existing dual box culvert at NW corner of Stapleton Road and Meridian Road at **Design Point 5 (DP5)**.

### **Onsite/Offsite Basin F2**

This drainage basin **F2** is approximately 1.44 acres and includes runoff from the periphery of Falcon Reserve Filing No.1 residential subdivision and the adjacent roadway corridors (Stapleton Drive). The calculated runoff produced within this area totals approximately 2.4 cfs and 5.5 cfs in the 5 and 100-year events respectively. Runoff from **Basin F2** will be conveyed via an existing roadside ditch to an existing 36" CMP culvert. The existing 36" culvert will outfall to an existing dual box culvert (**Pipe Run 1 (PR1)**) at NW corner of Stapleton Road and Meridian Road at **Design Point 5 (DP5)**. The cumulative flows from **Basin F1** (routed via an existing roadside ditch), **Basin F2** (routed via an existing roadside ditch), **DP2** (cumulative flows from Ex Pond 2 which outfalls to the existing roadside ditch located within Basin F1), **DP3** (cumulative flows from Ex Pond 3 which outfalls to the existing roadside ditch located within Basin F2) and **DP4** (cumulative flows from Basins E1 and DP1 which flow directly to DP5) reaching the southeast corner of the site (**DP5**) are approximately 134.2 cfs and 455.8 cfs in the 5 and 100-year events respectively. These flows are routed under Stapleton Drive to the southeast corner of the Stapleton Drive/Meridian Road intersection via an existing dual box culvert to an existing swale which is adjacent to Stapleton Road.

## **PROPOSED DRAINAGE CHARACTERISTICS**

Improvements proposed for early grading are overlot grading to balance the earthworks, prepare the site for future development, provide temporary sediment basins, surface roughing and temporary mulching and seeding. The 4 proposed FSD pond will ultimately convey runoff to an existing dual 2.5'x6' RCBC located at the southeast corner of the site. A visual inspection of these existing structures shall be made before use. A proposed storm sewer system onsite will convey runoff to the existing 2.5'x6' RCBC. For more information of drainage basins, existing and proposed structures refer to the Proposed Drainage Map located within the Appendix of this report.

## Detailed Drainage Discussion

### Design Point EX-1.1 (DP1.1, offsite area northwest of Pond 1)

**DPEX-1.1** consists of approximately 82.34 acres of existing Paint Brush Hills Pond 4, 5, 9, 13A northwest of the proposed site. The calculated runoff for **Basin A1, B1** and a portion of **B4** is 49.5 cfs and 173.3 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via sheet flow into Temporary Pond 1 (**Design Point 1 (DP1)**).

### Design Point EX-1.2 (DP1.2, offsite area north of Pond 1)

**DPEX-1.2** consists of approximately 5.42 acres of existing Paint Brush Hills Pond 4,5 northwest of the proposed site. The calculated runoff for **Basin B2** and **B3** is 6.3 cfs and 17.1 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via sheet flow to Temporary Sediment Pond 1 (**DP1**).

### Design Point EX-IN1 (DP EX-IN1, offsite area north of Pond 2)

**DP EX-IN1** is approximately 22.78 acres (**Basin C3**) in size and is located to the north of the subject site. **DP EX-IN1** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a **Basin C2** (in the 100-year event). Due to the capacity of the street section (Cranston Drive), a split flow was calculated for **DP EX-IN1**, in the 100-year event. The total calculated runoff produced within this area is 21.9 cfs and 76.5 cfs (all of Cranston Drive Street section 100-year event) in the 5 and 100-year events respectively and 10.9 cfs and 38.3 cfs (northwest half of Cranston Drive) in the 5 and 100-year events respectively. The Runoff from **DP EX-IN1** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Intercepted flow will be conveyed by an existing 30" RCP pipe (**PRE1** (Q5=10.9 Q100=34.1 cfs)) to **DP EX-IN2**. Excess runoff will be overflow to the inlet at **DP EX-IN2**. The existing storm system will convey the combined flow to detention Temporary Sediment Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site for water quality treatment.

### Design Point EX-IN2 (DP EX-IN2, offsite area north of Pond 2)

**DP EX-IN2** is approximately 21.69 acres (**Basin C3**) in size and is located to the north of the subject site. **DP EX-IN2** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a **Basin C3** (in the 100-year event). Due to the capacity of the street section (Cranston Drive), a split flow was calculated for **DP EX-IN2**, in the 100-year event. The total calculated runoff produced within this area is 21.9 cfs and 76.5 cfs (all of Cranston Drive Street section 100-year event) in the 5 and 100-year events respectively and 10.9 cfs and 38.3 cfs (southeast half of Cranston Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN2** is routed via curb and gutter to an existing 9' CDOT Type 13 combination inlet. Intercepted flow will combine with flows from **PRE1** and be conveyed by an existing 36" RCP pipe (**PRE2** (Q5=21.9 Q100=68.2 cfs)) to Temporary Sediment Pond 2 (**DP2**).

### Design Point EX-CUL (DP EX-CUL, offsite area north of Pond 2)

**DP EX-CUL** is approximately 21.69 acres in size and is located to the north of the subject site. **DP EX-CUL** consists of portions of existing Paint Brush Hills Filing No. 4, 6, 7, 8, 9 (single family residential lots) and a portion of Londonderry Drive. The calculated runoff for **Basin C4** produced within this area totals 18.0 cfs and 51.5 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-CUL** is routed via curb and gutter to an existing grass-lined swale. Flows are conveyed by an existing 24" CMP to Temporary

Sediment Pond 2 (**Design Point 2 (DP2)**) located at the northeast corner of the site for water quality treatment.

**Design Point EX-IN3 (DP EX-IN3, offsite area northwest of Pond 3)**

**DP EX-IN3** is approximately 16.01 acres (**Basin D1**) in size and is located to the west of the subject site. **DP EX-IN3** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and a portion of **Basin \*\*D6** (in the 100-year event). Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX-IN3**, in the 100-year event. The total calculated runoff produced within this area is 12.1 cfs and 50.5 cfs (all of Liberty Drive Street section 100-year event) in the 5 and 100-year events respectively and 2.5 cfs and 25.3 cfs (west half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN3** is routed via curb and gutter to an existing 10' Type R inlet, located north of the Liberty Drive/Waterbury Drive intersection. The intercepted flow (**PRE4** (Q5=7.7 Q100=10.8 cfs)) will be conveyed by an existing storm sewer system to **DP EX-02** and ultimately to Temporary Sediment Pond 3 (**Design Point 3 (DP3)**) located to the southwest corner of the site. Flowby will continue south along Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

**Design Point EX-IN4 (DP EX-IN4, offsite area northwest of Pond 3)**

**DP EX-IN4** is approximately 10.14 acres (**Basin D2**) in size and is located to the west of the subject site. **DP EX-IN4** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots). The calculated runoff produced within this area totals 7.2 cfs and 25.3 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-IN4** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The intercepted flow (**PRE5** (Q5=5.9 Q100=10.9 cfs)) will be conveyed by an existing storm sewer system to **DP EX-IN5** and ultimately to Temporary Sediment Pond 3 (**Design Point 3 (DP3)**), for water quality treatment, located to the southwest corner of the site. Flowby will continue east and south along Waterbury Drive and Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

**Design Point EX-IN5 (DP EX-IN5, offsite area northwest of Pond 3)**

**DP EX-IN5** is approximately 9.30 acres (**Basin D3**) in size and is located to the west of the subject site. **DP EX-IN5** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots), Scenic View at Paint Brush Hills Subdivision and a small portion of the Falcon Middle School. The calculated runoff produced within this area totals 6.1 cfs and 22.3 cfs in the 5 and 100-year events respectively. Runoff from **DP EX-IN5** is routed via curb and gutter to an existing 10' Type R inlet, located west of the Liberty Drive/Waterbury Drive intersection. The combined intercepted flow from **DP EX-IN4** and **DP EX-IN5** (**PRE6** (Q5=11.1 Q100=20.9 cfs)) will be conveyed by an existing storm sewer system to **DP EX-IN6** and ultimately to Temporary Sediment Pond 3 (**Design Point 3 (DP3)**). Flowby will continue east and south along Waterbury Drive and Liberty Drive to **DP EX-02** an existing 10' Type R inlet south of the Liberty Drive/Waterbury Drive intersection.

**Design Point EX-IN6 (DP EX-IN6, offsite area northwest of Pond 3)**

**DP EX-IN6** is approximately 0.09 acre (**Basin D2**) in size and is located to the west of the subject site. **DP EX-IN6** consists of a small portion of the existing Liberty Drive/Waterbury Drive intersection and a portion of **Basin \*\*D6** (in the 100-year event). Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX-IN6**, in the 100-year event. The total calculated runoff produced from **DP EX-**

**IN6** and flowby from **DP EX01**, **DP EX-IN4** and **DP EX-IN5** within this area totals 8.9 cfs and 69.2 cfs (all of Liberty Drive-street section 100-year event) in the 5 and 100-year events respectively and 8.9 cfs and 31.4 cfs (west half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX-IN6** is routed via crossspan and curb and gutter to an existing 10' Type R inlet, located south of the Liberty Drive/Waterbury Drive intersection. The intercepted flow will combine with flows from **PR E4** and **PR E6** and be conveyed by an existing 24" RCP storm sewer system (**PRE7** (Q5=24.7 Q100=42.7 cfs) to Temporary Sediment Pond 3 (**Design Point 3 (DP3)**). Flowby will continue south along Liberty Drive till it reaches an existing 15' wide curbcut, prior to the Liberty Drive/Stapleton Drive intersection (**Design Point EX03, DP EX03**).

#### **Design Point EX03 (DP EX03, offsite area west of Pond 3)**

**DP EX03** consists of existing Liberty Drive and a portion of flowby from Waterbury Drive and Liberty Drive inlets and **Basin\*\*D6**. Due to the capacity of the street section (Liberty Drive), a split flow was calculated for **DP EX03**, in the 100-year event. The calculated total runoff produced within this street section totals 6.1 cfs and 52.1 cfs (all of Liberty Drive-street section 100-year event) in the 5 and 100-year events respectively and 6.1 cfs and 26.2 cfs (half of Liberty Drive) in the 5 and 100-year events respectively. Runoff from **DP EX03** is routed via curb and gutter to existing 15' curbcuts on both sides of the street. The existing 15' curbcut on the west side of Liberty Drive will approximately intercept (Q5=3.2 Q100=8.0 cfs), which will be routed to a roadside swale in **Basin D4**. The remainder of the flow (Q5=2.9 Q100=18.2 cfs) will be routed south. A small portion of the 100 year flow (Q5=0.0 Q100=10.6 cfs) will transfer over the crown of Liberty Drive to the east. The remainder will be routed via a curb return and an existing 6' curb cut to a roadside swale in **Basin D4** which will then be routed to east in an existing 24" RCP culvert into Temporary Sediment Pond 3 for water quality treatment. The existing 15' curbcut on the east side of Liberty Drive will approximately intercept (Q5=2.2 Q100=8.0 cfs) which will be routed to Temporary Sediment Pond 3. The remainder of the flow (Q5=1.2 Q100=18.2 cfs) and the flowby from the westside of Liberty Drive will be routed via a curb return and an existing 6' curbcut to a roadside swale in **Basin Q** which will then be routed west to **Design Point 16 (DP16)**.

#### **Design Point EX04 (DP EX04, offsite area west of Pond 3)**

**DP EX04** consists of portions of existing Paint Brush Hills Filing No. 4 (single family residential lots) and portions of existing Liberty Drive contained within the west half of **DP EX03** minus the flowby transferred to the east of Liberty Drive. The calculated total runoff produced to this design point is 11.7 cfs and 40.7 cfs in the 5 and 100-year events respectively. Runoff from **DP EX04** is routed to east in an existing 24" RCP culvert (**PRE8** (Q5=11.7 Q100=40.7 cfs) to Temporary Sediment Pond 3.

#### **Design Point 1.1 (DP1.1, Temporary Offsite Temporary Sediment Basin #1)**

**DP1.1** consists of approximately 1.96 acres of existing Paint Brush Hills Pond 4 north of the proposed site. The basin consists of early overlot grading to balance earthworks and prepare the site for future development. Runoff from **Basin K** (Q5= 0.9 cfs, Q100= 5.0 cfs) is conveyed to a temporary sediment basin at **DP1.1** (Q5=0.9 cfs, Q100=5.0 cfs). The flows from **Temporary Sediment Basin #1 (TSB1)** will discharge through a 6" PVC storm sewer to the existing 42" CMP storm sewer that is to remain in place until construction has been completed.

### **Design Point 1 (DP1, Temporary Offsite Pond 1)**

**DP1** consists of approximately 90.64 acres of existing Paint Brush Hills Pond 4, 5, 9, 13A northwest of the proposed site. The cumulative runoff for **Basin A1, B1, B2, B3** and **B4** is 55.5 cfs and 192.4 cfs in the 5 and 100-year events respectively. **Basin B4** has a proposed swale (Section P2-P2) to dissipate the flows before combining with the flows from **DP1**. **Basin B2** has a proposed rip rap lined swale (Section P3-P3) to dissipate the flows before combining with from **DP1**. Calculations for the swales can be found in the appendix of this report. Runoff from the basin is collected and conveyed via a proposed grass-lined channel located within **Basin M**. The flows shall be released via an existing 42" CMP pipe.

### **Design Point 2.1 (DP2.1, Temporary Offsite Temporary Sediment Basin #2)**

**DP2.1** consists of approximately 3.58 acres of the proposed subject site. The basin consists of early overlot grading to balance earthworks and prepare the site for future development. Runoff from **Basin M** (Q5= 0.9 cfs, Q100= 5.0 cfs) and **Basin N** (Q5= 0.8 cfs, Q100= 4.2 cfs) is conveyed to a temporary sediment basin at **DP2.1** (Q5=1.6 cfs, Q100=8.5 cfs). The flows from **Temporary Sediment Basin #2 (TSB2)** will discharge through a 6" PVC storm sewer to the existing 30" CMP storm sewer that is to remain in place until construction has been completed.

### **Design Point 2 (DP2, Onsite Pond 2)**

**DP2** consists of approximately 61.99 acres of existing Paint Brush Hills Pond 4, 6, 7, 8, 9 north of the proposed site and a portion of the northern edge of the site. The cumulative runoff for **Basin M** (2.11 acres), **N** (1.47 acres), **Basin C1** (3.27 acres), flowby from **EX-IN2** and **DP1** is 65.8 cfs and 240.7 cfs in the 5 and 100-year events respectively. Runoff from the **Basin C1** is collected and conveyed via an existing grass-lined channel. Runoff from **DP1** and **Basin M** is routed via a proposed 60' grass lined swale to Pond 2. The flows shall be released via an existing 30" CMP storm sewer into **Basin O** and ultimately to **Design Point 17 (DP17)**.

### **Design Point 3.1 (DP3.1, Temporary Offsite Temporary Sediment Basin #3)**

**DP3.1** consists of approximately 8.17 acres of the proposed subject site. The basin consists of early overlot grading to balance earthworks and prepare the site for future development. Runoff from **Basin P1** (Q5= 1.6 cfs, Q100= 8.7 cfs), **Basin P** (Q5= 0.9 cfs, Q100= 4.7 cfs), and **Basin \*\*D6** (Q5= 3.8 cfs, Q100= 9.3 cfs) is conveyed to a temporary sediment basin at **DP3.1** (Q5=6.0 cfs, Q100=21.3 cfs). The flows from **Temporary Sediment Basin #3 (TSB3)** will discharge through a 6" PVC storm sewer to the existing 24" CMP storm sewer that is to remain in place until construction has been completed.

### **Design Point 3 (DP3, Onsite Temporary Sediment Pond 3)**

**DP3** consists of approximately 49.37 acres of existing Paint Brush Hills Pond 4, Scenic View at Paint Brush Hills Subdivision, a small portion of the Falcon Middle School west of the proposed site and a portion of the western edge of the site. The cumulative runoff for **Basin P, Basin P1** and partial capture of **Basin \*\*D6** by an existing 15' curbcut is 41.8 cfs and 102.1 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via an existing storm sewer system to Pond 3, located at the southwest corner of the site. Pond 3 shall release runoff into **Basin Q** and ultimately to **Design Point 16 (DP16)** via an existing 24" CMP storm sewer to **DP17**.

**Design Point 4.1 (DP4.1, Temporary Offsite Temporary Sediment Basin #4)**

**DP4.1** consists of approximately 8.89 acres of the proposed subject site. The basin consists of early overlot grading to balance earthworks and prepare the site for future development. Runoff from **Basin L1** (Q5= 3.8 cfs, Q100= 18.1 cfs) is conveyed to a temporary sediment basin at **DP4.1** (Q5=3.8 cfs, Q100=20.6 cfs). The flows from **Temporary Sediment Basin #4 (TSB4)** will discharge through a 6" PVC storm sewer to the south and ultimately to the existing dual 2.5'x6' RCBC.

