

REVISED

Final

EPC STORMWATER REVIEW COMMENTS ARE
SHOWN IN ORANGE BOXES WITH BLACK TEXT

NOTED

PRELIMINARY DRAINAGE REPORT FOR BRADLEY POINT FILING NO. 1

EL PASO COUNTY, COLORADO

PCD-ENGINEERING REVIEW COMMENTS
IN BLUE BOXES WITH BLUE TEXT

Engineering Review

04/02/2021 2:18:51 PM

dsdrice

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(719) 520-7877

EPC Planning & Community
Development Department

NOTED

December 2020

Prepared for:

NOTED

Stephen J. Schnurr
Bradley Point, LLC
2010 Fox Mountain Point
Colorado Springs, CO 80906
(719) 491-3101

See comment memo also.

Prepared by:



CIVIL CONSULTANTS, INC.

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Project #70-074

PCD Project # 70-XXX

MS-21-002

REVISED

**PRELIMINARY DRAINAGE REPORT FOR
BRADLEY POINT FILING NO. 1**

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.

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: _____
Stephen J. Schnurr

TITLE: _____

DATE: _____

ADDRESS: Stephen J. Schnurr
2010 Fox Mountain Point
Colorado Springs, CO 80906

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 Criteria Manual, as amended.

BY: _____ DATE: _____
Jennifer Irvine, P.E.
County Engineer / ECM Administrator

**PRELIMINARY DRAINAGE REPORT FOR
BRADLEY POINT FILING NO. 1**

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PRELIMINARY DRAINAGE REPORT FOR BRADLEY POINT FILING NO. 1

PURPOSE

This document is the Preliminary Drainage Report for Bradley Point Filing No. 1. The purpose of this document is to identify and analyze the on and offsite drainage patterns and to ensure that post development runoff is routed through the site safely and in a manner that satisfies the requirements set forth by the El Paso County Drainage Criteria Manual.

GENERAL LOCATION AND DESCRIPTION

“Bradley Point Filing No. 1” refers to the subdivision of two parcels, 6503-40-0038 and 6503-40-0040, which includes relocation of the existing subdividing lot line further south. Bradley Point Filing No. 1 is located within the southeast and northwest quarters of the southeast quarter of Section 3, Township 15 south, Range 66 West, of the 6th Principal Meridian, El Paso County, Colorado. The site boundary is defined by Highway 85/87 on the southwestern boundary, Parcel 1 of the Rocky Mountain Materials and Asphalt Exemption Plat Map – Rec. No. 211713132 on the northwestern boundary, A.T. & S.F. Railroad Right of Way on the northeastern boundary, and unplatted land – Book 2780, Page 119, Schedule No. 65112-00-001 on the southeastern boundary. Bradley Point Filing No. 1 lies within the Little Johnson Drainage Basin. Flows from this site are tributary to Fountain Creek.

Bradley Point Filing No. 1 consists of 9.74 acres and is presently undeveloped. Vegetation is sparse, consisting of native grasses. Existing site terrain generally slopes from northwest to southeast at grade rates that vary between 0.7% and 10.4%.

EXISTING ACCESS ROAD MENTIONED

Mention the existing access road.

Bradley Point Filing No. 1 is currently zoned M for industrial use, and is proposed to host materials storage, along with a surrounding fence and entrance gate. Additional improvements proposed for the site include paving for an internal access road to both lots and storm drainage improvements, as normally constructed for an industrial parking and materials storage development.

SOILS

Soils for this project are delineated by the Soils Map in the appendix as Blakeland Loamy Sand (8) and Nunn Clay Loam (59). Blakeland Loamy Sand is characterized as Hydrologic Soil Type "A", and comprises approximately 99.3% of the site. The remaining 0.7% on the southern corner of the site consists of the Nunn Clay Loam, which is characterized as Hydrologic Soil Group C. Soils in the study area are shown as mapped by S.C.S. in the "Soils Survey of El Paso County Area". Natural vegetation is sparse, consisting of native grasses and weeds over a majority of the site. Approximately one quarter of the site is covered with a semi-compacted base material. The site was treated this way through hydrologic analysis as a reasonable, conservative assumption.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

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.

FLOODPLAIN STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain as determined by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0744 G, effective date December 7th, 2018. A copy of this panel can be found in the appendix.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual, Volumes I & II, dated November 1991, including subsequent updates. El Paso County has also adopted Chapter 6 and Section 3.2.1 of Chapter 13 in the City of Colorado Springs & El Paso County Drainage Criteria Manual Volumes I and II, dated May 2014. (Appendix I of the El Paso County's Engineering Criteria Manual (ECM), 2008). In addition to the ECM, the Urban Storm Drainage Criteria Manuals, Volumes 1-3, published by the Urban Drainage and Flood Control District (Volumes 1 & 2 dated January 2016, Volume 3 dated November 2010 and updates). Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method.

EXISTING DRAINAGE CONDITIONS

The Bradley Point Filing No. 1 site consists of 9.74 acres and is situated east of the Fountain Creek Channel, on the southwestern side of the Little Johnson Drainage Basin. This area was previously studied in the "Little Johnson/Security Creek Drainage Basin Planning Study" (DBPS), dated April 1988, and prepared by Simons, LLI & Associates, Inc., in cooperation with Kiowa Engineering Corporation.

Design Point 1

Basin A consists of 4.82 undeveloped acres of moderately sparse natural grasses and vegetation, and is comprised of the northwestern half of this site. Runoff produced within **Basin A** is anticipated to reach peak runoff rates of $Q_5=3.5$ cfs and $Q_{100}=9.2$ cfs, and will flow east towards the design point, where it collects in a localized depression. Ponding effects were not considered in this analysis. From here, the runoff is considered to be directed east, entering **Basin B**.

Design Point 2

Basin B consists of 1.27 undeveloped acres of extremely sparse vegetation growing through a semi-compacted base material, and is centrally located within the site. Runoff produced within **Basin B** is anticipated to reach peak runoff rates of $Q_5=1.5$ cfs and $Q_{100}=3.5$ cfs, which will collect with runoff from **Design Point 1** to reach combined peak flow rates of $Q_5=4.8$ and $Q_{100}=12.0$ cfs. This flow naturally continues south towards the design point, where it collects in the roadside ditch and is redirected southeast towards downstream infrastructure.

Design Point 3

Basin C consists of 1.39 undeveloped acres, approximately 60% of which is extremely sparse vegetation growing through a semi-compacted base material, while the rest of the basin consists of moderately sparse natural grasses and vegetation. This basin is situated near the center of the site. Runoff produced within **Basin C** is anticipated to reach peak runoff rates of $Q_5=1.1$ cfs and $Q_{100}=2.9$ cfs, and will flow south towards the design point, where it will be redirected south east.

Design Point 4

D
REVISED

REVISED

southwest to roadside
ditch per routing?

Basin C consists of 1.82 undeveloped acres, approximately 30% of which is extremely sparse vegetation growing through a semi-compacted base material, while the rest of the basin consists of sparse natural grasses and vegetation. This basin is situated on the south eastern side of the site. Runoff produced within **Basin C** flows from north to south, collecting in a localized depression at the design point, and is anticipated to reach peak runoff rates of $Q_5=1.4$ cfs and $Q_{100}=3.7$ cfs.

Design Point 5

Basin E consists of approximately 1.00 acres of the northern half of existing Highway 85/87, located to the southwest of the site. Approximately half of this basin consists of an asphalt paved roadway surface, and the other half consists of sparse natural grasses and vegetation. Runoff produced within **Basin E** is anticipated to reach peak runoff rates of $Q_5=1.8$ cfs and $Q_{100}=4.0$ cfs, and will flow east where it will be redirected southeast towards the design point.

Design Point 6

Basin F consists of approximately 0.54 acres of the northern half of existing Highway 85/87, and is located on the south end of the site. A majority of this basin consists of an asphalt paved roadway surface, and the rest consists of sparse natural grasses and vegetation. Runoff produced within **Basin F** is anticipated to reach peak runoff rates of $Q_5=1.4$ cfs and $Q_{100}=2.6$ cfs. This flow will run east, and then will be redirected southeast towards the design point. At this point, the runoff will combine with flows from Design Point 2 and Design Point 5. This cumulative flow is expected to reach rates of $Q_5=8.0$ and $Q_{100}=19.2$ cfs.

