

**PRELIMINARY/FINAL DRAINAGE REPORT**

**FOR**

**LOTS 3 & 4 - ROCKY MOUNTAIN  
INDUSTRIAL PARK FILING NO. 1A**

**EL PASO COUNTY, COLORADO**

January 2024

Prepared for:  
Colorado River Landscaping, LLC

Mr. Eduardo Hernadez  
2170 Capital Drive  
Colorado Springs, Colorado Springs 80951

Prepared by:



**CIVIL CONSULTANTS, INC.**

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Project #70-140  
PCD Filing No.: PPR

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FOR  
LOTS 3 & 4 ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**

**DRAINAGE PLAN STATEMENTS**

**ENGINEERS STATEMENT**

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

\_\_\_\_\_  
Virgil A. Sanchez, P.E. #37160  
For and on Behalf of M&S Civil Consultants, Inc

**DEVELOPER'S STATEMENT**

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

BY:\_\_\_\_\_  
Eduardo Hernandez – Owner

DATE:\_\_\_\_\_

ADDRESS: Colorado River Landscaping, LLC  
2170 Capital Drive  
Colorado Springs, CO 80951

**EL PASO COUNTY'S STATEMENT**

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.

BY:\_\_\_\_\_ DATE:\_\_\_\_\_  
Joshua Palmer, P.E.  
County Engineer / ECM Administrator

**CONDITIONS:**

**PRELIMINARY/FINAL DRAINAGE REPORT  
FOR  
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**PRELIMINARY/FINAL DRAINAGE REPORT  
FOR  
LOTS 3 & 4 ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**

**Purpose**

This Preliminary/Final Drainage Report for Lots 3 & 4 of Rocky Mountain Industrial Park Filing No. 1A is in support of a Site Development Plan submittal, necessitated by El Paso County, to bring the subject site in compliance with El Paso County Code. As it exists the properties are being utilized for equipment and material storage associated with an existing landscaping business. This report functions to identify the existing drainage conditions and recommend proposed drainage improvements which are intended to safely convey runoff through the development, while minimizing impacts to downstream facilities and adjacent properties.

**Project Location and Description**

Lots 3 & 4 Rocky Mountain Industrial Filing Park No 1A, is located in Section 2, of Township 13 South, Range 65 West of the Sixth Principal Meridian, City of Colorado Springs, El Paso County, Colorado. Lot 3 (2.09 acres) and Lot 4 (1.40 acres) are currently undeveloped but are presently being utilized to store vehicles and materials that coincide with a landscaping business. The existing development is bound to the north by existing Sandy Court (80' Public ROW), to the east by an undeveloped parcel of land and East Highway 24, to the south by Lot 7 Block 1, Rocky Mountain Industrial Park Filing No. 1, and to the west by existing Capital Drive (80' Public ROW). The subject site is currently zoned as I-3 Heavy Industrial (per Zone Map 533, EPC Development Services Department).

Most of the existing Lots 3 & 4 consist of exposed soils and gravels associated with a non-paved parking area, possessing limited ground cover. The site has been previously graded (over lot) with the development of the parent subdivision. Generally, the site slopes from northeast to southwest at average slopes between 2% and 10%. The site lies within the Sand Creek Drainage Basin. With the exception of a riprap lined channel along the east property line and a existing earthen swale along the south property line, no formal drainage facilities or improvements are onsite. No known irrigation systems or wells are present.

**Soils**

Soils in the project area have been determined to be Blendon Sandy Loam (10), which is characterized to be part of Hydrologic Soil Types "B" as determined from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) "Web Soils Survey". A soils map illustrating the site location and soil types is provided in the appendix of this report.



## **Floodplain Statement**

The Sand Creek East Fork Channel is located to the east of Lots 3 & 4 of the Rocky Mountain Industrial Park Filing No. 1A. According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 08041C0756 G, effective date December 7<sup>th</sup>, 2018, a small portion of Lot 4 lies within Zone A. It should be noted that there is a LOMR, (effective February 6<sup>th</sup>, 2025) in process that will slightly alter the existing floodplain and place it with a Zone AE. A copy of the annotated maps can be found in the appendix. In addition, the two floodplain lines (effective/soon to be effective) are reflected on the drainage maps also found in the appendix.

## **Previous Studies**

The area which encompasses Lots 3 and 4 of Rocky Mountain Industrial Park Filing 1A has been previously studied. Below is a short outline of the assumptions regarding the lands of the subject site and those based upon the previously assembled and approved drainage reports and how the assumptions within them impact the subject site.

“Preliminary/Final Drainage Report Jackson Office Warehouse & Storage Building Development Rocky Mountain Industrial Park Filing No. 1A, prepared by Associated Design Professionals, Inc, dated May 2, 2018.

- Discusses development located to the north of subject site
- No detention provided
- Water quality provided via 1400 cf Sand Filter Basin
- Based upon proposed development re-establishes developed flow at NE Corner of subject site at existing riprap lined channel DP6, CA5=, CA100=, TC=20.5 mins (Q5=52.4 cfs Q100=122.0 cfs), used in this analysis.

“Drainage letter for Rocky Mountain Industrial Park Filing 1A, prepared by Land Development Consultants, Inc., approved January 26, 2010.

- Supports the replat of the existing lot into 4 lots, henceforth to be known as Rocky Mountain Industrial Park No. 1A, Lots 1-4.
- Indicates that runoff from Lots 1 and 2 are to be collected within the existing street and directed to an existing Type R Inlet at the terminus of Sandy Court and piped to an existing (south draining) riprap channel.
- The flows from lots 3 and 4, which are considered previously developed (as the result of overlot grading) are conveyed via sheet flow to an existing grass lined channel along the south boundary which drains to the aforementioned riprap channel.
- Per the report, drainage basin fees for the lots were paid with the initial filing.

“Final Drainage Plan and Erosion Control Plan, Rocky Mountain Industrial Park Filing 1, prepared by Kiowa Engineering Corporation, approved February 15, 2002.

- Initially analyzed the 7.5 acres industrial commercial lot \*(Lot 7), drainage basins 3 & 4 (totaling 8.5 acres) of which the subject sites are a portion of.
- North lots to drain to inlet/overflow swale at end of Sandy Court.
- Recommended a 10' wide 3:1, “VL” riprap lined channel along the eastern boundary of the lots 3 and 4.
- Recommended a 4' wide 3:1, “VL” riprap lined channel along the southern boundary of the lots 4, 5 and 6.
- Estimated the peak flow at the confluence of the two channels (at Design Point 4) to be  $Q_5=101.4\text{ cfs}$  and  $Q_{100}=166.0\text{ cfs}$ .

“Sand Creek Drainage Basin Planning Study, Preliminary Design Report”, prepared by Kiowa Engineering Corporation, dated January 1993, revised March 1996.

- Establishes that the subject site falls within the East Fork Sand Creek Drainage Basin, a portion of the larger Sand Creek Watershed
- Establishes that there are no requirements for major infrastructure improvements and subsequently no drainage-improvement related reimbursements with the development of this parcel

## **Drainage Criteria**

### **Hydrologic Calculations**

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design 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 DCM as revised in May 2014. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals. The Mile High Flood District UD-BMP version 3.07 was utilized to size the proposed water quality treatment facility. Infiltration rates were

### **Hydraulic Calculations**

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report.

### **Existing Drainage Characteristics**

In the existing condition, the two lots (3 and 4) are being used to store vehicles and materials associated with a landscaping company. The storage yards generally lack vegetation and consist of exposed gravels and sands and silts typical of a non-paved parking lot. Runoff from the area, and a portion of the adjacent right of way drains north to south and are collected by an existing privately

owned and maintained swale located along the shared southern property line. The trapezoidal shaped earthen grass lined swale, which lies within an existing 30' drainage easement, conveys runoff easterly at slightly less than a one percent grade. The exception being the far east portion of Lot 3 which drains easterly to an existing riprap lined channel that parallels the eastern boundary. The trapezoidal shaped conveyance channel, with an approximate bottom width of 10'w, (also lying within an existing 30'w drainage easement) functions to convey offsite drainage from approximately 38 acres to the north through the subject site in accordance with the subdivision overall drainage plan. Ultimately, the combined drainage from the site and offsite flows discharges into the East Fork of Sand Creek approximately 100 feet south of the southeast corner of Lot 3. Due to its proximity, a portion of the East Fork of Sand Creek Channel's 100-year FEMA regulatory floodplain impacts a portion of Lot 3. The subsequent paragraphs further describe the drainage patterns and the associated runoff developed in the existing condition.

### **Design Point 1**

Offsite **Basin OS1** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.04 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin A**.

**Basin A** ( $Q_5=3.1$  cfs,  $Q_{100}=6.2$  cfs) consists of 1.15 acres of a portion of existing parking/storage area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast.

Off-site **Basin OS4** ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) consists of 0.06 acres of grass covered rights of way immediately adjacent to the west property line of Lot 4. Runoff from this basin is conveyed south and east as sheet flow toward **Basin A**.

Off-site **Basin OS5** ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) consists of 0.11 acres of undeveloped property located to the south of the subject site. Runoff produced within the basin combines with flows produced within **Basins OS1, A, and OS4** within an existing earthen swale located along the south property line of Lot 4. The combined runoff at **Design Point 1** (east lot of Lot 4) is calculated to reach peak flow rates of  $Q_5=3.2$  cfs,  $Q_{100}=6.8$  cfs. From here, flows continue east, along the southern boundary of Lot 3.

### **Design Point 2**

Offsite **Basin OS2** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.03 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin B**.

**Basin B** ( $Q_5=0.6$  cfs,  $Q_{100}=1.3$  cfs) consists of 0.25 acres of existing parking/storage area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast.

Offsite **Basin OS3** ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) consists of 0.05 acres which includes portions of the grass covered right of way located to the north of Lot 3. Flows from this basin are conveyed south as sheet flow toward **Basin C**.

**Basin C** ( $Q_5=3.1$  cfs,  $Q_{100}=6.1$  cfs) consists of 1.16 acres of existing parking/storage area located within the western portion of Lot 3. Flows from **Basin OS3** combine with the flows from this basin and continue overland to the southeast.

**Basin D** ( $Q_5=0.8$  cfs,  $Q_{100}=1.7$  cfs) consists of 0.34 acres of existing parking/storage area located within the eastern portion of Lot 3. Runoff from Basin D is conveyed as sheet flow to the southeast.

Off-site **Basin OS6** ( $Q_5=0.0$  cfs,  $Q_{100}=0.3$  cfs) consists of 0.17 acres of undeveloped property located to the south of the subject site. Runoff produced within the basin combines with flows produced within **Basins B, OS2, OS3, C, OS6 and DP1** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 2** is calculated to reach peak flow rates of  $Q_5=7.7$  cfs,  $Q_{100}=16.3$  cfs. From here, flows continue east, along the southern boundary of Lot 3.

### **Design Point 3**

**Design Point 3** is located at the northeast corner of Lot 3. The contributing area and calculated runoff reaching this location was determined, most recently, within the Preliminary/Final Drainage Report Jackson Office Warehouse & Storage Building Development Rocky Mountain Industrial Park Filing No. 1A, prepared by Associated Design Professionals, Inc, dated May 2, 2018. Per the report runoff collected by the inlet within the adjacent street and the flow from the offsite watershed located to the north of the subject site values of  $CA_5=18.23$  and  $CA_{100}=24.28$  at a time of concentration of 20.5 mins. Per M&S existing conditions rational calculation these values result in peak runoff rates of  $Q_5=55.6$  cfs,  $Q_{100}=124.4$  cfs. Flows reaching **DP3** enter Lot 3 and continue south within an existing type 'VL' riprap lined swale.

### **Design Point 4**

**Basin E** ( $Q_5=1.2$  cfs,  $Q_{100}=2.6$  cfs), consists of 0.60 acres of existing parking storage area located within the eastern portion of Lot 3. Flows from the basin are conveyed as sheet flow to the existing riprap lined channel that parallels the eastern boundary.

Off-site **Basin OS7** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.02 acres of undeveloped property located near the southeast corner of Lot 3. Runoff produced within the basin combines with flows produced within **Basins E, DP2, and DP3** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 4** is calculated to reach peak flow rates of  $Q_5=57.1$  cfs,  $Q_{100}=126.9$  cfs

### **Proposed Drainage Characteristics**

Limited site improvements are required to the site to bring Lots 3 and 4 into compliance, which includes the installation of landscaping, and the creation of a swale/berm around the perimeter of the site to direct a large quantity of developed runoff to a newly constructed water quality pond. Runoff will leave the property at the southeast corner of the site as in the historic condition. No proposed grading is planned to occur within the effective 100-year floodplain as the result of these improvements.

### **Design Point 1**

Offsite **Basin OS1** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.04 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin A**.

**Basin A** ( $Q_5=2.8$  cfs,  $Q_{100}=5.6$  cfs) consists of 1.04 acres of heavy industrial area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast. Runoff produced within the basin combines with flows produced within **Basins OS1** withing a proposed earthen swale/berm located along the south property line of Lot 4. The combined runoff at **Design Point 1** is calculated to reach peak flow rates of  $Q_5=2.8$  cfs,  $Q_{100}=5.7$  cfs. Runoff reaching **DP1** continue east into Lot 3.

### **Design Point 2**

Offsite **Basin OS2** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.03 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin B**.

**Basin B** ( $Q_5=0.6$  cfs,  $Q_{100}=1.3$  cfs) consists of 0.25 acres of heavy industrial area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast.

**Basin C** ( $Q_5=0.6$  cfs,  $Q_{100}=1.2$  cfs) consists of 0.22 acres of heavy industrial area within the western portion of Lot 3. Runoff produced within the basin combines with flows produced within **Basins OS2, B, DP1, and DP2** within a proposed earthen swale/berm located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 2** is calculated to reach peak flow rates of  $Q_5=3.9$  cfs,  $Q_{100}=7.9$  cfs

### **Design Point 3**

Offsite **Basin OS3** ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) consists of 0.05 acres which includes portions of the grass covered right of way located to the north of Lot 3. Flows from this basin are conveyed south as sheet flow toward **Basin D**.

**Basin D** ( $Q_5=2.8$  cfs,  $Q_{100}=5.5$  cfs) consists of 1.07 acres of heavy industrial area located within the eastern portion of Lot 3. Flows from **Basin OS3** combine with the flows from this basin and continue overland to the southeast. Via surface grading small swales and sump/low point is to be constructed in front of the proposed water quality facility which will allow from the runoff from the upstream area to consolidate at a single point where runoff can be safely discharged into the pond at Design Point 3. The combined runoff at **Design Point 3** is calculated to reach peak flow rates of  $Q_5=2.8$  cfs,  $Q_{100}=5.6$  cfs. A 6' concrete chase/rundown with a 'VL' riprap apron is proposed to convey flows from the localized depression to the pond bottom.

### **Design Point 4/ Detention Facility Design**

**Basin E** ( $Q_5=0.0$  cfs,  $Q_{100}=0.3$  cfs) consists of approximately 0.14 acres. The basins will house a 4:1 side sloped Sand Filter Water Quality Pond. Runoff from **DP2, DP3, and Basin E** will combine

at **Design Point 4** within the proposed facility (Pond 1) at peak flow rates of 6.8 cfs and 13.9 cfs in the 5 and 100-year events respectively.

A sand filter basin has been designed for the site to provide water quality capture volume for the existing site. Due to limited vertical differential that exists between the pond and outfall options the water quality event will fully infiltrate through the substrate and subsurface soils, while storm events in excess of the water quality event will be discharged through a spillway section into the existing earthen swale that parallels the southern boundary.

Based upon a contributory area of 128,467 sq feet (or 2.949 acres) and an anticipated impervious percentage of 74% the Mile High Flood District UD-BMP, Version 3.07 worksheet calculates a 0.24 watershed inches, 2,521 cubic feet of water quality storage and a minimum filter area of 1,188 square feet.

The proposed Sand Filter Basin is designed to have a surface bottom area of 1,415 sq. ft., side slopes of 4:1, resulting in a maximum water quality ponding depth of 1.15' and a WQCV of 2,526 cf. The bottom of the sand filter basin will be at an elevation of 6452.60' and the top including 1' of freeboard, will be at an elevation of 6455.36'. The WQCV peak water surface elevation is 6453.75' and the 100-year water surface elevation when passing the peak 100 year 13.9 cfs through a 30' wide spillway will reside at an elevation of 6454.31'. The spillway will possess a concrete cutoff wall and 'VL' riprap rundown which events in excess of the water quality storm will consistently utilize.

To confirm the infiltration capacity of the existing soils onsite, Entech Engineering was hired to perform percolation tests in the area of the planned sand filter basin. These tests were completed on December 13, 2024 and show the existing soil has an infiltration rate of 1.86 in/hr (~1.9 in/hr) at location PH-2 (refer to boring locations on proposed drainage map).

All calculations for the sand filter basin, and percolation testing, can be seen in the appendix of this report.

### **Design Point 5**

Off-site **Basin OS4** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.06 acres of grass covered rights of way immediately adjacent to the west property line of Lot 3. Runoff from this basin is conveyed south and east as sheet flow toward **Basin F**.

**Basin F** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.11 acres of existing parking/storage area located within the western portion of Lot 4 that will continue to drains in a historic nature to the existing swale located along the southern property line, after the onsite grading is to occur.

Off-site **Basin OS5** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.11 acres of undeveloped property located to the south of the subject site. Runoff produced within the basin combines with flows produced within **Basins OS4**, and **F** within an existing earthen swale located along the south property line of Lot 4. The combined runoff at **Design Point 5** is calculated to reach peak flow rates of Q5=0.1 cfs, Q100=0.6 cfs. Runoff reaching **DP5** continue east, along the southern boundary of Lot 3.

## **Design Point 6**

**Basin G** ( $Q_5=0.7$  cfs,  $Q_{100}=1.4$  cfs), consists of 0.24 acres of existing parking storage area located within the eastern portion of Lot 3 and along the south side of the proposed water quality pond. Flows from the basin are conveyed as sheet flow to the existing earthen swale that parallels the south boundary.

Off-site **Basin OS6** ( $Q_5=0.0$  cfs,  $Q_{100}=0.3$  cfs) consists of 0.17 acres of undeveloped property located near the southeast corner of Lot 3. Runoff produced within the basin combines with flows produced within **Basins G, DP5, and DP4** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 6** is calculated to reach peak flow rates of  $Q_5=7.0$  cfs,  $Q_{100}=15.2$  cfs

## **Design Point 7**

**Design Point 7** is located at the northeast corner of Lot 3. The contributing area and calculated runoff reaching this location was determined, most recently, within the Preliminary/Final Drainage Report Jackson Office Warehouse & Storage Building Development Rocky Mountain Industrial Park Filing No. 1A, prepared by Associated Design Professionals, Inc, dated May 2, 2018. Per the report runoff collected by the inlet within the adjacent street and the flow from the offsite watershed located to the north of the subject site values of  $CA_5=18.23$  and  $CA_{100}=24.28$  at a time of concentration of 20.5 mins. Per M&S existing conditions rational calculation these values result in peak runoff rates of  $Q_5=55.6$  cfs,  $Q_{100}=124.4$  cfs. Flows reaching **DP7** enter Lot 3 and continue south within an existing type 'VL' riprap lined swale.

## **Design Point 8**

**Basin H** ( $Q_5=0.8$  cfs,  $Q_{100}=1.9$  cfs), consists of 0.43 acres of existing parking storage area located within the eastern portion of Lot 3. Flows from the basin are conveyed as sheet flow to the existing riprap lined channel that parallels the eastern boundary.

Off-site **Basin OS7** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.02 acres of undeveloped property located near the southeast corner of Lot 3. Runoff produced within the basin combines with flows produced within **Basins H, DP6, and DP7** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 8** is calculated to reach peak flow rates of  $Q_5=56.7$  cfs,  $Q_{100}=126.5$  cfs

## **Future Detailed Drainage Discussion**

It should be noted that although no development or additional impervious surfaces are to be added to bring the site into compliance, the proposed condition drainage analysis has been conducted using heavy industrial development coefficients of  $C_5=0.73$ ,  $C_{100}=0.81$ , in areas where development is currently permitted (outside of the 100-yr floodplain). This was done at the request of the developer which will allow for the design of a water quality treatment facility and conveyance structures that will be of sufficient size to accommodate future development. The subsequent paragraphs will further detail the drainage conditions and peak flow rates associated with the developed property.

### **Design Point 1**

Offsite **Basin OS1** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.04 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin A**.

**Basin A** ( $Q_5=3.7$  cfs,  $Q_{100}=6.8$  cfs) consists of 1.04 acres of heavy industrial area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast. Runoff produced within the basin combines with flows produced within **Basins OS1** withing a proposed earthen swale/berm located along the south property line of Lot 4. The combined runoff at **Design Point 1** is calculated to reach peak flow rates of  $Q_5=3.7$  cfs,  $Q_{100}=7.0$  cfs. Runoff reaching **DP1** continue east into Lot 3.

### **Design Point 2**

Offsite **Basin OS2** ( $Q_5=0.0$  cfs,  $Q_{100}=0.1$  cfs) consists of 0.03 acres which includes a portion of an existing gravel entrance as well as portions of the grass covered right of way located to the north of Lot 4. Flows from this basin are conveyed south as sheet flow toward **Basin B**.

**Basin B** ( $Q_5=0.9$  cfs,  $Q_{100}=1.6$  cfs) consists of 0.25 acres of heavy industrial area located within the western portion of Lot 4. Flows from **Basin OS1** combine with the flows from this basin and continue overland to the southeast.

**Basin C** ( $Q_5=0.8$  cfs,  $Q_{100}=1.5$  cfs) consists of 0.22 acres of heavy industrial area within the western portion of Lot 3. Runoff produced within the basin combines with flows produced within **Basins OS2, B, DP1, and DP2** within a proposed earthen swale/berm located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 2** is calculated to reach peak flow rates of  $Q_5=5.0$  cfs,  $Q_{100}=9.5$  cfs

### **Design Point 3**

Offsite **Basin OS3** ( $Q_5=0.0$  cfs,  $Q_{100}=0.2$  cfs) consists of 0.05 acres which includes portions of the grass covered right of way located to the north of Lot 3. Flows from this basin are conveyed south as sheet flow toward **Basin D**.