**Design Point 5.1 (DP5.1, Temporary Offsite Temporary Sediment Basin #5)**

**DP5.1** consists of approximately 15.71 acres of the proposed subject site. The basin consists of early overlot grading to balance earthworks and prepare the site for future development. Runoff from **Basin L** (Q5= 10.4 cfs, Q100= 56.8 cfs) is conveyed to a temporary sediment basin at **DP5.1** (Q5=10.4 cfs, Q100=56.8 cfs). The flows from **Temporary Sediment Basin #5 (TSB5)** will discharge through a 6" PVC storm sewer to the south and ultimately to the existing dual 2.5'x6' RCBC.

**Design Point 15 (DP15, Onsite Pond 4)**

**DP15** consists of approximately 15.70 acres of Falcon Reserve Filing No. 1 single family lots. The cumulative runoff for **Basin L** is 10.4 cfs and 56.8 cfs in the 5 and 100-year events respectively. Runoff from the basin is collected and conveyed via sheet flow to Pond 4, located at the southeast corner of the site. The emergency overflow path shall release runoff into **Basin O** and ultimately to **Design Point 17 (DP17)**.

**Design Point 16 (DP16)**

**DP16** consists of **Basin Q** (2.98 acres), **Basin R** (0.45 acres) single family lots, **DP3**, and flowby from half of **DP EX03**. The calculated runoff produced within this area totals 37.0 cfs and 114.7 cfs in the 5 and 100-year events respectively. Runoff from **DP16** is routed via an existing grass lined swale to an existing 36" CMP culvert. The intercepted flow will be conveyed by an existing 36" CMP culvert (**PRE09** (Q5=37.0 Q100=114.7 cfs)) downstream to **DP17**.

**Design Point 17 (DP17)**

**DP17** consists of **Basin \*\*F1** (1.50 acres), **Basin O** (3.48 acres), **DP2**, **DP15**, and to Meridian Road. The calculated runoff produced within this area totals 78.7 cfs and 282.8 cfs in the 5 and 100-year events respectively. Runoff from **DP17** is routed via an existing grass lined swale to an existing dual box culvert. The intercepted flow will be conveyed by an existing dual box culvert (**PRE10** (Q5=78.7 Q100=282.8 cfs)) downstream under the Meridian Road/Stapleton Road intersection to an existing swale southeast of the site.

**EROSION CONTROL**

It is the policy of the El Paso County that M&S Civil Consultants submit a grading and erosion control plan with the final drainage report. Proposed silt fence, vehicle tracking control, seeding and mulching, straw bale barriers, and temporary sediment basins are proposed as a few of the erosion control measures.

## DRAINAGE & BRIDGE FEES

Drainage and Bridge Fees for the **Falcon Reserve Filing No. 1** site are as follows:

					<b>Falcon Drainage</b>		
	<b>Acres</b>		<b>Imperviousness</b>		<b>Basin Fee</b>		
<b>2025 Drainage Fees:</b>	40.0	x	52.7%	x	\$43,094.00	=	\$908,421.52
<b>2025 Bridge Fees:</b>	40.0	x	52.7%	x	\$5,920.00	=	<u>\$124,793.60</u>
						<b>Total</b>	<b>\$1,033,215.12</b>

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2025.

## CONSTRUCTION COST OPINION

The construction cost associated with the early grading are for earth moving, proposed silt fence, vehicle traffic control, reseeding and mulching, straw bale barriers, and temporary sediment basins. Assurances will be posted with the submittal early grading plan (GEC).

## TEMPORARY SEDIMENT POND SUMMARY

A total of 5 proposed private temporary sediment basins have been designed per the Mile High Flood District (MHFD) Drainage Criteria manual (SB-5 and SB-6 details). The five temporary sediment basins are summarized below.

**Temporary Sediment Pond Table**

TSB	Upstream Drainage Basin	Required Volume (cubic-feet)	Provided Volume (cubic-feet)
1	K	8,165	253,728
2	N	10,922	223,659
3	P	25,665	217,482
4	L1	25,665	37,537
5	L	40,673	255,682

## SUMMARY

The development of Falcon Reserve Filing No. 1 will not adversely affect the surrounding development. The proposed early grading will adequately convey, detain, and route runoff from offsite and onsite to existing facilities. This final drainage report is only for early grading. Care will be taken to accommodate overland emergency flow routes on site and temporary drainage conditions.

## REFERENCES

City of Colorado Springs/El Paso County and City of Colorado Springs Drainage Criteria Manual" City of Colorado Springs, May 2014 <https://coloradosprings.gov/stormwater-enterprise/page/stormwater-criteria>

Drainage Criteria Manual County of El Paso, Colorado Volume 1, Volume 1 Update  
[https://library.municode.com/co/el\\_paso\\_county/codes/drainage\\_criteria\\_manual](https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual)

HEC-HMS Version 4.2.1, <https://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>

Mile High Flood District Software Excel Detention Design <https://mhfd.org/resources/software/>

Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date March 17, 1997; revised March 4, 2004.

FEMA Map Service Center <https://msc.fema.gov/portal/advanceSearch>

El Paso County Assessor <https://property.spatalest.com/co/elpaso/#/property/4230319053>

Web Soil Survey. <https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>

"Conceptual Drainage Analysis for Falcon Reserve, El Paso County, Colorado, prepared by Core Engineering Group, March 2014.

"Drainage Analysis for Paint Brush Hills Filing No. 4" prepared by KKBNA, December 1986

"Falcon Drainage Basin Planning Study, Selected Plan Report Final – September 2015" prepared by Matrix Design Group.

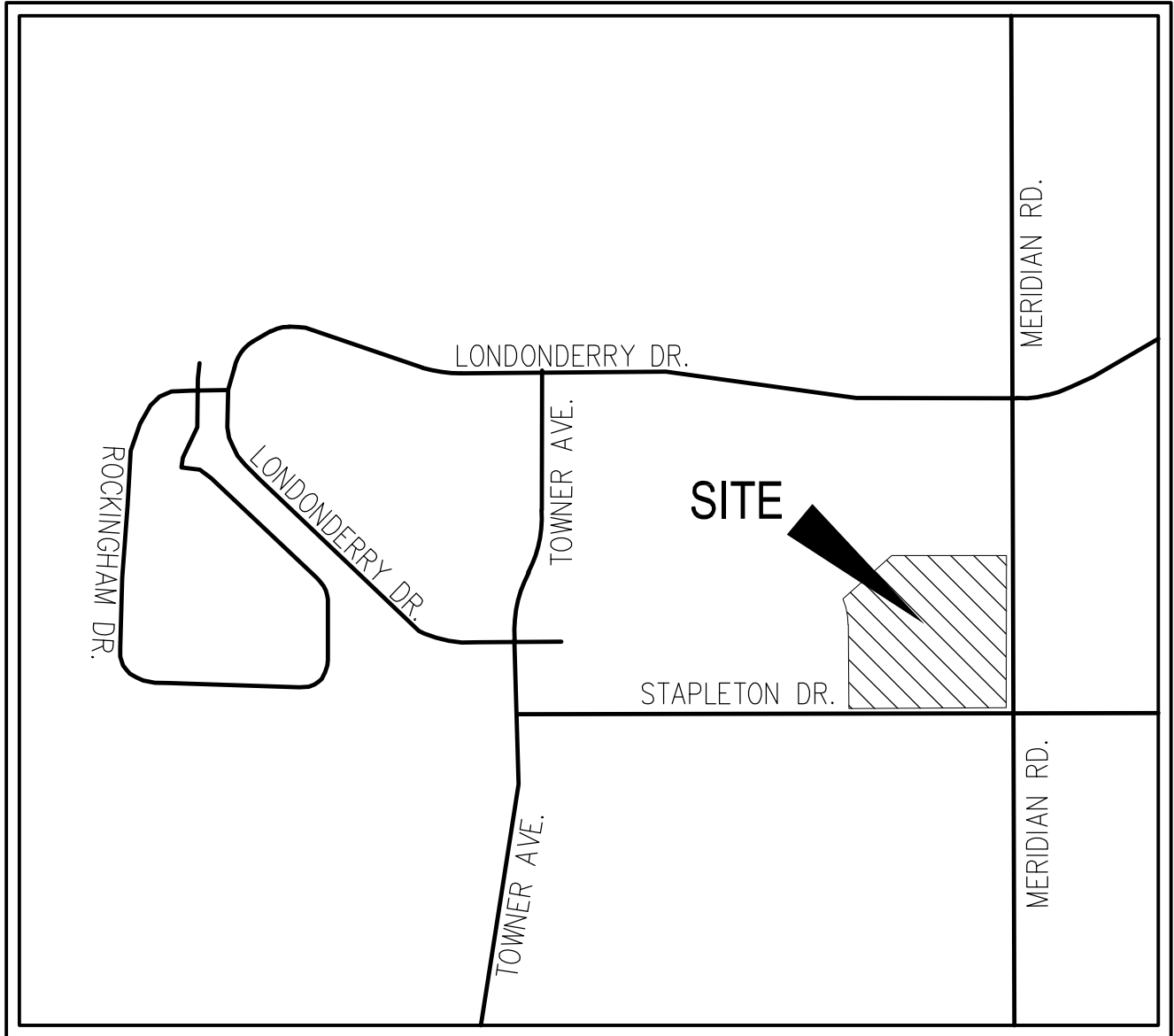
"Falcon Reserve Drainage Study" prepared by LDC Inc., February 2006.

"Master Development Drainage Plan, Falcon Reserve Filing No.1" prepared by MVE, Inc., September 12, 2000.



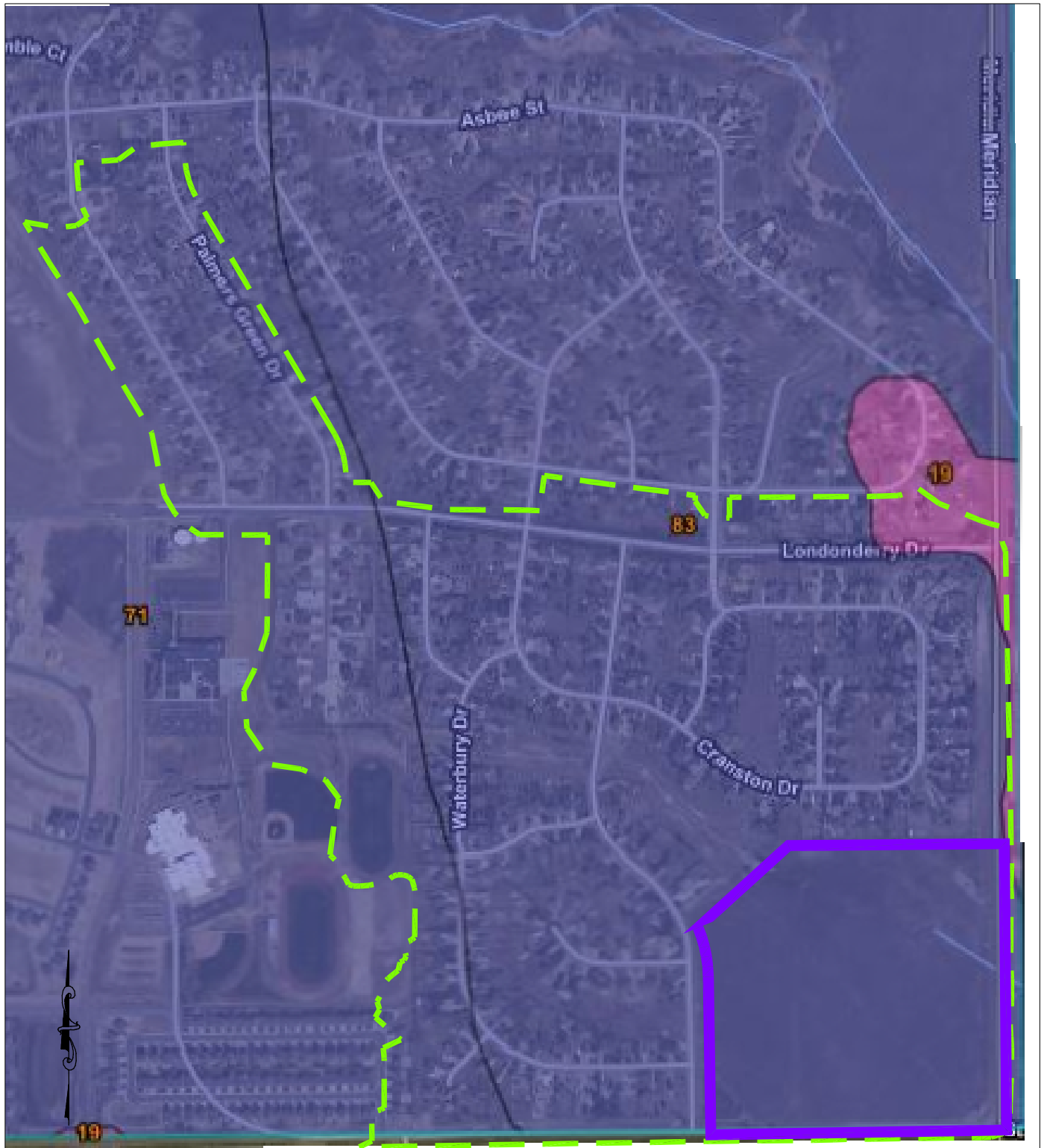
## **APPENDIX**

## **VICINITY MAP**



**VICINITY MAP**  
N.T.S.

## **SOILS MAP**



NOT TO SCALE

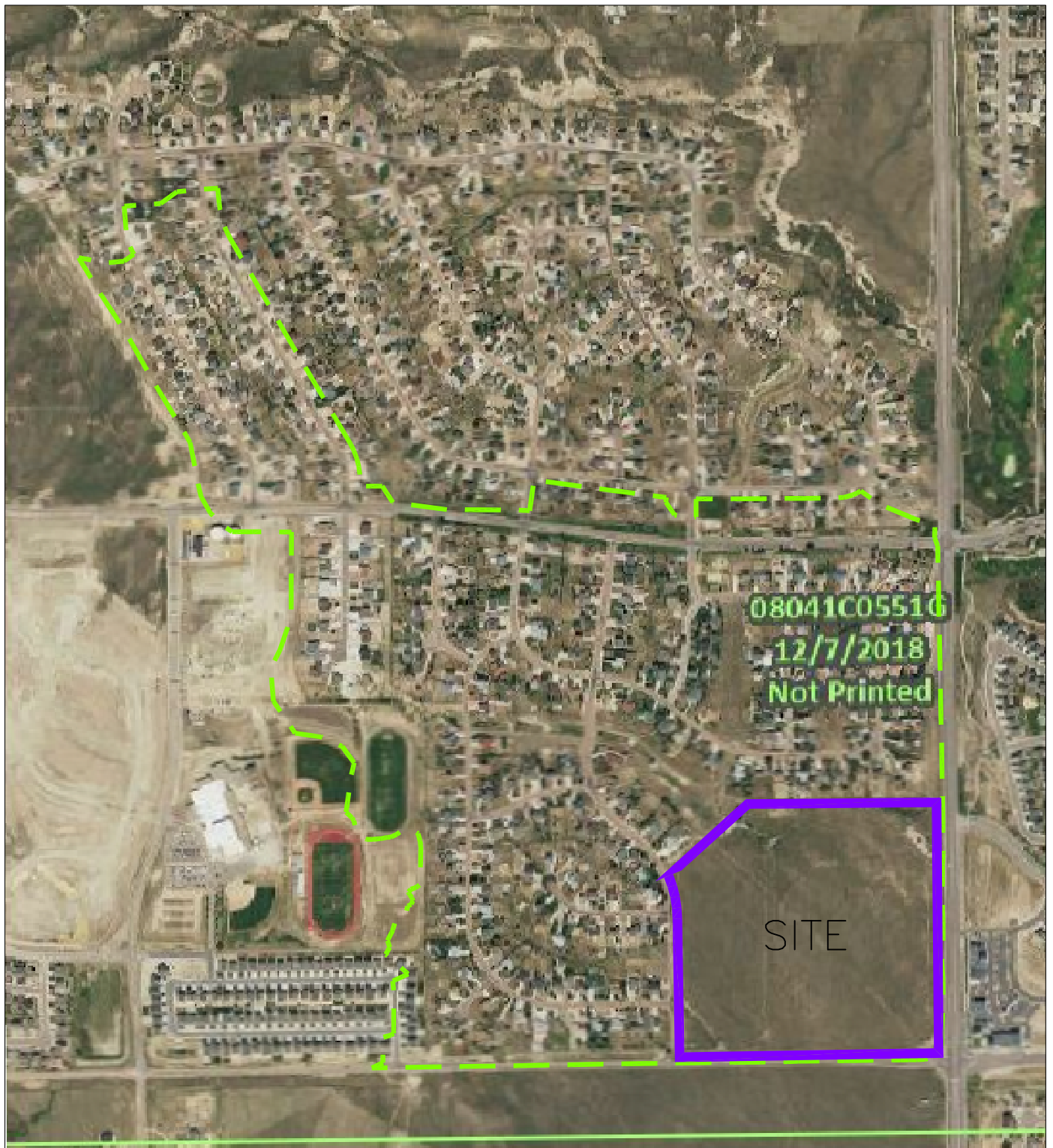
FALCON RESERVE  
FILING NO. 1

Summary by Map Unit — El Paso County Area, Colorado (C0625)		
Summary by Map Unit — El Paso County Area, Colorado (C0625)		
Map unit symbol	Map unit name	Rating
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A
71	Pring coarse sandy loam, 3 to 8 percent slopes	B
83	Stapleton sandy loam, 3 to 8 percent slopes	B

TYPE A SOILS  
TYPE B SOILS

SOILS MAP  
**MS**  
CIVIL CONSULTANTS, INC.