Design Point 7

Basin G consists of approximately 1.13 acres of the northern half of existing Highway 85/87, located to the southwest of the site. Approximately half of this basin consists of an asphalt paved roadway surface, and the other half consists of sparse natural grasses and vegetation. Runoff produced within **Basin E** is anticipated to reach peak runoff rates of $Q_5=1.9$ cfs and $Q_{100}=4.1$ cfs. This flow will run east in order

to discharge into the existing roadside ditch. At this point, the runoff will combine with flows from Design Point 3 and Design Point 6, and will be redirected south east towards downstream infrastructure. This cumulative flow is expected to reach rates of Q5=9.0 and Q100=21.3 cfs.

FOUR STEP PROCESS

Step 1 Employ Runoff Reduction Practices. A reduced slope has been used to lower the flows on site. A gravel base material was also proposed as the ground cover to minimize directly connected impervious areas from the proposed paved road, and to promote infiltration.

Step 2 Implement BMPs that provide a water quality capture volume with slow release. – A Full Spectrum Detention Facility was planned to handle tributary flows for this site which will incorporate water quality capture volumes that are intended to slowly drain in 40 hours and excess urban runoff volumes that are intended to drain within 72 hours.

Step 3 Stabilize streams. – With the full spectrum detention facility in place, the runoff from the proposed industrial development will be reduced to predevelopment conditions. The developed discharge on and off the site is less than existing and, therefore, is not anticipated to have negative effects on downstream drainageways.

Step 4 Implement site specific and other source control BMPs. – The proposed project will use silt fences, vehicle tracking control pads, straw bale barriers, stabilized staging areas, outlet protection, and mulching and reseeded to mitigate the potential for erosion across the site and protect downstream waters.

REVISED SECTION

PROPOSED DRAINAGE CHARACTERISTICS

Please use the "Four-Step Process" for selecting structural BMPs as outlined in the ECM Section I.7.2 BMP Selection

General Concept Drainage Discussion

The following is a description of the onsite basins, offsite flows and the overall drainage characteristics for the development of Bradley Point Filing No. 1. The development for this project consists of a paved street and gravel storage area. Surface runoff is routed from the north side of the site to the detention pond at the south end of the site via over lot drainage, and a swale located on the southeastern end of the site. In the event of clogging or inlet failure at the detention pond's outlet structure, an emergency overflow route has been designed to convey runoff to the adjacent lot, at flow rates equal to or less than that of historic conditions.

← This appears to be a changed condition to a point discharge. See comment memo. REVISED

The following detailed drainage discussion provides an overview of the proposed development. Surface flow is designated as Design Points (DP). Captured flow within the storm sewer system is designated as Pipe Runs (PR).

Detailed Drainage Discussion (Design Points)

Design Point 1

Basin A consists of 2.85 acres of moderately sparse natural grasses and vegetation growing through gravel storage area, and is comprised of the northwestern half of this site. Runoff produced within **Basin**

The grading plan shows regrading - will this just be gravel?

7

REVISED

REVISED, CROSS PAN

how does it cross
the access road?

A is anticipated to reach peak runoff rates of $Q_5=2.1$ cfs and $Q_{100}=5.6$ cfs, and will flow from north to south towards the design point, where it collects in a proposed 10' bottom, grassed swale. The runoff is then directed south east towards downstream infrastructure.

REVISED, AGGREGATE BASE

Design Point 2

What is the proposed material?

Basin B consists of 5.88 acres, including a proposed paved road that makes up about 20% of the basin. Approximately half of this basin is extremely sparse vegetation growing through a moderately compacted base material, while the remaining area is gravel storage area. This basin is centrally located within the site. Runoff produced within **Basin B** is anticipated to reach peak runoff rates of $Q_5=5.6$ cfs and $Q_{100}=14.1$ cfs, which will collect with runoff from **Design Point 1** to reach combined peak flow rates of $Q_5=7.0$ and $Q_{100}=17.8$ cfs, at the proposed private 18" RCP storm sewer. This storm sewer will convey the flow collection south east under the pond's berm. A rip rap pad is located at the terminus of the storm sewer.

FSD Pond? REVISED, YES

Design Point 3

Basin C consists of 0.29 undeveloped acres of the berm surrounding the detention pond, and is comprised of moderately sparse natural grasses and vegetation. This basin is situated on the southern end of the site. Runoff from this basin begins at the top of the earthen berm of the detention pond and flows to the south to reach the bottom. This flow collects at the central point of the basin. Runoff produced within **Basin C** is anticipated to reach peak runoff rates of $Q_5=0.1$ cfs and $Q_{100}=0.5$ cfs, and will combine with flows from **PR A1** and **Design Point 4** at the rip rap at the design point, at rates of $Q_5=0.3$ and $Q_{100}=2.6$. This cumulative flow will be directed southeast, where it will exit the site. These rates are less than existing flows exiting the site near this point; therefore, downstream infrastructure will not be affected.

REVISED
REVISED TO ADD LEVEL SPREADER

Design Point 4

but the manner of discharge is being
changed to a point discharge

Basin E consists of approximately 1.10 acres of the northern half of existing Highway 85/87, located to the southwest of the site. Approximately half of this basin consists of an asphalt paved roadway surface, and the other half consists of sparse natural grasses and vegetation. Runoff produced within **Basin E** is anticipated to reach peak runoff rates of $Q_5=2.0$ cfs and $Q_{100}=4.5$ cfs, and will flow east from the crown of the road where it discharges into the existing roadside ditch, which will redirect the flow southeast towards the design point. From here, the runoff will continue southeast.

Design Point 5

Basin F consists of approximately 0.68 acres of the northern half of existing Highway 85/87, and is located on the south end of the site. A majority of this basin consists of an asphalt paved roadway surface, and the rest consists of sparse natural grasses and vegetation. Runoff produced within **Basin F** is anticipated to reach peak runoff rates of $Q_5=1.6$ cfs and $Q_{100}=3.3$ cfs. This flow will run east from the crown of the road in order to discharge into the existing roadside ditch. At this point, the runoff will combine with flows from **Design Point 5** and will be redirected south east. This cumulative flow is expected to reach rates of $Q_5=3.6$ and $Q_{100}=7.7$ cfs.

REVISED — continue?

Design Point 6

Basin G consists of approximately 0.90 acres of the northern half of existing Highway 85/87, located to the southwest of the site. Approximately half of this basin consists of an asphalt paved roadway surface, and the other half consists of sparse natural grasses and vegetation. Runoff produced within **Basin G** is anticipated to reach peak runoff rates of $Q_5=2.2$ cfs and $Q_{100}=4.4$ cfs. This flow will run east from the crown of the road in order to discharge into the existing roadside ditch. At this point, the runoff will combine with flows from **Design Point 6**, and will be redirected south east. This cumulative flow is expected to reach rates of $Q_5=4.7$ and $Q_{100}=9.9$ cfs.

CONVEYANCE ADDRESSED

Address
conveyance - ditch
or sheet flow?

WATER QUALITY

A Private Full Spectrum Detention (FSD) Pond is being proposed for this site in order to reduce the fully developed flows from the site to pre-development levels and address water quality. The pond has been sized utilizing MHFD v4.0 from Urban Drainage and Flood Control District (UDFCD). The pond is being constructed with an outlet control structure which limits the release rate of the pond through the use of orifices, weirs, and a restrictor plate placed before a proposed public 18" RCP outlet pipe. The pond has been sized to store the WQCV, EURV, and the flood control volumes for the 2, 5, 10, 25, 50, and 100 year storm events. The WQCV will be slowly released over 40 hours. The 100 year will drain in less than 120 hours. The maximum 100-Yr storage volume is 0.424 acre-feet. Watershed imperviousness is 33.3%. An overflow emergency weir is proposed along the southern embankment to safely convey flows to the directly adjacent U-Haul Neighborhood Dealer parcel in the event of outlet clogging, at rates lower than historic conditions provide. The emergency overflow weir will be situated at a crest elevation of 5781.34 feet and will have a crest length of 30 feet, and a spillway design flow depth of 0.35 feet. This overflow weir will contain permanent erosion control fabric as reinforcement.