**Basin D** ( $Q_5=3.6$  cfs,  $Q_{100}=6.8$  cfs) consists of 1.07 acres of heavy industrial area located within the eastern portion of Lot 3. Flows from **Basin OS3** combine with the flows from this basin and continue overland to the southeast. Via surface grading small swales and sump/low point is to be constructed in front of the proposed water quality facility which will allow from the runoff from the upstream area to consolidate at a single point where runoff can be safely discharged into the pond at Design Point 3. The combined runoff at **Design Point 3** is calculated to reach peak flow rates of  $Q_5=3.7$  cfs,  $Q_{100}=6.9$  cfs. A 6' concrete chase/rundown with a 'VL' riprap apron is proposed to convey flows from the localized depression to the pond bottom.

### **Design Point 4/ Detention Facility Design**

**Basin E** ( $Q_5=0.0$  cfs,  $Q_{100}=0.3$  cfs) consists of approximately 0.14 acres. The basins will house a 4:1 side sloped Sand Filter Water Quality Pond. Runoff from **DP2, DP3, and Basin E** will combine



at **Design Point 4** within the proposed facility (Pond 1) at peak flow rates of 8.9 cfs and 17.0 cfs in the 5 and 100-year events respectively.

Based upon an estimated future contributing drainage area of 128,467 sq feet (or 2.949 acres) and an anticipated impervious percentage of 79% the Mile High Flood District UD-BMP, Version 3.07 worksheet calculates a 0.26 watershed inches, 2,759 cubic feet of water quality storage and a minimum filter area of 1,269 square feet.

The proposed Sand Filter Basin is designed to have a surface bottom area of 1,415 sq. ft., side slopes of 4:1, resulting in a maximum future water quality ponding depth of 1.24'. The bottom of the sand filter basin will be at an elevation of 6452.60' and the top, including 1' of freeboard, will be at an elevation of 6455.36'. The future WQCV water surface elevation is calculated at 6453.84'. The 100-year water surface elevation has been calculated to reach an elevation of 6454.36' when passing a future 100 year peak flow rate 17.0 cfs through the 30' wide spillway.

All calculations for the sand filter basin, and percolation testing, can be seen in the appendix of this report.

### **Design Point 5**

Off-site **Basin OS4** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.06 acres of grass covered rights of way immediately adjacent to the west property line of Lot 3. Runoff from this basin is conveyed south and east as sheet flow toward **Basin F**.

**Basin F** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.11 acres of existing parking/storage area located within the western portion of Lot 4 that will drain to the existing swale located along the southern property line.

Off-site **Basin OS5** (Q5=0.0 cfs, Q100=0.2 cfs) consists of 0.11 acres of undeveloped property located to the south of the subject site. Runoff produced within the basin combines with flows produced within **Basins OS4**, and **F** within an existing earthen swale located along the south property line of Lot 4. The combined runoff at **Design Point 5** is calculated to reach peak flow rates of Q5=0.1 cfs, Q100=0.6 cfs. Runoff reaching **DP5** continue east, along the southern boundary of Lot 3.

### **Design Point 6**

**Basin G** (Q5=0.7 cfs, Q100=1.4 cfs), consists of 0.24 acres of existing parking storage area located within the eastern portion of Lot 3 and along the south side of the proposed water quality pond. Flows from the basin are conveyed as sheet flow to the existing earthen swale that parallels the south boundary.

Off-site **Basin OS6** (Q5=0.0 cfs, Q100=0.3 cfs) consists of 0.17 acres of undeveloped property located near the southeast corner of Lot 3. Runoff produced within the basin combines with flows produced within **Basins G**, **DP5**, and **DP4** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 6** is calculated to reach peak flow rates of Q5=8.7 cfs, Q100=17.6 cfs

## **Design Point 7**

**Design Point 7** is located at the northeast corner of Lot 3. The contributing area and calculated runoff reaching this location was determined, most recently, within the Preliminary/Final Drainage Report Jackson Office Warehouse & Storage Building Development Rocky Mountain Industrial Park Filing No. 1A, prepared by Associated Design Professionals, Inc, dated May 2, 2018. Per the report runoff collected by the inlet within the adjacent street and the flow from the offsite watershed located to the north of the subject site values of CA5=18.23 and CA100=24.28 at a time of concentration of 20.5 mins. Per M&S existing conditions rational calculation these values result in peak runoff rates of Q5=55.6 cfs, Q100=124.4 cfs. Flows reaching **DP7** enter Lot 3 and continue south within an existing type 'VL' riprap lined swale.

## **Design Point 8**

**Basin H** (Q5=0.8 cfs, Q100=1.9 cfs), consists of 0.43 acres of existing parking storage area located within the eastern portion of Lot 3. Flows from the basin are conveyed as sheet flow to the existing riprap lined channel that parallels the eastern boundary.

Off-site **Basin OS7** (Q5=0.0 cfs, Q100=0.1 cfs) consists of 0.02 acres of undeveloped property located near the southeast corner of Lot 3. Runoff produced within the basin combines with flows produced within **Basins H, DP6, and DP7** within an existing earthen swale located along the south property line of Lot 4. The combined runoff within the existing swale at **Design Point 8** is calculated to reach peak flow rates of Q5=57.7 cfs, Q100=127.8 cfs

## **Four Step Process**

**Step 1      Employ Runoff Reduction Practices** – Whenever possible, runoff produced within developable area containing impervious surfaces will be routed through landscaped areas to minimize direct connection of impervious surfaces.

**Step 2      Stabilize Drainageways** – The development of this site is not anticipated to have negative effects on downstream drainage ways since flows released will be near historic rates. Fees previously paid (at the time of platting) are utilized to stabilize drainageways.

**Step 3      Provide Water Quality Capture Volume (WQCV)** – The site will utilize an existing Sand Filter Water Quality Pond (Pond 1), located southwest of the subject site, for water quality. The water quality event storm shall be detained and released via the full spectrum detention (FSD) pond which will discharge the WQCV in approximately 12 hours. The pond continuously releases or infiltrates at least 97% of all of the runoff from a rainfall event that is less than or equal to a 5-year storm within 72 hours after the end of the event. It also continuously releases as quickly as practicable, but in all cases releases at least 99% of the runoff within 120 hours after the end of events greater than a 5-year storm.

**Step 4      Consider Need for Selecting Industrial and Commercial BMP's** – The proposed development will implement a Stormwater Management Plan including property housekeeping practices, spill containment procedures, and coverage of storage/handling areas. Specialized BMP's are not required since the vertical development of the commercial areas are unknown at this time.

## Water Quality Provisions and Maintenance

The on-site proposed pond functions to provide water quality for the proposed development. The pond will be privately owned and maintained by the owner of Lot 3 and 4 (currently same owner).

## 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 drainage report. The plan includes proposed silt fence and vehicle tracking control as proposed erosion control measures. The plan also includes provisions for stockpiling, staging, and concrete washout areas. A stormwater management plan is provided to accompany the plans.

## 2024 Drainage & Bridge Fees:

The site is located within the Sand Creek Drainage Basin. The total disturbance in the basin is estimated at approximately 1.2 acres. Since the property has been previously platted as a portion of Rocky Mountain Industrial Park Filing No. 1, no drainage basin fees are required.

## Comparative Analysis

In the existing condition drainage reaching **Design Point 4** at the southeast corner of the site is **Q5=57.1 cfs, Q100=126.9 cfs**. In the proposed condition drainage reaching **Design Point 8** totals **Q5=56.7 cfs, Q100=126.5 cfs** a decrease of 0.4 cfs and a decrease of 0.4 cfs in the 5- and 100-year storm event respectively. In the future condition drainage reaching **Design Point 8** has been estimated to total **Q5=57.7 cfs, Q100=127.8 cfs** a slight increase of 0.6 cfs in the 5-year event, and a slight increase of 0.9 cfs in the 100-year storm event.

No increases in runoff is anticipated in the proposed condition, and minor increase estimated by the future conditions analysis are negligible. The anticipated minor increases in runoff remain in compliance with the Final Drainage Report/Proposed Drainage Plan for Rocky Mountain Industrial Park by Kiowa Engineering Corporation which anticipated **Q5=101.4 cfs, Q100=186.0 cfs** at the same location (refer to background information in appendix).

No negative impacts to either water quality or to the downstream improvements or facilities are anticipated as a result of the development.

## Summary

Lot 3 and 4 of Rocky Mountain Industrial Park Filing No. 1A, consist of equipment and material storage associated with an existing landscaping business. The owner of the property has been asked to bring the development up to El Paso County Code by adding landscaping and implementing water quality detention storage.

Based on the analysis, the 5-year & 100-year post-development stormwater peak flow rates will be slightly higher than the pre-developed stormwater peak flow rates but less than those planned for within

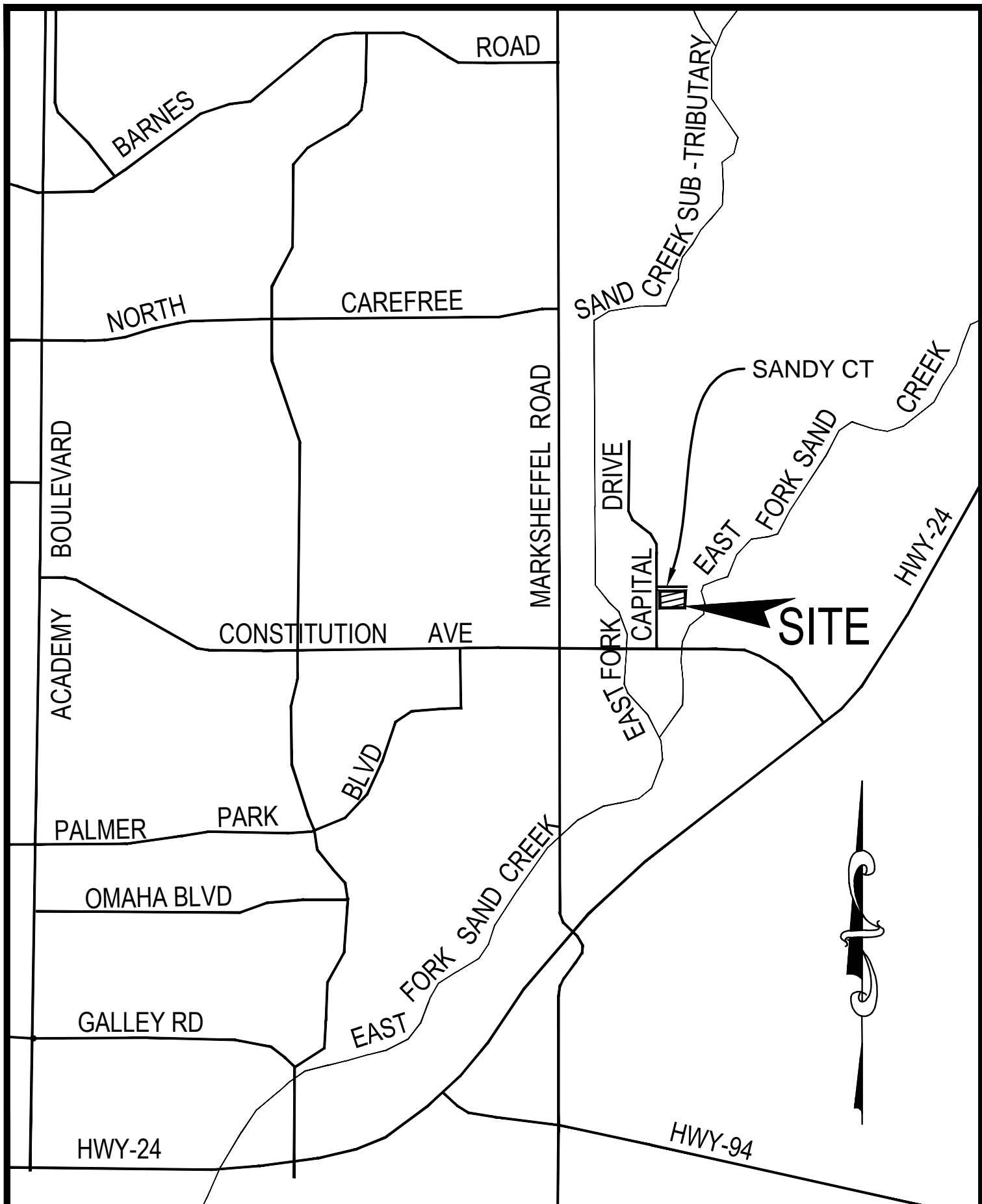
the sites master development drainage plan. A sand filter basin will be implemented into the site to capture and infiltrate runoff generated from the existing development. Runoff will continue to leave the site through historic drainageways. Development of the site should not adversely impact surrounding or downstream properties or negatively impact water quality.

## References

- 1.) "Design Criteria Manual, Volume 1", Revised January 2021, City of Colorado Springs.
- 2.) "Design Criteria Manual, Volume 2", Revised December 2020, City of Colorado Springs.
- 3.) "Web Soils Survey", United States Department of Agriculture, National Resources Conservation Service, <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>
- 4.) FEMA Flood Map Service Center, Federal Emergency Management Agency  
<https://msc.fema.gov/portal>
- 5.) "Urban Storm Drainage Criteria Manual, Vol. 1, Revised August 2018, Mile High Flood District.
- 6.) "Urban Storm Drainage Criteria Manual, Vol. 2, Revised September 2017, Mile High Flood District
- 7.) "Final Drainage Plan and Erosion Control Plan, Rocky Mountain Industrial Park Filing 1, prepared by Kiowa Engineering Corporation, approved February 15, 2002
- 8.) "Preliminary/Final Drainage Report Jackson Office Warehouse & Storage Building Development Rocky Mountain Industrial Park Filing No. 1A, prepared by Associated Design Professionals, Inc, dated May 2, 2018.
- 9.) "Sand Creek Drainage Basin Planning Study, Preliminary Design Report", prepared by Kiowa Engineering Corporation, dated January 1993, revised March 1996.

## **APPENDIX**

## **VICINITY MAP**



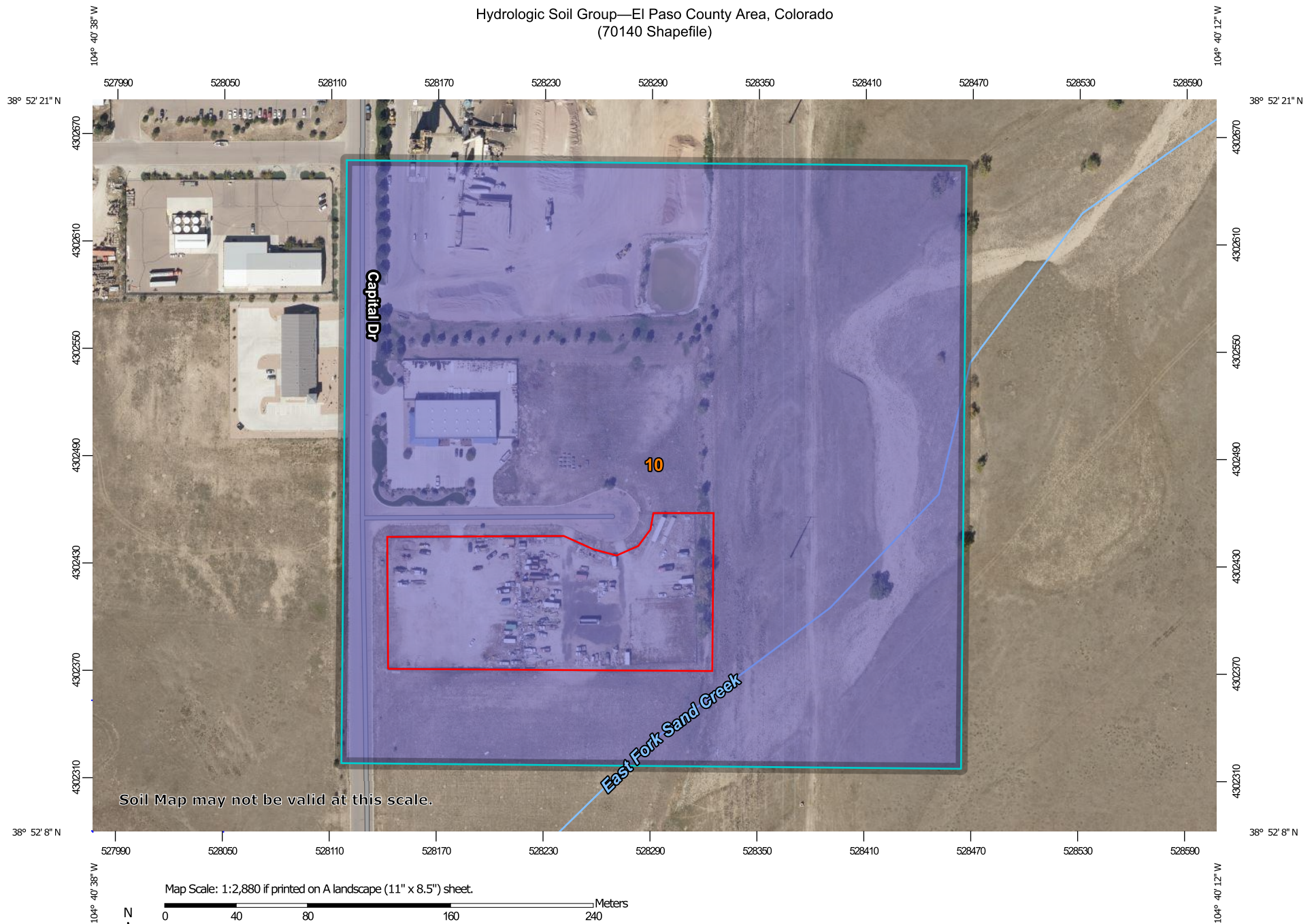
# VICINITY MAP

N.T.S.



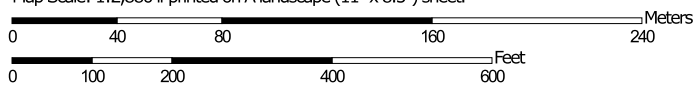
## **SOILS MAP**

# Hydrologic Soil Group—El Paso County Area, Colorado (70140 Shapefile)



Soil Map may not be valid at this scale.

Map Scale: 1:2,880 if printed on A landscape (11" x 8.5") sheet.



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




**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

12/5/2024  
Page 1 of 4

## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





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

#### Soil Rating Lines

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

#### Soil Rating Points




 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available


### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Blendon sandy loam, 0 to 3 percent slopes	B	29.1	100.0%
<b>Totals for Area of Interest</b>			<b>29.1</b>	<b>100.0%</b>

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

## **FIRM PANELS**



# NOTES TO USERS

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

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

**Coastal Base Flood Elevations** shown on this map apply only to landward of 0.0' North American Vertical Datum of 1988 (NAVD83). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD83)**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services  
NDA4, NNGS12  
National Geodetic Survey  
SSMC-3, #9020  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

**Base Map** information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

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

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

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

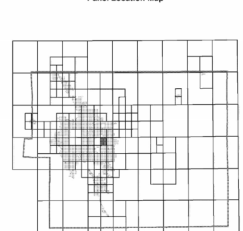
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-335-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-338-9620 and its website at <http://www.msc.fema.gov>.

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

## El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.1 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

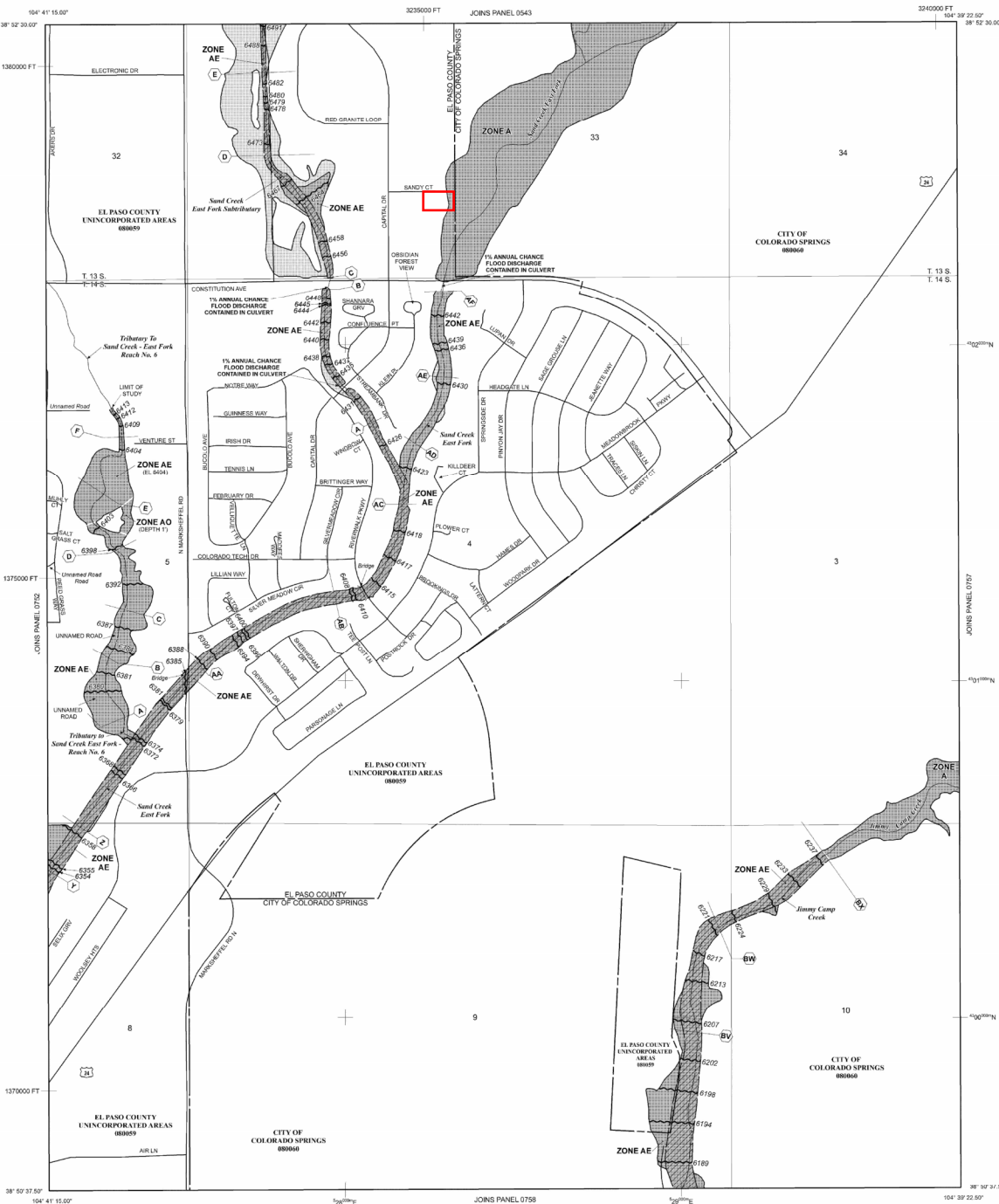
## Panel Location Map



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



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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST, AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

# LEGEND

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

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

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

**FLOODWAY AREAS IN ZONE AE**

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

- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with velocities less than 1 square mile, and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

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

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary

Boundary defining Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet.