**FEMA MAP**



NO MAPPED FLOODPLAIN ZONE 'A', ZONE  
'A/E' OR ZONE 'X' PRESENT WITHIN THE  
WATERSHED OR ADJACENT TO THE SITE

NOT TO SCALE

FALCON RESERVE  
FILING NO. 1

FLOODPLAIN MAP



APPROXIMATE SCALE IN FEET

2,000 1,000 0 2,000

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM FLOOD INSURANCE RATE MAP

EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

PANEL 575 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY

NUMBER PANEL SUFFIX

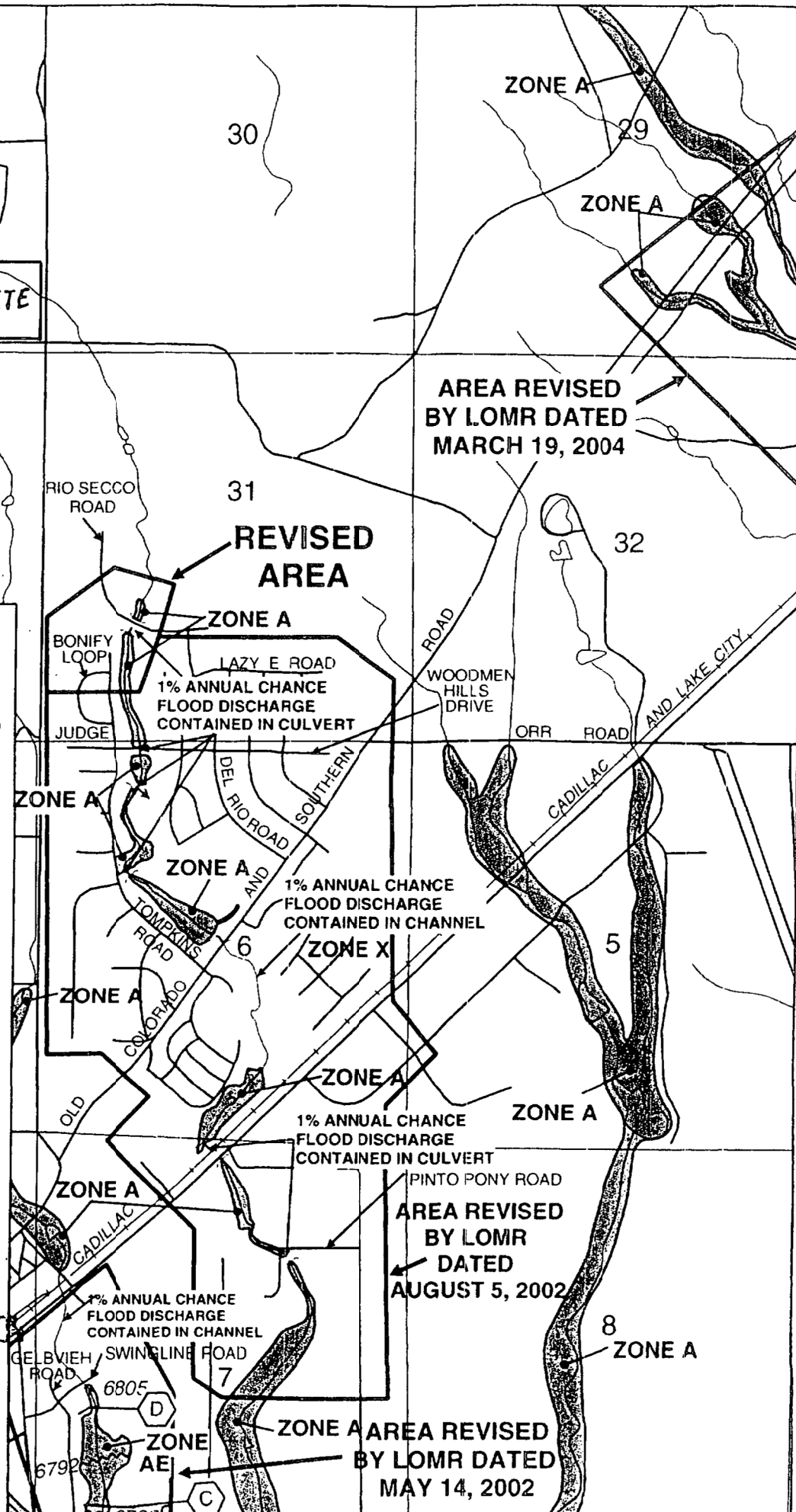
EL PASO COUNTY, (UNINCORPORATED AREAS)	08051	0575	F
COLORADO SPRINGS CITY (ORDINANCE)	0575		F

MAR 04 2004

MAP NUMBER  
08041C0575 F

EFFECTIVE DATE:  
MARCH 17, 1997

Federal Emergency Management Agency





## **HYDROLOGIC CALCULATIONS**

**FALCON RESERVE FILING NO. 1**  
**EXISTING CONDITIONS**  
**(Area Runoff Coefficient Summary)**

			STREETS			DEVELOPMENT			OPEN SPACE / LANDSCAPING				
BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>
A1	1284951.077	29.50	1.45	0.90	0.96	28.05	0.22	0.46	0.00	0.12	0.39	0.25	0.48
B1	2145946.281	49.26	0.75	0.90	0.96	35.65	0.22	0.46	12.86	0.12	0.39	0.20	0.45
B2	182820.655	4.20	0.37	0.90	0.96	3.51	0.22	0.46	0.32	0.12	0.39	0.27	0.50
B3	53200.105	1.22	0.66	0.90	0.96	0.22	0.22	0.46	0.34	0.12	0.39	0.56	0.71
B4	281197.991	6.46	0.00	0.90	0.96	2.29	0.22	0.46	4.17	0.12	0.39	0.16	0.41
C	92687.993	2.13	0.00	0.90	0.96	0.00	0.22	0.46	2.13	0.12	0.39	0.12	0.39
C1	142408.855	3.27	0.00	0.90	0.96	3.27	0.22	0.46	0.00	0.12	0.39	0.22	0.46
C2	464632.547	10.67	0.00	0.90	0.96	10.67	0.22	0.46	0.00	0.12	0.39	0.22	0.46
C3	992481.477	22.78	0.32	0.90	0.96	20.78	0.22	0.46	1.68	0.12	0.39	0.22	0.46
C4	944917.366	21.69	3.63	0.90	0.96	12.83	0.22	0.46	5.23	0.12	0.39	0.31	0.53
D1	697206.606	16.01	0.00	0.90	0.96	16.01	0.22	0.46	0.00	0.12	0.39	0.22	0.46
D2	441658.436	10.14	0.00	0.90	0.96	10.14	0.22	0.46	0.00	0.12	0.39	0.22	0.46
D3	405216.216	9.30	0.00	0.90	0.96	8.34	0.22	0.46	0.96	0.12	0.39	0.21	0.45
D4	407709.294	9.36	1.19	0.90	0.96	6.60	0.24	0.47	1.57	0.12	0.39	0.30	0.52
D5	3709.640	0.09	0.09	0.90	0.96	0.00	0.22	0.46	0.00	0.12	0.39	0.90	0.96
D6	89219.344	2.05	0.52	0.90	0.96	1.37	0.22	0.46	0.16	0.12	0.39	0.38	0.58
E1	1572396.699	36.10	0.00	0.90	0.96	0.00	0.30	0.50	36.10	0.12	0.39	0.12	0.39
F1	136555.886	3.13	1.56	0.90	0.96	0.00	0.22	0.46	1.57	0.12	0.39	0.51	0.67
F2	62792.500	1.44	0.64	0.90	0.96	0.00	0.22	0.46	0.80	0.12	0.39	0.47	0.64

# FALCON RESERVE FILING NO. 1

## EXISTING CONDITIONS

### (Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C <sub>s</sub>	C <sub>100</sub>	C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>C</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	CHECK (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
		From DCM Table S-1															
A1	29.50	0.25	0.48	0.25	100	6	8.5	1575	2.0%	2.8	9.2	17.7	19.3	3.3	5.5	24.5	78.6
B1	49.26	0.20	0.45	0.20	100	2.0	12.9	1620	2.5%	3.1	8.6	21.5	19.6	3.1	5.2	31.4	116.0
B2	4.20	0.27	0.50	0.27	100	2	11.9	933	2.8%	3.3	4.7	16.5	15.7	3.4	5.8	3.9	12.1
B3	1.22	0.56	0.71	0.56	22	0.4	3.8	1258	2.4%	3.1	6.8	10.6	17.1	4.0	6.8	2.8	5.9
B4	6.46	0.16	0.41	0.16	100	2.0	13.6	609	3.9%	3.0	3.4	17.0	13.9	3.6	6.1	3.6	16.3
C	2.13	0.12	0.39	0.12	100	2.0	14.1	845	2.7%	2.5	5.7	19.8	15.3	3.5	5.9	0.9	4.9
C1	3.27	0.22	0.46	0.22	100	4.0	10.1	261	3.5%	3.8	1.2	11.2	12.0	4.0	6.6	2.8	10.0
C2	10.67	0.22	0.46	0.22	100	2.0	12.6	1897	1.9%	2.8	11.5	24.1	21.1	3.0	5.1	7.1	24.8
C3	22.78	0.31	0.53	0.31	100	3.0	9.9	2038	1.6%	2.5	13.6	23.5	21.9	3.0	5.0	20.8	59.5
C4	21.69	0.31	0.53	0.31	100	4.0	9.0	2816	2.1%	2.2	21.8	30.8	26.2	2.7	4.5	18.0	51.5
D1	16.01	0.22	0.46	0.22	100	4.0	10.1	1200	3.0%	3.5	5.8	15.8	17.2	3.4	5.8	12.1	42.5
D2	10.14	0.22	0.46	0.22	100	3.0	11.1	1599	3.5%	3.7	7.1	18.2	19.4	3.2	5.4	7.2	25.3
D3	9.30	0.21	0.45	0.21	100	3.0	11.2	1766	3.4%	3.7	8.0	19.2	20.4	3.2	5.3	6.1	22.3
D4	9.36	0.30	0.52	0.30	100	2.0	11.4	1235	2.9%	2.6	8.1	19.5	17.4	3.3	5.5	9.4	26.9
D5	0.09	0.90	0.96	0.90	90	1.8	2.7	0	0.0%	0.0	0.0	5.0	10.5	5.2	8.7	0.4	0.7
D6	2.05	0.38	0.58	0.38	50	1.0	7.3	1566	2.7%	3.3	7.9	15.2	19.0	3.5	5.9	2.8	7.0
E1	36.10	0.12	0.39	0.12	100	3.0	12.3	1597	2.6%	2.4	11.0	23.3	19.4	3.1	5.3	13.6	74.0
F1	3.13	0.51	0.67	0.51	30	0.2	6.7	2332	1.8%	2.0	19.3	26.0	23.1	2.9	4.8	4.6	10.2
F2	1.44	0.47	0.64	0.47	50	1.0	6.4	1172	2.2%	2.2	8.7	15.2	16.8	3.5	5.9	2.4	5.5

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT  
Date: 4/8/2025  
Checked by: VAS

**FALCON RESERVE FILING NO. 1**  
**EXISTING CONDITIONS**  
**(Surface Routing Summary)**

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA <sub>5</sub>	CA <sub>100</sub>	C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	I <sub>5</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>5</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)	
<b>1</b>	<b>Basin A1</b>	7.48	14.29	Basin B1 Tc was used			19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	55.5	192.4	EX POND 1
	<b>Basin B1</b>	10.06	22.14														
	<b>Basin B2</b>	1.14	2.09														
	<b>Basin B3</b>	0.68	0.87														
	<b>Basin B4</b>	1.00	2.68														
	<b>Total</b>	20.37	42.07														
<b>2</b>	<b>Basin C</b>	0.26	0.83	Basin C4 Tc was used			26.2					26.2	2.7	4.5	45.9	138.2	EX POND 2
	<b>Basin C1</b>	0.72	1.50														
	<b>Basin C2</b>	2.35	4.91														
	<b>Basin C3</b>	7.06	12.00														
	<b>Basin C4</b>	6.72	11.43														
	<b>Total</b>	17.09	30.67														
<b>3</b>	<b>Basin D1</b>	3.52	7.36	Basin D3 Tc was used			19.2	258	2.3%	3.0	1.4	20.6	3.0	5.1	34.8	114.4	EX POND 3
	<b>Basin D2</b>	2.23	4.66														
	<b>Basin D3</b>	1.95	4.21														
	<b>Basin D4</b>	2.84	4.86														
	<b>Basin D5</b>	0.08	0.08														
	<b>Basin D6</b>	0.79	1.19														
	<b>Total</b>	11.41	22.37														
<b>4</b>	<b>Basin E1</b>	4.33	14.08	Design Point 1 Tc was used			19.6	1697	2.6%	2.4	11.7	31.2	2.4	4.1	59.8	228.0	SOUTHEAST CORNER OF BASIN E1
	<b>DP 1</b>	20.37	42.07														
	<b>Total</b>	24.70	56.15														
<b>5</b>	<b>Basin F1</b>	1.59	2.11	Design Point 4 was used			31.2					31.2	2.4	4.1	134.2	455.8	EXISTING DUAL 2.5' x 6' RCBC
	<b>Basin f2</b>	0.67	0.93														
	<b>DP 2</b>	17.09	30.67														
	<b>DP 3</b>	11.41	22.37														
	<b>DP 4</b>	24.70	56.15														
	<b>Total</b>	55.47	112.22														

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT  
Date: 4/8/2025  
Checked by: VAS

**FALCON RESERVE FILING NO. 1**  
**EXISTING CONDITIONS**  
**(Storm Sewer Routing Summary)**

<i>PIPE</i>	<i>Contributing Pipes/Design Points</i>	<i>Equivalent CA<sub>5</sub></i>	<i>Equivalent CA<sub>100</sub></i>	<i>Maximum T<sub>C</sub></i>	<i>Intensity*</i>		<i>Flow</i>	
					<i>I<sub>5</sub></i>	<i>I<sub>100</sub></i>	<i>Q<sub>5</sub></i>	<i>Q<sub>100</sub></i>
<b>PR1</b>	<b>DP5</b>	55.47	112.22	31.2	2.4	4.1	<b>134.2</b>	<b>455.8</b>

\* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point

EX - Existing Design Point

PR - Pipe Run

FB- Flow By from Design Point

IN- Proposed Inlet

IN-A(#)- Existing Inlet

Calculated by: GT

Date: 4/8/2025

Checked by: VAS

**FALCON RESERVE FILING NO. 1**  
**EARLY GRADING PROPOSED CONDITIONS**  
**(Area Runoff Coefficient Summary)**

BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	STREETS			DEVELOPMENT			OPEN SPACE / LANDSCAPING			WEIGHTED	
			AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	AREA (Acres)	C <sub>5</sub>	C <sub>100</sub>	C <sub>5</sub>	C <sub>100</sub>
A1	1284951.077	29.50	1.45	0.90	0.96	28.05	0.22	0.46	0.00	0.12	0.39	0.25	0.48
B1	2145946.281	49.26	0.75	0.90	0.96	35.65	0.22	0.46	12.86	0.12	0.39	0.20	0.45
B2	182820.655	4.20	0.37	0.90	0.96	3.51	0.22	0.46	0.32	0.12	0.39	0.27	0.50
B3	53200.105	1.22	0.66	0.90	0.96	0.22	0.22	0.46	0.34	0.12	0.39	0.56	0.71
B4	281197.991	6.46	0.00	0.90	0.96	2.29	0.22	0.46	4.17	0.12	0.39	0.16	0.41
C1	142408.855	3.27	0.00	0.90	0.96	3.27	0.22	0.46	0.00	0.12	0.39	0.22	0.46
C2	464632.547	10.67	0.00	0.90	0.96	10.67	0.22	0.46	0.00	0.12	0.39	0.22	0.46
C3	992481.477	22.78	0.32	0.90	0.96	20.78	0.22	0.46	1.68	0.12	0.39	0.22	0.46
C4	944751.991	21.69	3.63	0.90	0.96	12.83	0.22	0.46	5.23	0.12	0.39	0.31	0.53
D1	697206.606	16.01	0.00	0.90	0.96	16.01	0.22	0.46	0.00	0.12	0.39	0.22	0.46
D2	441658.436	10.14	0.00	0.90	0.96	10.14	0.22	0.46	0.00	0.12	0.39	0.22	0.46
D3	405216.216	9.30	0.00	0.90	0.96	8.34	0.22	0.46	0.96	0.12	0.39	0.21	0.45
D4	407709.294	9.36	1.19	0.90	0.96	6.60	0.24	0.47	1.57	0.12	0.39	0.30	0.52
D5	3709.640	0.09	0.09	0.90	0.96	0.00	0.22	0.22	0.00	0.12	0.39	0.90	0.96
**D6	127441.193	2.93	0.60	0.90	0.96	2.00	0.25	0.44	0.33	0.12	0.39	0.37	0.54
**F1	65419.185	1.50	0.71	0.90	0.96	0.00	0.40	0.56	0.79	0.12	0.39	0.49	0.66
K	85377.655	1.96	0.00	0.90	0.96	0.00	0.40	0.46	1.96	0.12	0.39	0.12	0.39
L1	387440.632	8.89	0.00	0.90	0.96	0.00	0.40	0.46	8.89	0.12	0.39	0.12	0.39
L	1234955.065	28.35	0.00	0.90	0.96	0.00	0.43	0.58	28.35	0.12	0.39	0.12	0.39
M	92114.376	2.11	0.00	0.90	0.96	0.00	0.45	0.59	2.11	0.12	0.39	0.12	0.39
N	64060.632	1.47	0.00	0.90	0.96	0.00	0.45	0.59	1.47	0.12	0.39	0.12	0.39
O	151753.917	3.48	0.85	0.90	0.96	0.00	0.45	0.59	2.63	0.12	0.39	0.31	0.53
PI	162082.700	3.72	0.00	0.90	0.96	0.00	0.45	0.59	3.72	0.12	0.39	0.12	0.39
P	67500.177	1.55	0.00	0.90	0.96	0.00	0.45	0.59	1.55	0.12	0.39	0.12	0.39
Q	129806.652	2.98	0.53	0.90	0.96	0.00	0.45	0.59	2.45	0.12	0.39	0.26	0.49
R	19697.882	0.45	0.11	0.90	0.96	0.00	0.45	0.59	0.34	0.12	0.39	0.31	0.53

\*\* Revised from existing condition basin map

**FALCON RESERVE FILING NO. 1**  
**EARLY GRADING PROPOSED CONDITIONS**  
**(Area Drainage Summary)**

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T <sub>t</sub> )		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C <sub>s</sub>	C <sub>100</sub>	C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>t</sub> (min)	TOTAL (min)	CHECK (min)	I <sub>s</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>s</sub> (c.f.s.)	Q <sub>100</sub> (c.f.s.)
<b>A1</b>	29.50	0.25	0.48	0.25	100	6	8.5	1575	2.0%	2.8	9.2	17.7	19.3	3.3	5.5	24.5	78.6
<b>B1</b>	49.26	0.20	0.45	0.20	100	2.0	12.9	1620	2.5%	3.1	8.6	21.5	19.6	3.1	5.2	31.4	116.0
<b>B2</b>	4.20	0.27	0.50	0.27	100	2	11.9	933	2.8%	3.3	4.7	16.5	15.7	3.4	5.8	3.9	12.1
<b>B3</b>	1.22	0.56	0.71	0.56	22	0.4	3.8	1258	2.4%	3.1	6.8	10.6	17.1	4.0	6.8	2.8	5.9
<b>B4</b>	6.46	0.16	0.41	0.16	100	2.0	13.6	609	3.9%	3.0	3.4	17.0	13.9	3.6	6.1	3.6	16.3
<b>C1</b>	3.27	0.22	0.46	0.22	100	4.0	10.1	261	3.5%	3.8	1.2	11.2	12.0	4.0	6.6	2.8	10.0
<b>C2</b>	10.67	0.22	0.46	0.22	100	2.0	12.6	1897	1.9%	2.8	11.5	24.1	21.1	3.0	5.1	7.1	24.8
<b>C3</b>	22.78	0.22	0.46	0.22	100	3.0	11.0	2038	1.6%	2.5	13.6	24.6	21.9	3.0	5.0	15.0	52.2
<b>C4</b>	21.69	0.31	0.53	0.31	100	4.0	9.0	2816	2.1%	2.2	21.8	30.8	26.2	2.7	4.5	18.0	51.5
<b>D1</b>	16.01	0.22	0.46	0.22	100	4.0	10.1	1200	3.0%	3.5	5.8	15.8	17.2	3.4	5.8	12.1	42.5
<b>D2</b>	10.14	0.22	0.46	0.22	100	3.0	11.1	1599	3.5%	3.7	7.1	18.2	19.4	3.2	5.4	7.2	25.3
<b>D3</b>	9.30	0.21	0.45	0.21	100	3.0	11.2	1766	3.4%	3.7	8.0	19.2	20.4	3.2	5.3	6.1	22.3
<b>D4</b>	9.36	0.30	0.52	0.30	100	2.0	11.4	1235	2.9%	2.6	8.1	19.5	17.4	3.3	5.5	9.4	26.9
<b>D5</b>	0.09	0.90	0.96	0.90	90	1.8	2.7	0	0.0%	0.0	0.0	5.0	10.5	5.2	8.7	0.4	0.7
<b>**D6</b>	2.93	0.37	0.54	0.37	50	1.0	7.4	1568	2.7%	3.3	8.0	15.4	19.0	3.5	5.8	3.8	9.3
<b>**F1</b>	1.50	0.49	0.66	0.49	30	0.2	6.9	1070	1.7%	2.0	9.1	16.0	16.1	3.4	5.7	2.5	5.7
<b>K</b>	1.96	0.12	0.39	0.12	100	1.0	17.7	243	4.1%	3.0	1.3	19.0	11.9	3.9	6.5	0.9	5.0
<b>L1</b>	8.89	0.12	0.39	0.12	100	3.0	12.3	771	3.0%	1.7	7.4	19.8	14.8	3.5	5.2	3.8	18.1
<b>L</b>	28.35	0.12	0.39	0.12	100	4.0	11.2	1765	2.7%	1.6	17.8	29.0	20.4	3.1	5.1	10.4	56.8
<b>M</b>	2.11	0.12	0.39	0.12	90	3.0	11.3	601	3.0%	3.5	2.9	14.2	13.8	3.6	6.1	0.9	5.0
<b>N</b>	1.47	0.12	0.39	0.12	63	12.0	5.3	310	0.6%	1.6	3.2	8.5	12.1	4.4	7.3	0.8	4.2
<b>O</b>	3.48	0.31	0.53	0.31	52	5.0	4.9	1151	2.0%	2.1	9.1	13.9	16.7	3.6	6.1	3.9	11.2
<b>P1</b>	3.72	0.12	0.39	0.12	100	5.0	10.4	722	1.8%	1.3	9.0	19.4	14.6	3.6	6.0	1.6	8.7
<b>P</b>	1.55	0.12	0.39	0.12	56	12.0	4.8	247	0.8%	1.8	2.3	7.1	11.7	4.6	7.8	0.9	4.7
<b>Q</b>	2.98	0.26	0.49	0.26	100	9.0	7.4	578	2.2%	2.2	4.3	11.6	13.8	3.9	6.5	3.0	9.6
<b>R</b>	0.45	0.31	0.53	0.31	69	3.0	7.3	127	3.9%	2.0	1.1	8.4	11.1	4.4	7.4	0.6	1.8

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT

\*\* Revised from existing condition basin map

Date: 4/9/2025

Checked by: VAS

**FALCON RESERVE FILING NO. 1**  
**EARLY GRADING PROPOSED CONDITIONS**  
**(Surface Routing Summary)**

From Area Runoff Coefficient Summary																
DESIGN POINT	CONTRIBUTING BASINS	OVERLAND		PIPE / CHANNEL FLOW				Time of Travel (T <sub>r</sub> )	TOTAL (min)	INTENSITY *		TOTAL FLOWS		COMMENTS		
		C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)			Velocity (fps)	T <sub>r</sub> (min)	I <sub>a</sub> (in/hr)	I <sub>m</sub> (in/hr)		Q <sub>s</sub> (cfs)	Q <sub>m</sub> (cfs)
EX-I.1	Basin A1	7.48	14.29		19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	49.5	173.3	PROP DUAL 36" RCP CULVERTS	
	Basin B1	10.06	22.14													
	Partial Basin B4	0.64	1.47													
	Total	18.18	37.90													
EX-I.2	Basin B2	1.14	2.09	Basin B2 Tc was used						15.7	3.4	5.8	6.3	17.1	PROP 24" RCP CULVERT	
	Basin B3	0.68	0.87													
	Total	1.83	2.96													
EX-IN1	Combined Basin C2 and C3 split	7.41	15.43	Basin C3 Tc was used						21.9	3.0	5.0	21.9	76.5	EX 9' CDOT TYPE 13 COMBINATION INLET Combined flows split over EX-IN1 and EX-IN2	
	Combined flows split over EX-IN1 and EX-IN2	3.70	7.71										10.9	38.3		
EX-IN2	Combined Basin C2 and C3 split	7.41	15.43	Basin C3 Tc was used						21.9	3.0	5.0	21.9	76.5	EX 9' CDOT TYPE 13 COMBINATION INLET Combined flows split over EX-IN1 and EX-IN2	
	Combined flows split over EX-IN1 and EX-IN2	3.70	7.71										10.9	38.3		
	Total															
EX-CUL	Basin C4	6.72	11.43	Basin C4 Tc was used						26.2	2.7	4.5	18.0	51.5	EX 30" CULVERT W/FES	
EX-IN3/EX01	Basin D1	3.52	7.36	Basin D1 Tc was used						15.8	3.4	5.8	12.1	50.5	Total Flow within Liberty Street Section EX 10' CDOT TYPE R INLET FLOWS SPLIT Q100/side Q5 Contained within Crown for Basin **D6	
	Basin **D6 @ EX-IN3		1.38											25.2		
	Total	3.52	8.74										2.6			
EX-IN4	Basin D2	2.23	4.66	Basin D2 Tc was used						18.2	3.2	5.4	7.2	25.3	EX 10' CDOT TYPE R INLET	
EX-IN5	Basin D3	1.95	4.21	Basin D3 Tc was used						19.2	3.2	5.3	6.1	22.3	EX 10' CDOT TYPE R INLET	
EX-IN6/EX02	FB EX-IN3/EX01	1.28	2.50	Basin D3 Tc was used						19.2	3.2	5.3	8.9	62.9	Total Flow within Liberty Street Section EX 10' CDOT TYPE R INLET Q100/side  Q5 Contained within Crown for Basin **D6	
	FB EX-IN4	0.41	2.66											31.4		
	FB EX-IN5	0.27	2.27													
	Basin D5	0.08	0.08													
	Basin **D6 @ EXIN6	0.79	4.37										2.5			
	Total	2.83	11.88													
EX03 Flow that is contained within Liberty street section	FB EX-IN6/EX02	0.74	3.69	Basin **D6 Tc was used						19.0	3.2	5.3	6.1	52.3	Total Flow within Liberty Street Section EX 5' CURBCUTQ100 SIDE Q5 for Basin **D6	
	Basin D4 Street Section Only	0.10	0.11											26.2		
	Basin **D6 @ Stapleton	1.08	6.04										3.4			
	Total	1.91	9.84													
EX04	Basin D4 exclude D4 street section	2.74	4.75	Basin D3 Tc was used	19.2					19.2	3.2	5.3	11.7	40.7	EX 24" RCP CULVERT	
	1/2 DP-EX03 westside minus FB transferred over crown	0.96	2.93													
	Total	3.70	7.69													
1	Basin A1	7.48	14.29	Basin B1 Tc was used	19.6	881	2.7%	2.5	6.0	25.5	2.7	4.6	55.5	192.4	POND 1	
	Basin B1	10.06	22.14													
	Basin B2	1.14	2.09													
	Basin B3	0.68	0.87													
	Basin B4	1.00	2.68													
	Total	20.37	42.07													
1.1	K	0.24	0.76	Basin K Tc was Used						11.9	3.9	6.5	0.9	5.0	Temporary Sediment Basin #1	
	Total	0.24	0.76													
2	Basin C1	0.72	1.50	Pipe Run E2 Tc Used	21.9	1620	2.5%	3.1	19.5556	41.4	2.0	3.4	65.8	240.7	POND 2	
	Basin M	1.07	3.47													
	Basin N	3.40	11.06													
	PRE2	7.41	13.75													
	DP1	20.37	42.07													
	PRE3	0.00	0.00													
2.1	Total	32.96	71.85													
	M	0.25	0.82	Basin M Tc was Used						13.8	3.6	6.1	1.6	8.5	Temporary Sediment Basin #2	
	N	0.18	0.57													
Total	0.43	1.40														
3	Basin P	0.18	0.57	Pipe Run E7 Tc was used						19.2	3.2	5.3	41.8	102.1	POND 3	
	Basin P1	0.45	1.45													
	PRE7	7.84	8.07													
	PRE8	3.70	7.69													
	EX 15' CURBCUT PARTIAL CAPTURE OF **DP6 @ STAPLETON	1.08	1.50													
	Total	13.24	19.29													
3.1	P	0.19	0.60	Basin **D6 Tc Used						15.4	3.5	5.8	6.0	21.3	Temporary Sediment Basin #3	
	P1	0.45	1.45													
	**D6	1.08	1.58													
	Total	1.71	3.64													
4.1	L1	1.07	3.47	Basin L1 Tc Used						14.8	3.5	5.9	3.8	20.6	Temporary Sediment Basin #4	



**FALCON RESERVE FILING NO. 1**  
**EARLY GRADING PROPOSED CONDITIONS**  
**(Surface Routing Summary)**

From Area Runoff Coefficient Summary																	
DESIGN POINT	CONTRIBUTING BASINS	C <sub>A<sub>s</sub></sub>	C <sub>A<sub>100</sub></sub>	OVERLAND			PIPE / CHANNEL FLOW				Time of Travel (T <sub>r</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS	
				C <sub>s</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>r</sub> (min)	TOTAL (min)	I <sub>s</sub> (in/hr)	I <sub>100</sub> (in/hr)	Q <sub>s</sub> (c.f.s.)		Q <sub>100</sub> (c.f.s.)
	Total	1.07	3.47														
5.1	L	3.40	11.06		Basin L, Tc Used							20.4	3.1	5.1	10.4	56.8	Temporary Sediment Basin #5
	Total	3.40	11.06														
15	Basin L	3.40	11.06		Basin L, Tc was used							20.4	3.1	5.1	10.4	56.8	POND 4
	Total	3.40	11.06														
16	Basin Q	1.08	1.84		DP3 Tc was used		19.17	578	2.2%	2.2	11.6	30.8	2.4	4.1	37.0	114.7	EX CULVERT
	Basin R	0.45	1.45														
	FB FROM EX 15' CURCUT EX03 Q100 Flow EASTSIDE STAPLETON	0.38	3.41														
	FB WESTSIDE OF STAPLETON OVER CROWN	0.00	1.99														
	DP3	13.24	19.29														
	Total	15.15	27.98														
17	Basin **F1	0.73	0.99		DP2 Tc Used		41.4	1070	1.7%	2.0	16.0	57.4	1.5	2.5	78.7	282.8	EXISTING DUAL 2.5' x 6' RCBC
	Basin O	0.00	0.00														
	DP15	3.40	11.06														
	DP2	32.96	71.85														
	PR E9	15.15	27.98														
	Total	52.25	111.88														

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT  
Date: 4/10/2025  
Checked by: VAS