EROSION CONTROL

REVISED

REVISED Gravel is 80%,
plus pavement

It is the policy of the City of Colorado Springs that M&S Civil Consultants, Inc submits an erosion control plan with the drainage report. Proposed straw bale barriers, silt fence, vehicle traffic control, a sediment basin, permanent erosion control fabric, and reseeding are proposed as erosion control measures. The proposed development will not adversely impact the existing surrounding industrial infrastructure.

CONSTRUCTION COST OPINION – SOUTH PLANT 85/87

Drainage Facilities:

Item	Description	Quantity	Unit Cost	Cost
1.	18" ADS HP Pipe	50 LF	\$50 /LF	\$2,500.00
2.	FSD/WQ Pond	1 EA	\$15,000 /EA	\$15,000
Total \$				\$17,500

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2020.

DRAINAGE & BRIDGE FEES – BRADLEY POINT FILING NO. 1

This site is within the Little Johnson Drainage Basin. The 2020 Drainage and Bridge Fees per El Paso County for the Bradley Point Filing No. 1 site are as follows:

2021 REVISED

Per Bradley Point Filing No. 1 Site Boundary – Total Area

9.74 Acres

(no bridge fees)
REVISED

these need to be based on the
ultimate use of the property. REVISED IMPERVIOUSNESS
Gravel and paving , except for the
FSD pond area. REVISED \$12,048

BRADLEY POINT FILING NO. 1 FEES:

Drainage Fees:	9.74	x	33.3%	x	\$13,902	=	\$	45,090.02
Pond Land Fees:	9.74	x	33.3%	x	\$8,057	=	\$	26,132.23
Total								\$ 71,222.25

It should be noted that these fees are provided in this Preliminary Drainage Report for informational purposes only.

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2020.

SUMMARY

Development of this site will not adversely affect the surrounding developments per this final drainage report. The proposed drainage facilities will adequately convey, detain and route runoff from tributary and onsite flows to the Fountain Creek Drainage Channel via proposed onsite improvements. A Full Spectrum Detention pond will be used to discharge developed flows into Fountain Creek per the Urban Drainage criteria flow rates, which are at or less than the historic flow. Care will be taken during construction to accommodate overland flow routes onsite and temporary drainage conditions. Overall, the development of the Bradley Point Filing No. 1 project shall not adversely affect adjacent or downstream property.

REVISED adjoining
property?

El Paso County Drainage Basin Fees

Resolution No. 20-424

Basin Number	Receiving Waters	Year Studied	Drainage Basin Name	2021 Drainage Fee (per Impervious Acre)	2021 Bridge Fee (per Impervious Acre)
<u>Drainage Basins with DBPS's:</u>					
CHMS0200	Chico Creek	2013	Haegler Ranch	\$11,113	\$1,640
CHWS1200	Chico Creek	2001	Bennett Ranch	\$12,441	\$4,772
CHWS1400	Chico Creek	2013	Falcon	\$31,885	\$4,380
FOFO2000	Fountain Creek	2001	West Fork Jimmy Camp Creek	\$13,524	\$4,001
FOFO2600	Fountain Creek	1991*	Big Johnson / Crews Gulch	\$19,752	\$2,551
FOFO2800	Fountain Creek	1988*	Widefield	\$19,752	\$0
FOFO2900	Fountain Creek	1988*	Security	\$19,752	\$0
FOFO3000	Fountain Creek	1991*	Windmill Gulch	\$19,752	\$296
FOFO3100 / FOFO3200	Fountain Creek	1988*	Carson Street / Little Johnson	\$12,048	\$0

REFERENCES

- 1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual, Vol I & II".
- 2.) "Urban Storm Drainage Criteria Manuals, Volumes 1-3"
- 3.) NRSC Web Soil Survey Map for El Paso County. <http://websoilsurvey.nrcs.usda.gov>
- 4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date December 7th, 2018.
- 5.) "Little Johnson/Security Creek Drainage Basin Planning Study" (DBPS), dated April 1988 prepared by Simons, LLI & Associates, Inc., in cooperation with Kiowa Engineering Corporation

APPENDIX

VICINITY MAP

SOILS MAP

FIRM PANEL

HYDROLOGIC CALCULATIONS

HYDRAULIC CALCULATIONS

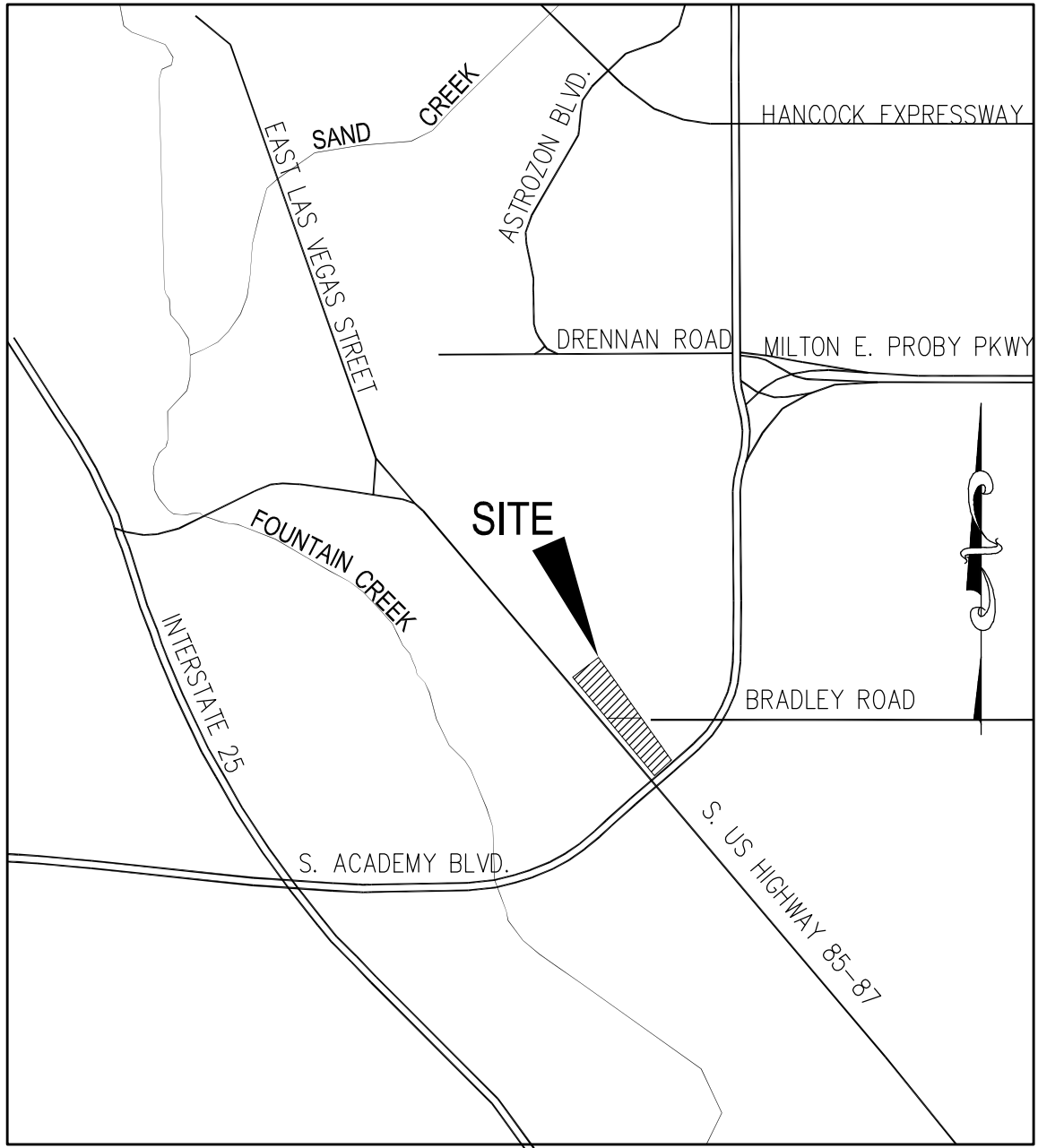
EXISTING DRAINAGE MAP

PROPOSED DRAINAGE MAP

GRADING AND EROSION CONTROL PLANS

APPENDIX

VICINITY MAP



VICINITY MAP

N.T.S.