Base Flood Elevation value where uniform within zone; elevation in feet.

\* referenced to the North American Vertical Datum of 1988 (NAVD83)

Cross section line

Traverse line

Geographic coordinates referenced to the North American Vertical Datum of 1988 (NAVD83).

2000-meter Universal Transverse Mercator grid ticks, zone 13

5000-foot grid ticks: Colorado State Plane coordinate system, central zone (EPSG:5003).

Lambert Conformal Conic Projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

Route Mile

MAP REPOSITORIES

Refer to Map Repository List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

MARCH 17, 1997

EFFECTIVE DATES (OF REVISIONS) TO THIS PANEL

DECEMBER 7, 2018: To update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and rail names, and to incorporate previously issued Letters of Map Change.

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

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6625.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 300 METERS

PANEL 0756G

## FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 756 OF 1300  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SHEET
COLORADO SPRINGS CITY OF	4809	0756	0
EL PASO COUNTY	4809	0756	0

Notice: This map was released on 08/10/2020 to replace the previous version. The previous version contains errors. Users are advised to update their records to reflect the current version.

Notice to User: The Map Number shown should be used when ordering your policy. The Community Number shown should be used on insurance applications for the correct community.

MAP NUMBER  
08041C0756G

MAP REVISED  
DECEMBER 7, 2018

Federal Emergency Management Agency

**El Paso County  
Unincorporated Areas  
080059**

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 65 WEST AND TOWNSHIP 14 SOUTH, RANGE 65 WEST.

*Sand Creek East Fork  
Old Flowpath Lower*

*Sand Creek  
East Fork*

**ZONE  
AE**

**RED  
GRANITE  
LOOP**

**CAPITAL DR**

**SANDY  
CT**

**City of  
Colorado Springs  
080060**

**REVISED  
AREA**

34

T. 13 S.

T. 14 S.

3

**OBSIDIAN  
FOREST VW**

**ZONE AE**

6446.9

6444.5

**CONFLUENCE  
PT**

1%-ANNUAL-CHANCE FLOOD  
DISCHARGE CONTAINED IN  
STRUCTURE

6442

*Sand Creek  
East Fork*

6439  
6436

**KLEIN PL**

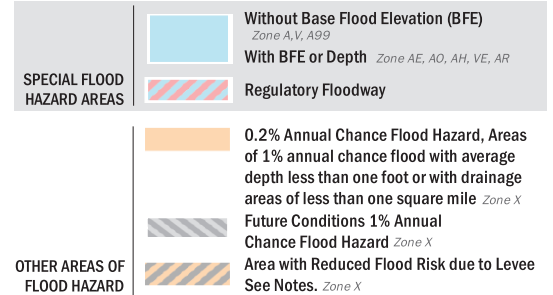
**SPRINGSIDE DR**

**LUPAN DR**

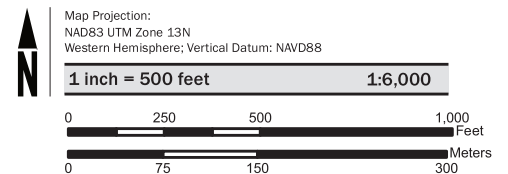
**PINYON JAY DR**

**SAGE GROUSE LN**

**JEANETTE  
WAY**



**SCALE**



**FEMA**  
National Flood Insurance Program

**NATIONAL FLOOD INSURANCE PROGRAM  
FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY, COLORADO**  
And Incorporated Areas  
PANEL 756 OF 1300

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0756	G
EL PASO COUNTY	080059	0756	G

Notice: This map was reissued on 05/15/2020 to make a correction. This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

**REVISED TO  
REFLECT LOMR  
EFFECTIVE: February 6, 2025**

VERSION NUMBER  
1.1.1.0

MAP NUMBER  
08041C0756G

MAP REVISED  
DECEMBER 7, 2018



## **HYDROLOGIC CALCULATIONS**

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(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>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length (ft)	Height (ft)	T <sub>c</sub> (min)	Length (ft)	Slope (%)	Velocity (fps)	T <sub>i</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.)
<b>A</b>	1.15	0.59	0.70	0.59	40	1.0	4.3	260	1.9%	1.4	3.1	7.4	11.7	4.6	7.7	3.1	6.2
<b>B</b>	0.25	0.59	0.70	0.59	60	1.0	6.0	195	2.1%	1.4	2.3	8.3	11.4	4.4	7.4	0.6	1.3
<b>C</b>	1.16	0.59	0.70	0.59	50	1.0	5.2	215	1.9%	1.4	2.6	7.8	11.5	4.5	7.6	3.1	6.1
<b>D</b>	0.34	0.59	0.70	0.59	75	1.0	7.3	165	2.4%	1.6	1.8	9.0	11.3	4.3	7.2	0.8	1.7
<b>E</b>	0.60	0.50	0.64	0.50	50	0.6	7.2	286	1.7%	1.3	3.6	10.8	11.9	4.0	6.7	1.2	2.6
<b>OS1</b>	0.04	0.12	0.38	0.12	15	0.6	4.3	0	0.0%	0.0	0.0	5.0	10.1	5.2	8.7	0.0	0.1
<b>OS2</b>	0.03	0.13	0.39	0.13	20	0.6	5.4	0	0.0%	0.0	0.0	5.4	10.1	5.0	8.5	0.0	0.1
<b>OS3</b>	0.05	0.08	0.35	0.08	20	0.6	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.3	0.0	0.2
<b>OS4</b>	0.06	0.08	0.35	0.08	15	0.3	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.4	0.0	0.2
<b>OS5</b>	0.11	0.08	0.35	0.08	40	0.5	10.8	200	0.8%	0.9	3.8	14.7	11.3	3.6	6.0	0.0	0.2
<b>OS6</b>	0.17	0.08	0.35	0.08	40	0.5	10.8	285	0.7%	0.8	5.7	16.5	11.8	3.4	5.7	0.0	0.3
<b>OS7</b>	0.02	0.42	0.58	0.42	10	0.2	3.1	15	3.7%	1.9	0.1	5.0	10.1	5.2	8.7	0.0	0.1

Calculated by: DLM

Date: 1/13/2025

Checked by: VAS

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(Existing Conditions - Area Runoff Coefficient Summary)**

			<i>STREETS / ASPHALT DRIVES</i> <i>(0.90-0.96)</i>			<i>GRAVEL AREAS</i> <i>(0.59-0.70)</i>			<i>UNDEVELOPED AREAS</i> <i>(0.08-0.35)</i>			<i>RUNOFF COEFFICIENT</i>	
BASIN	TOTAL AREA (Sq. Ft.)	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>
<i>A</i>	50133.7	1.15	0.00	0.90	0.96	1.15	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>B</i>	10859.2	0.25	0.00	0.90	0.96	0.25	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>C</i>	50522.9	1.16	0.00	0.90	0.96	1.16	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>D</i>	14647.5	0.34	0.00	0.90	0.96	0.34	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>E</i>	25927.7	0.60	0.00	0.90	0.96	0.49	0.59	0.70	0.10	0.08	0.35	0.50	0.64
<i>OS1</i>	1631.8	0.04	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.12	0.38
<i>OS2</i>	1479.9	0.03	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.13	0.39
<i>OS3</i>	2365.1	0.05	0.00	0.90	0.96	0.00	0.59	0.70	0.05	0.08	0.35	0.08	0.35
<i>OS4</i>	2830.4	0.06	0.00	0.90	0.96	0.00	0.59	0.70	0.06	0.08	0.35	0.08	0.35
<i>OS5</i>	4889.2	0.11	0.00	0.90	0.96	0.00	0.59	0.70	0.11	0.08	0.35	0.08	0.35
<i>OS6</i>	7294.1	0.17	0.00	0.90	0.96	0.00	0.59	0.70	0.17	0.08	0.35	0.08	0.35
<i>OS7</i>	732.7	0.02	0.00	0.90	0.96	0.01	0.59	0.70	0.01	0.08	0.35	0.42	0.58

Calculated by: DLM  
Date: 1/13/2025  
Checked by: VAS

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(Existing Conditions - Basin Routing Summary)**

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				(T <sub>t</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA <sub>5</sub>	CA <sub>100</sub>	C <sub>5</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.)	
1	A, OS1, OS4, OS5	0.70	0.88									7.4	4.6	7.7	3.2	6.8	EXISTING EARTHEN SWALE
				Basin A Tc Used													
2	OS2, B, OS3, C, D, OS6, DP1	1.75	2.19				7.4	285	0.7%	0.8	5.7	8.3	4.4	7.4	7.7	16.3	EXISTING EARTHEN SWALE
				DP1 Tc Used													
3	OFFSITE JOW FDR DP6	18.23	24.28									20.5	3.1	5.1	55.6	124.4	OFFSITE FLOW ABOVE LINED CHANNEL
				JOW DP6 Tc Used													
4	DP2, DP3, E, OS7	20.29	26.87				20.5	300	0.5%	1.4	3.5	24.0	2.8	4.7	57.1	126.9	COMBINED FLOW AT SE CORNER (EXISTING SWALE)
				DP3 Used													

Calculated by: DLM  
Date: 1/13/2025  
Checked by: VAS

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(Proposed Conditions - Area Runoff Coefficient Summary)**

			<i>STREETS / ASPHALT DRIVES</i> <i>(0.90-0.96)</i>			<i>GRAVEL/HEAVY INDUSTRIAL</i> <i>(0.59-0.70/0.73-0.81)</i>			<i>UNDEVELOPED AREAS</i> <i>(0.08-0.35)</i>			<i>RUNOFF COEFFICIENT</i>	
BASIN	TOTAL AREA (Sq. Ft.)	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>
<i>A</i>	45300.3	1.04	0.00	0.90	0.96	1.04	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>B</i>	10821.1	0.25	0.00	0.90	0.96	0.25	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>C</i>	9375.7	0.22	0.00	0.90	0.96	0.22	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>D</i>	46584.2	1.07	0.00	0.90	0.96	1.07	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>E</i>	6027.2	0.14	0.00	0.90	0.96	0.00	0.59	0.70	0.14	0.08	0.35	0.08	0.35
<i>F</i>	4882.0	0.11	0.00	0.90	0.96	0.00	0.59	0.70	0.11	0.08	0.35	0.08	0.35
<i>G</i>	10573.3	0.24	0.00	0.90	0.96	0.24	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>H</i>	18584.0	0.43	0.00	0.90	0.96	0.32	0.59	0.70	0.10	0.08	0.35	0.47	0.62
<i>OS1</i>	1631.8	0.04	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.12	0.38
<i>OS2</i>	1479.9	0.03	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.13	0.39
<i>OS3</i>	2365.1	0.05	0.00	0.90	0.96	0.00	0.59	0.70	0.05	0.08	0.35	0.08	0.35
<i>OS4</i>	2830.4	0.06	0.00	0.90	0.96	0.00	0.59	0.70	0.06	0.08	0.35	0.08	0.35
<i>OS5</i>	4889.2	0.11	0.00	0.90	0.96	0.00	0.59	0.70	0.11	0.08	0.35	0.08	0.35
<i>OS6</i>	7294.1	0.17	0.00	0.90	0.96	0.00	0.59	0.70	0.17	0.08	0.35	0.08	0.35
<i>OS7</i>	732.7	0.02	0.00	0.90	0.96	0.01	0.59	0.70	0.01	0.08	0.35	0.42	0.58

Calculated by: DLM  
Date: 1/13/2025  
Checked by: VAS

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(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>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length	Height	T <sub>c</sub>	Length	Slope	Velocity	T <sub>i</sub>	TOTAL	CHECK	I <sub>5</sub>	I <sub>100</sub>	Q <sub>5</sub>	Q <sub>100</sub>
					(ft)	(ft)	(min)										
<b>A</b>	1.04	0.59	0.70	0.59	40	1.0	4.3	260	1.9%	1.4	3.1	7.4	11.7	4.6	7.7	2.8	5.6
<b>B</b>	0.25	0.59	0.70	0.59	60	1.0	6.0	185	1.9%	1.4	2.2	8.3	11.4	4.4	7.4	0.6	1.3
<b>C</b>	0.22	0.59	0.70	0.59	45	1.0	4.7	180	2.2%	1.5	2.0	6.8	11.3	4.7	7.9	0.6	1.2
<b>D</b>	1.07	0.59	0.70	0.59	50	1.0	5.2	250	1.6%	1.3	3.3	8.5	11.7	4.4	7.3	2.8	5.5
<b>E</b>	0.14	0.08	0.35	0.08	60	2.0	9.6	75	0.5%	0.7	1.8	11.4	10.8	3.9	6.6	0.0	0.3
<b>F</b>	0.11	0.08	0.35	0.08	40	1.0	8.6	375	1.2%	1.1	5.7	14.3	12.3	3.6	6.0	0.0	0.2
<b>G</b>	0.24	0.59	0.70	0.59	40	1.0	4.3	180	2.2%	1.5	2.0	6.3	11.2	4.8	8.1	0.7	1.4
<b>H</b>	0.43	0.47	0.62	0.47	40	0.6	6.3	260	1.9%	1.4	3.1	9.4	11.7	4.2	7.1	0.8	1.9
<b>OS1</b>	0.04	0.12	0.38	0.12	15	0.6	4.3	0	0.0%	0.0	0.0	5.0	10.1	5.2	8.7	0.0	0.1
<b>OS2</b>	0.03	0.13	0.39	0.13	20	0.6	5.4	0	0.0%	0.0	0.0	5.4	10.1	5.0	8.5	0.0	0.1
<b>OS3</b>	0.05	0.08	0.35	0.08	20	0.6	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.3	0.0	0.2
<b>OS4</b>	0.06	0.08	0.35	0.08	15	0.3	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.4	0.0	0.2
<b>OS5</b>	0.11	0.08	0.35	0.08	40	0.5	10.8	200	0.8%	0.9	3.8	14.7	11.3	3.6	6.0	0.0	0.2
<b>OS6</b>	0.17	0.08	0.35	0.08	50	1.0	10.4	285	0.7%	0.8	5.7	16.0	11.9	3.4	5.7	0.0	0.3
<b>OS7</b>	0.02	0.42	0.58	0.42	10	0.2	3.1	15	3.7%	1.9	0.1	5.0	10.1	5.2	8.7	0.0	0.1

Calculated by: DLM

Date: 1/13/2025

Checked by: VAS

# FINAL DRAINAGE REPORT

## LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

### (Proposed Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				(T <sub>t</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA <sub>5</sub>	CA <sub>100</sub>	C <sub>5</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.)	
1	OS1, A	0.62	0.74									7.4	4.6	7.7	2.8	5.7	EARTHEN SWALE/BERM
				Basin A Tc Used													
2	DP1, OS2, B, C	0.90	1.08				7.4	75	1.7%	1.3	0.9	8.7	4.3	7.3	3.9	7.9	EARTHEN SWALE/BERM
				DP1 Tc Used													
3	OS3, D	0.64	0.77									8.5	4.4	7.3	2.8	5.6	CONCRETE CHASE/RUNDOWN
				Basin D Tc Used													
4	DP2, DP3, E	1.54	1.90				8.5					8.5	4.4	7.3	6.8	13.9	COMBINED FLOW AT SE CORNER (EXISTING SWALE)
				DP3 Used													
5	OS4, OS5, F	0.02	0.10									12.3	3.8	6.4	0.1	0.6	EXISTING EARTHEN SWALE
				Checked Basin F Tc Used													
6	DP4, DP5, OS6, G	1.72	2.23									10.4	4.1	6.8	7.0	15.2	EXISTING EARTHEN SWALE AT SE CORNER
				Avg of DP4 and DP5													
7	OFFSITE JOW FDR DP6	18.23	24.28									20.5	3.1	5.1	55.6	124.4	OFFSITE FLOW ABOVE LINED CHANNEL
				JOW DP6 Tc Used													
8	DP6, DP7, H, OS7	20.16	26.78				20.5	300	0.5%	1.4	3.5	24.0	2.8	4.7	56.7	126.5	COMBINED FLOW AT SE CORNER (EXISTING SWALE)
				DP7 Used													

Calculated by: DLM

Date: 1/13/2025

Checked by: VAS

<b>Total Weighted Percent Imperviousness (Proposed)</b>				
<b>Contributing Basins</b>	<b>Area (Acres)</b>	<b><math>C_s</math></b>	<b>Impervious (I)</b>	<b>(Acres)*(I)</b>
<b>A</b>	1.04	0.59	0.80	0.83
<b>B</b>	0.25	0.59	0.80	0.20
<b>C</b>	0.22	0.59	0.80	0.17
<b>D</b>	1.07	0.59	0.80	0.86
<b>E</b>	0.14	0.08	0.00	0.00
<b>F</b>	0.11	0.08	1.00	0.11
<b>OS1</b>	0.04	0.12	0.07	0.00
<b>OS2</b>	0.03	0.13	0.09	0.00
<b>OS3</b>	0.05	0.08	0.00	0.00
<b>Totals</b>	<b>2.95</b>			2.18
<b>Total Imperviousness</b>	<b>0.74</b>			



**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(Future Conditions - Area Runoff Coefficient Summary)**

			<i>STREETS / ASPHALT DRIVES</i> <i>(0.90-0.96)</i>			<i>GRAVEL/HEAVY INDUSTRIAL</i> <i>(0.59-0.70/0.73-0.81)</i>			<i>UNDEVELOPED AREAS</i> <i>(0.08-0.35)</i>			<i>RUNOFF COEFFICIENT</i>	
BASIN	TOTAL AREA (Sq. Ft.)	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>
<i>A</i>	45300.3	1.04	0.00	0.90	0.96	1.04	0.73	0.81	0.00	0.08	0.35	0.73	0.81
<i>B</i>	10821.1	0.25	0.00	0.90	0.96	0.25	0.73	0.81	0.00	0.08	0.35	0.73	0.81
<i>C</i>	9375.7	0.22	0.00	0.90	0.96	0.22	0.73	0.81	0.00	0.08	0.35	0.73	0.81
<i>D</i>	46584.2	1.07	0.00	0.90	0.96	1.07	0.73	0.81	0.00	0.08	0.35	0.73	0.81
<i>E</i>	6027.2	0.14	0.00	0.90	0.96	0.00	0.59	0.70	0.14	0.08	0.35	0.08	0.35
<i>F</i>	4882.0	0.11	0.00	0.90	0.96	0.00	0.59	0.70	0.11	0.08	0.35	0.08	0.35
<i>G</i>	10573.3	0.24	0.00	0.90	0.96	0.24	0.59	0.70	0.00	0.08	0.35	0.59	0.70
<i>H</i>	18584.0	0.43	0.00	0.90	0.96	0.32	0.59	0.70	0.10	0.08	0.35	0.47	0.62
<i>OS1</i>	1631.8	0.04	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.12	0.38
<i>OS2</i>	1479.9	0.03	0.00	0.90	0.96	0.00	0.59	0.70	0.03	0.08	0.35	0.13	0.39
<i>OS3</i>	2365.1	0.05	0.00	0.90	0.96	0.00	0.59	0.70	0.05	0.08	0.35	0.08	0.35
<i>OS4</i>	2830.4	0.06	0.00	0.90	0.96	0.00	0.59	0.70	0.06	0.08	0.35	0.08	0.35
<i>OS5</i>	4889.2	0.11	0.00	0.90	0.96	0.00	0.59	0.70	0.11	0.08	0.35	0.08	0.35
<i>OS6</i>	7294.1	0.17	0.00	0.90	0.96	0.00	0.59	0.70	0.17	0.08	0.35	0.08	0.35
<i>OS7</i>	732.7	0.02	0.00	0.90	0.96	0.01	0.59	0.70	0.01	0.08	0.35	0.42	0.58