***FALCON RESERVE FILING NO. 1***  
***EARLY GRADING PROPOSED CONDITIONS***  
***(Storm Sewer Routing Summary)***

<i>PIPE</i>	<i>Contributing Pipes/Design Points</i>	<i>Equivalent CA<sub>5</sub></i>	<i>Equivalent CA<sub>100</sub></i>	<i>Maximum T<sub>C</sub></i>	<i>Intensity*</i>		<i>Flow</i>	
					<i>I<sub>5</sub></i>	<i>I<sub>100</sub></i>	<i>Q<sub>5</sub></i>	<i>Q<sub>100</sub></i>
<b><i>PRE1</i></b>	EX-IN1	3.70	6.88	21.9	3.0	5.0	<b><i>10.9</i></b>	<b><i>34.1</i></b>
<b><i>PRE2</i></b>	EX-IN2, PRE1	7.41	13.75	21.9	3.0	5.0	<b><i>21.9</i></b>	<b><i>68.2</i></b>
<b><i>PRE3</i></b>	EX-CUL	6.72	11.43	26.2	2.7	4.5	<b><i>18.0</i></b>	<b><i>51.5</i></b>
<b><i>PRE4</i></b>	EX-IN3	2.24	1.87	15.8	3.4	5.8	<b><i>7.7</i></b>	<b><i>10.8</i></b>
<b><i>PRE5</i></b>	EX-IN4	1.83	2.01	18.2	3.2	5.4	<b><i>5.9</i></b>	<b><i>10.9</i></b>
<b><i>PRE6</i></b>	EX-IN5, PRE5	3.51	3.95	19.2	3.2	5.3	<b><i>11.1</i></b>	<b><i>20.9</i></b>
<b><i>PRE7</i></b>	EX-IN6, PRE4, PRE6	7.84	8.07	19.2	3.2	5.3	<b><i>24.7</i></b>	<b><i>42.7</i></b>
<b><i>PRE8</i></b>	EX04	3.70	7.69	19.2	3.2	5.3	<b><i>11.7</i></b>	<b><i>40.7</i></b>
<b><i>PRE9</i></b>	DP16	15.15	27.98	30.8	2.4	4.1	<b><i>37.0</i></b>	<b><i>114.7</i></b>
<b><i>PRE10</i></b>	DP17	52.25	111.88	57.4	1.5	2.5	<b><i>78.7</i></b>	<b><i>282.8</i></b>

\* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: GT

DP - Design Point

FB- Flow By from Design Point

Date: 12/17/2024

EX - Existing Design Point

IN- Proposed Inlet

Checked by: VAS

PR - Pipe Run

IN-A(#)- Existing Inlet

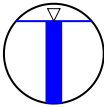
## **HYDRAULIC CALCULATIONS**

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Printable Title

Printable Subtitle

Inputs			Results		
			Flow depth, y	3.7170	ft ▾
Pipe diameter, d <sub>0</sub>	54	in ▾	Flow area, a	14.0505	ft^2 ▾
<a href="#">Manning roughness, n</a>	0.013		Pipe area, a <sub>0</sub>	15.9045	ft^2 ▾
Pressure slope (possibly <a href="#">?</a> equal to pipe slope), S <sub>0</sub>	0.0132	rise/run ▾	Relative area, a/a <sub>0</sub>	0.8834	fraction ▾
Relative flow depth, y/d <sub>0</sub>	82.6	% ▾	Wetted perimeter, P <sub>w</sub>	10.2645	ft ▾
			Hydraulic radius, R <sub>h</sub>	1.3688	ft ▾
			Top width, T	3.4120	ft ▾
			Velocity, v	16.1894	ft/sec ▾
			Velocity head, h <sub>v</sub>	4.0734	ft H2O ▾
			<a href="#">Froude number, F</a>	1.41	
			Average shear stress (tractive force), tau	1.1280	psf ▾
			<b>Flow, Q</b> (See notes)	227.4596	cfs ▾
			Full flow, Q <sub>0</sub>	225.9108	cfs ▾
			Ratio to full flow, Q/Q <sub>0</sub>	1.0069	fraction ▾



Notes:

**This is the flow and depth inside an *infinitely long* pipe.**

Getting the flow into the pipe may require significantly higher headwater depth. Add at least 1.5 times the velocity head to get the headwater depth or [see my 2-minute tutorial](#) for standard culvert headwater calculations using HY-8.

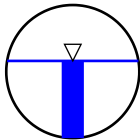
EXISTING CONDITION MAP  
EXISTING DUAL 2.5'x6.0' RCBC  
PR1 Q100=455.8 cfs/2=227.9 cfs  
PIPE EQUIVALENT AREA FOR  
1-2.5'x6.0' RCBS IS 54" RCP

# Manning Formula Uniform Pipe Flow at Given Slope and Depth

Printable Title

Printable Subtitle

Inputs			Results		
Pipe diameter, $d_0$	54	in	Flow depth, $y$	2.6100	ft
<a href="#">Manning roughness, <math>n</math></a>	0.013		Flow area, $a$	9.5653	ft <sup>2</sup>
Pressure slope (possibly <a href="#">2</a> equal to pipe slope), $S_0$	0.0132	rise/run	Pipe area, $a_0$	15.9045	ft <sup>2</sup>
Relative flow depth, $y/d_0$	58	%	Relative area, $a/a_0$	0.6014	fraction
			Wetted perimeter, $P_w$	7.7916	ft
			Hydraulic radius, $R_h$	1.2276	ft
			Top width, $T$	4.4420	ft
			Velocity, $v$	15.0560	ft/sec
			Velocity head, $h_v$	3.5230	ft H <sub>2</sub> O
			<a href="#">Froude number, <math>E</math></a>	1.81	
			Average shear stress (tractive force), $\tau$	1.0116	psf
			<b>Flow, <math>Q</math></b> (See notes)	144.0094	cfs
			Full flow, $Q_0$	225.9108	cfs
			Ratio to full flow, $Q/Q_0$	0.6375	fraction



Notes:

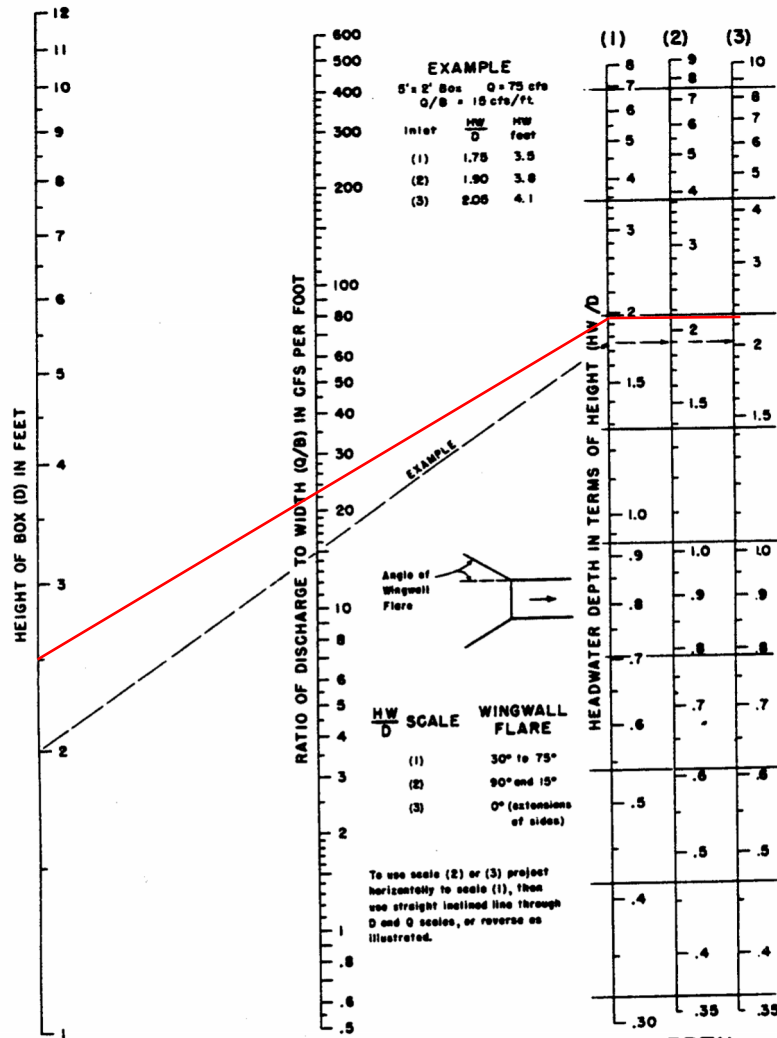
**This is the flow and depth inside an *infinitely long* pipe.**

Getting the flow into the pipe may require significantly higher headwater depth. Add at least 1.5 times the velocity head to get the headwater depth or [see my 2-minute tutorial](#) for standard culvert headwater calculations using HY-8.

PROPOSED CONDITION MAP  
EXISTING DUAL 2.5'x6.0' RCBC  
PR EX10 Q100=282.8 cfs/2=141.4 cfs  
PIPE EQUIVALENT AREA FOR  
1-2.5'x6.0' RCBS IS 54" RCP

DUAL 2.5' X 6' RCBC  
 Q=282.8 CFS  
 Q/2=141.4 CFS

INLET HW/D HW  
 (1) 1.98 3.94'



**HEADWATER DEPTH  
 FOR BOX CULVERTS  
 WITH INLET CONTROL**

BUREAU OF PUBLIC ROADS JAN. 1953



HDR Infrastructure, Inc.  
 A Centerra Company

The City of Colorado Springs / El Paso County  
 Drainage Criteria Manual

Date

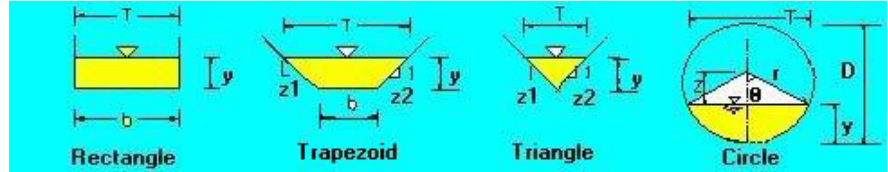
OCT. 1987

Figure

9-30

## The open channel flow calculator

Select Channel Type: Trapezoid ▼



Velocity(V)&Discharge(Q) ▼

Select unit system: Feet(ft) ▼

Channel slope: .02 ft/ft

Water depth(y): 0.58 ft

Bottom W(b) 2.5  
ft

Flow velocity 4.44 ft/s

LeftSlope (Z1): 4 to 1 (H:V)

RightSlope (Z2): 4  
to 1 (H:V)

Flow discharge 12.4123  
ft^3/s

Input n value 0.025 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 7.28  
ft

Flow area 2.8 ft^2

Top width(T) 7.14 ft

Specific energy 0.89 ft

Froude number 1.25

Flow status Supercritical flow

Critical depth 0.65 ft

Critical slope 0.0122 ft/ft

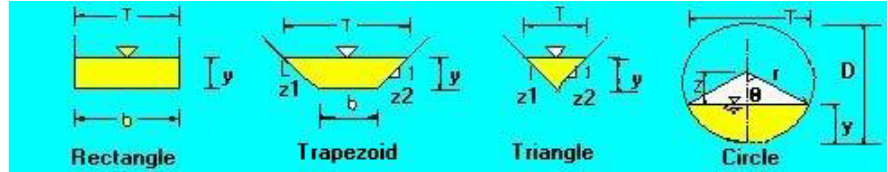
Velocity head 0.31 ft

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EXISTING GRASS LINED SWALE  
EXISTING GRADE SECTION  
E1-E1 Q100=12.1 cfs

## The open channel flow calculator

Select Channel Type: Trapezoid ▼



Velocity(V)&Discharge(Q) ▼

Select unit system: Feet(ft) ▼

Channel slope: .015 ft/ft

Water depth(y): 0.57 ft

Bottom W(b) 3.0  
ft

Flow velocity 3.3714 ft/s

LeftSlope (z1): 22 to 1 (H:V)

RightSlope (z2): 22  
to 1 (H:V)

Flow discharge 29.8632  
ft^3/s

Input n value 0.025 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 28.11  
ft

Flow area 8.86 ft^2

Top width(T) 28.08 ft

Specific energy 0.75 ft

Froude number 1.06

Flow status Supercritical flow

Critical depth 0.58 ft

Critical slope 0.0133 ft/ft

Velocity head 0.18 ft

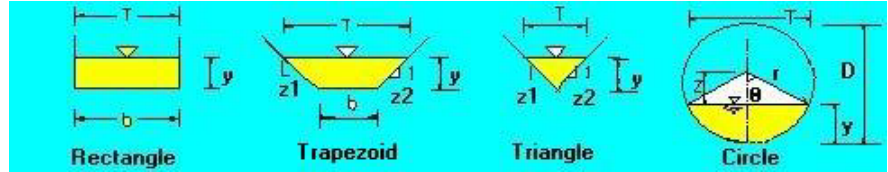
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EXISTING GRASS LINED SWALE  
EXISTING GRADE  
SECTION E2-E2 Q100=28.9 cfs



## The open channel flow calculator

Select Channel Type: Trapezoid ▼



Velocity(V)&Discharge(Q) ▼

Select unit system: Feet(ft) ▼

Channel slope: .01 ft/ft

Water depth(y): 2.11 ft

Bottom W(b) 6  
ft

Flow velocity 6.5509 ft/s

LeftSlope (Z1): 7.5 to 1 (H:V)

RightSlope (Z2): 18  
to 1 (H:V)

Flow discharge 454.792  
ft<sup>3</sup>/s

Input n value 0.025 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 60  
ft

Flow area 69.42 ft<sup>2</sup>

Top width(T) 59.81 ft

Specific energy 2.78 ft

Froude number 1.07

Flow status Supercritical flow

Critical depth 2.18 ft

Critical slope 0.0086 ft/ft

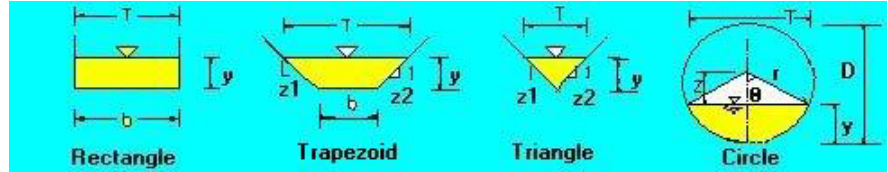
Velocity head 0.67 ft

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EXISTING CONDITION  
SECTION E3-E3  
Q100=454.4 cfs

## The open channel flow calculator

Select Channel Type: Trapezoid ▼



Velocity(V)&Discharge(Q) ▼

Select unit system: Feet(ft) ▼

Channel slope: .01 ft/ft

Water depth(y): 1.6 ft

Bottom width(b) 6  
ft

Flow velocity 5.5395 ft/s

LeftSlope (Z1): 7.5 to 1 (H:V)

RightSlope (Z2): 18  
to 1 (H:V)

Flow discharge 233.9867  
ft<sup>3</sup>/s

Input n value 0.025 or select n

Calculate!