SOILS MAP


Hydrologic Soil Group—El Paso County Area, Colorado (South Plant 85/87)



Hydrologic Soil Group—El Paso County Area, Colorado
(South Plant 85/87)

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 18, Jun 5, 2020

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	11.2	99.3%
59	Nunn clay loam, 0 to 3 percent slopes	C	0.1	0.7%
Totals for Area of Interest			11.3	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FIRM PANEL

HYDROLOGIC CALCULATIONS

BRADLEY POINT FILING NO. 1

EXISTING CONDITIONS DRAINAGE CALCULATIONS

(Area Runoff Coefficient Summary)

BASIN	STREETS/DEVELOPED		GRAVEL STORAGE AREA			UNDEVELOPED/LANDSCAPE			RUNOFF COEFFICIENT	
	TOTAL AREA (SF)	TOTAL AREA (Acres)	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
A	210004.2499	4.82	0.07	0.90	0.96	4.75	0.26	0.41	0.08	0.35
B	55366.9622	1.27	0.20	0.90	0.96	1.07	0.26	0.41	0.08	0.35
C	60412.5405	1.39	0.00	0.90	0.96	1.39	0.26	0.41	0.08	0.35
D	79161.6725	1.82	0.00	0.90	0.96	1.82	0.26	0.41	0.08	0.35
E	43453.8094	1.00	0.50	0.90	0.96	0.00	0.26	0.41	0.08	0.35
F	19702.8045	0.45	0.35	0.90	0.96	0.00	0.26	0.41	0.08	0.35
G	28387.025	0.65	0.49	0.90	0.96	0.00	0.26	0.41	0.08	0.35

Calculated by: CVW

Date: 11/12/2020

Checked by: VAS

BRADLEY POINT FILING NO. 1

EXISTING CONDITIONS DRAINAGE CALCULATIONS

(Area Drainage Summary)

From Area Runoff Coefficient Summary					OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T _t)		INTENSITY *			TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C _s	C ₁₀₀		C _s	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	CHECK (min)	I _s (in/hr)	I ₁₀₀ (in/hr)	Q _s (cfs)	Q ₁₀₀ (cfs)	
			From DCM Table 5-1																
A	4.82	0.27	0.42	0.50	0.27	100	2.75	10.7	613	0.9%	0.7	15.1	25.8	14.0	2.7	4.5	3.5	9.2	
B	1.27	0.36	0.50		0.36	100	1.6	11.4	316	0.9%	1.0	5.5	16.9	12.3	3.3	5.6	1.5	3.5	
C	1.39	0.26	0.41		0.26	100	1.4	13.6	417	1.1%	1.1	6.6	20.1	12.9	3.1	5.2	1.1	2.9	
D	1.82	0.26	0.41		0.26	100	1.98	12.1	470	1.3%	0.8	9.7	21.8	13.2	3.0	5.0	1.4	3.7	
E	1.00	0.49	0.66		0.49	100	0.96	11.1	525	0.3%	0.8	10.8	21.9	13.5	3.7	6.2	1.8	4.0	
F	0.45	0.71	0.82		0.71	75	1.06	5.4	298	0.7%	1.3	4.0	9.3	12.1	4.2	7.1	1.4	2.6	
G	0.65	0.70	0.81		0.70	100	1.34	6.6	406	0.6%	1.1	5.9	12.5	12.8	3.8	6.4	1.7	3.4	

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

Calculated by: CVW

Date: 11/12/2020

Checked by: VAS

please be sure and check intensity formula if you expand and add columns!!!

BRADLEY POINT FILING NO. 1

EXISTING CONDITIONS DRAINAGE CALCULATIONS

(Basin Routing Summary)

From Area Runoff Coefficient Summary									
DESIGN POINT	CONTRIBUTING BASINS/PIPES		OVERLAND			PIPE / CHANNEL FLOW			COMMENTS
	CA _s	CA ₁₀₀	C _s	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	
1	1.30	2.02				25.8			LOCALIZED DEPRESSION
2	1.76	2.65				25.8			
3	0.36	0.57				20.1			
4	0.47	0.75				21.8			LOCALIZED DEPRESSION
5	0.49	0.65				13.5			
6	2.57	3.67				19.7			
7	3.39	4.77				19.7			EXISTING ROADSIDE DITCH

BRADLEY POINT FILING NO. 1

PROPOSED CONDITIONS DRAINAGE CALCULATIONS

(Area Runoff Coefficient Summary)

BASIN	TOTAL AREA (SF)	TOTAL AREA (Acres)	STREETS/DEVELOPED			GRAVEL STORAGE AREA			UNDEVELOPED/LANDSCAPE			RUNOFF COEFFICIENT	
			AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
A	124119	2.85	0.03	0.90	0.96	2.82	0.26	0.41	0.00	0.09	0.36	0.27	0.42
B	256008.6	5.88	0.31	0.90	0.96	5.57	0.26	0.41	0.00	0.09	0.36	0.29	0.44
C	12709.5	0.29	0.00	0.90	0.96	0.00	0.26	0.41	0.29	0.09	0.36	0.09	0.36
E	47916	1.10	0.56	0.90	0.96	0.00	0.26	0.41	0.54	0.09	0.36	0.50	0.67
F	29795	0.68	0.43	0.90	0.96	0.00	0.26	0.41	0.25	0.09	0.36	0.60	0.74
G	39363	0.90	0.62	0.90	0.96	0.00	0.26	0.41	0.28	0.09	0.36	0.65	0.77

Calculated by: CVW

Date: 11/19/2020

Checked by: VAS

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Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

BRADLEY POINT FILING NO. 1

PROPOSED CONDITIONS DRAINAGE CALCULATIONS

(Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T _t)		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C _s	C ₁₀₀	C _s	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	CHECK (min)	I _s (in/hr)	I ₁₀₀ (in/hr)	Q _s (cfs)	Q ₁₀₀ (cfs)
			From PCM Table 5-1														
<i>A</i>	2.85	0.27	0.42	0.27	100	2	12.0	665	0.9%	0.9	11.9	23.9	14.3	2.8	4.7	2.1	5.6
<i>B</i>	5.88	0.29	0.44	0.29	100	1.6	12.5	316	0.9%	1.0	5.5	18.0	12.3	3.3	5.5	5.6	14.1
<i>C</i>	0.29	0.09	0.36	0.09	100	1.4	16.3	417	1.1%	0.7	9.4	25.7	12.9	2.7	4.6	0.1	0.5
<i>E</i>	1.10	0.50	0.67	0.50	100	1.47	9.5	525	0.2%	0.7	13.1	22.6	13.5	3.7	6.2	2.0	4.5
<i>F</i>	0.68	0.60	0.74	0.60	100	1.28	8.3	287	0.6%	1.2	4.0	12.2	12.2	3.8	6.4	1.6	3.3
<i>G</i>	0.90	0.65	0.77	0.65	100	1.34	7.4	406	0.5%	1.0	6.6	14.1	12.8	3.8	6.3	2.2	4.4

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

Calculated by: CVW

Date: 11/19/2020

Checked by: VAS

please be sure and check intensity formula if you expand and add columns!!!