Calculated by: DLM  
Date: 1/13/2025  
Checked by: VAS

**FINAL DRAINAGE REPORT**  
**LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A**  
**(Future 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>5</sub>	C <sub>100</sub>	C <sub>5</sub>	Length	Height	T <sub>c</sub>	Length	Slope	Velocity	T <sub>i</sub>	TOTAL	CHECK	I <sub>5</sub>	I <sub>100</sub>	Q <sub>5</sub>	Q <sub>100</sub>
					(ft)	(ft)	(min)										
<b>A</b>	1.04	0.73	0.81	0.73	40	1.0	3.1	260	1.9%	1.4	3.1	6.2	11.7	4.8	8.1	3.7	6.8
<b>B</b>	0.25	0.73	0.81	0.73	60	1.0	4.4	185	1.9%	1.4	2.2	6.6	11.4	4.7	8.0	0.9	1.6
<b>C</b>	0.22	0.73	0.81	0.73	45	1.0	3.4	180	2.2%	1.5	2.0	5.5	11.3	5.0	8.5	0.8	1.5
<b>D</b>	1.07	0.73	0.81	0.73	50	1.0	3.8	250	1.6%	1.3	3.3	7.1	11.7	4.7	7.8	3.6	6.8
<b>E</b>	0.14	0.08	0.35	0.08	60	2.0	9.6	75	0.5%	0.7	1.8	11.4	10.8	3.9	6.6	0.0	0.3
<b>F</b>	0.11	0.08	0.35	0.08	40	1.0	8.6	375	1.2%	1.1	5.7	14.3	12.3	3.6	6.0	0.0	0.2
<b>G</b>	0.24	0.59	0.70	0.59	40	1.0	4.3	180	2.2%	1.5	2.0	6.3	11.2	4.8	8.1	0.7	1.4
<b>H</b>	0.43	0.47	0.62	0.47	40	0.6	6.3	260	1.9%	1.4	3.1	9.4	11.7	4.2	7.1	0.8	1.9
<b>OS1</b>	0.04	0.12	0.38	0.12	15	0.6	4.3	0	0.0%	0.0	0.0	5.0	10.1	5.2	8.7	0.0	0.1
<b>OS2</b>	0.03	0.13	0.39	0.13	20	0.6	5.4	0	0.0%	0.0	0.0	5.4	10.1	5.0	8.5	0.0	0.1
<b>OS3</b>	0.05	0.08	0.35	0.08	20	0.6	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.3	0.0	0.2
<b>OS4</b>	0.06	0.08	0.35	0.08	15	0.3	5.7	0	0.0%	0.0	0.0	5.7	10.1	5.0	8.4	0.0	0.2
<b>OS5</b>	0.11	0.08	0.35	0.08	40	0.5	10.8	200	0.8%	0.9	3.8	14.7	11.3	3.6	6.0	0.0	0.2
<b>OS6</b>	0.17	0.08	0.35	0.08	50	1.0	10.4	285	0.7%	0.8	5.7	16.0	11.9	3.4	5.7	0.0	0.3
<b>OS7</b>	0.02	0.42	0.58	0.42	10	0.2	3.1	15	3.7%	1.9	0.1	5.0	10.1	5.2	8.7	0.0	0.1

Calculated by: DLM

Date: 1/13/2025

Checked by: VAS

# FINAL DRAINAGE REPORT

## LOT 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

### (Future Conditions - Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				(T <sub>t</sub> )	INTENSITY *		TOTAL FLOWS		COMMENTS
DESIGN POINT	CONTRIBUTING BASINS	CA <sub>5</sub>	CA <sub>100</sub>	C <sub>5</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.)	
1	OS1, A	0.76	0.86									6.2	4.8	8.1	3.7	7.0	EARTHEN SWALE/BERM
				Basin A Tc Used													
2	DP1, OS2, B, C	1.11	1.25				6.2	75	1.7%	1.3	0.9	7.6	4.5	7.6	5.0	9.5	EARTHEN SWALE/BERM
				DP1 Tc Used													
3	OS3, D	0.79	0.89									7.1	4.7	7.8	3.7	6.9	CONCRETE CHASE/RUNDOWN
				Basin D Tc Used													
4	DP2, DP3, E	1.90	2.18				7.1					7.1	4.7	7.8	8.9	17.0	COMBINED FLOW AT SE CORNER (EXISTING SWALE)
				DP3 Used													
5	OS4, OS5, F	0.02	0.10									12.3	3.8	6.4	0.1	0.6	EXISTING EARTHEN SWALE
				Checked Basin F Tc Used													
6	DP4, DP5, OS6, G	2.08	2.51									9.7	4.2	7.0	8.7	17.6	EXISTING EARTHEN SWALE AT SE CORNER
				Avg of DP4 and DP5													
7	OFFSITE JOW FDR DP6	18.23	24.28									20.5	3.1	5.1	55.6	124.4	OFFSITE FLOW ABOVE LINED CHANNEL
				JOW DP6 Tc Used													
8	DP6, DP7, H, OS7	20.52	27.06				20.5	300	0.5%	1.4	3.5	24.0	2.8	4.7	57.7	127.8	COMBINED FLOW AT SE CORNER (EXISTING SWALE)
				DP7 Used													

Calculated by: DLM

Date: 1/13/2025

Checked by: VAS

<b>Total Weighted Percent Imperviousness (Future)</b>				
<b>Contributing Basins</b>	<b>Area (Acres)</b>	<b><math>C_s</math></b>	<b>Impervious (I)</b>	<b>(Acres)*(I)</b>
<i>A</i>	1.04	0.73	0.90	0.94
<i>B</i>	0.25	0.73	0.90	0.22
<i>C</i>	0.22	0.73	0.90	0.19
<i>D</i>	1.07	0.73	0.90	0.96
<i>E</i>	0.14	0.08	0.00	0.00
<i>F</i>	0.11	0.08	0.00	0.00
<i>OS1</i>	0.04	0.12	0.07	0.00
<i>OS2</i>	0.03	0.13	0.09	0.00
<i>OS3</i>	0.05	0.08	0.00	0.00
<b>Totals</b>	<b>2.95</b>			2.32
<b>Total Imperviousness</b>	<b>0.79</b>			

## **HYDRAULIC CALCULATIONS**

## Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 2

**Designer:** D. Moffett  
**Company:** M&S Civil Consultants Inc.  
**Date:** January 28, 2025  
**Project:** Lot 3/4 Rocky Mountain Industrial Park Filing 1A (Future)  
**Location:** Sandy Ct

### 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$   
(100% if all paved and roofed areas upstream of sand filter)
- B) Tributary Area's Imperviousness Ratio ( $i = I_a/100$ )
- C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time  
 $WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$
- D) Contributing Watershed Area (including sand filter area)
- E) Water Quality Capture Volume (WQCV) Design Volume  
 $V_{WQCV} = WQCV / 12 * \text{Area}$
- F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)

$I_a =$   %

$i =$

WQCV =  watershed inches

Area =  sq ft

$V_{WQCV} =$   cu ft

$d_e =$   in

$V_{WQCV \text{ OTHER}} =$   cu ft

$V_{WQCV \text{ USER}} =$   cu ft

### 2. Basin Geometry

- A) WQCV Depth
- B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.
- C) Minimum Filter Area (Flat Surface Area)
- D) Actual Filter Area
- E) Volume Provided

$D_{WQCV} =$   ft

$Z =$   ft / ft

$A_{Min} =$   sq ft

$A_{Actual} =$   sq ft

$V_T =$   cu ft

### 3. Filter Material

Choose One

☒ 18" CDOT Class B or C Filter Material

☐ Other (Explain):

### 4. Underdrain System

- A) Are underdrains provided?
- B) Underdrain system orifice diameter for 12 hour drain time
- i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice
- ii) Volume to Drain in 12 Hours
- iii) Orifice Diameter, 3/8" Minimum

Choose One

☐ YES

☒ NO

$y =$   ft

$Vol_{12} =$   cu ft

$D_o =$   in

## Design Procedure Form: Sand Filter (SF)

Sheet 2 of 2

**Designer:** D. Moffett  
**Company:** M&S Civil Consultants Inc.  
**Date:** January 28, 2025  
**Project:** Lot 3/4 Rocky Mountain Industrial Park Filing 1A (Future)  
**Location:** Sandy Ct

**5. Impermeable Geomembrane Liner and Geotextile Separator Fabric**

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

☐ YES
 ☒ NO

**6. Inlet / Outlet Works**

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Inlet points will be protected by rip rap for energy dissipation. No outlet  
structres are provided. WQ Event will infiltrate and the excess water exit the  
pond via the provided spilway.

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

***Preliminary Drainage Report***  
***Lot 3 & 4 - Rocky Mountain Industrial Park Filing No.1A***  
***(Pond Volume Calculation)***

***SF INFILTRATION POND 1 (FUTURE)***

	Elevation	SF	CF	Storage AF	Sum
6452.6	0.00	1,415.00			0
6453	0.40	1,901.00	663.20	0.02	0.02
6453.5	0.90	2,578.00	1,119.75	0.03	0.04
6454	1.40	3,429.00	1,501.75	0.03	0.08
6455	2.40	5,337.00	4,383.00	0.10	0.18
6455.4	2.80	9,534.00	2,974.20	0.07	0.24
			<u>10,642</u> CF		
			Total =	<u>0.2</u> Ac-ft	
At Elevation 1.24, the Storage is 0.064 Ac-ft. or 2787.84 cf    WQCV					

Calculated by: DLM  
Date: 1/28/2025  
Checked by: \_\_\_\_\_



## Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 2

**Designer:** D. Moffett  
**Company:** M&S Civil Consultants Inc.  
**Date:** January 28, 2025  
**Project:** Lot 3/4 Rocky Mountain Industrial Park Filing 1A  
**Location:** Sandy Ct/

### 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$   
(100% if all paved and roofed areas upstream of sand filter)
- B) Tributary Area's Imperviousness Ratio ( $i = I_a/100$ )
- C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time  
 $WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$
- D) Contributing Watershed Area (including sand filter area)
- E) Water Quality Capture Volume (WQCV) Design Volume  
 $V_{WQCV} = WQCV / 12 * \text{Area}$
- F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)

$I_a =$   %

$i =$

WQCV =  watershed inches

Area =  sq ft

$V_{WQCV} =$   cu ft

$d_e =$   in

$V_{WQCV \text{ OTHER}} =$   cu ft

$V_{WQCV \text{ USER}} =$   cu ft

### 2. Basin Geometry

- A) WQCV Depth
- B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.
- C) Minimum Filter Area (Flat Surface Area)
- D) Actual Filter Area
- E) Volume Provided

$D_{WQCV} =$   ft

$Z =$   ft / ft

$A_{Min} =$   sq ft

$A_{Actual} =$   sq ft

$V_T =$   cu ft

### 3. Filter Material

Choose One

☒ 18" CDOT Class B or C Filter Material

☐ Other (Explain):

### 4. Underdrain System

- A) Are underdrains provided?
- B) Underdrain system orifice diameter for 12 hour drain time
- i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice
- ii) Volume to Drain in 12 Hours
- iii) Orifice Diameter, 3/8" Minimum

Choose One

☐ YES

☒ NO

$y =$   ft

$Vol_{12} =$   cu ft

$D_o =$   in

## Design Procedure Form: Sand Filter (SF)

Sheet 2 of 2

**Designer:** D. Moffett  
**Company:** M&S Civil Consultants Inc.  
**Date:** January 28, 2025  
**Project:** Lot 3/4 Rocky Mountain Industrial Park Filing 1A  
**Location:** Sandy Ct/

**5. Impermeable Geomembrane Liner and Geotextile Separator Fabric**

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

Choose One

☐ YES
 ☒ NO

**6. Inlet / Outlet Works**

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Inlet points will be protected by rip rap for energy dissipation. No outlet  
structres are provided. Basin will infiltrate and the excess water exit the pond  
via the provided spilway.

Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

***Preliminary Drainage Report***  
***Lot 3 & 4 - Rocky Mountain Industrial Park Filing No.1A***  
***(Pond Volume Calculation)***

***SF INFILTRATION POND 1 (PROPOSED)***

	Elevation	SF	CF	Storage AF	Sum
6452.6	0.00	1,415.00			0
6453	0.40	1,901.00	663.20	0.02	0.02
6453.5	0.90	2,578.00	1,119.75	0.03	0.04
6454	1.40	3,429.00	1,501.75	0.03	0.08
6455	2.40	5,337.00	4,383.00	0.10	0.18
6455.4	2.80	9,534.00	2,974.20	0.07	0.24
			<u>10,642</u> CF		
			Total =	<u>0.2</u> Ac-ft	
At Elevation 1.15, the Storage is 0.058 Ac-ft. or 2526.48 cf WQCV					

Calculated by: DLM

Date: 1/28/2025

Checked by: \_\_\_\_\_

## LOT 3 & 4 ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

### POND 1

(PROPOSED CONDITIONS)

#### CALCULATIONS FOR WATER QUALITY CONTROL VOLUME DRAIN TIME REQUIREMENTS (BTM ONLY)

VOLUME OF WQCV EVENT STORM	(cf)	2521 B, PER UD-BMP RUNOFF REDUCTION
INFILTRATION AREA (POND BOTTOM)	(sf)	1415 I, BOTTOM AREA
DESIGN SOIL INFILTRATION RATE	(in/hr)	1.9 R, PER TEST
DRAWDOWN RATE	cfs	0.0622338 $A=(I*R)/12/(60*60)$
WQCV DESIGN DRAIN TIME	cf/hr	224.04167 $D=I*R/12$
WQCV DRAIN TIME	(hours)	11.3

## LOT 3 & 4 ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

### POND 1

(FUTURE CONDITIONS)

#### CALCULATIONS FOR WATER QUALITY CONTROL VOLUME DRAIN TIME REQUIREMENTS (BTM ONLY)

VOLUME OF WQCV EVENT STORM	(cf)	2759 B, PER UD-BMP RUNOFF REDUCTION
INFILTRATION AREA (POND BOTTOM)	(sf)	1415 I, BOTTOM AREA
DESIGN SOIL INFILTRATION RATE	(in/hr)	1.9 R, PER TEST
DRAWDOWN RATE	cfs	0.0622338 $A=(I*R)/12/(60*60)$
WQCV DESIGN DRAIN TIME	cf/hr	224.04167 $D=I*R/12$
WQCV DRAIN TIME	(hours)	12.3

## Worksheet for Parabolic Channel - DP1 (Proposed)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.009 ft/ft
Constructed Depth	18.0 in
Constructed Top Width	20.00 ft
Discharge	7.00 cfs
Results	
Normal Depth	5.5 in
Flow Area	3.3 ft <sup>2</sup>
Wetted Perimeter	11.1 ft
Hydraulic Radius	3.6 in
Top Width	11.02 ft
Critical Depth	4.5 in
Critical Slope	0.021 ft/ft
Velocity	2.09 ft/s
Velocity Head	0.07 ft
Specific Energy	0.52 ft
Froude Number	0.669
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.5 in
Critical Depth	4.5 in
Channel Slope	0.009 ft/ft
Critical Slope	0.021 ft/ft

## Worksheet for Parabolic Channel - DP1 (Future)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.009 ft/ft
Constructed Depth	18.0 in
Constructed Top Width	20.00 ft
Discharge	7.00 cfs
Results	
Normal Depth	5.5 in
Flow Area	3.3 ft <sup>2</sup>
Wetted Perimeter	11.1 ft
Hydraulic Radius	3.6 in
Top Width	11.02 ft
Critical Depth	4.5 in
Critical Slope	0.021 ft/ft
Velocity	2.09 ft/s
Velocity Head	0.07 ft
Specific Energy	0.52 ft
Froude Number	0.669
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.5 in
Critical Depth	4.5 in
Channel Slope	0.009 ft/ft
Critical Slope	0.021 ft/ft

## Worksheet for Parabolic Channel - DP2 (Proposed)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.017 ft/ft
Constructed Depth	18.0 in
Constructed Top Width	20.00 ft
Discharge	7.90 cfs
Results	
Normal Depth	5.0 in
Flow Area	2.9 ft <sup>2</sup>
Wetted Perimeter	10.6 ft
Hydraulic Radius	3.3 in
Top Width	10.52 ft
Critical Depth	4.7 in
Critical Slope	0.021 ft/ft
Velocity	2.71 ft/s
Velocity Head	0.11 ft
Specific Energy	0.53 ft
Froude Number	0.909
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.0 in
Critical Depth	4.7 in
Channel Slope	0.017 ft/ft
Critical Slope	0.021 ft/ft

## Worksheet for Parabolic Channel - DP2 (Future)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.017 ft/ft
Constructed Depth	18.0 in
Constructed Top Width	20.00 ft
Discharge	9.50 cfs
Results	
Normal Depth	5.4 in
Flow Area	3.3 ft <sup>2</sup>
Wetted Perimeter	11.0 ft
Hydraulic Radius	3.6 in
Top Width	10.96 ft
Critical Depth	5.2 in
Critical Slope	0.020 ft/ft
Velocity	2.89 ft/s
Velocity Head	0.13 ft
Specific Energy	0.58 ft
Froude Number	0.929
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	5.4 in
Critical Depth	5.2 in
Channel Slope	0.017 ft/ft
Critical Slope	0.020 ft/ft



## Worksheet for Rectangular Weir - Chase DP3 (Proposed)

Project Description	
Solve For	Headwater Elevation
Input Data	
Discharge	5.60 cfs
Crest Elevation	6,454.00 ft
Tailwater Elevation	6,454.00 ft
Weir Coefficient	$3.10 \text{ ft}^{(1/2)}/\text{s}$
Crest Length	6.0 ft
Number Of Contractions	0
Results	
Headwater Elevation	6,454.45 ft
Headwater Height Above Crest	0.45 ft
Tailwater Height Above Crest	0.00 ft
Flow Area	2.7 ft <sup>2</sup>
Velocity	2.08 ft/s
Wetted Perimeter	6.9 ft
Top Width	6.00 ft

## Worksheet for Rectangular Weir - Chase DP3 (Future)

Project Description	
Solve For	Headwater Elevation
Input Data	
Discharge	6.90 cfs
Crest Elevation	6,454.00 ft
Tailwater Elevation	6,454.00 ft
Weir Coefficient	3.10 ft <sup>(1/2)</sup> /s
Crest Length	6.0 ft
Number Of Contractions	0
Results	
Headwater Elevation	6,454.52 ft
Headwater Height Above Crest	0.52 ft
Tailwater Height Above Crest	0.00 ft
Flow Area	3.1 ft <sup>2</sup>
Velocity	2.23 ft/s
Wetted Perimeter	7.0 ft
Top Width	6.00 ft

## Worksheet for Rectangular Channel - 6' Chase (Proposed)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.104 ft/ft
Bottom Width	6.00 ft
Discharge	5.60 cfs
Results	
Normal Depth	1.3 in
Flow Area	0.7 ft <sup>2</sup>
Wetted Perimeter	6.2 ft
Hydraulic Radius	1.3 in
Top Width	6.00 ft
Critical Depth	3.6 in
Critical Slope	0.004 ft/ft
Velocity	8.35 ft/s
Velocity Head	1.08 ft
Specific Energy	1.19 ft
Froude Number	4.401
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.3 in
Critical Depth	3.6 in
Channel Slope	0.104 ft/ft
Critical Slope	0.004 ft/ft

## Worksheet for Rectangular Channel - 6' Chase (Future)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.104 ft/ft
Bottom Width	6.00 ft
Discharge	6.90 cfs
Results	
Normal Depth	1.5 in
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	6.3 ft
Hydraulic Radius	1.5 in
Top Width	6.00 ft
Critical Depth	4.1 in
Critical Slope	0.004 ft/ft
Velocity	9.06 ft/s
Velocity Head	1.28 ft
Specific Energy	1.40 ft
Froude Number	4.486
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.5 in
Critical Depth	4.1 in
Channel Slope	0.104 ft/ft
Critical Slope	0.004 ft/ft

## Worksheet for Broad Crested Weir - Spillway (Future)

Project Description	
Solve For	Headwater Elevation
Input Data	
Discharge	17.00 cfs
Crest Elevation	6,454.00 ft
Tailwater Elevation	6,454.00 ft
Crest Surface Type	Gravel
Crest Breadth	10.00 ft
Crest Length	30.0 ft
Results	
Headwater Elevation	6,454.36 ft
Headwater Height Above Crest	0.36 ft
Tailwater Height Above Crest	0.00 ft
Weir Coefficient	$2.65 \text{ ft}^{1/2}/\text{s}$
Submergence Factor	1.000
Adjusted Weir Coefficient	$2.65 \text{ ft}^{1/2}/\text{s}$
Flow Area	10.7 ft <sup>2</sup>
Velocity	1.58 ft/s
Wetted Perimeter	30.7 ft
Top Width	30.00 ft

## Worksheet for Broad Crested Weir - Spillway (Proposed)

Project Description	
Solve For	Headwater Elevation
Input Data	
Discharge	13.90 cfs
Crest Elevation	6,454.00 ft
Tailwater Elevation	6,454.00 ft
Crest Surface Type	Gravel
Crest Breadth	10.00 ft
Crest Length	30.0 ft
Results	
Headwater Elevation	6,454.31 ft
Headwater Height Above Crest	0.31 ft
Tailwater Height Above Crest	0.00 ft
Weir Coefficient	$2.63 \text{ ft}^{(1/2)}/\text{s}$
Submergence Factor	1.000
Adjusted Weir Coefficient	$2.63 \text{ ft}^{(1/2)}/\text{s}$
Flow Area	9.4 ft <sup>2</sup>
Velocity	1.47 ft/s
Wetted Perimeter	30.6 ft
Top Width	30.00 ft

## Worksheet for Spillway Rundown (Proposed)

Project Description	
Friction Method	Manning
	Formula
Solve For	Normal Depth
<b>Input Data</b>	
Roughness Coefficient	0.055
Channel Slope	0.250 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	26.00 ft
Discharge	13.90 cfs
<b>Results</b>	
Normal Depth	1.7 in
Flow Area	3.8 ft <sup>2</sup>
Wetted Perimeter	27.2 ft
Hydraulic Radius	1.7 in
Top Width	27.15 ft
Critical Depth	2.5 in
Critical Slope	0.076 ft/ft
Velocity	3.65 ft/s
Velocity Head	0.21 ft
Specific Energy	0.35 ft
Froude Number	1.716
Flow Type	Supercritical
<b>GVF Input Data</b>	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
<b>GVF Output Data</b>	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.7 in
Critical Depth	2.5 in
Channel Slope	0.250 ft/ft
Critical Slope	0.076 ft/ft

## Worksheet for Spillway Rundown (Future)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.055
Channel Slope	0.250 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	26.00 ft
Discharge	17.00 cfs
Results	
Normal Depth	1.9 in
Flow Area	4.3 ft <sup>2</sup>
Wetted Perimeter	27.3 ft
Hydraulic Radius	1.9 in
Top Width	27.29 ft
Critical Depth	2.8 in
Critical Slope	0.073 ft/ft
Velocity	3.94 ft/s
Velocity Head	0.24 ft
Specific Energy	0.40 ft
Froude Number	1.749
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.9 in
Critical Depth	2.8 in
Channel Slope	0.250 ft/ft
Critical Slope	0.073 ft/ft



## **BACKGROUND**



2850 Serendipity Circle West  
Colorado Springs, CO 80917

Phone: 719-528-6133  
Fax: 719-528-6848

Surveying • Planning • Engineering • Landscape Architecture

www ldc-inc.com

December 29, 2008  
**Revised March 18, 2009**

**El Paso County Development Services**  
2880 International Circle  
Colorado Springs, CO 80910

**Rocky Mountain Industrial Park, Filing 1A, Final Plat (07072)**

Dear Sir/Madam:

**RECEIVED**

**MAR 18 2009**

**EPC DEVELOPMENT SERVICES**

**VERSION # 3**  
**DATE 3/19/09**

Please consider this letter the Final Drainage Report for Rocky Mountain Industrial Park, Filing 1A.