Status: Calculation finished

Reset

Wetted perimeter 46.95  
ft

Flow area 42.24 ft<sup>2</sup>

Top width(T) 46.8 ft

Specific energy 2.08 ft

Froude number 1.03

Flow status Supercritical flow

Critical depth 1.62 ft

Critical slope 0.0094 ft/ft

Velocity head 0.48 ft

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PROPOSED CONDITION  
SECTION E3-E3  
Q100=231.2 cfs

Project: FH/CON Reserve

Date: Estimating Curb Cut Capacity

15' Curb openings (EXISTING) PAIR

$$L_T = 0.6 Q^{0.42} S_L^{0.3} \left( \frac{1}{n S_x} \right)^{0.6}$$

$Q_{1/2} = 26.2 \text{ cfs}$   $X_{\text{slope}} = 2.0\%$   $L_{\text{slope}} = 3.5\%$

$$L_T = 0.6 (26.2)^{0.42} (0.02)^{0.3} \left( \frac{1}{0.013 \times 0.03} \right)^{0.6}$$

$$L_T = 3.94 \times .309 \times 111.0$$

$$L_T = 81.19$$

Efficiency of the curb opening @ 15'

$$E = 1 - \left( 1 - \frac{L}{L_T} \right)^{1.8}$$

$$E = 1 - \left( 1 - \frac{15}{81.19} \right)^{1.8} = 0.307$$

$$Q_{15CAP} = 26.2 \times 0.307 = \underline{8.04 \text{ CFS (EACH SIDE)}}$$

Project: FALCON RESERVE  
 Date: Estimating Symp Curb Cut

6' SYMP CURB CUTS (PAR)

ASSUME PONDING - VELOCITY = 0

ASSUME CREST FLAT

ASSUME MAX DEPTH = MAX PONDING DEPTH AT EACH LOCATION

WEST SIDE

ELEV. 13.08 > AVG = 13.10 @ L.P.  
 ELEV. 13.13

MAX PONDING DEPTH @ Q ROAD = 13.45<sup>±</sup>

USE RECTANGULAR WEIR FORMULA =

$$Q = 3.2 \times L \times H^{1.5}$$

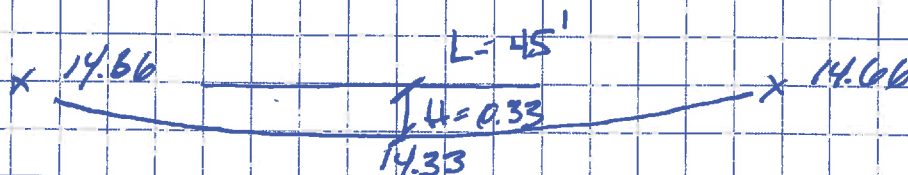
ASSUME MAX DEPTH 0.2'  
 HIGHER THAN CROWN.

$$= 3.2 \times 6' \times 0.55^{1.5} = 7.6 \text{ cfs}$$

$$\text{WEST SIDE} = 26.2 \text{ cfs} - 8.04 - 7.6 = 10.6 \text{ BYPASS}$$

FLOW CROSSES CENTERLINE

BROAD CRESTED WEIR

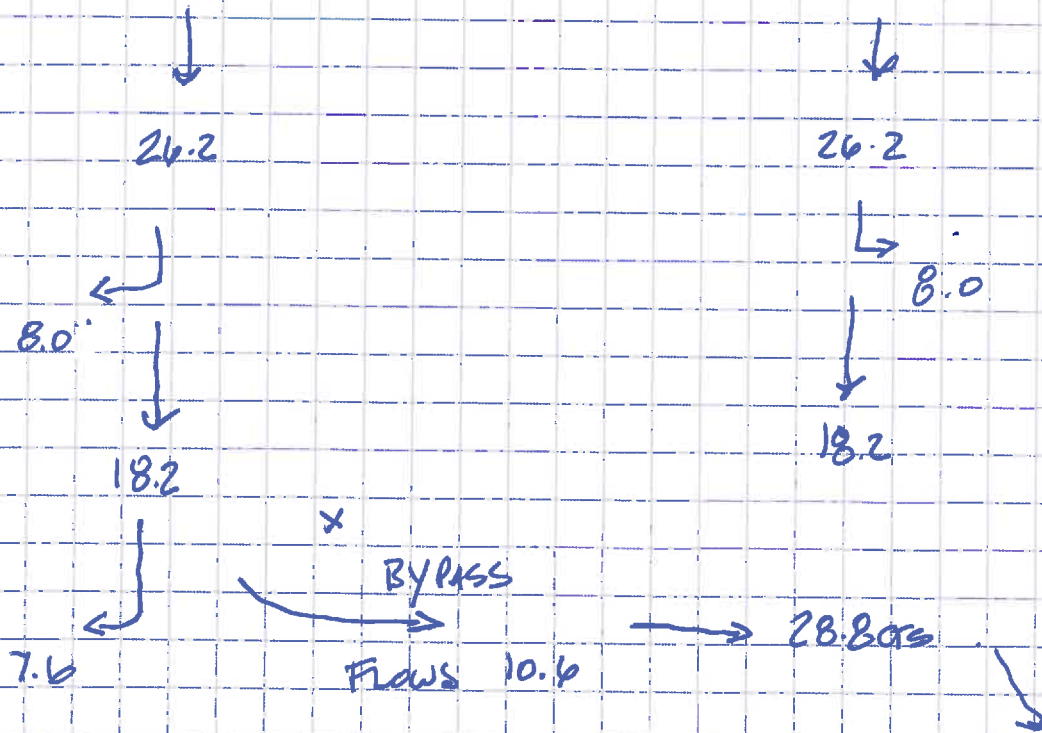


Project: Falcon Reserve

Date: 12/17/24

$$Q = 3.1 \times L \times H_{avg}^{1.5} = 3.1 \times 45 \times 0.17^{1.5} = 9.8 \sim 10.6$$

\* ASSUME FLOWS IN EXCESS OF WEST SIDE CAPACITY DIRECTED EAST



MAX PONDING @ EAST 6' CURB OPENING

ASSUME AT GRADE AS THERE IS LIMITED SUMP

CROSS SLOPE = 0.005 (0.5%)      LONG SLOPE = 0.005 (0.5%)

USE INLET FORMULA



Project: FAYON RESERVE

Date: \_\_\_\_\_

28.8 CFS → TO CURB CUT (6')

↘ TO STAKEOUT

$$L_T = 0.6 Q^{0.42} S_L^{0.3} \left( \frac{1}{n S_x} \right)^{0.6}$$

$$L_T = 0.6 (28.8)^{0.42} (0.005)^{0.3} \left( \frac{1}{0.013 \times 0.005} \right)^{0.6}$$

$$L_T = 163.31$$

Efficiency of curb opening @ 6'

$$E = 1 - \left( 1 - \frac{L}{L_T} \right)^{1.8}$$

$$E = 1 - \left( 1 - \frac{6}{163.3} \right)^{1.8} = 0.965 = 96.5\%$$

$$28.8 \times 0.965 = 27.8 \text{ CFS}$$

28.8 CFS → 27.8 CFS

↘ 27.8 to Stakeout

Project: FALCON RESERVE

Date: ESTIMATING CURB CAPACITY

15' Curb Openings (EXISTING) (WEST SIDE)

$$L_T = 0.6 Q^{0.42} S_L^{0.3} \left( \frac{1}{n S_x} \right)^{0.6}$$

$$Q_{WEST} = 6.1 \times \text{slope} = 2.0\% \quad L_{\text{slope}} = 3.0\%$$

$$L_T = 0.6 (6.1)^{0.42} (0.02)^{0.3} \left( \frac{1}{0.013 \times 0.03} \right)^{0.6}$$

$$L_T = 44.02$$

Efficiency of the curb opening @ 15'

$$E = 1 - \left( 1 - \frac{L}{L_T} \right)^{1.8}$$

$$E = 1 - \left( 1 - \frac{15}{44.02} \right)^{1.8} = 0.53$$

QCAP

$$6.1 \times 0.528 = 3.22 \text{ cfs}$$

$$\text{Flow By} = 6.1 \div 3.22 = 2.89 \sim 2.9 \text{ cfs}$$

Project: FALCON Reserve

Date: \_\_\_\_\_

6' curb opening accepting flow-by of 2.9 cfs

(West Side)  
Sye.

6' Sump

using Rect Weir Egn estimate ht req'd to  
accept flow

$$Q = 3.2 \times L \times H^{1.5}$$

Solve for H, Given  $Q = 2.9$ ,  $L = 6'$

$$H = 0.28$$

$$\text{MAX allowable ht} = 13.45 - 13.10 = .35 \text{ OK}$$



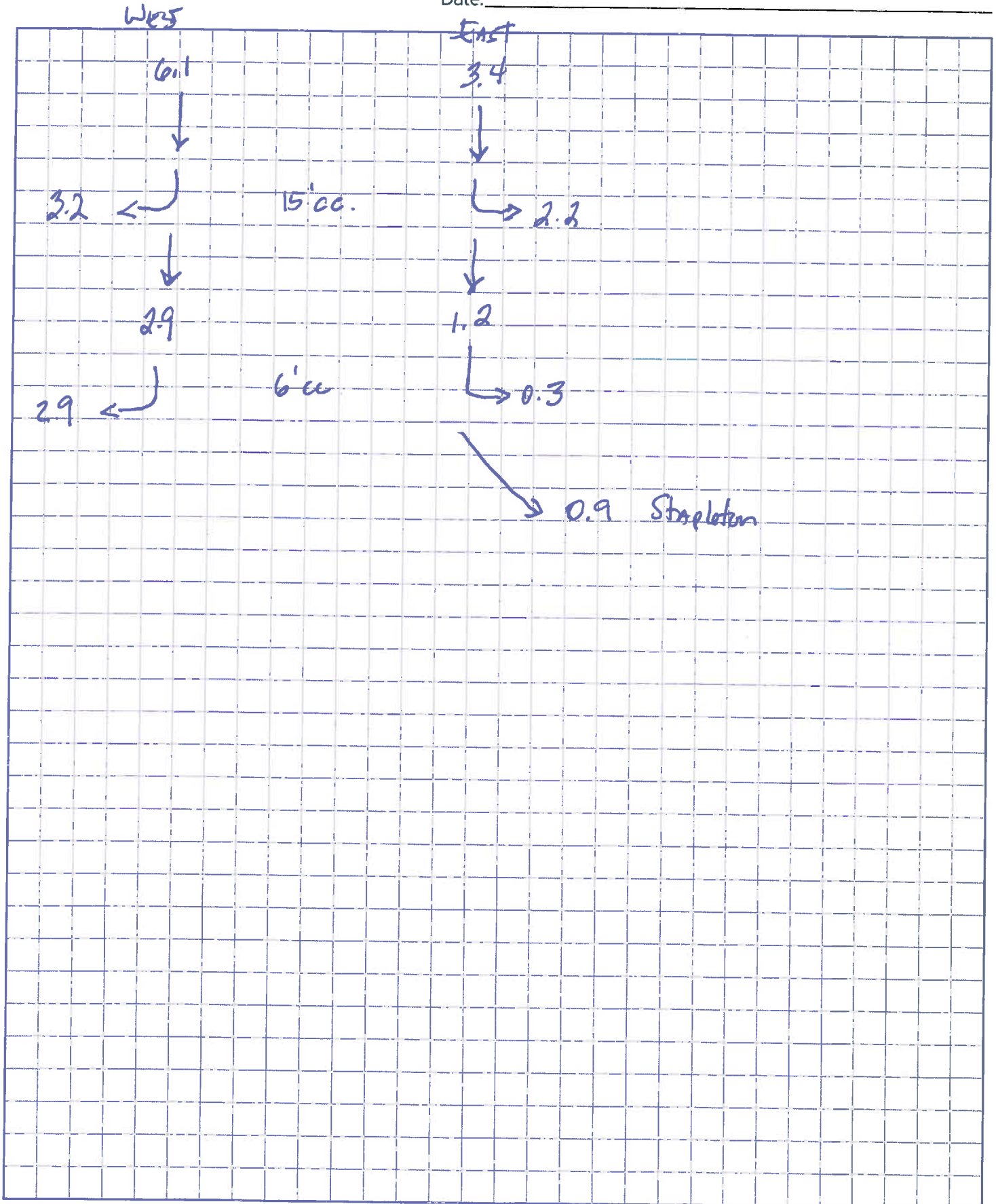


CIVIL CONSULTANTS, INC.

212 N. Wahsatch Ave., Ste. 305  
Colorado Springs, CO  
719.955.5485

Project: \_\_\_\_\_

Date: \_\_\_\_\_



Project: FALCON RESERVE

Date: ESTIMATING CURB CUT CAPACITY

15' Curb Opening (EXISTING) (EAST SIDE)

$$LT = 0.6 Q^{0.42} S_L^{0.3} \left( \frac{1}{n S_x} \right)^{0.6}$$

$$Q_{EXIST} = 3.4 \quad X_{slope} = 2.0\% \quad L_{slope} = 3.0\%$$

$$LT = 0.6 (3.4)^{0.42} (0.02)^{0.3} \left( \frac{1}{0.013 \times 0.03} \right)^{0.6}$$

$$LT = 34.44$$

Efficiency of the curb opening @ 15'

$$E = 1 - \left( 1 - \frac{L}{LT} \right)^{1.8}$$

$$1 - \left( 1 - \frac{15}{34.44} \right)^{1.8} = 0.64$$

$$Q_{CAP} = 3.4 \times 0.643 = 2.19 \text{ cfs} \quad - 2.2$$

$$Flow_{by} = 3.4 - 2.2 = 1.2 \text{ cfs}$$

Project: Falcon Reserve

Date: \_\_\_\_\_

Using inlet formula to solve for 6' curb opening

$Q$  = Flow by from 15' opening  $Q = 1.2 \text{ cfs}$

Assume at grade condition as there is limited slope for ponding.

cross slope = 0.005 ft/ft Long. Slope = 0.005 ft/ft

Use Inlet Formula.

$$L_T = 0.6 Q^{0.42} S_L^{0.3} \left( \frac{1}{n S_x} \right)^{0.6}$$

$$L_T = 0.6 (1.2)^{0.42} (0.005)^{0.3} \left( \frac{1}{0.013 \times 0.005} \right)^{0.6}$$

$$L_T = 42.98$$

$$E = 1 - \left( 1 - \frac{6}{42.98} \right)^{1.8} = .237 \sim 24\%$$

$$1.2 \times 0.24 \sim 0.3$$

$$1.2 - 0.3 = 0.9 \text{ flow to Stormwater}$$

**PROPOSED AND EXISTING DRAINAGE MAP**



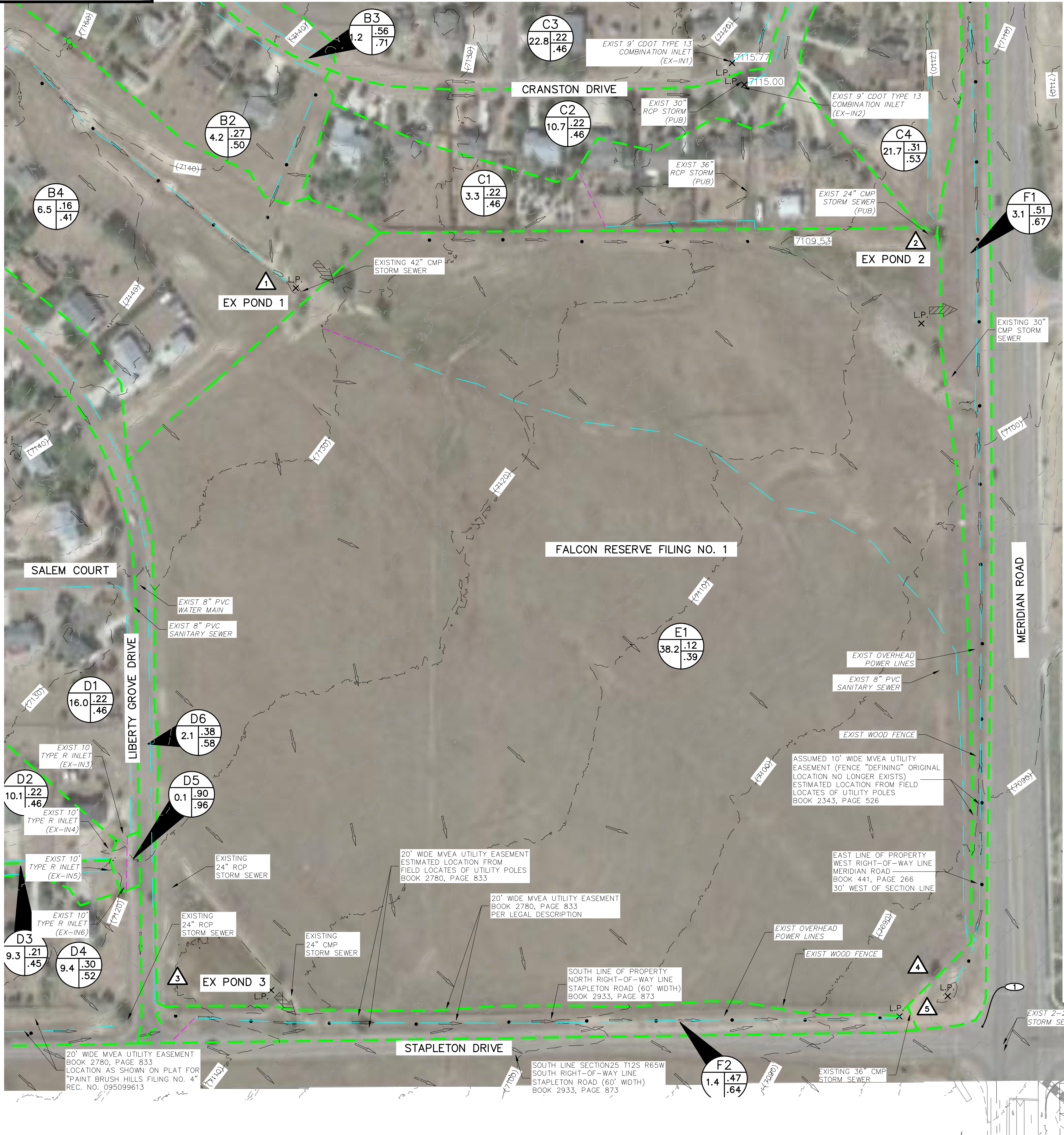
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# FALCON RESERVE FILING NO. 1