BRADLEY POINT FILING NO. 1

PROPOSED CONDITIONS DRAINAGE CALCULATIONS

(Basin Routing Summary)

From Area Runoff Coefficient Summary																
DESIGN POINT	CONTRIBUTING BASINS/PIPES	CA _s	CA ₁₀₀	OVERLAND				PIPE / CHANNEL FLOW			Time of Travel (T _T)		TOTAL FLOWS		COMMENTS	
		CA _s	CA ₁₀₀	Length (ft)	Height (ft)	T _c (min)	Length (ft)	Slope (%)	Velocity (fps)	T _t (min)	TOTAL (min)	I _s	I ₁₀₀	Q _s (cfs.)		Q ₁₀₀ (cfs.)
												I _s (in/hr)	I ₁₀₀ (in/hr)			
1	Basin A	0.76	1.19			23.9					23.9	2.8	4.7	2.1	5.6	10' BOTTOM GRASSSED SWALE
				Basin A Tc was used												
2	Basin B Design Point 1	2.49	3.77			23.9					23.9	2.8	4.7	7.0	17.8	18" RCP- STORM SEWER
				Design Point 1 Tc was used												
3	Basin C PRA1 (Design Point 2)	0.10 0.03	0.54 0.44			23.9					23.9	2.8	4.7	0.3	2.6	RIP R/LP PAD
				Design Point 2 Tc was used												
4	Basin E	0.55	0.73			13.5					13.5	3.7	6.2	2.0	4.5	
				Basin E Tc was used												
5	Basin F Design Point 4	0.97 0.55	1.24 0.73			13.5					13.5	3.7	6.2	3.6	7.7	
				Design Point 4 Tc was used												
6	Basin G Design Point 6	1.55 0.97	1.94 1.24			13.5					20.5	3.1	5.1	4.7	9.9	EXISTING ROADSIDE DITCH
				Design Pt 6 Tc was used												

HYDRAULIC CALCULATIONS

BRADLEY POINT FILING NO. 1
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

PIPE RUN	Contributing Pipes/Design	Equivalent CA_5	Equivalent CA_{100}	Maximum T_c	Intensity*		Flow	
					I_5	I_{100}	Q_5	Q_{100}
PRA1	DESIGN POINT 2	REFER TO "Prelim Pond Sizing, Outlet Structure" SHEET PEAK OUTFLOW			3.2	5.4	0.1	2.4

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

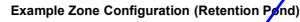
Calculated by: CVW

Date: 11/19/2020

Checked by: VAS

MHFD-Detention, Version 4.03 (May 2020)

Basin ID: Pond 1



Initial Surge Area (A_{ISV}) =	user	ft ²
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{LFLOOR}) =	user	ft
Length of Basin Floor (L_{LFLOOR}) =	user	ft
Width of Basin Floor (W_{LFLOOR}) =	user	ft
Area of Basin Floor (A_{LFLOOR}) =	user	ft ²
Volume of Basin Floor (V_{LFLOOR}) =	user	ft ³
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft ²
Volume of Main Basin (V_{MAIN}) =	user	ft ³
culated Total Basin Volume (V_{TOTAL}) =	user	acre-feet

REVISED

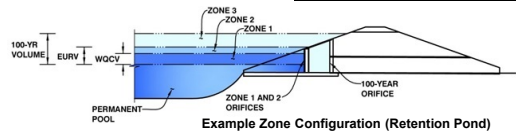
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Bradley Point Filing No. 1

Basin ID: Pond 1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.30	0.121	Orifice Plate
Zone 2 (EURV)	2.78	0.187	Orifice Plate
Zone 3 (100+1/2WQCV)	3.24	0.306	Weir&Pipe (Restrict)
Total (all zones)		0.613	

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
Underdrain Orifice Diameter = inches

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = inches

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.94	1.88					
Orifice Area (sq. inches)	0.40	0.40	1.05					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

Calculated Parameters for Vertical Orifice

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % = %
Debris Clogging % = %

Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area = ft²
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

Calculated Parameters for Overflow Weir

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = feet
Spillway End Slopes = H:V
Freeboard above Max Water Surface = feet

Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

Calculated Parameters for Spillway

Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
One-Hour Rainfall Depth (in) =	0.121	0.307	0.117	0.168	0.215	0.363	0.504	0.695	1.113
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.117	0.168	0.215	0.363	0.504	0.695	1.113
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.0	0.1	0.1	1.0	2.1	3.5	6.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.12	0.23	0.39	0.72
Peak Inflow Q (cfs) =	N/A	N/A	0.8	1.2	1.5	2.8	4.0	5.6	8.9
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	1.0	2.4	6.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.6	0.1	0.5	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.2	0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	69	38	47	55	77	76	74	69
Time to Drain 99% of Inflow Volume (hours) =	40	72	40	50	58	81	82	81	79
Maximum Ponding Depth (ft) =	2.30	2.78	2.22	2.40	2.52	2.84	2.92	2.99	3.07
Area at Maximum Ponding Depth (acres) =	0.27	0.52	0.23	0.32	0.38	0.54	0.58	0.62	0.69
Maximum Volume Stored (acre-ft) =	0.122	0.311	0.102	0.149	0.194	0.337	0.382	0.424	0.476

BRADLEY POINT FILING NO. 1
EMERGENCY SPILLWAY CALCULATIONS FSD POND 1

Horizontal Broad-Crested Weir (Eqn 12-20 UDFCD)				
Variable			Solve For	
<i>C</i>	3.00		L (ft)	H (ft) Q (cfs)
<i>L</i>	30.00	ft	0.0	0.0 18.6
<i>H</i>	0.35	ft		
<i>Q</i>		cfs		

Sloping Broad-Crested Weir (Eqn 12-21 UDFCD)				
Variable			Solve For	
<i>C</i>	3.00		Z (ft)	H (ft) Q (cfs)
<i>Z</i>	2.00	ft	0.0	0.0 0.2
<i>H</i>	0.35	ft		
<i>Q</i>		cfs		

Total <i>Q</i>	18.98
100-yr Emergency Spillway Crest Elev.	5781.34
100-yr Emergency Spillway W.S Elev.	5781.69
Top of Embankment Elev.	5783.00
Freeboard Provided (ft.)	1.31

Equation 12-20

$$Q = C_{BCW} L H^{1.5}$$

Where:

Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

L = broad-crested weir length (ft)

H = head above weir crest (ft)