**For clarification**, please note that this Filing 1A is a Replat of Lot 1, Rocky Mountain Industrial Park Filing No.1. This Filing 1A is wholly within drainage basins 3 & 4, which are depicted in the final drainage report for Rocky Mountain Industrial Park Filing No.1, prepared by Kiowa Engineering Corporation, dated August 2001 and revised February 7, 2002. A lot line vacation was subsequently done which created one lot from the previous 6 lots abutting Sandy Court. A site development plan (PPR-08-007) for this one lot was subsequently prepared, depicting a future layout of 4 lots, was approved, and is supported with a drainage letter by LDC, Inc. dated February 13, 2008. See also (3) *attached exhibits*.

This current action, Filing 1A, is the anticipated replatting from one to four lots, identified hereinafter as lots 1 through 4.

This site is located in the West one-half of Section 33, Township 13 South, Range 65 West of the 6<sup>th</sup> P.M., El Paso County, Colorado. This 7.94 acre site is zoned I-3 and currently has (1) developed lot located on the Northwest portion of the site and (3) remaining vacant lots with the proposed Replat.

#### **EXISTING DRAINAGE:**

Currently, storm water runoff from this Filing 1A site is a combination of fully developed and partially developed conditions. Completion of construction for the previously approved "Ewing Irrigation" wholesale business, within Lot 1, conforms to the drainage letter from LDC, Inc., dated February 13, 2008, that was approved with the Site Development Plan (PPR-08-007), as well as the approved drainage report prepared by Kiowa Engineering Corporation, dated February 2002. The flows from this fully developed lot 1 site, added to the flows from lot 2, which is considered partially developed as a result of previous overlot grading with now-established vegetative cover, are conveyed by the existing street section to a Type R inlet at the terminus of Sandy Ct., and thence via pipe to an existing south draining rip-rap channel. The flows from lots 3 and 4, which are also considered partially developed as a result of previous overlot grading with now-established vegetative cover, are conveyed via sheetflow to the existing grass lined channel to the south, which then flows into the aforementioned rip-rap channel.

**PROPOSED DRAINAGE:**

No site development is proposed with this Final Plat and therefore existing drainage conditions will not be affected. Any future development will need to meet all El Paso County requirements, including those referenced in the ECM and DCM, and as noted on the proposed Plat.

**FLOODPLAIN STATEMENT:**

This site is located in the Sand Creek Drainage Basin and a portion of this property is located in the 100-year, Zone A, floodplain per Flood Insurance Rate Map Panel No. 08041C0756F, effective date March 17, 1997 and as modified by LOMR No. 04-08-0062P effective date November 18, 2004.

**IMPROVEMENTS:**

No improvements are proposed with this Plat. At the time of site development on the remaining (3) lots, it is noted on the Plat that any future site development will require an updated Drainage letter. The letter will need to address the need for drainage improvements as required by the El Paso County Engineering Criteria Manual and Drainage Criteria Manual.

**DRAINAGE FEES:**

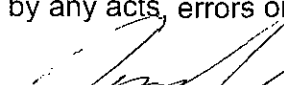
Drainage Basin fees were paid with the initial filing, this replat to 4 lots will result in a decreased density from the initial filing of 6 lots, so no additional fees are required.

**EROSION CONTROL:**

Erosion control, as required by the El Paso County ECM and DCM will need to be addressed with any future Site Development.

### Engineer's Statement

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

  
David C. Ewald, P.E.

For and on behalf of LDC,



3/10/2009  
DATE

### Developer's Statement

The developer has read and will comply with all of the requirements specified in this report and plan.

Ewing Irrigation Products, Inc.  
(Business Name)

Raynor W. York  
BY

President  
TITLE

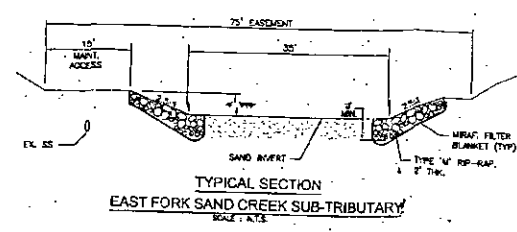
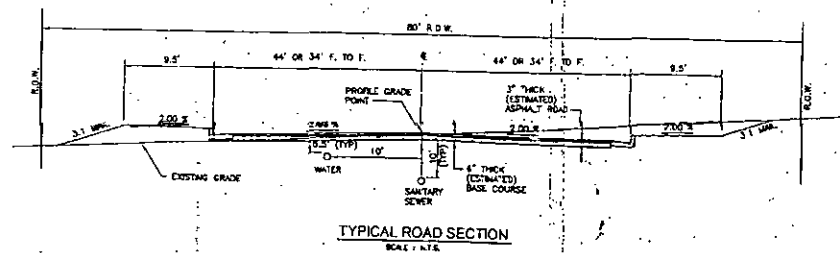
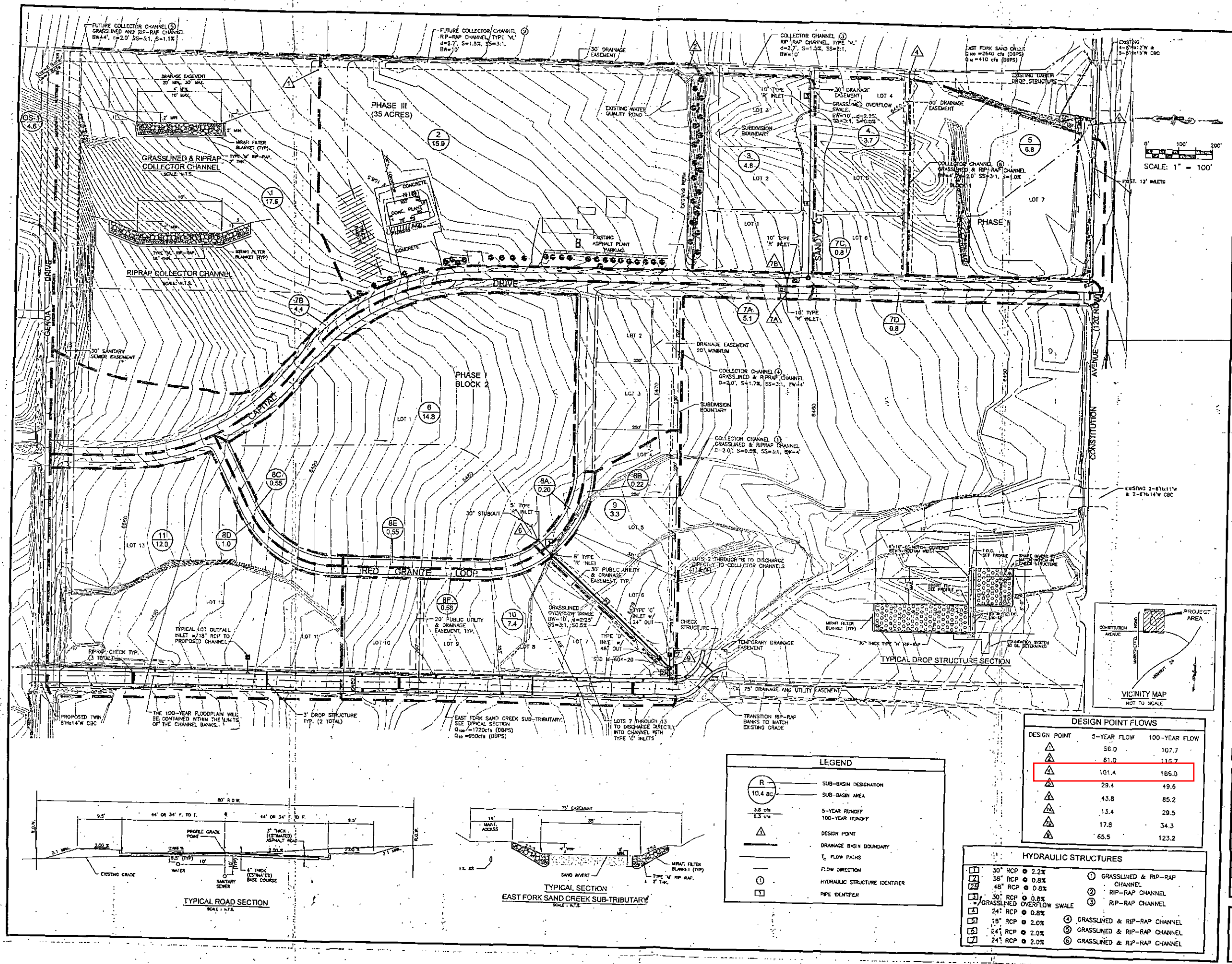
3441 E. Harbourn Dr P.O. Box 7  
ADDRESS  
85034

### El Paso County

Filed in accordance with Section 51.1 of the El Paso County Land Development Code.

Max Z. Rothschulte P.E.  
for Andu Bracken  
County Engineer / ECM Administrator

1/24/10  
DATE



**LEGEND**

- SUB-BASIN DESIGNATION
- SUB-BASIN AREA
- 5-YEAR RUNOFF
- 100-YEAR RUNOFF
- DESIGN POINT
- DRAINAGE BASIN BOUNDARY
- FLOW PATHS
- FLOW DIRECTION
- HYDRAULIC STRUCTURE IDENTIFIER
- PIPE IDENTIFIER

**DESIGN POINT FLOWS**

DESIGN POINT	5-YEAR FLOW	100-YEAR FLOW
1	56.0	107.7
2	61.0	116.7
3	101.4	166.0
4	29.4	49.6
5	43.8	85.2
6	13.4	29.5
7	17.8	34.3
8	65.5	123.2

**HYDRAULIC STRUCTURES**

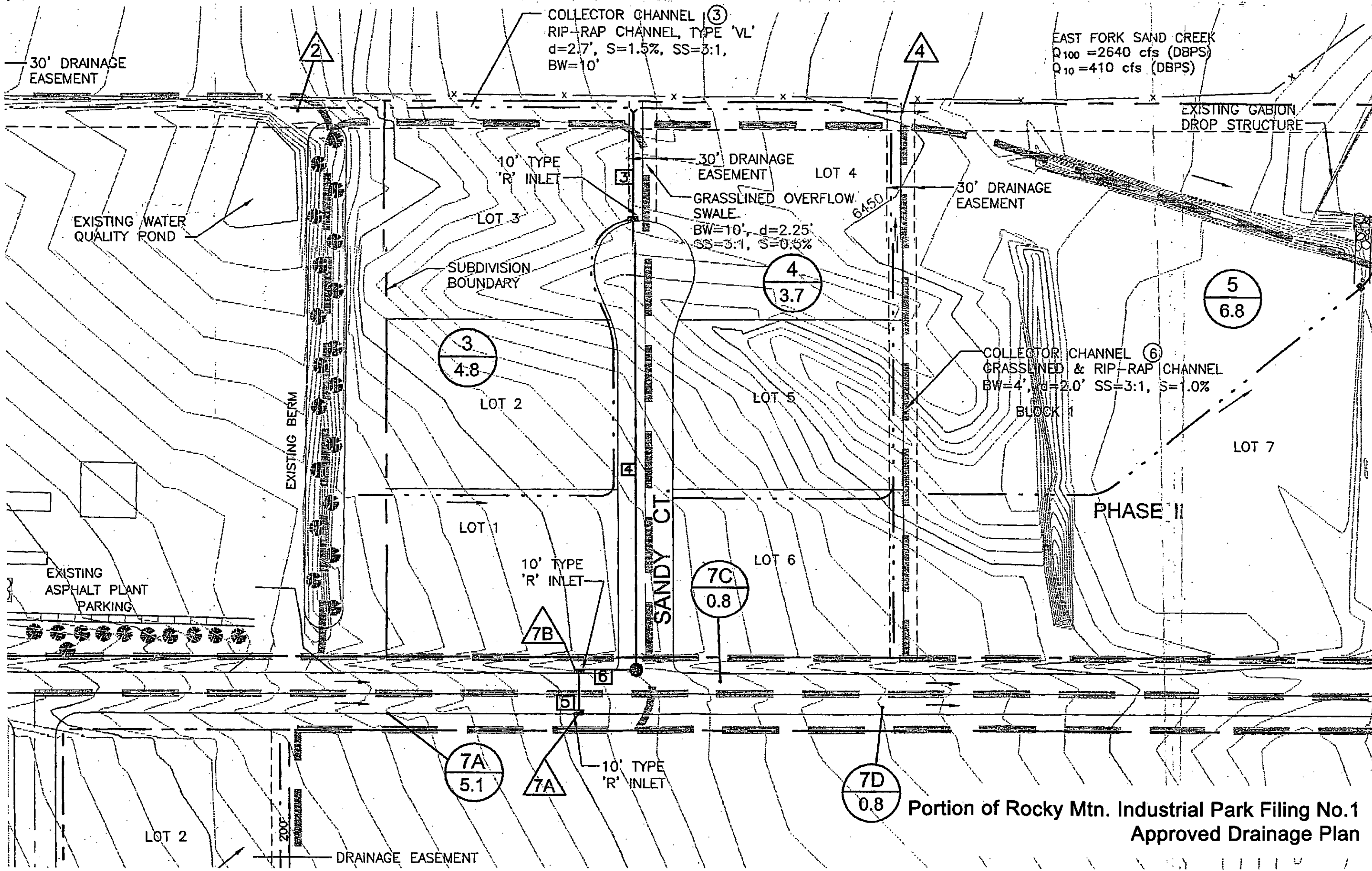
STRUCTURE	DESIGN
30" RCP @ 2.2%	1 GRASSLINED & RIP-RAP CHANNEL
36" RCP @ 0.8%	2 RIP-RAP CHANNEL
48" RCP @ 0.8%	3 RIP-RAP CHANNEL
30" RCP @ 0.8%	4 GRASSLINED & RIP-RAP CHANNEL
36" RCP @ 2.0%	5 GRASSLINED & RIP-RAP CHANNEL
24" RCP @ 2.0%	6 GRASSLINED & RIP-RAP CHANNEL

Kiowa Engineering Corporation  
2814 International Circle  
Colorado Springs, Colorado  
80910-3127  
(719) 530-7342

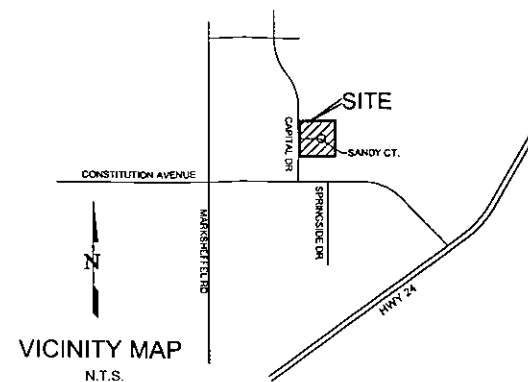
**ROCKY MOUNTAIN INDUSTRIAL PARK**  
**Final Drainage Report Proposed Drainage Plan**  
COLORADO SPRINGS, COLORADO


Project No.: 01017  
Scale: 1" = 100'  
Date: 05/05/01  
Design: RNW  
Drawn: JUN  
Check: RNW  
Revisions:

**Fig. 2**

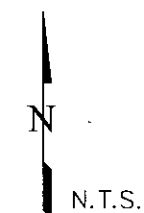






DRAINAGE PLAN LEGEND		
		BASIN BOUNDARY
	EXISTING BASIN NAME ACREAGE	EXISTING DRAINAGE BASIN TAG

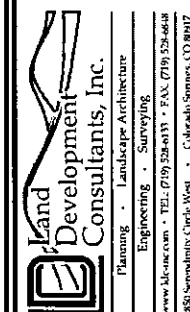
NOTES:  
1. NO PROPOSED CHANGES AS REPLATTED  
2. REFERENCE APPROVED DRAINAGE LETTER FOR EWING IRRIGATION SITE DEVELOPMENT PLAN(PPR-08-007) DATED FEBRUARY 13, 2008 BY LDC, INC.



**NOT FOR CONSTRUCTION:**

[illegible]

H Scale	Designed By:	KIOWA
V Scale	Drawn By:	JAR
	Checked By:	DCE
	Date:	3/18/09



ROCKY MTN. INDUSTRIAL PARK  
FILING 1A  
EXISTING DRAINAGE  
COLORADO SPRINGS, CO

Project Number: 07072

Sheet: X of 1

# **PRELIMINARY/FINAL DRAINAGE REPORT**

**FOR**

## **JACKSON OFFICE WAREHOUSE & STORAGE BUILDINGS DEVELOPMENT ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A, LOT 2**

**Prepared For:**

**Jackson Developmental Solutions, LLC  
55963 Maroon Mesa Drive  
Colorado Springs, CO 80918**

**Prepared By:**

**Associated Design Professionals, Inc.  
3520 Austin Bluffs Parkway Suite 102  
Colorado Springs, CO 80918  
719.266-5212**

**ADP Project No.170602**

**May 2, 2018**

**PCD File No. PPR-17-057**





**PRELIMINARY/FINAL DRAINAGE REPORT**  
**JACKSON OFFICE WAREHOUSE & STORAGE BUILDINGS DEVELOPMENT**  
**ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A, LOT 2**

**PROJECT DESCRIPTION**

This drainage report is for the development of the Rocky Mountain Industrial Park Filing No. 1A, Lot 2. The currently vacant 2.09 acre site is located north of Constitution Avenue and east of Capital Drive on the north side of Sandy Court at the end of the cul-de-sac. It is further described as a portion of Section 33, Township 13 South, Range 65 West of the 6<sup>th</sup> Principal Meridian in El Paso County, Colorado.

All of this lot is located in Sand Creek drainage basin. An existing storm sewer is located within Sandy Court which empties into an existing riprap lined channel located along the east edge of the property.

**SOILS**

The soil on the site can be described as having a rapid permeability, medium-surface runoff, and moderate to high hazard of erosion. The soils within the site are Blendon sandy loams. These soils are classified as Hydrologic Group 'B'.

**FLOODPLAIN STATEMENT**

A small portion of the developed site is located within a designated FEMA 100-year floodplain according to the information published in the Federal Emergency Management Agency Flood Plain Map N. 08041C0756F, dated March 17, 1997, LOMR 04-08-0062P dated November 18, 2004. This area falls within the existing riprap channel.

**METHOD OF COMPUTATION**

The methodology utilized for this report is in accordance with the *City Drainage Criteria Manual, Volumes 1*, dated May 2014. The Rational Method for computation of runoff was used for determining Sub-Basin flows.

$Q = c i a$

Where

- $Q$  = maximum rate of runoff in cubic feet per second
- $c$  = runoff coefficient representing drainage area characteristics
- $i$  = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established
- $a$  = drainage basin size in acres

**EXISTING DRAINAGE CONDITIONS**

The existing site has been overlaid grades and is covered with rangeland. The site slopes in a southeasterly direction with most flows directed onto Sandy Court where they are intercepted by an existing 10' sump window inlet. The inlet flows into a 30" RCP storm sewer which empties into the east tributary of Sand Creek. The remainder of the site drains directly into the riprap-lined collector channel which will be privately maintained by the property owner. This channel then flows into the east fork of Sand Creek.

No flows enter the site from the east; however, flows from the north do enter the site as delineated in the Final Drainage Report for the Rocky Mountain Industrial Park Filing No. 1 by

Kiowa Engineering Corporation. These flows enter the site within a 10' wide channel with estimated flows of 51.0 cfs for the 5-year storm and 116.7 cfs for the 100-year storm at DP1. The off-site sub-basin OS1 only drains the existing landscape area and produces flows of 0.2 cfs for the 5-year storm and 1.1 cfs for the 100-year storm. Sub-basin AEX drains to the western portion of the undeveloped site. It produces flows of 0.8 cfs and 5.7 cfs respectively. These flows combine with the flows from OS1 at DP2 to produce flows to Sandy Court of 0.8 cfs for the 5-year storm and 6.3 cfs for the 100-year storm. These flows combine with the flows from DP1 at DP2 to produce total flows of 51.0 cfs for the 5-year storm and 116.7 cfs for the 100-year storm.

The estimated runoff amounts produced for the project under existing conditions are shown in Table 1 below.

<b>TABLE 1 – EXISTING CONDITIONS</b>		
<b>Sub-Basin</b>	<b>Q<sub>5</sub>CFS</b>	<b>Q<sub>100</sub> CFS</b>
OS1	0.2	1.1
AEX	0.8	5.7
DP1	50.2	116.8
DP2 (OS1 + AEX)	0.8	6.3
DP3(DP1+DP2)	49.5	118.4

#### **DEVELOPED DRAINAGE CONDITIONS**

The development of this site includes the addition of two (2) 5,067 sf office/warehouse buildings in the center of the site and a 3,000 sf vehicle storage building in the northwest corner of the site.

The lower portion of the lot will be paved with asphalt while the upper portion will be covered with gravel. The site will be regraded to direct the flows around the proposed office/warehouse buildings.