## EXISTING CONDITIONS DRAINAGE MAP

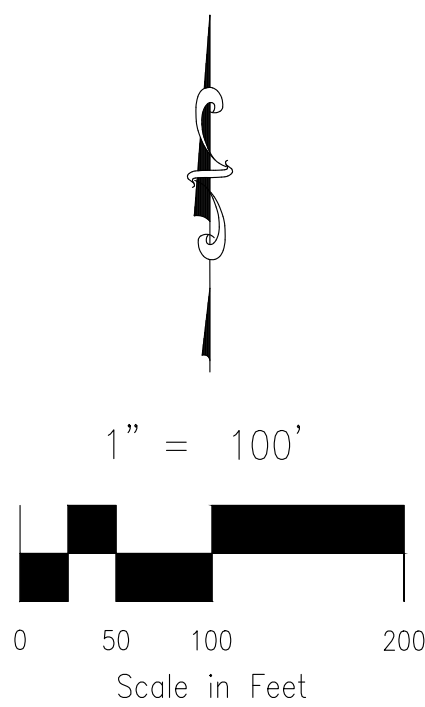
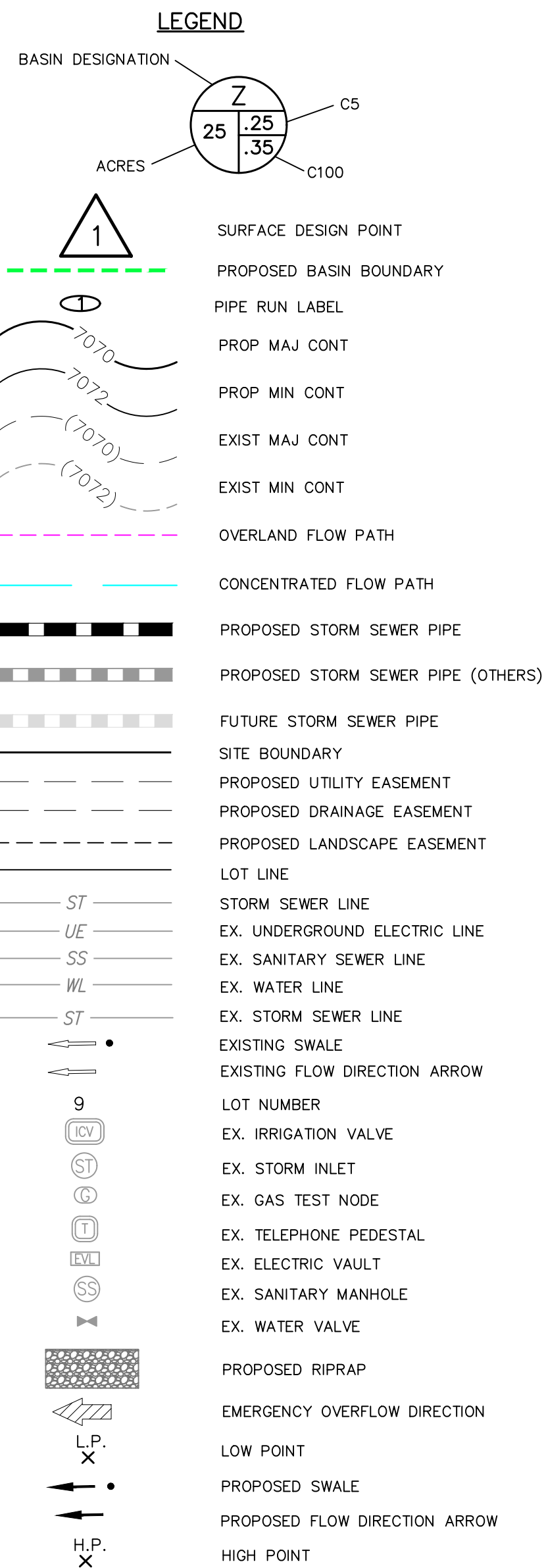
DECEMBER 2024



BASIN SUMMARY			
BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>100</sub>
A1	29.50	24.5	78.6
B1	49.26	31.4	116.0
B2	4.20	3.9	12.1
B3	1.22	2.8	5.9
B4	6.46	3.6	16.3
C1	3.27	2.8	10.0
C2	10.67	7.1	24.8
C3	22.78	20.8	59.5
C4	21.69	18.0	51.5
D1	16.01	12.1	42.5
D2	10.14	7.2	25.3
D3	9.30	6.1	22.3
D4	9.36	9.4	26.9
D5	0.09	0.4	0.7
D6	2.05	2.8	7.0
E1	38.23	14.4	78.4
F1	3.13	4.6	10.2
F2	1.44	2.4	5.5

DESIGN POINT SUMMARY				
DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	BASIN	STRUCTURE
1	55.5	192.4	A1, B1, B2, B3, B4	EX POND 1
2	45.2	134.4	C1, C2, C3, C4	EX POND 2
3	34.8	114.4	D1, D2, D3, D4, D5, D6	EX POND 3
4	60.4	231.4	E1, DP1	SOUTHEAST CORNER OF BASIN E1
5	134.2	455.8	F1, F2, DP2, DP3, DP4	EX DUAL 2.5' x 6' RCBC

STORM SEWER SUMMARY				
PIPE RUN	Q <sub>5</sub>	Q <sub>100</sub>	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	134.2	455.8	EX DUAL 2.5' x 6' RCBC	DP 5



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FALCON RESERVE FILING NO. 1

EXISTING DRAINAGE MAP

PROJECT NO. 43-144

DESIGNED BY: GT  
DRAWN BY: GT  
CHECKED BY: DM

SCALE:  
HORIZONTAL:  
1"=100'  
VERTICAL:  
NA

DATE: 12/23/24

SHEET 1 OF 2

EDM





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FALCON RESERVE FILING NO. 1  
EXISTING CONDITIONS DRAINAGE MAP

DECEMBER 2024

MATCHLINE SEE BELOW LEFT

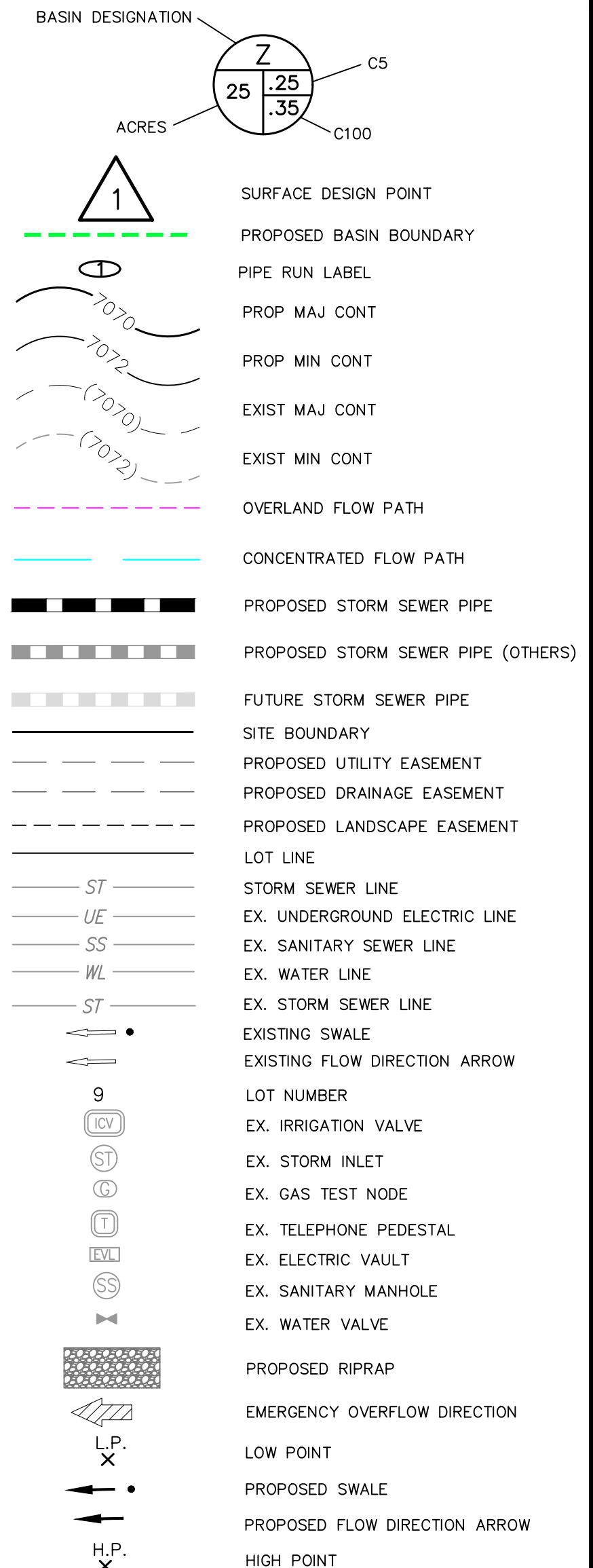
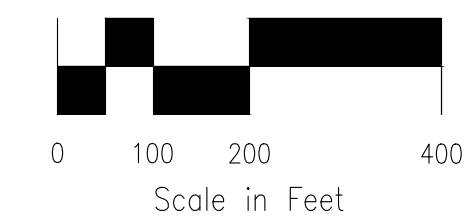


BASIN SUMMARY			
BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>10</sub>
A1	29.50	24.5	78
B1	49.26	31.4	116
B2	4.20	3.9	12
B3	1.22	2.8	5
B4	6.46	3.6	16
C	2.13	0.9	4
C1	3.27	2.8	10
C2	10.67	7.1	24
C3	22.78	20.8	59
C4	21.69	18.0	51
D1	16.01	12.1	42
D2	10.14	7.2	25
D3	9.30	6.1	22
D4	9.36	9.4	26
D5	0.09	0.4	0
D6	2.05	2.8	7
E1	38.23	13.6	74
F1	3.13	4.6	10
F2	1.44	2.4	5

DESIGN POINT SUMMARY				
DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	BASIN	STRUCTURE
1	55.5	192.4	A1, B1, B2, B3, B4	EX POND 1
2	45.9	138.2	C, C1, C2, C3, C4	EX POND 2
3	34.8	114.4	D1, D2, D3, D4, D5, D6	EX POND 3
4	59.8	228.0	E1, DP1	SOUTHEAST CORNER OF BASIN 1
5	134.2	455.8	F1, F2, DP2, DP3, DP4	EX DUAL 2.5' x 6' RCBC

STORM SEWER SUMMARY				
PIPE RUN	Q <sub>5</sub>	Q <sub>100</sub>	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	134.2	455.8	EX DUAL 2.5' x 6' 2000	DP 5

LEGEND


$$1'' = 200'$$


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COLORADO SPRINGS, CO 80903  
PHONE: 719.955.5485

## FALCON RESERVE FILING NO. 1

EXISTING OVERALL DRAINAGE MAP

PROJECT NO. 43-144		SCALE:	DATE: 12/23/24	
DESIGNED BY: GT		HORIZONTAL:	SHEET 2 OF 2	EDM
DRAWN BY: GT		1"=200'		
CHECKED BY: DM		VERTICAL:		





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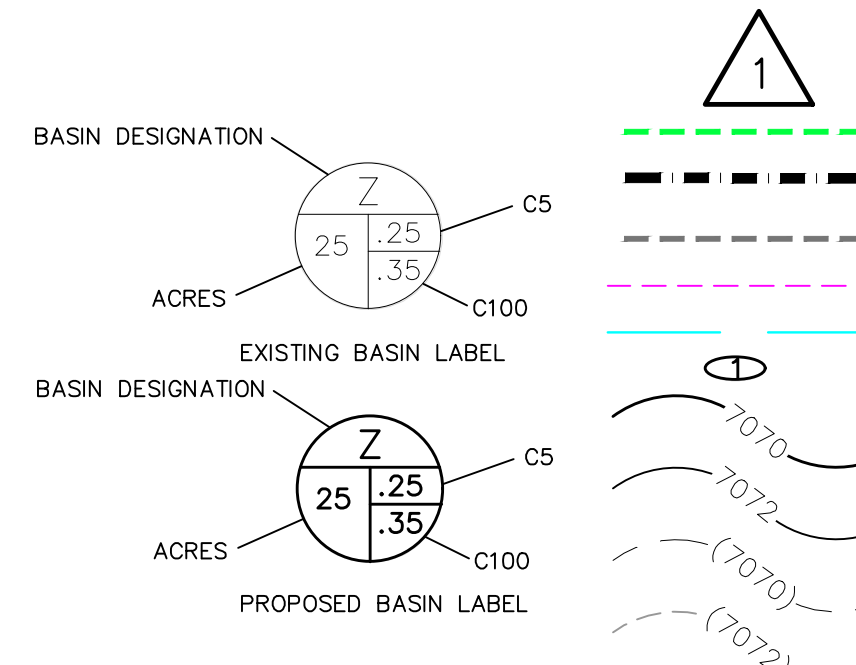
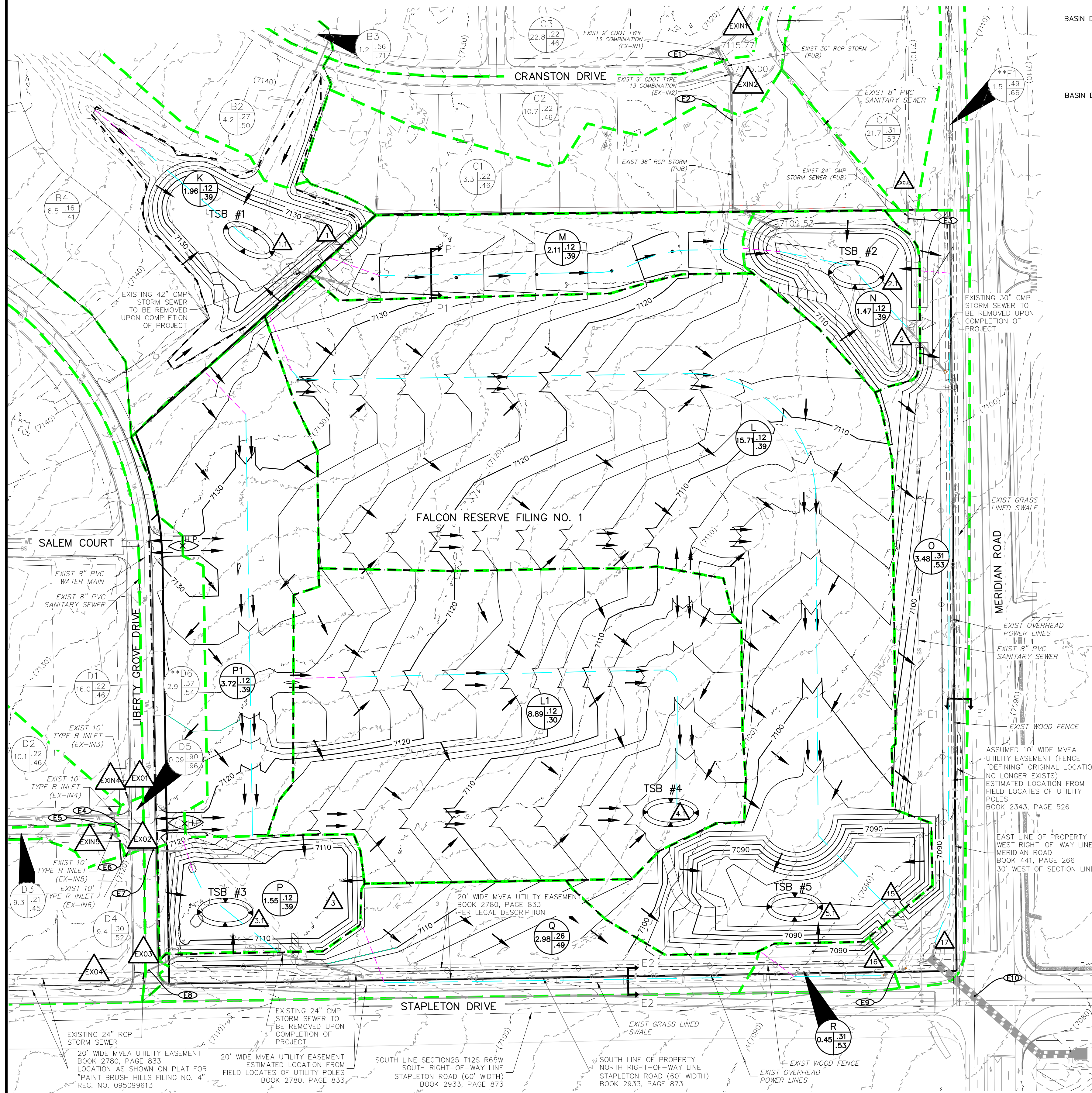
**NOTE:**