Equation 12-21

$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5}$$

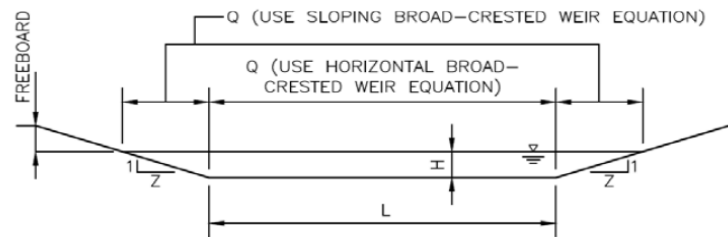


Figure 12-20. Sloping broad-crest weir

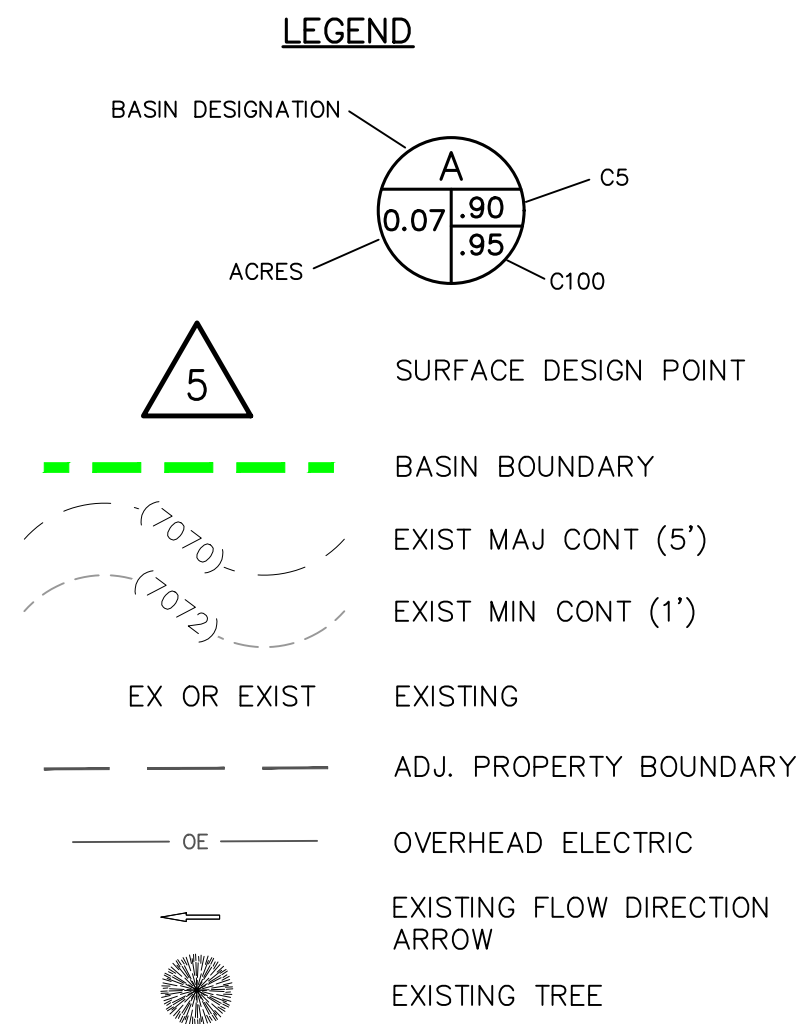
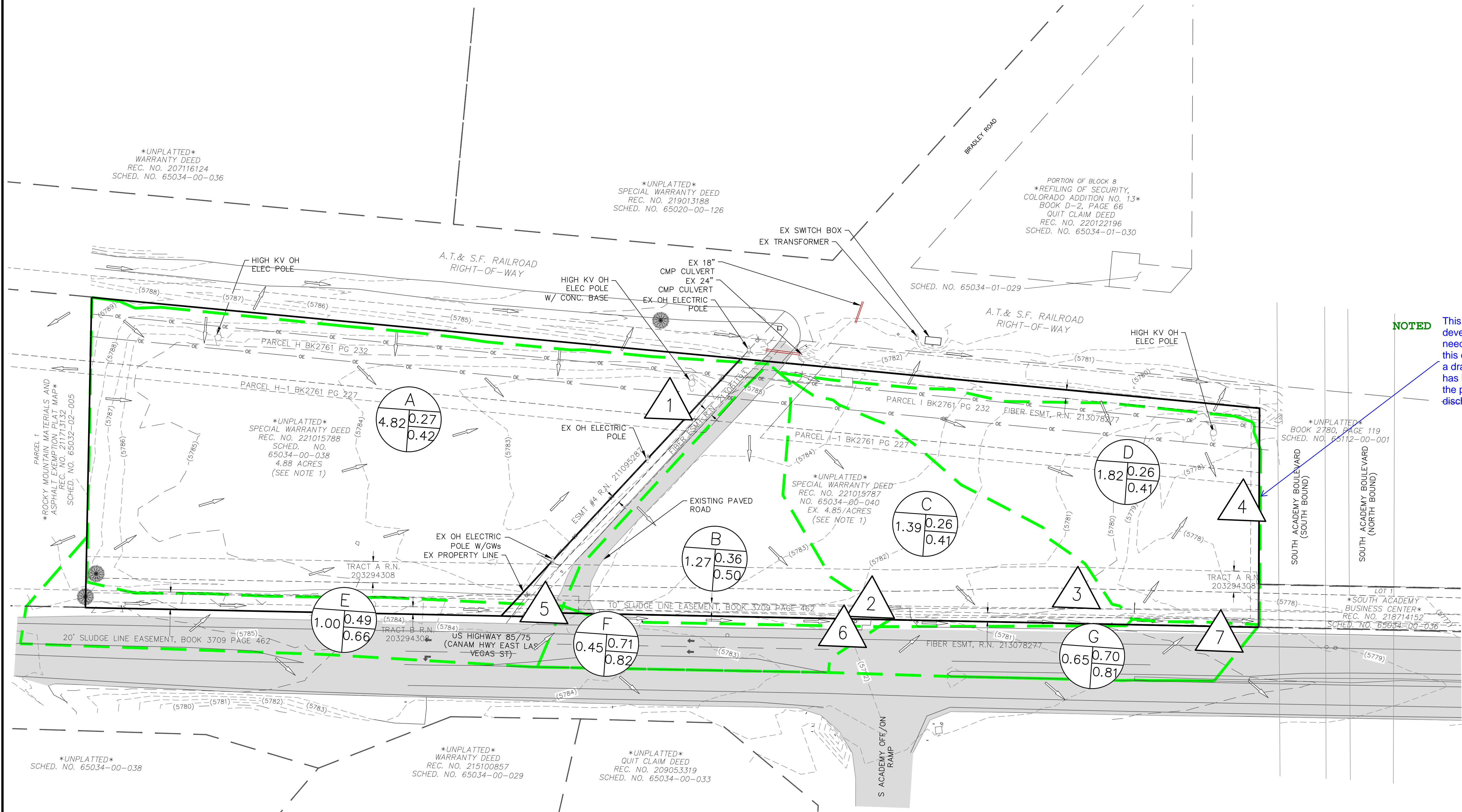
Provide roadside ditch and downstream conveyance calculations.

NOTED REVISED IN TEXT, EXHIBIT INCLUDED

EXISTING DRAINAGE MAP

BRADLEY POINT FILING NO. 1 - EXISTING DRAINAGE MAP

AP NO. 65034-00-038 AND AP NO. 65034-00-040 ON HIGHWAY 85/87 (EAST LAS VEGAS STREET)
IN SECTION 3, T15S R66W, 6th P.M., EL PASO COUNTY, COLORADO



BASIN SUMMARY				
BASIN	AREA (ACRES)	Q ₅	Q ₁₀₀	
A	4.82	3.5	9.2	
B	1.27	1.5	3.5	
C	1.39	1.1	2.9	
D	1.82	1.4	3.7	
E	1.00	1.8	4.0	
F	0.45	1.4	2.6	
G	0.65	1.7	3.4	

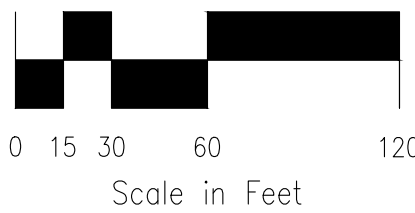
NOTED This is a wide swale - developed release needs to approximate this condition unless a drainage easement has been obtained for the proposed point discharge.

DESIGN POINT SUMMARY				
DESIGN POINT	Q ₅	Q ₁₀₀	CONTRIBUTING BASIN/DESIGN POINT	STRUCTURE
1	3.5	9.2	A	LOCALIZED DEPRESSION
2	4.8	12.0	B, DP 1	
3	1.1	2.9	C	
4	1.4	3.7	D	LOCALIZED DEPRESSION
5	1.8	4.0	E	
6	8.0	19.2	F, DP 2, DP 5	
7	9.0	21.3	G, DP 3, DP 6	EXISTING ROADSIDE DITCH

BRADLEY POINT FILING NO. 1
EXISTING DRAINAGE MAP
DATE SUBMITTED: 12/18/20
SHEET 1 OF 1

NOTED REVISED IN TEXT
Does the ditch have capacity or do flows enter the site?