Flows from the northern area will be directed to curbs and cross pans in the southern area and directed into a sand filter water quality basin.

As stated in the previous section, a small amount of off-site flow enters the site from a grass-covered berm on the north side of the site. Sub-basin OS1 drains the western part of this berm and produces flows of 0.1 cfs for the 5-year storm and 0.7 cfs for the 100-year storm. These flows drain onto Sub-basin A1.

The western portion of the developed site is designated as Sub-basin A1. This sub-basin will produce flows of 2.5 cfs and 5.2 cfs respectively. These flows combine with the flows from OS1 at DP2 to produce flows of 2.6 cfs for the 5-year storm and 5.7 cfs for the 100-year storm. Flows from DP1 continue to the east and into Sub-basin A2.

Sub-basin OS2 drains the eastern part of this berm and produces flows of 0.1 cfs for the 5-year storm and 0.4 cfs for the 100-year storm. These flows drain onto Sub-basin A2.

The eastern portion of the developed site is designated as Sub-basin A2. This sub-basin will produce flows of 2.1 cfs and 4.2 cfs respectively. These flows combine with the flows from OS2 at DP3 to produce flows of 2.1 cfs for the 5-year storm and 4.6 cfs for the 100-year storm.

Flows from DP3 combine with the flows from DP2 at DP4 to produce total flows into the sand filter basin of 4.7 cfs for the 5-year storm and 10.2 cfs for the 100-year storm.

No flows enter the site from the east; however, flows from the north do enter the site as delineated in the Final Drainage Report for the Rocky Mountain Industrial Park by Kiowa Engineering Corporation. These flows enter the site within a 10' wide channel with estimated flows of 51.0 cfs for the 5-year storm and 116.7 cfs for the 100-year storm at DP1.

Sub-basin B drains the eastern swale and the landscape area south of the developed site. This area produces flows of 0.3 cfs and 1.1 cfs respectively. These flows combine with the flows from DP4 at DP5 to produce total site flows of 4.9 cfs for the 5-year storm and 11.2 cfs for the 100-year storm. These flows combine with the off-site flows from DP1 at DP6 to produce total site flows of 52.4 cfs for the 5-year storm and 122.0 cfs for the 100-year storm.

Table 2 shows the estimated runoff which will be produced for the project under developed conditions.

<b>TABLE 2 –PHASE I DEVELOPED CONDITIONS</b>		
<b>Sub-Basin</b>	<b>Q<sub>5</sub>CFS</b>	<b>Q<sub>100</sub> CFS</b>
OS1	0.1	0.7
OS2	0.1	0.4
A1	2.5	5.2
A2	2.1	4.2
B	0.3	1.1
DP1	50.2	116.8
DP2 (OS1 + A1)	2.6	5.7
DP3 (OS2 + A2)	2.1	4.6
DP4 (DP2 + DP3)	4.7	10.2
DP5 (DP4 + B)	4.9	11.2
DP6(DP1+DP5)	52.4	122.0

## **WATER QUALITY**

Water quality for the site will be achieved through a 1,400 cf sand filter basin (SFB) with a four-inch slotted underdrain tied into a "Type C" inlet with an 18" HDPE pipe outlet. This SFB will be privately owned and maintained by the property owner.

## **DETENTION**

A Regional Detention Facility is proposed to be built upstream of the Rocky Mountain Industrial Park. This facility will be designed to account for the proposed flows within the proposed development within the industrial development according to the Hydrology Analysis section of the Final Drainage Report for the Rocky Mountain Industrial Park Filing No. 1 by Kiowa Engineering Corporation. No detention was proposed or exists within the existing subdivision, only Water Quality basins.

## **PRIVATE DRAINAGE FACILITIES**

<b>Item</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Total Cost</b>
18" HDPE FES	EA	1	\$400	\$ 400
18" HDPE	LF	15	\$40	\$ 600
Outlet Structure	EA	1	\$5,000	\$5,000

Emergency Spillway	EA	1	\$1,500	<u>\$1,500</u>
			Sub-Total	\$7,500
			15% Contingency & Engineering	<u>\$1,125</u>
			<b>TOTAL</b>	<b>\$8,625</b>

#### **DRAINAGE BASIN FEES**

The entire project was previously platted and lies within the Sand Creek Drainage Basin; therefore, no fees are due.

#### **CONCLUSION**

The proposed development and subsequent lot developments follow the "Four Step Process" as mandated by the EPA as follows:

Step 1: Runoff has been reduced by disconnecting impervious areas where possible, eliminating "unnecessary" impervious areas and encouraging infiltration into suitable soils.

Step 2: All drainageways, ditches and channels have been stabilized by the following methods:

- Tributaries have been left in their relatively natural state where possible.
- New drainageways and swales have been stabilized with either riprap or erosion control fabric depending on the erosion potential.
- No new roadside ditches are proposed for the development.

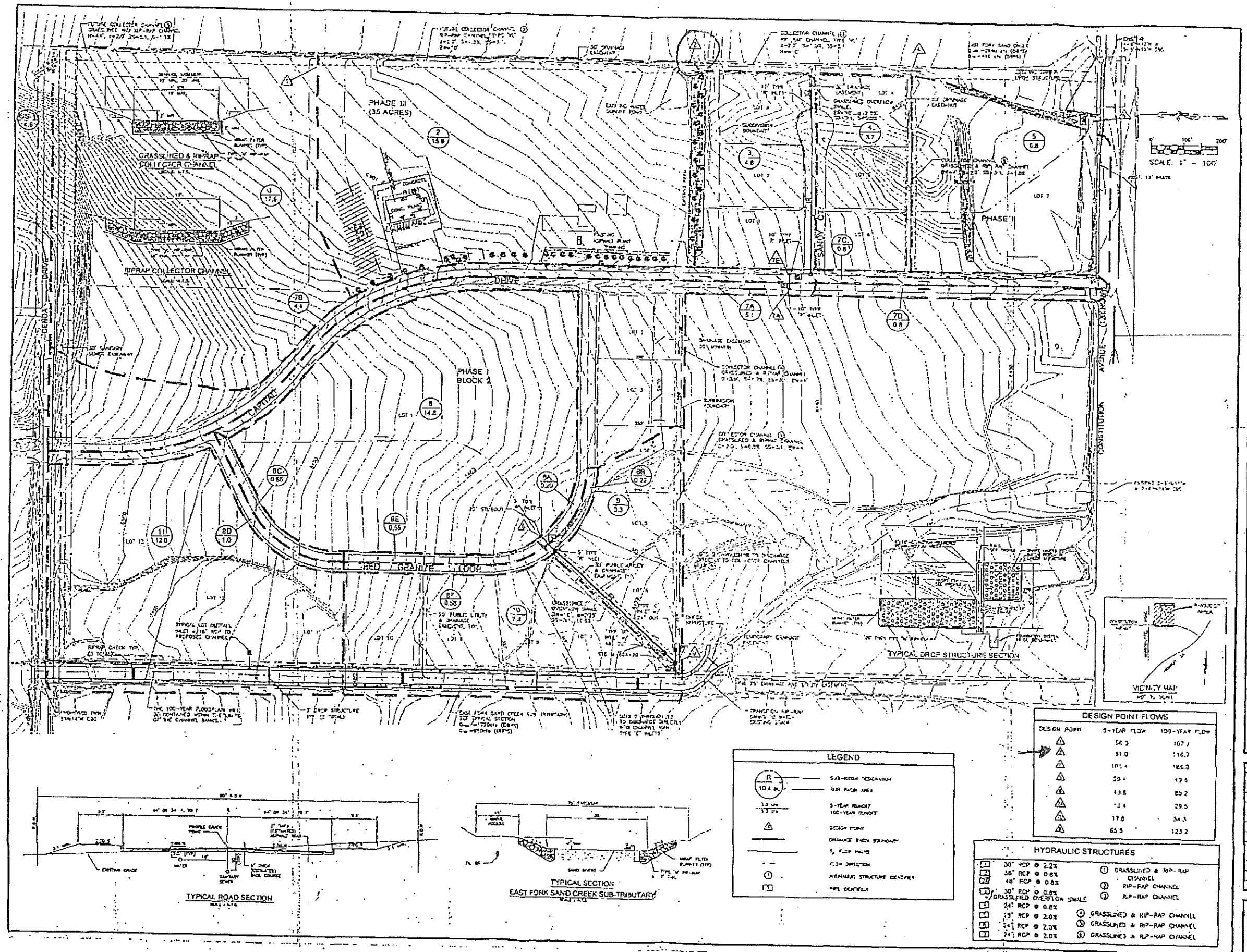
Step 3: The proposed development will disturb approximately 2.0 acres.

Step 4: The development of this project will not affect sensitive waters.

The development of this site will have little impact on downstream properties once the water quality is constructed.

## REFERENCES

1. City of Colorado Springs and El Paso County (1994). *Drainage Criteria Manual Volume 1* (DCM).
2. City of Colorado Springs and El Paso County (1994). *Drainage Criteria Manual Volume II* (DCM).
3. Soil Survey of El Paso County Area, Colorado by USDA, NRCS.
4. *El Paso County (January 2006) Engineering Criteria Manual*.
5. Urban Drainage and Flood Control District (June 2011). *Urban Storm Drainage Criteria Manual, Volume 1-3*.
6. Rocky Mountain Industrial Park Filing No. 1 Final Drainage Plan by Kiowa Engineering Corporation, dated February 2002.
7. Rocky Mountain Industrial Park Filing No. 1A by Land Development Consultants, Inc., dated March, 2009.



Kiowa Engineering Corporation  
2814 International Drive  
Colorado Springs, Colorado  
83310-3127  
(719) 630-7342

ROCKY MOUNTAIN INDUSTRIAL PARK  
Final Drainage Report Proposed Drainage Plan  
COLORADO SPRINGS, COLORADO

Project No: 01017  
Scale: 1" = 100'  
Date: 05/05/01  
Designer: BME  
Checker: JLM  
Reviewer:

Fig. 2

8140 SANDY CT																					
PROJ. #170703																					
DRAINAGE CALCULATION SHEET																					
file:sandy ct dr																					
06/02/18																					
AREA	AREA	C5	C100	C5 X A	C100 X A	Initial TC		Travel Time			length		vel.	AREA							
DESIG.	(acre)	(5 yr)	(100 yr)			L (ft)	Slope (%)	ti (min)	L (ft)	Slope (%)	V (fps)	Tt (min)	TC (min)	I5 (in/hr)	I100 (in/hr)	Q5 (cfs)	Q100 (cfs)	L (feet)	V (fps)	^1 (min)	DESIG.
EXISTING CONDITIONS																					
DP1	33.40	0.51	0.68	17.03	22.71								19.60	2.95	5.14	50.17	116.84	270	5.00	0.90	DP1
OS1	0.35	0.08	0.35	0.03	0.12	50	25.00	4.66	0	2.50	1.70	0.00	5.00	5.19	9.06	0.15	1.11	350	1.50	3.89	OS1
Aex	2.09	0.08	0.35	0.17	0.73	20	25.00	2.95	350	1.70	1.20	4.86	7.81	4.47	7.80	0.75	5.71				Aex
DP2	2.44			0.20	0.85								8.89	4.25	7.42	0.83	6.34				DP2
DP3	35.84			17.23	23.57								20.50	2.88	5.02	49.54	118.36				DP3
DEVELOPED CONDITIONS																					
DP1	33.40	0.51	0.68	17.03	22.71								19.60	2.95	5.14	50.17	116.84	270	5.00	0.90	DP1
OS1	0.22	0.08	0.35	0.02	0.08	50	25.00	4.66	0	2.50	1.70	0.00	5.00	5.19	9.06	0.09	0.70	260	1.00	4.33	OS1
A1	0.97	0.62	0.74	0.60	0.71	60	2.50	5.12	260	1.00	1.00	4.33	9.45	4.15	7.24	2.50	5.16				A1
DP2	1.19			0.62	0.79								9.45	4.15	7.24	2.57	5.72				DP2
OS2	0.13	0.06	0.35	0.01	0.05	50	25.00	4.66	0	2.50	1.70	0.00	5.00	5.19	9.06	0.05	0.41	300	1.00	5.00	OS2
A2	0.78	0.65	0.76	0.51	0.59	60	2.50	4.79	300	1.00	1.00	5.00	9.79	4.09	7.14	2.08	4.23				A2
DP3	0.91			0.52	0.64								9.79	4.09	7.14	2.12	4.56	125	1.50	1.39	DP3
DP4	2.10			1.14	1.43								9.79	4.09	7.14	4.66	10.20				DP4
B	0.34	0.16	0.41	0.06	0.14	15	2.50	5.02	280	2.50	1.70	2.75	7.77	4.48	7.82	0.25	1.09				B
DP5	2.44			1.20	1.57								9.79	4.09	7.14	4.89	11.19				DP5
DP6	35.84			18.23	24.28								20.50	2.88	5.02	52.42	121.95				DP6
IMPERVIOUS AREA CALC																					
Description	Imperv %																				
UNDEV	0																				
LOOSE GRAVEL	80																				
PAVED PARKING	100																				
BUILDINGS	100																				
Imperious Area Description																					
Area	Landscape	Building	Paved	Loose	Total																
OS1	0.22	0.22	0	0	0																
OS2	0.13	0.13	0	0	0																
A1	0.97	0.18	0.19	0.20	0.41	73.1															
A2	0.78	0.10	0.12	0.23	0.33	78.6															
Total	2.10				63.0																
Ponding Elev = 6453.45 - 6452.85																					
Max Ponding Depth = 0.65' = 7.8"																					
Q = 11.2 cfs																					
Ponding Depth = 6.75' (Per Figure 8-10)																					

# Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.06, November 2016)

Sheet 1 of 2

Designer: Michael A Bartusek  
 Company: Associated Design Professionals  
 Date: March 27, 2018  
 Project: Jackson Office/Warehouse Storage Buildings Development  
 Location: Rocky Mountain Industrial Park Fil 1A Lot 2

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$   
(100% if all paved and roofed areas upstream of sand filter)
- B) Tributary Area's Imperviousness Ratio ( $i = I_a/100$ )
- C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time  
 $WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$
- D) Contributing Watershed Area (including sand filter area)
- E) Water Quality Capture Volume (WQCV) Design Volume  
 $V_{WQCV} = WQCV / 12 * \text{Area}$
- F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)

$I_a = 63.0 \%$

$i = 0.630$

WQCV = 0.20 watershed inches

Area = 91,475 sq ft

$V_{WQCV} = 1,504$  cu ft

$d_e = 0.40$  in

$V_{WQCV \text{ OTHER}} = 1,399$  cu ft

$V_{WQCV \text{ USER}} = 1,400$  cu ft

## 2. Basin Geometry

- A) WQCV Depth
- B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.
- C) Minimum Filter Area (Flat Surface Area)
- D) Actual Filter Area
- E) Volume Provided

$D_{WQCV} = 1.4$  ft

$Z = 4.00$  ft / ft

$A_{\text{Min}} = 720$  sq ft

$A_{\text{Actual}} = 792$  sq ft

$V_T = 1400$  cu ft

## 3. Filter Material

- Choose One
- ☒ 18" CDOT Class B or C Filter Material
- ☐ Other (Explain):

## 4. Underdrain System

- A) Are underdrains provided?
- B) Underdrain system orifice diameter for 12 hour drain time
- i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice
- ii) Volume to Drain in 12 Hours
- iii) Orifice Diameter, 3/8" Minimum

- Choose One
- ☒ YES
- ☐ NO

$y = 1.8$  ft

$Vol_{12} = 1,400$  cu ft

$D_o = 7/8$  in



# Design Procedure Form: Sand Filter (SF)

Sheet 2 of 2

Designer: Michael A Bartusek  
 Company: Associated Design Professionals  
 Date: March 27, 2018  
 Project: Jackson Office/Warehouse Storage Buildings Development  
 Location: Rocky Mountain Industrial Park Fil 1A Lot 2

## 5. Impermeable Geomembrane Liner and Geotextile Separator Fabric

A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?

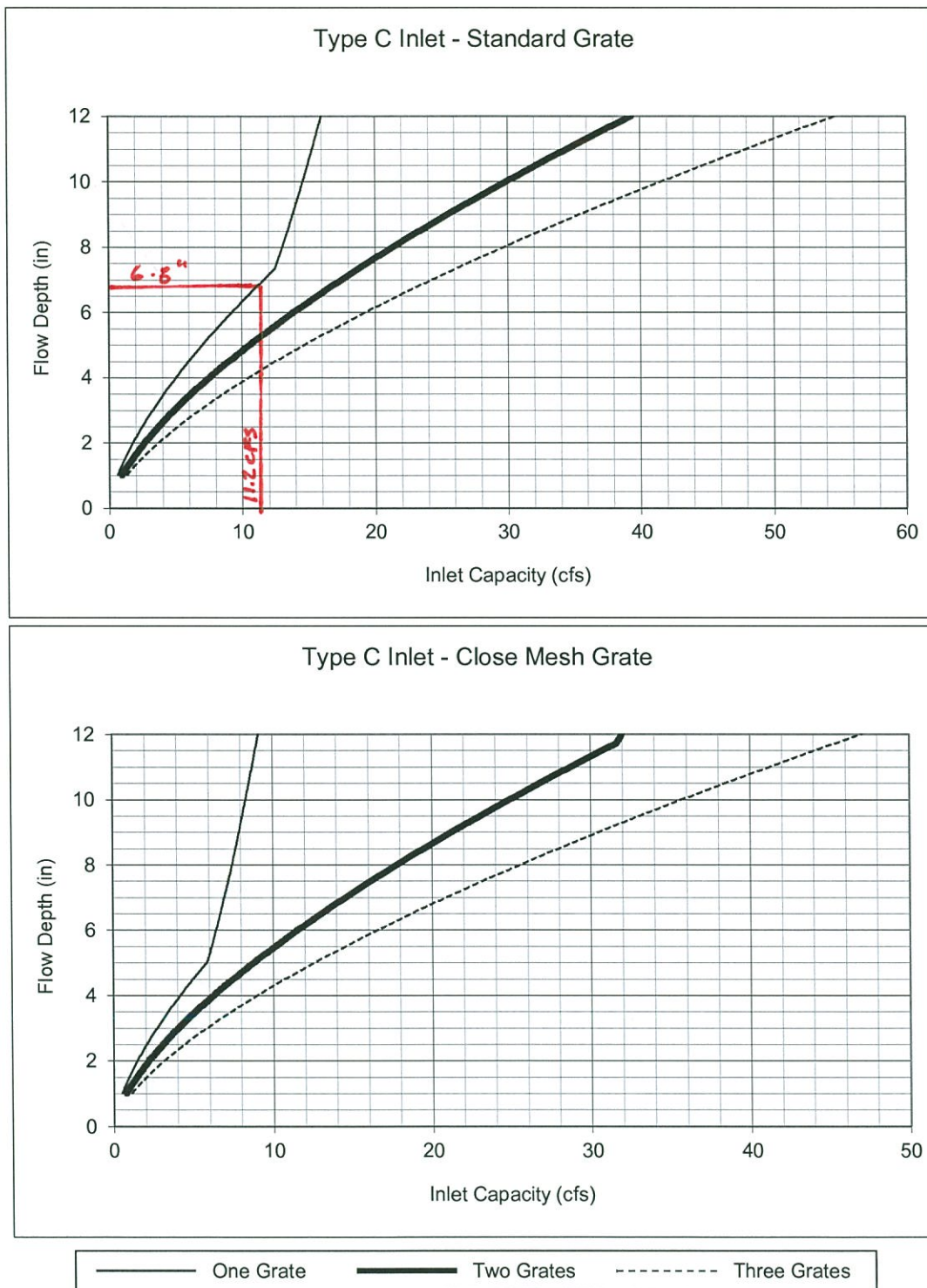
Choose One \_\_\_\_\_  
☐ YES ☒ NO

## 6-7. Inlet / Outlet Works

A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet

Riprap rundowns into basin with riprap emergency spillway.  
Type C inlet w/18" HDPE pie outlet structure.