REFER TO EXISTING CONDITIONS DRAINAGE MAP WITHIN  
THIS REPORT FOR OFFSITE BASIN DELINEATION AND  
DRAINAGE PATTERNS

# FALCON RESERVE FILING NO. 1

## EARLY GRADING PROPOSED CONDITIONS DRAINAGE MAP

APRIL 2025



SURFACE DESIGN POINT

PROPOSED BASIN BOUNDARY

DISTURBED AREA TREATED BY SEDIMENT BASIN

EXISTING BASIN BOUNDARY

OVERLAND FLOW PATH

CONCENTRATED FLOW PATH

PIPE RUN LABEL

PROP MAJ CONT

PROP MIN CONT

EXIST MAJ CONT

EXIST MIN CONT

**LEGEND**

PROPOSED STORM SEWER PIPE

PROPOSED STORM SEWER PIPE (OTHERS)

FUTURE STORM SEWER PIPE

SITE BOUNDARY

PROPOSED UTILITY EASEMENT

PROPOSED DRAINAGE EASEMENT

PROPOSED LANDSCAPE EASEMENT

LOT LINE

STORM SEWER LINE

EX. UNDERGROUND ELECTRIC LINE

EX. SANITARY SEWER LINE

EX. WATER LINE

EX. STORM SEWER LINE

EXISTING SWALE

EXISTING FLOW DIRECTION ARROW

9

LOT NUMBER

EX. IRRIGATION VALVE

EX. STORM INLET

EX. GAS TEST NODE

EX. TELEPHONE PEDESTAL

EX. ELECTRIC VAULT

EX. SANITARY MANHOLE

EX. WATER VALVE

PROPOSED RIPRAP

EMERGENCY OVERFLOW DIRECTION

LOW POINT

PROPOSED SWALE

PROPOSED FLOW DIRECTION ARROW

HP HIGH POINT/LP LOW POINT

**SEDIMENT BASIN TABLE**

SEDIMENT BASIN NO.	UPSTREAM DRAINAGE AREA AC.	BASIN WIDTH FT.	BASIN LENGTH FT.	ANTIC. WATER HT. FT.	MAX. REO'D VOLUME C.F.	SPILLWAY LENGTH FT.	HOLE DIA. IN.	ROWS OF HOLES IN STANDPIPE
1	2	21	42	3	8,165	3	13/16	1
2	4	33.5	67	3	10,922	6	9/16	1
3	9	55	110	3	25,665	13	7/8	1
4	9	55	110	3	25,665	13	7/8	1
5	15	73.25	146.5	3	40,673	22	1-3/16	1

**BASIN SUMMARY**

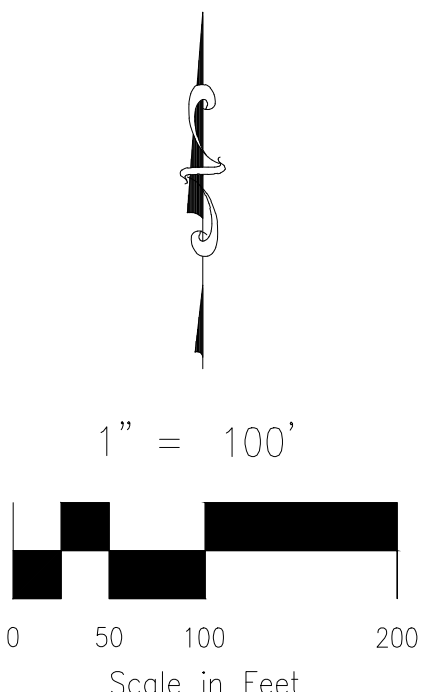
BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>100</sub>
A1	29.50	24.5	78.6
B1	49.26	31.4	116.0
B2	4.20	3.9	12.1
B3	1.22	2.8	5.9
B4	6.46	3.6	16.3
C1	3.27	2.8	10.0
C2	10.67	7.1	24.8
C3	22.78	15.0	52.2
C4	21.69	18.0	51.5
D1	16.01	12.1	42.5
D2	10.14	7.2	25.3
D3	9.30	6.1	22.3
D4	9.36	9.4	26.9
D5	0.09	0.4	0.7
**D6	2.93	3.8	9.3
**F1	1.50	2.5	5.7
L	2.65	1.5	7.2
M	2.11	0.9	5.0
N	1.47	0.8	4.2
O	3.48	3.9	11.2
P	1.55	0.9	4.7
Q	2.98	3.0	9.6
R	0.45	0.6	1.8

**DESIGN POINT SUMMARY**

DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	BASIN	STRUCTURE
EX-1.1	49.5	173.3	A1, B1, PARTIAL B4	DUAL 36" RCP CULVERTS
EX-1.2	6.3	17.1	B2, B3	PROP 24" RCP CULVERT
EX-IN1	10.9	38.3	TOTAL C2-C3 SPLIT	EX 9" CDOT TYPE 13 COMBINATION INLET
EX-IN2	10.9	38.3	TOTAL C2-C3 SPLIT	EX 9" CDOT TYPE 13 COMBINATION INLET
EX-CUL	18.0	51.5	C4	EX 30" CULVERT W/FES
EX-IN3/EX01	12.1	25.2	D1, PARTIAL **D6 @ EX-IN3	EX 10 CDOT TYPE R INLET Q100 FLOWS SPLIT
EX-IN4	7.2	25.3	D2	EX 10 CDOT TYPE R INLET
EX-IN5	6.1	22.3	D3	EX 10 CDOT TYPE R INLET
EX-IN6/EX02	4.9	31.4	D5, PARTIAL **D6 @ EX-IN6, FB EX01, EX-IN4, EX-IN5	EX 10 CDOT TYPE R INLET Q100 FLOW SPLIT
EX-03	6.1	26.2	D4 STREET, **D6 @ STAPLETON, FB EX-IN6/EX02	TOTAL FLOW WITHIN LIBERTY STREET SECTION
EX-04	11.7	40.7	D4 EXCLUDE D4 STREET SECTION, 1/2 DP EX-03 MINUS FB TRANSFER OVER CROWN	EX 24" RCP CULVERT
1.1	0.9	5.0	K	TSB #1
1	55.5	192.4	A1, B1, B2, B3, B4	POND 1
2.1	1.6	8.5	M, N	TSB #2
2	65.3	240.7	C1, M, N, PRE2, PRE3, DP1	POND 2
3.1	6.0	21.3	P, P1, **D6	TSB #3
3	41.8	102.1	P, P1, PRE7, PRE8, EX 15" CURBCUT PARTIAL CAPTURE **D6 @ STAPLETON	POND 3
4.1	3.8	20.6	L1	TSB #4
5.1	10.4	56.8	L	TSB #5
15	10.4	56.8	L	POND 4
16	37.0	114.7	Q, R, EASTSIDE FB-15" CURBCUT EX03, WESTSIDE FB EX03 OVER CROWN	EX CULVERT
17	78.7	282.8	**F1, O, PRE9, DP2, DP15	EX DUAL 2.5'x6.0' RCBC

**STORM SEWER SUMMARY**

PIPE RUN	Q <sub>5</sub>	Q <sub>100</sub>	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
PRE1	10.9	34.1	EX 30" RCP	EX-IN1
PRE2	21.9	68.2	EX 36" RCP	EX-IN2, PREX1
PRE3	18.0	51.5	EX 24" CMP	EX-CUL
PRE4	7.7	10.8	NA EXISTING	EX-IN3
PRE5	5.9	10.9	NA EXISTING	EX-IN4
PRE6	11.1	20.9	NA EXISTING	EX-IN5, PREX5
PRE7	24.7	42.7	EX 24" RCP	EX-IN6, PREX4, PREX6
PRE8	11.7	40.7	EX 24" RCP	DP EX04
PRE9	37.0	114.7	EX 36" CMP	DP16
PRE10	78.7	282.8	DUAL 2.5'x6.0' RCBC	DP17



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**FALCON RESERVE FILING NO. 1**

**EARLY GRADING PROPOSED DRAINAGE MAP**

PROJECT NO. 43-144	SCALE: HORIZONTAL: 1"=100' VERTICAL: NA	DATE: 04/08/2025	PDM
DESIGNED BY: GT	DRAWN BY: GT	CHECKED BY: VAS	



## **BACKGROUND INFORMATION**





212 N. Wahsatch Avenue, Ste. 305  
Colorado Springs, CO 80901  
(719) 955-5485

October 22, 2021

El Paso County  
Planning and Community Development  
2880 International Circle, Suite 110  
Colorado Springs, Colorado 80910

**RE: Falcon Reserve Filing No.1 - Concept Drainage Analysis**

Dear Staff,

This conceptual drainage analysis for Falcon Reserve Filing No.1 has been provided for your review as a foundation to discuss the following:

- Concepts for major drainage improvement from the site, which may differ from those recommended by the 2015 Falcon Drainage Basin Planning Study (DPBS) but function to achieve the same goals and more cost effective for the drainage basin
- Determine if improvements recommended by the DBPS, specially the recommendation to improve the existing box culvert at Meridian and Stapleton are necessary and if so discuss the cost and impacts associate with these improvements.
- Discuss the Stapleton – Briargate Corridor Study planned drainage assumptions and improvements and how they impact the subject site.
- Discuss deficiencies noted by the DBPS that are adjacent to the subject site and confirm that they are/ or are not the responsibility of the developer.
- Determine what drainage improvements associated with development is reimbursable to the developer.

Once your staff has had time to evaluate the analysis and recommendation for concept drainage improvements we would appreciate a chance to meet with your team to discuss the aforementioned discussion items.

Please let us know when you are available.

Respectfully,

Darin L. Moffett, P.E.  
For and on behalf of M&S Civil Consultants, Inc.

**Conceptual Drainage Analysis**  
**for**  
**Falcon Reserve**  
**El Paso County, CO**

**Prepared For:**

**The Landhuis Company**  
**212 N. Wahsatch Avenue, Suite 301**  
**Colorado Springs, CO 80903**

**By:**

**Core Engineering Group**  
**15004 1<sup>st</sup> Avenue S.**  
**Burnsville, MN 55306**  
**(719) 570-1100**

**Job No. xxx**

**March, 2014**

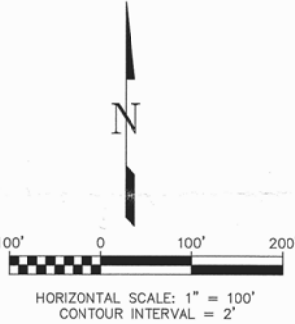
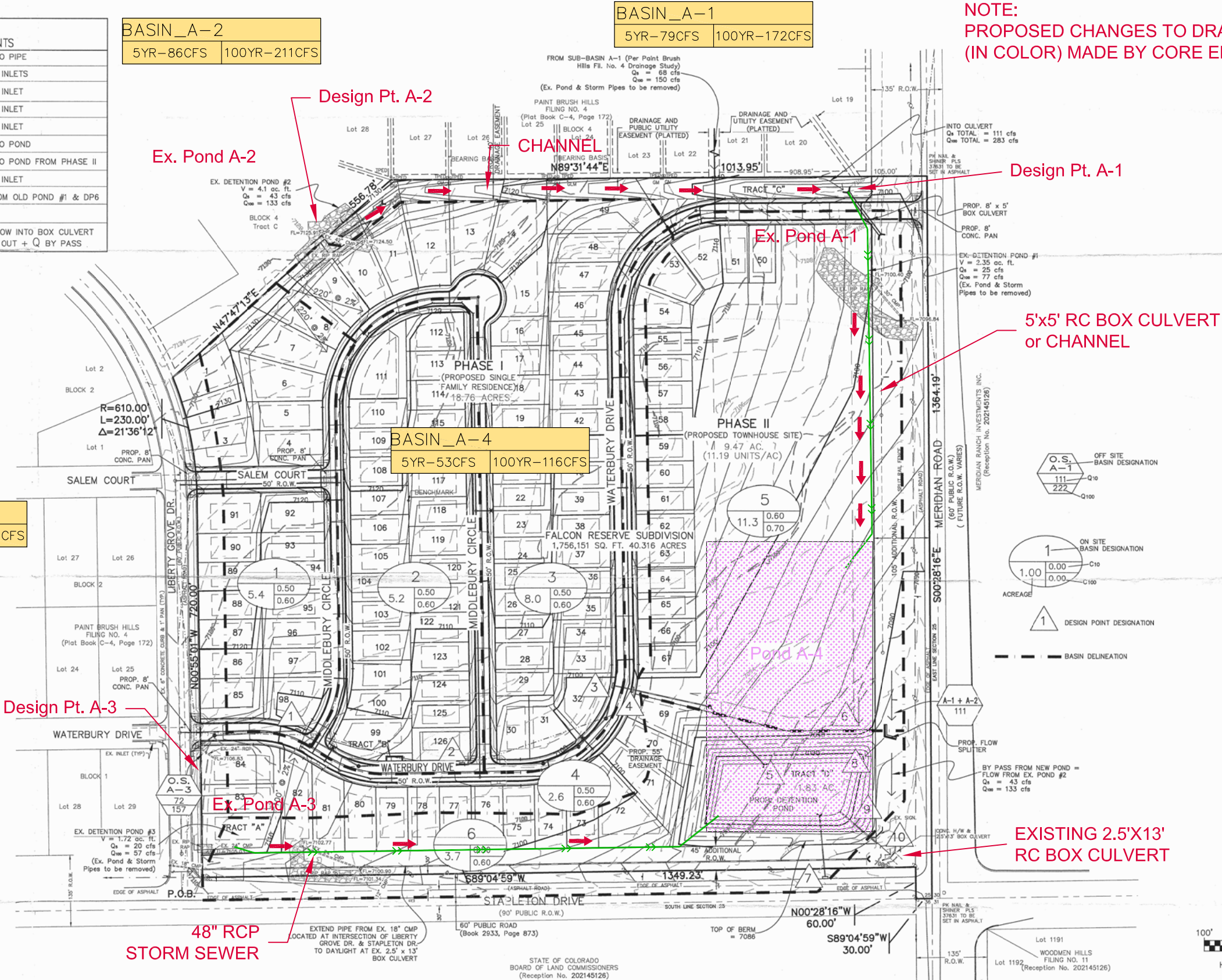
DESIGN POINT	TRIBUTARY AREA	Q <sub>5</sub> cfs	Q <sub>100</sub> cfs	COMMENTS
O.S. A-3	—	72.0	157.0	FLOW INTO PIPE
1	5.4	9.5	19.8	FLOW TO INLETS
2	5.2	9.1	18.7	FLOW TO INLET
3	8.0	9.6	17.1	FLOW TO INLET
4	2.6	4.8	9.7	FLOW TO INLET
5	—	105.0	222.3	FLOW INTO POND
6	11.3	25.1	49.0	FLOW INTO POND FROM PHASE II
7	2.3	6.8	13.8	FLOW TO INLET
8	—	93.1	199.0	FLOW FROM OLD POND #1 & DP6
9	TOTAL FLOW	208.0	442.7	
10	—	103.7	311.9	TOTAL FLOW INTO BOX CULVERT Q POND OUT + Q BY PASS

BASIN_A-2
5YR-86CFS 100YR-211CFS

BASIN_A-1
5YR-79CFS 100YR-172CFS

NOTE:  
PROPOSED CHANGES TO DRAINAGE MAP  
(IN COLOR) MADE BY CORE ENGINEERING GROUP

BASIN_A-3
5YR-67CFS 100YR-141CFS



SITE BENCHMARK:  
CONTROL POINT 200 NO. 4 REBAR  
ELEV.=7119.42

LDC, Inc.  
PLANNING, SURVEYING, LANDSCAPE ARCHITECTURE  
3520 Austin Bluffs Parkway  
Colorado Springs, CO 80918  
(719) 528-6133 FAX (719) 528-6848

NO.	REVISIONS DESCRIPTION	BY	DATE

# PRELIMINARY PLAN - DRAINAGE MAP

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FALCON RESERVE MASTER DEVELOPMENT DRAINAGE PLAN			
PROJECT NO.	04086.1	Drawn By: KEM	Date: 02-21-06
		Checked By:	Sheet: 1 of 1



DRAINAGE ANALYSIS

FOR

PAINT BRUSH HILLS

FILING NO. 4

DECEMBER 1986

Owner: Paint Brush Hills Partnership  
3720 Sinton Road, Suite 200  
Colorado Springs, CO 80907

Engineer: KKBNA, Inc., Consulting Engineers  
4251 Kipling Street  
Wheat Ridge, CO 80033  
431-6100



[illegible]

date NOVEMBER 1986  
job number 9205.01.0007  
design by M. SCHOLZ  
drawn by C. BURK  
checked by R. DOMINICAK

sheet number

**D-1**