1" = 60'

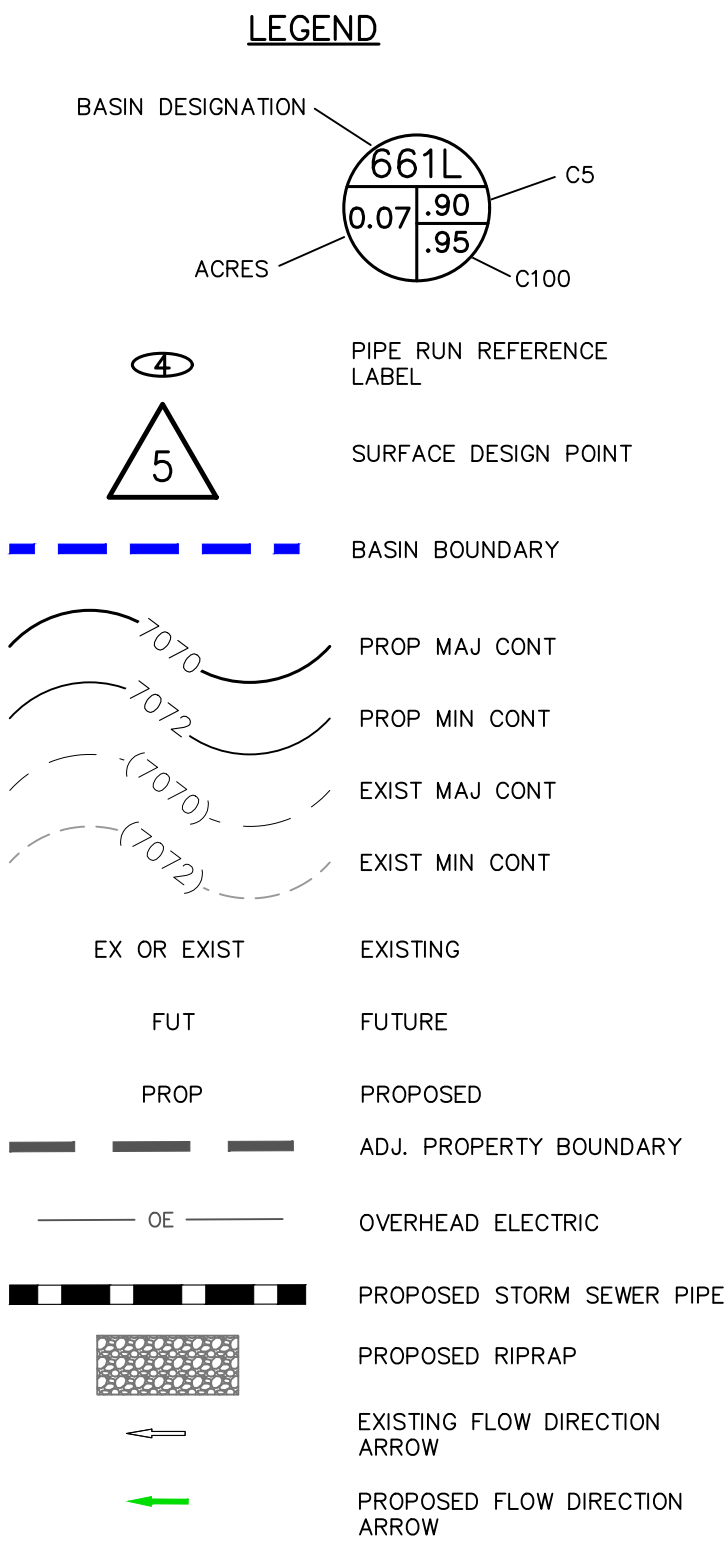
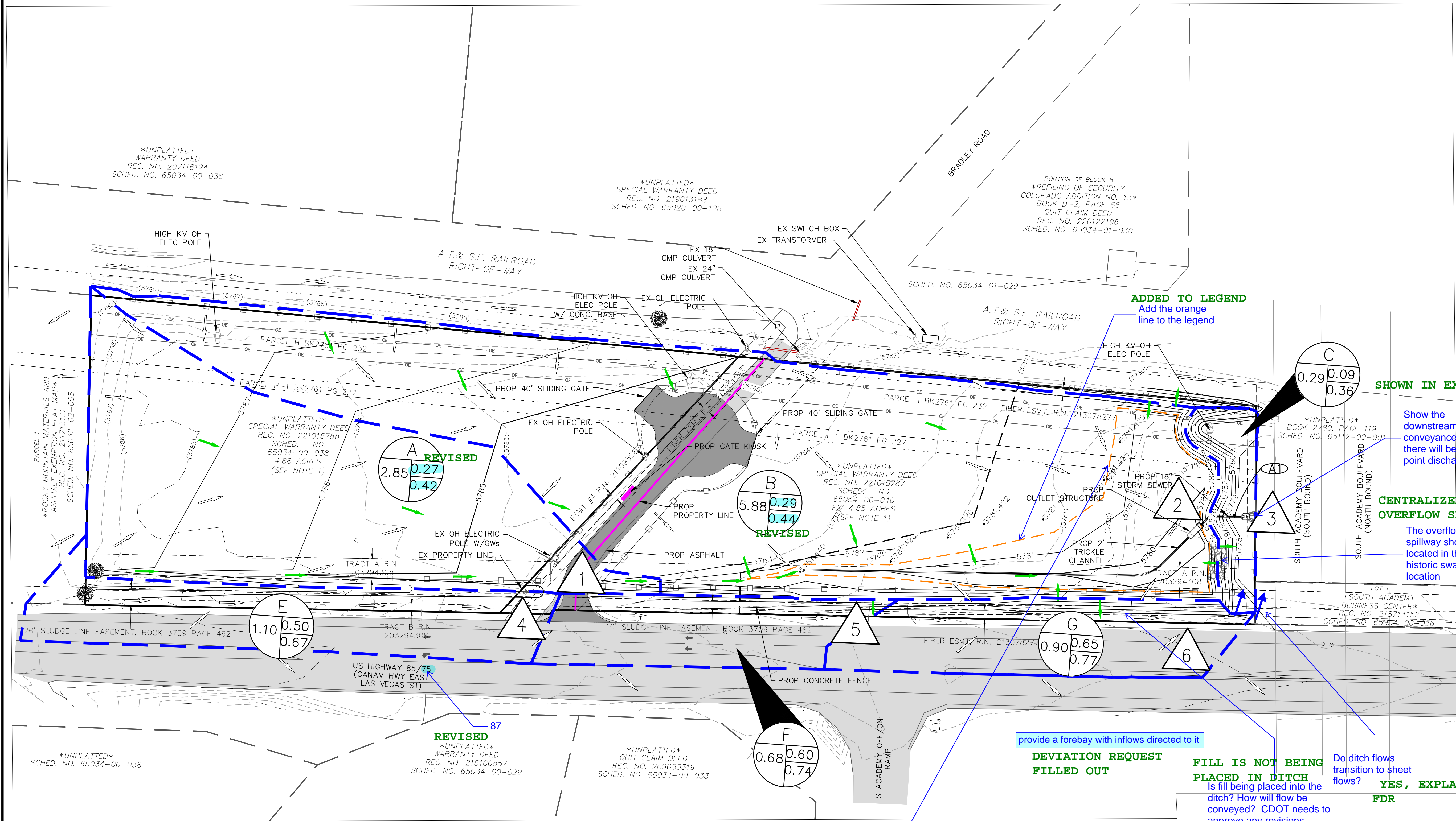


NOTE 1:
PARCELS ARE UNDER THE SAME OWNERSHIP

PROPOSED DRAINAGE MAP

BRADLEY POINT FILING NO. 1 - PROPOSED DRAINAGE MAP

AP NO. 65034-00-038 AND AP NO. 65034-00-040 ON HIGHWAY 85/87 (EAST LAS VEGAS STREET)
IN SECTION 3, T15S R66W, 6th P.M., EL PASO COUNTY, COLORADO



BASIN SUMMARY

BASIN	AREA (ACRES)	Q _s	Q ₁₀₀
A	2.85	2.3	5.6
B	5.88	5.6	14.1
C	0.29	0.1	0.5
E	1.10	2.0	4.5
F	0.68	1.6	3.3
G	0.90	2.1	4.2

DESIGN POINT SUMMARY

DESIGN POINT	Q _s	Q ₁₀₀	BASIN	STRUCTURE
1	2.1	5.6	A	10' BOTTOM GRASSED SWALE
2	7.0	17.8	B, DP 1	18" RCP STORM SEWER
3	0.3	2.6	C, PR A1, DP 4	RIP RAP PAD
4	2.0	4.5	E	
5	3.6	7.7	F, DP 5	
6	4.7	9.9	G, DP 6	EXISTING ROADSIDE DITCH

BRADLEY POINT FILING NO. 1
PROPOSED DRAINAGE MAP
DATE SUBMITTED: 12/18/20
SHEET 1 OF 1

NOTE 1:
PARCELS ARE UNDER THE SAME OWNERSHIP

How will the storage area be separated from the ponding area?