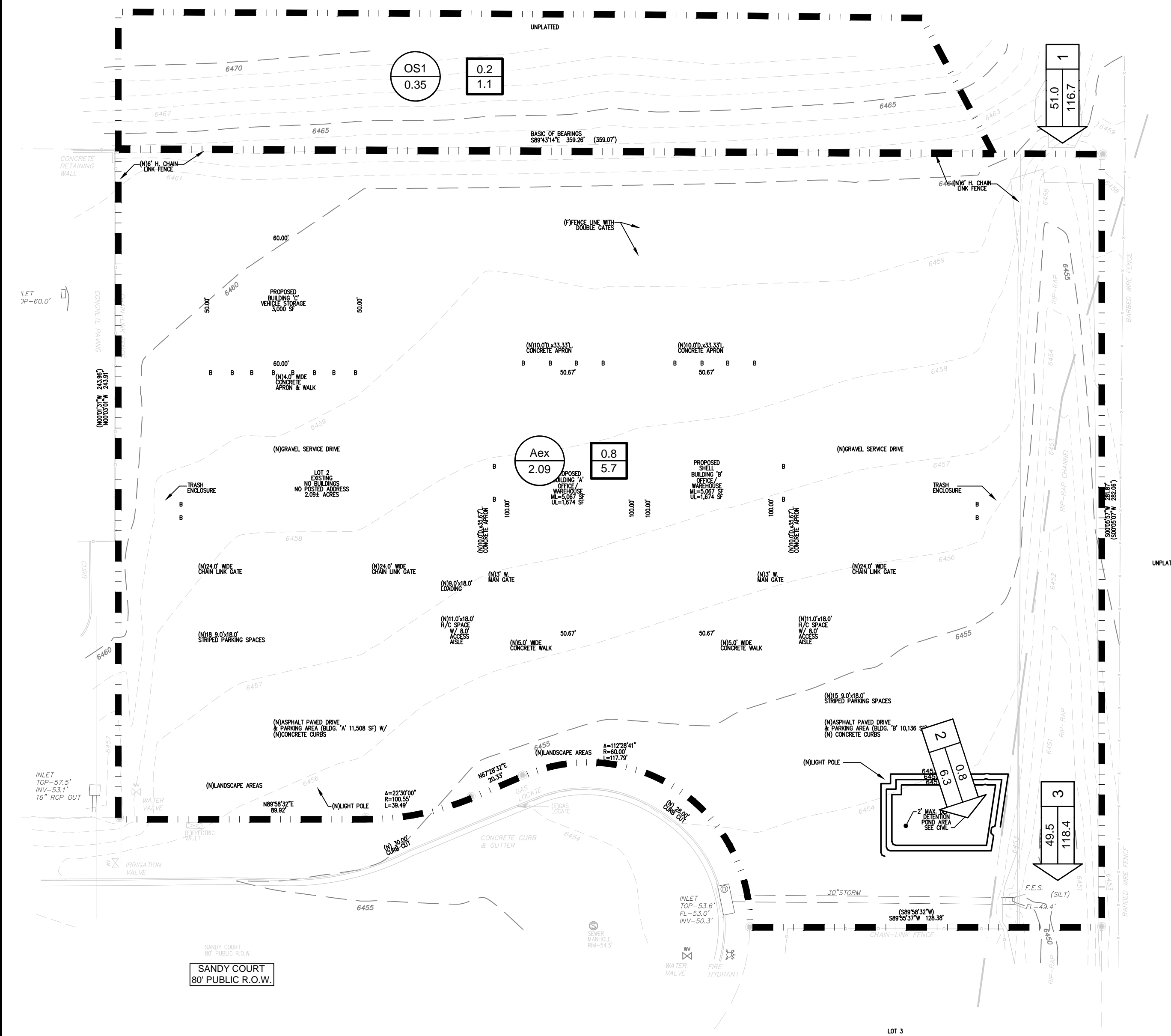
Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet**

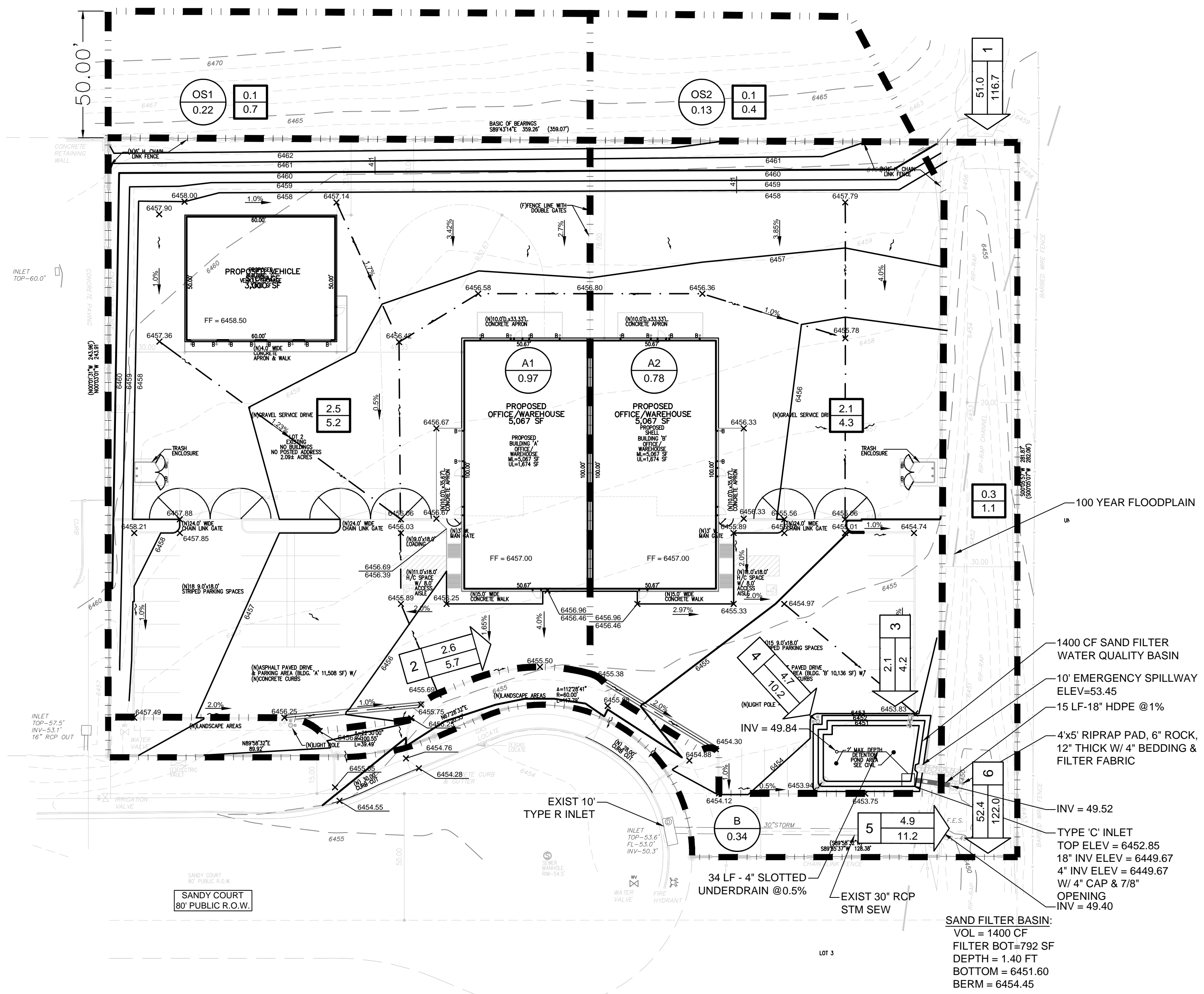
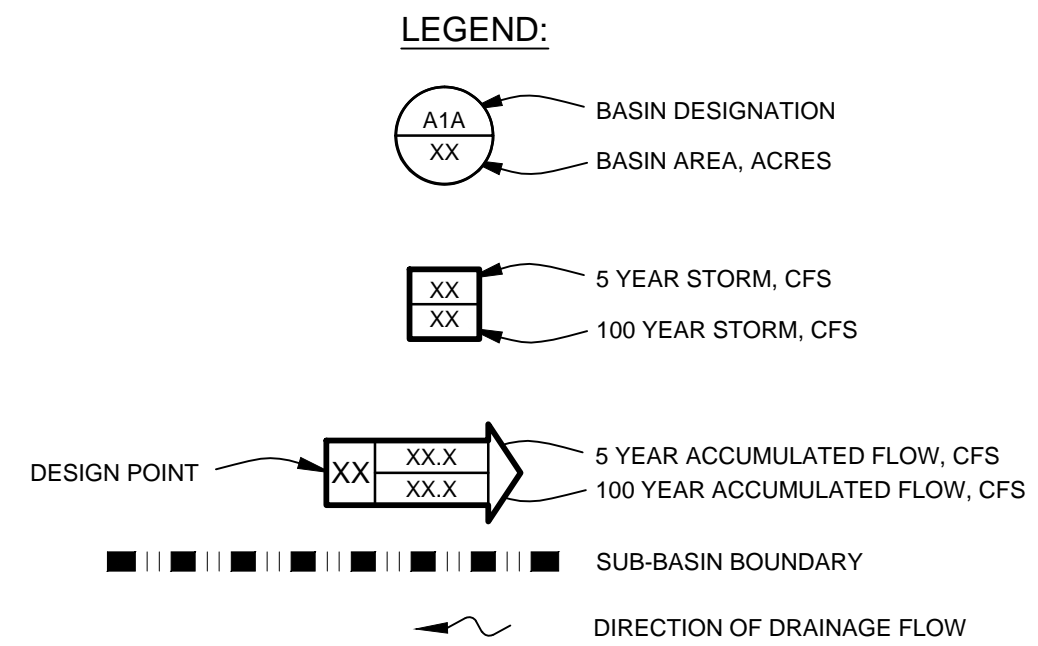
Notes:

1. The standard inlet parameters must apply to use these charts.

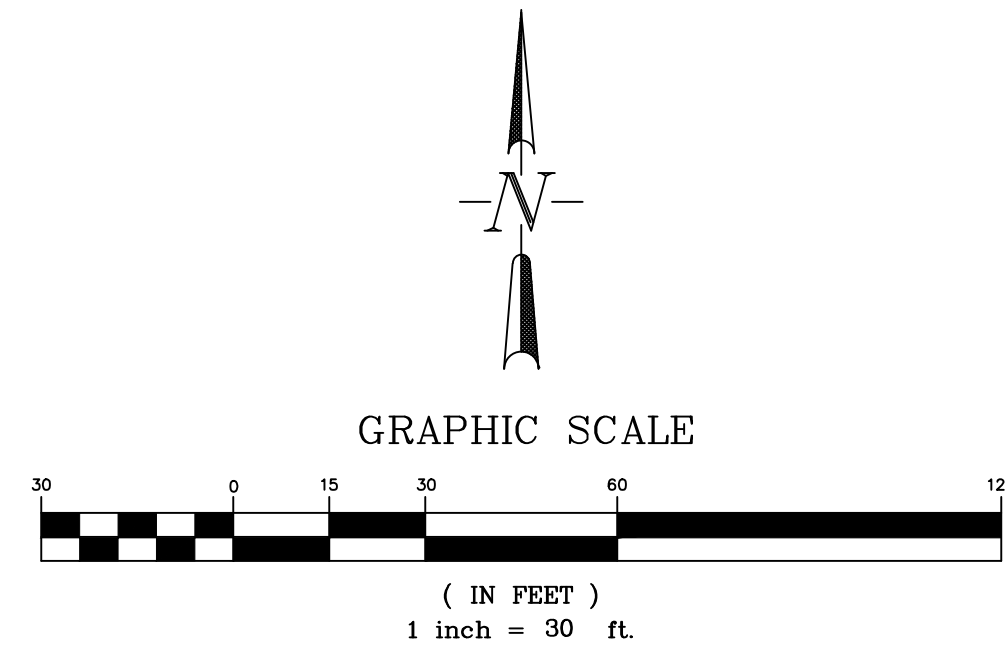
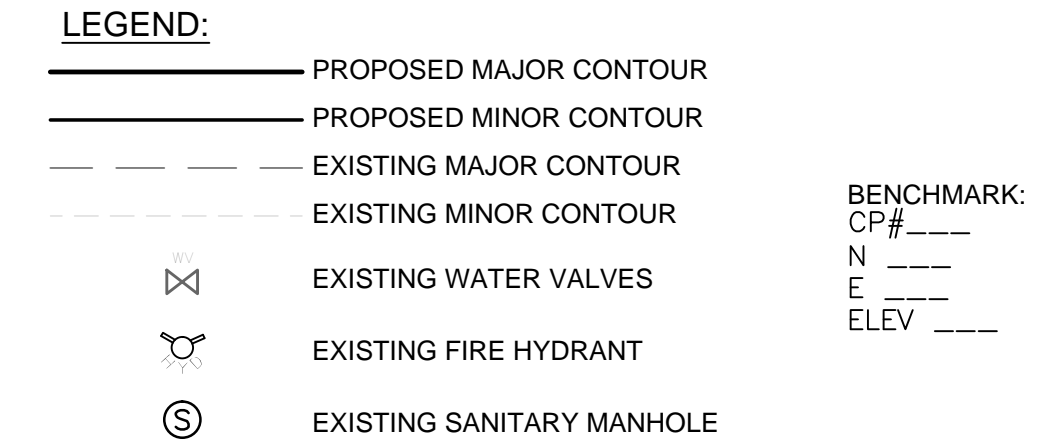




EXISTING CONDITIONS



PROPOSED CONDITIONS



DESIGNED BY: MAB  
PROJECT ENGINEER: MAB  
PROJECT MANAGER: MAB  
DATE: 10/06/17  
JOB NO: 170802  
CADD FILE NO: 170802-Drainage  
DRAWN BY: HJG  
SCALE: 1" = 30'  
VERT: XX" = XX'

PREPARED BY:  
**ADPcivIL**  
ENGINEERING FOR THE FUTURE  
3520 Ausin Bluffs Parkway  
Suite 102  
Colorado Springs, CO 80918  
(719) 266-5212  
fax: (719) 266-5341

NO.	DATE	REVISION	BY

**JACKSON OFFICE WAREHOUSE & STORAGE BLDGS**  
8140 SANDY COURT  
EL PASO COUNTY, COLORADO  
EXIST & DEVELOPED DRAINAGE PLAN

## **DRAINAGE MAPS**

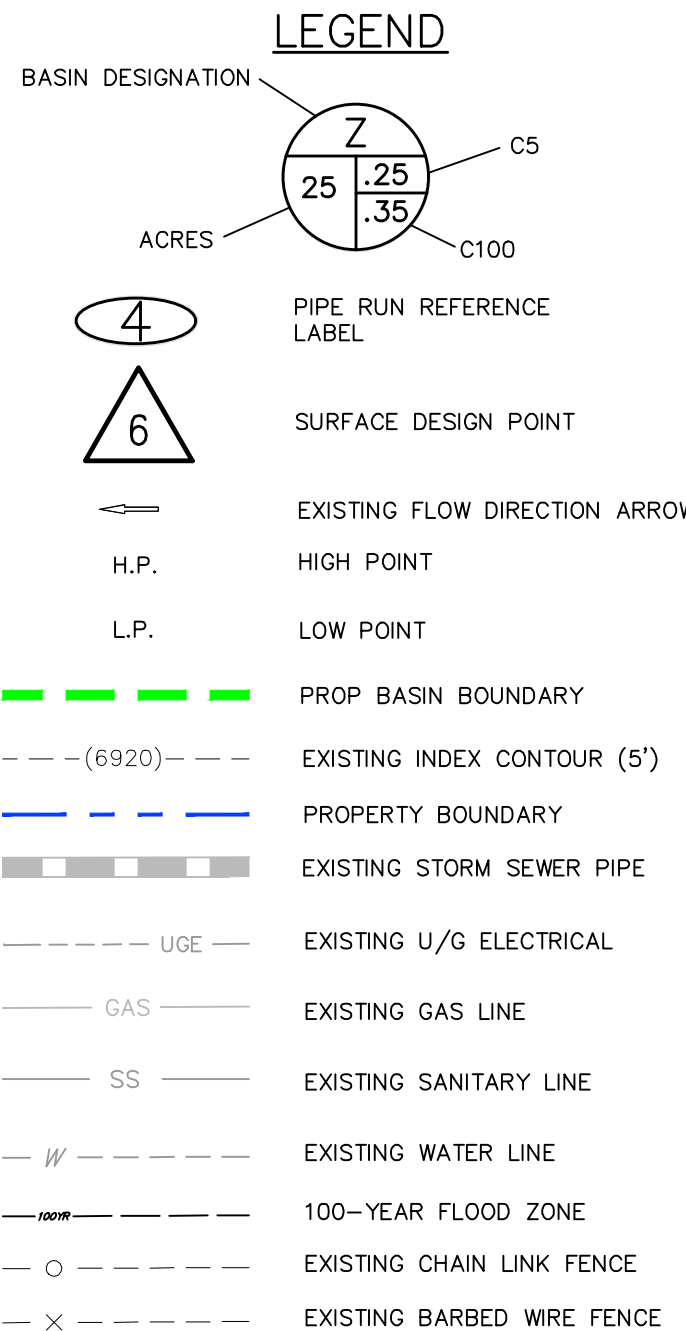


# LOTS 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

CITY OF COLORADO SPRINGS, STATE OF COLORADO

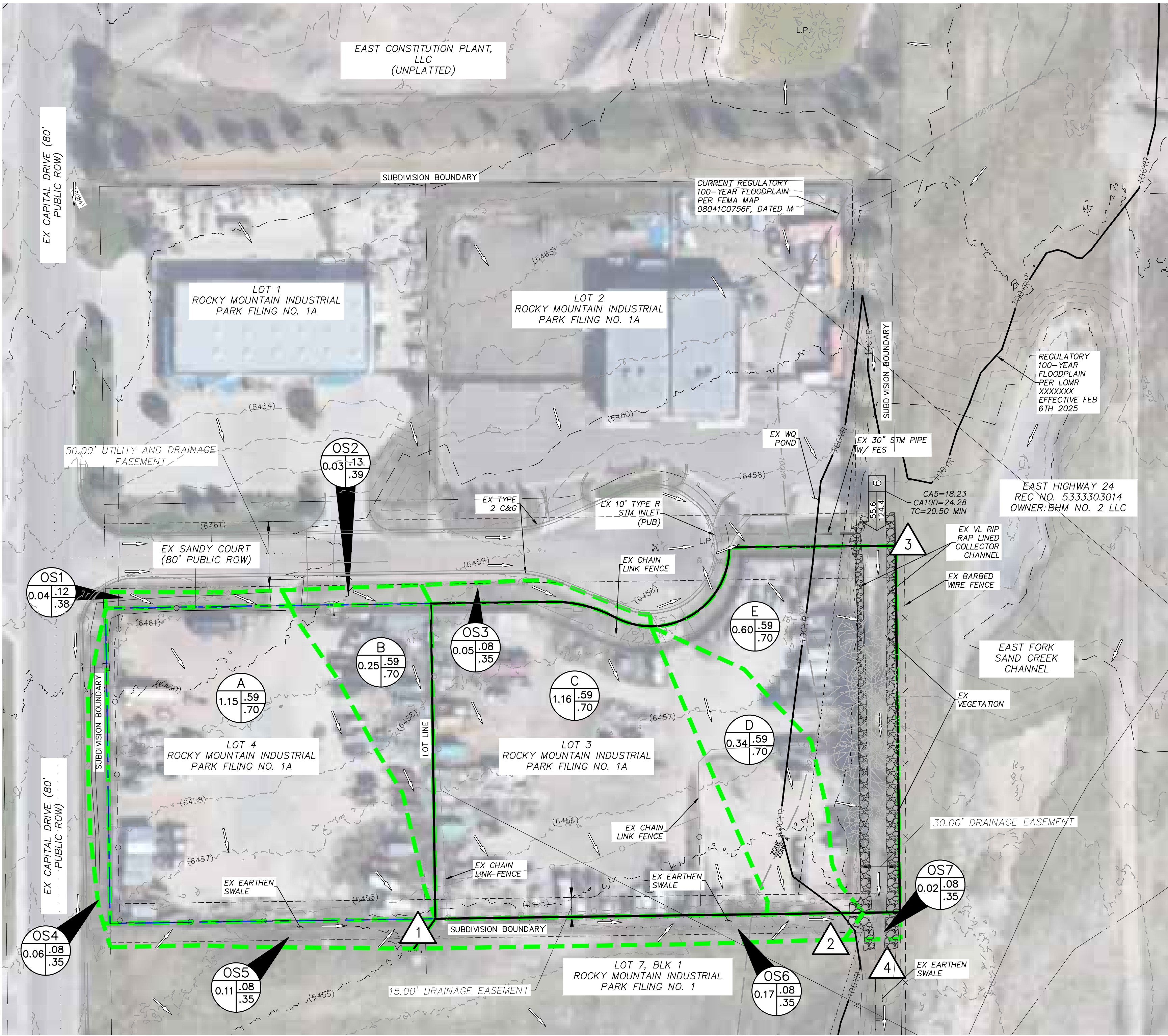
## EXISTING DRAINAGE MAP

JANUARY 2025



### ABBREVIATION LEGEND

CL CENTERLINE  
C&G CURB AND GUTTER  
EL ELEVATION  
CONST CONSTRUCTION  
STM STORM SEWER  
PUB PUBLIC  
EX/EXIST EXISTING  
STA STATION  
NTS NOT TO SCALE  
PROP PROPOSED  
SAN SANITARY SEWER  
PVT PRIVATE  
U/G UNDERGROUND  
FES FLARED END SECTION  
WQ WATER QUALITY  
PP POLYPROPYLENE PIPE  
ROW RIGHT OF WAY  
CDOT COLORADO DEPARTMENT OF TRANSPORTATION



BASIN SUMMARY				
BASIN	AREA (ACRES)	Q <sub>5</sub>	Q <sub>100</sub>	
A	1.15	3.1	6.2	
B	0.25	0.6	1.3	
C	1.16	3.1	6.1	
D	0.34	0.8	1.7	
E	0.60	1.2	2.6	
OS1	0.04	0.0	0.1	
OS2	0.03	0.0	0.1	
OS3	0.05	0.0	0.2	
OS4	0.06	0.0	0.2	
OS5	0.11	0.0	0.2	
OS6	0.17	0.0	0.3	
OS7	0.02	0.0	0.1	

DESIGN POINT SUMMARY			
DESIGN POINT	Q <sub>5</sub>	Q <sub>100</sub>	STRUCTURE
1	3.2	6.8	EX EARTHEN SWALE/SOUTH PL
2	7.7	16.3	EX EARTHEN SWALE/SOUTH PL
3	55.6	124.4	COMBINED FLOW AT NE CORNER/SWALE
4	57.1	126.9	COMBINED FLOW AT SE CORNER/SWALE

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PHONE: 719.955.5485

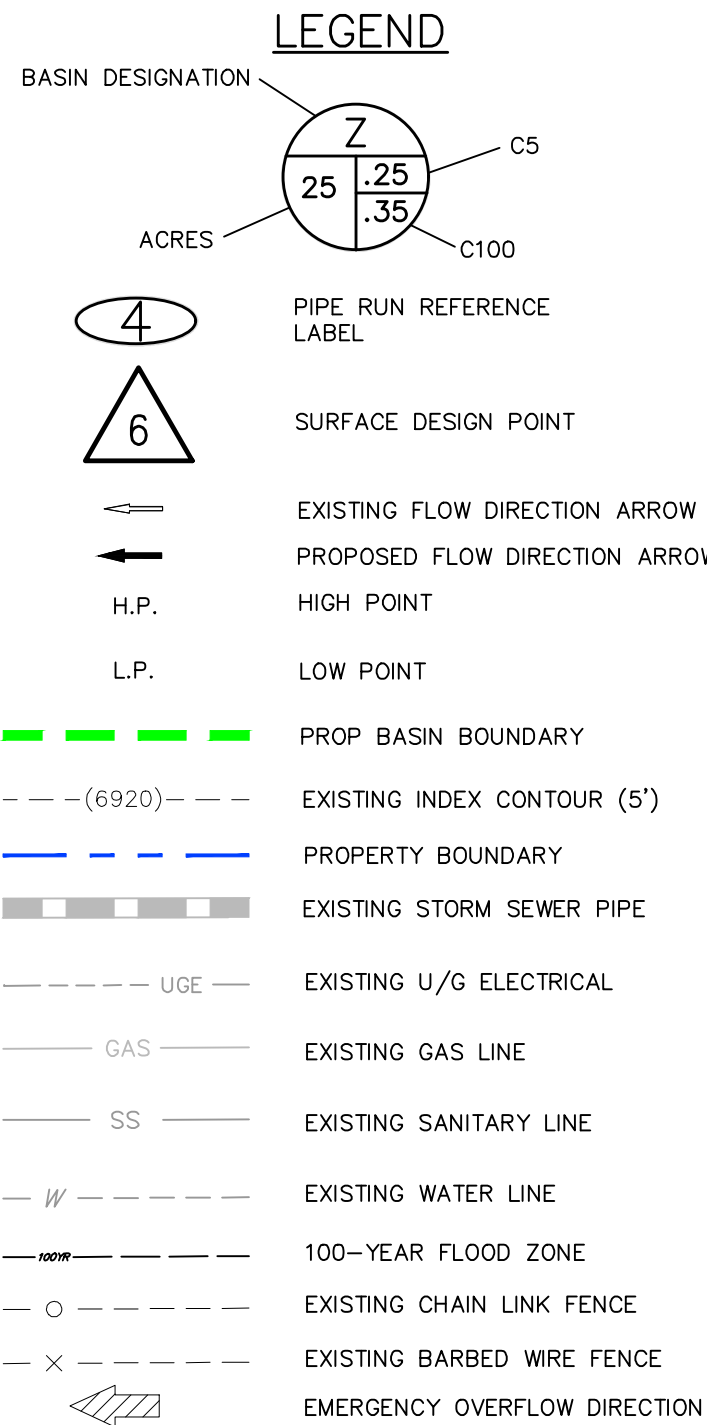
LOTS 3 & 4-ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A			
EXISTING DRAINAGE MAP			
PROJECT NO. 70-140	SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A	DATE: 12/05/2024	
DESIGNED BY: SPM	DRAWN BY: SPM	CHECKED BY: VAS	
SHEET 1 OF 1		EDM	



# LOTS 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

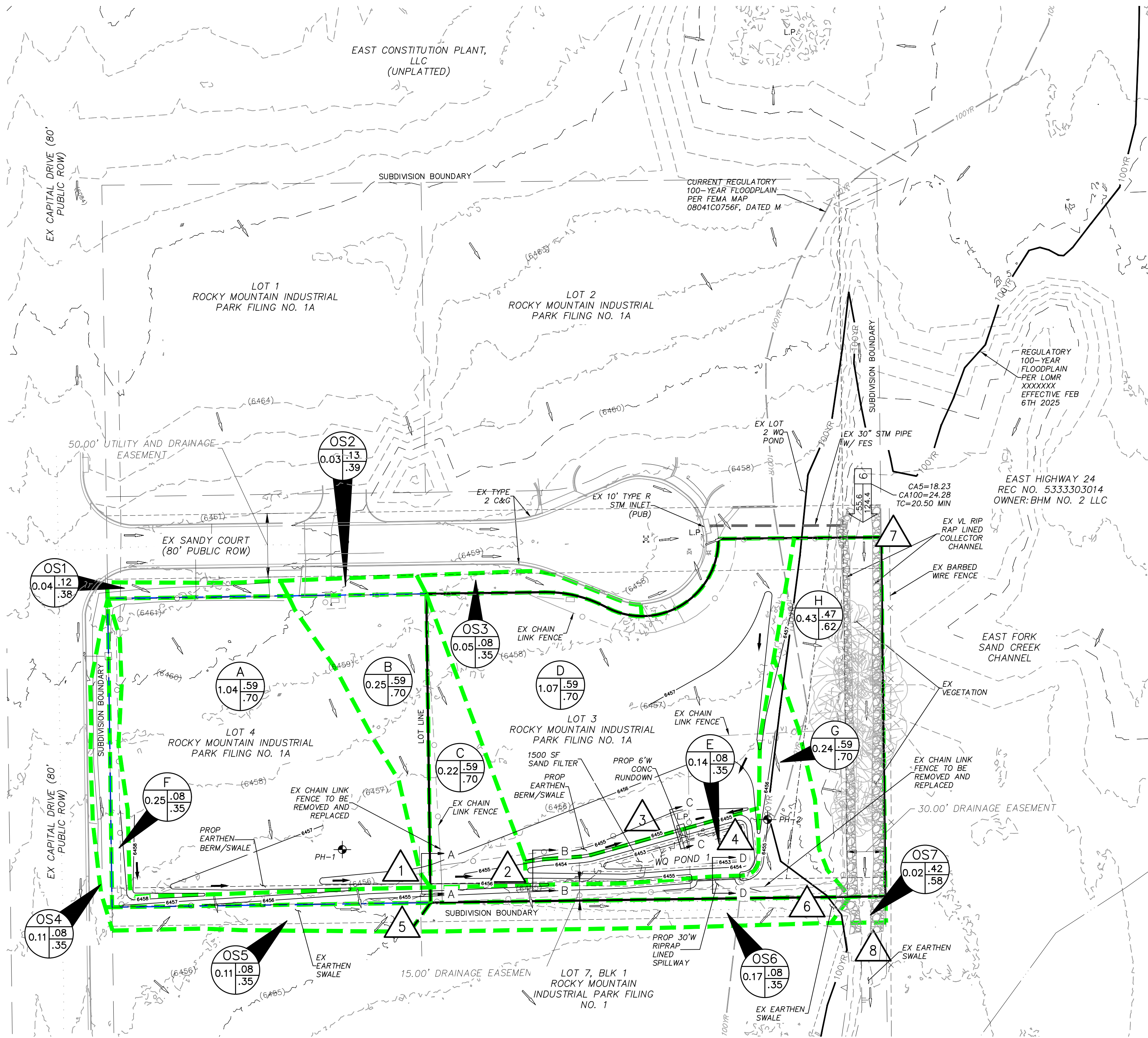
## CITY OF COLORADO SPRINGS, STATE OF COLORADO PROPOSED DRAINAGE MAP

JANUARY 2025



### ABBREVIATION LEGEND

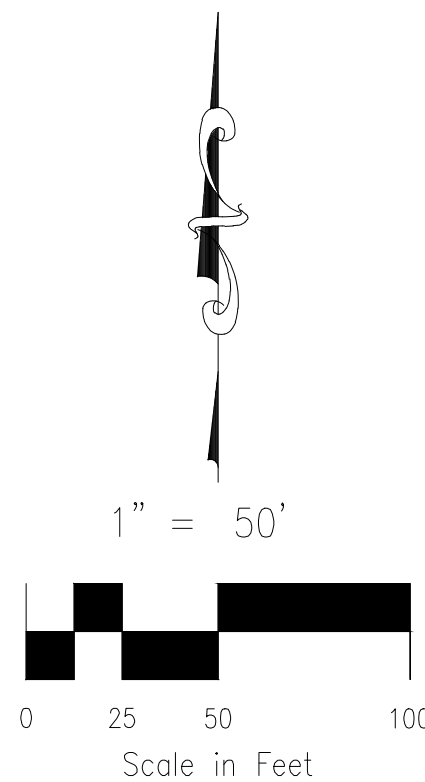
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C&G CURB AND GUTTER  
EL ELEVATION  
CONST CONSTRUCTION  
STM STORM SEWER  
PUB PUBLIC  
EX/EXIST EXISTING  
STA STATION  
NTS NOT TO SCALE  
PROP PROPOSED  
SAN SANITARY SEWER  
PVT PRIVATE  
U/G UNDERGROUND  
FES FLARED END SECTION  
WQ WATER QUALITY  
PP POLYPROPYLENE PIPE  
ROW RIGHT OF WAY  
CDOT COLORADO DEPARTMENT OF TRANSPORTATION



BASIN SUMMARY				
BASIN	AREA (ACRES)	Q <sub>s</sub>	Q <sub>100</sub>	
A	1.04	2.8	5.6	
B	0.25	0.6	1.3	
C	0.22	0.6	1.2	
D	1.07	2.8	5.5	
E	0.14	0.0	0.3	
F	0.11	0.0	0.2	
G	0.24	0.7	1.4	
H	0.43	0.8	1.9	
OS1	0.04	0.0	0.1	
OS2	0.03	0.0	0.1	
OS3	0.05	0.0	0.2	
OS4	0.06	0.0	0.2	
OS5	0.11	0.0	0.2	
OS6	0.17	0.0	0.3	
OS7	0.02	0.0	0.1	

POND 1 SAND FILTER WQCV POND DATA	
WQ WATER SURFACE EL = 6453.75	
WQ VOLUME = 0.058 AC-FT	
MAX 100-YR DEPTH = 1.71 FT	
MAX 100-YR WATER SURFACE EL = 6454.31	
100-YR VOLUME = 0.107 AC-FT	
SPILLWAY CREST EL = 6454.00	
TOP OF EMBANKMENT EL = 6455.36	
CALC 100-YR INFLOW 13.9 = CFS	
INFILTRATION RATE (AVG) = 1.9 IN/HR	

DESIGN POINT SUMMARY				
DESIGN POINT	Q <sub>s</sub>	Q <sub>100</sub>	BASIN(S)/ DESIGN PT(S)	STRUCTURE
1	2.8	5.7	OS1, A	PROP EARTHEN SWALE/BERM
2	3.9	7.9	DP1, OS2, B, C	PROP EARTHEN SWALE/BERM
3	2.8	5.6	OS3, D	CONCRETE CHASE/RUNDOWN
4	6.8	13.9	DP2, DP3, E	COMBINED FLOW AT SE CORNER (EX SWALE)
5	0.1	0.6	OS4, OS5, F	EXISTING EARTHEN SWALE
6	7.0	15.2	DP4, DP5, OS6, G	EXISTING EARTHEN SWALE AT SE CORNER
7	55.6	124.4	OFFSITE JOW FDR DP6	OFFSITE FLOW ABOVE LINED CHANNEL
8	56.7	126.5	DP6, DP7, H, OS7	COMBINED FLOW AT SE CORNER (EXISTING SWALE)



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PHONE: 719.955.5485

LOTS 3 & 4-ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A PROPOSED DRAINAGE MAP			
PROJECT NO. 70-140	SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A	DATE: 1/10/2025	
DESIGNED BY: SPM	DRAWN BY: SPM	CHECKED BY: VAS	
SHEET 1 OF 1			EDM

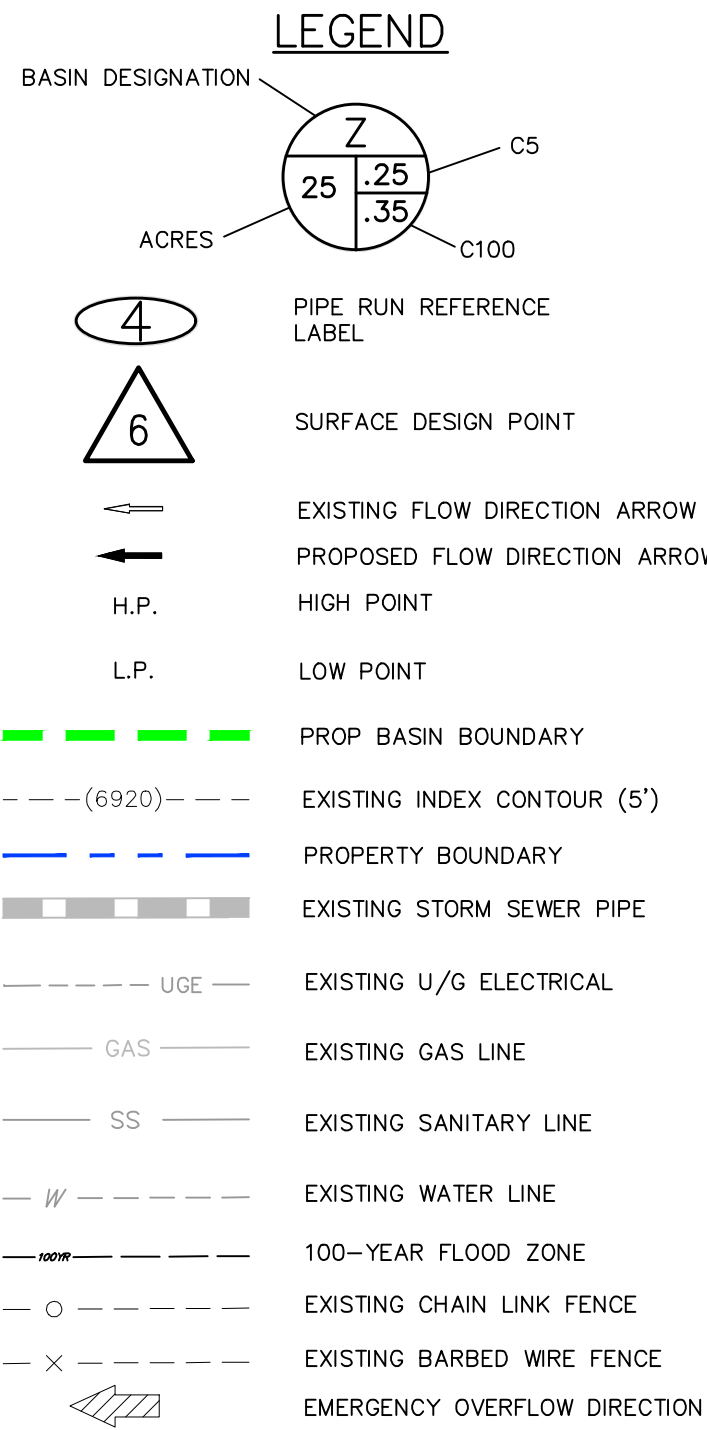


# LOTS 3 & 4 - ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A

CITY OF COLORADO SPRINGS, STATE OF COLORADO

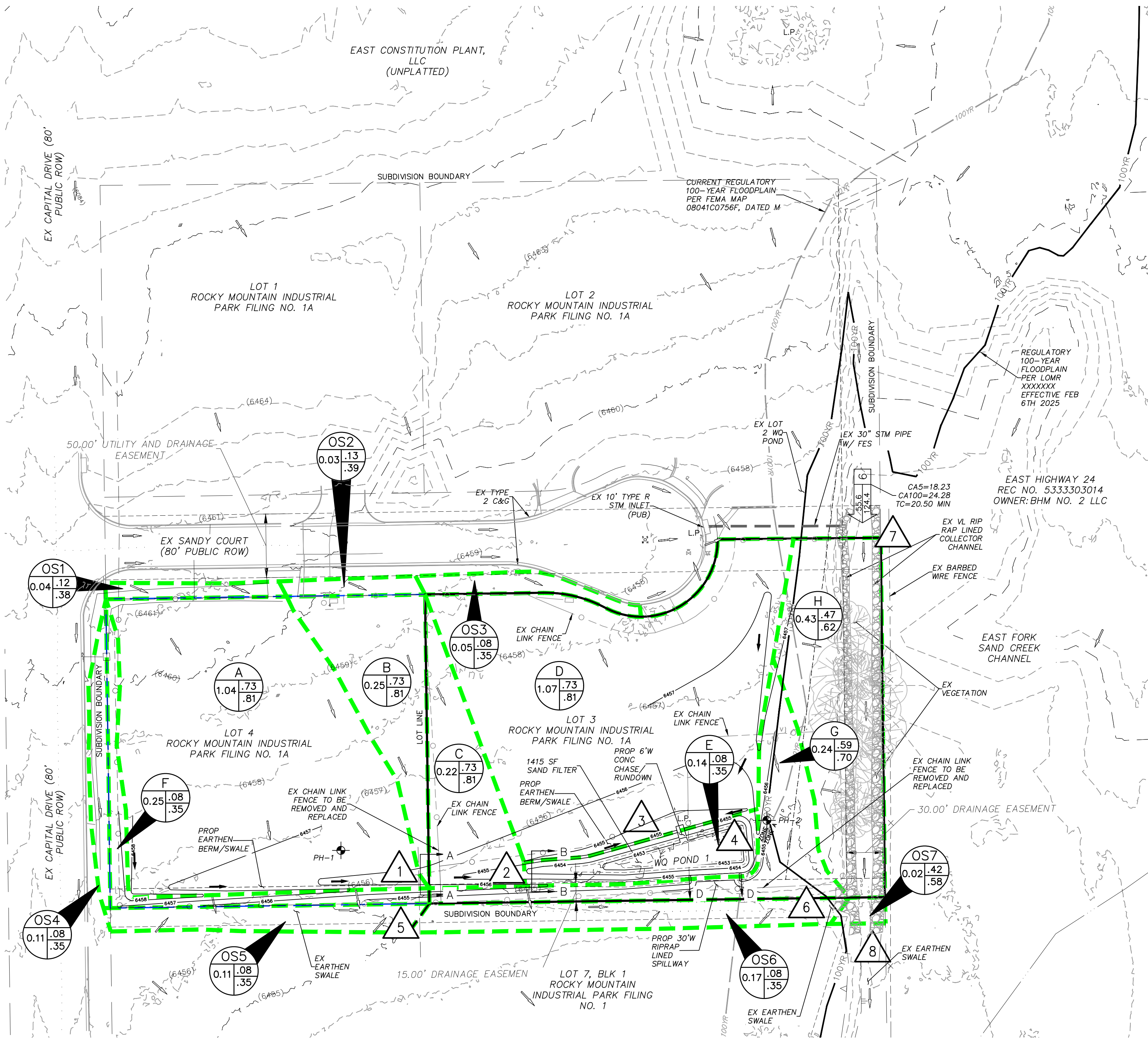
## FUTURE DRAINAGE MAP

JANUARY 2025



### ABBREVIATION LEGEND

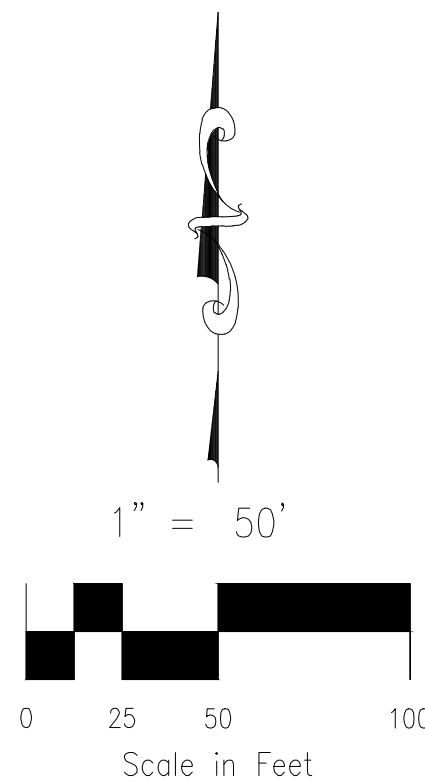
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C&G CURB AND GUTTER  
EL ELEVATION  
CONST CONSTRUCTION  
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EX/EXIST EXISTING  
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BASIN SUMMARY				
BASIN	AREA (ACRES)	Q <sub>s</sub>	Q <sub>100</sub>	
A	1.04	3.7	6.8	
B	0.25	0.9	1.6	
C	0.22	0.8	1.5	
D	1.07	3.6	6.8	
E	0.14	0.0	0.3	
F	0.11	0.0	0.2	
G	0.24	0.7	1.4	
H	0.43	0.8	1.9	
OS1	0.04	0.0	0.1	
OS2	0.03	0.0	0.1	
OS3	0.05	0.0	0.2	
OS4	0.06	0.0	0.2	
OS5	0.11	0.0	0.2	
OS6	0.17	0.0	0.3	
OS7	0.02	0.0	0.1	

POND 1 SAND FILTER WQCV POND DATA	
WQ WATER SURFACE EL = 6453.84	
WQ VOLUME = 0.064 AC-FT	
MAX 100-YR DEPTH = 1.76 FT	
MAX 100-YR WATER SURFACE EL = 6454.36	
100-YR VOLUME = 0.112 AC-FT	
SPILLWAY CREST EL = 6454.00	
TOP OF EMBANKMENT EL = 6455.36	
CALC 100-YR INFLOW 17.0 = CFS	
INFILTRATION RATE (AVG) = 1.9 IN/HR	

DESIGN POINT SUMMARY				
DESIGN POINT	Q <sub>s</sub>	Q <sub>100</sub>	BASIN(S)/ DESIGN PT(S)	STRUCTURE
1	3.7	7.0	OS1, A	PROP EARTHEN SWALE/BERM
2	5.0	9.5	DP1, OS2, B, C	PROP EARTHEN SWALE/BERM
3	3.7	6.9	OS3, D	CONCRETE CHASE/RUNDOWN
4	8.9	17.0	DP2, DP3, E	COMBINED FLOW AT SE CORNER (EX SWALE)
5	0.1	0.6	OS4, OS5, F	EXISTING EARTHEN SWALE
6	8.7	17.6	DP4, DP5, OS6, G	EXISTING EARTHEN SWALE AT SE CORNER
7	55.6	124.4	OFFSITE JOW FDR DP6	OFFSITE FLOW ABOVE LINED CHANNEL
8	57.7	127.8	DP6, DP7, H, OS7	COMBINED FLOW AT SE CORNER (EXISTING SWALE)



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LOTS 3 & 4-ROCKY MOUNTAIN INDUSTRIAL PARK FILING NO. 1A				
FUTURE DRAINAGE MAP				
PROJECT NO. 70-140	SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A	DATE: 1/10/2025		
DESIGNED BY: SPM	DRAWN BY: SPM	CHECKED BY: VAS	SHEET 1 OF 1	EDM