SIGN LOCATIONS WILL BE PROVIDED

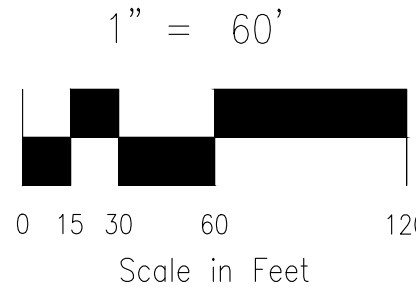
provide a forebay with inflows directed to it
DEVIATION REQUEST FILLED OUT

FILL IS NOT BEING PLACED IN DITCH
Is fill being placed into the ditch? How will flow be conveyed? CDOT needs to approve any revisions.

Do ditch flows transition to sheet flows? **YES, EXPLAINED IN FDR**

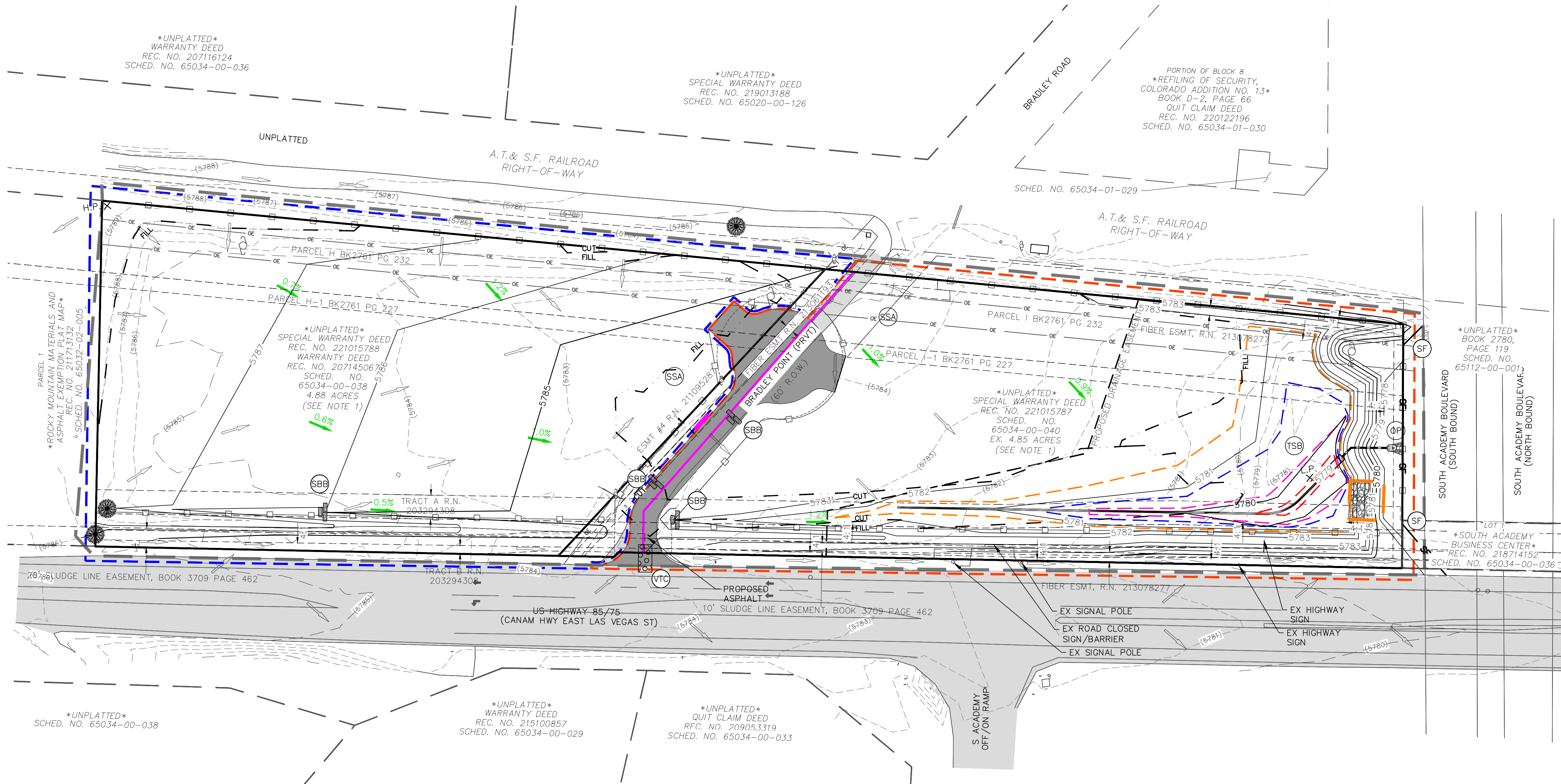
Provide roadside ditch cross-sections at DP 5 and DP 6 and capacity calculations

ROADSIDE DITCH CROSS SECTIONS PROVIDED



GRADING AND EROSION CONTROL PLANS

BRADLEY POINT FILING NO. 1
GRADING AND EROSION CONTROL PLAN
DECEMBER 2020



NARRATIVE NOTES:

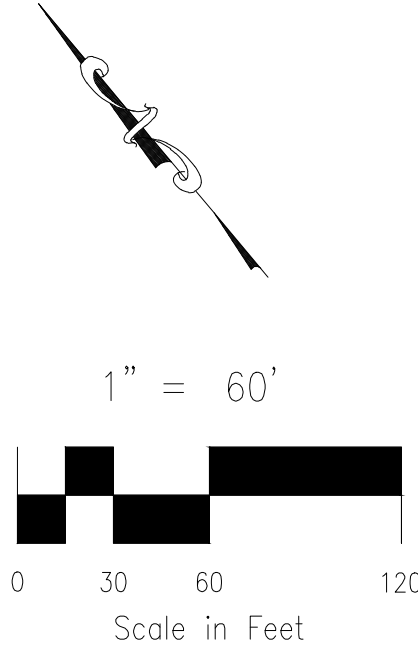
1. LOCATION OF STOCKPILES SHALL BE DETERMINED BY CONTRACTOR. ALL STOCKPILES SHALL REMAIN WITHIN THE CONSTRUCTION BOUNDARIES AS INDICATED ON THE SITE MAP.
2. THE EXACT LOCATION FOR THE STABILIZED STAGING AREA, STORAGE EQUIPMENT AND TEMPORARY DISPOSAL AREAS SHALL BE DETERMINED IN THE FIELD BY THE CONTRACTOR. PLAN SHALL BE UPDATED BY CONTRACTOR UPON DETERMINATION OF EXACT LOCATION.
3. FINAL STABILIZATION SHALL BE COMPLETED AT THE END OF THE CONSTRUCTION ACTIVITIES. ALL AREAS DISTURBED WITHIN THE CONSTRUCTION BOUNDARY/LIMITS OF DISTURBANCE AREA SHALL BE RESEEDING WITH NATIVE SEEDING.
4. NO PORTION OF THE PROPOSED CROSSROADS MIXED USE SITE LIES WITH A FEMA EFFECTIVE 100-YR FLOODPLAIN.
5. EROSION CONTROL BLANKET SHALL BE USED ON SLOPES GREATER THAN 4:1.

ADDITIONAL NOTES:

1. STAGING AREA TO BE DETERMINED BY CONTRACTOR IN THE FIELD. THE LOCATIONS SHALL BE DELINEATED ON THIS PLAN BY THE CONTRACTOR.
2. THE EROSION CONTROL DELINEATED ON THIS PLAN SHALL BE REGULARLY UPDATED BY THE CONTRACTOR.
3. PROPOSED SLOPES SHALL BE 4:1 OR LESS.
4. THE CONTRACTOR SHALL OBTAIN A COPY OF THE GEOTECHNICAL ENGINEERING REPORT AND KEEP A COPY ONSITE DURING ALL EARTHWORK OPERATIONS.
5. THE CONTRACTOR SHALL PROVIDE SUFFICIENT BUFFER BETWEEN THE LIMITS OF DISTURBANCE AND AREAS IN WHICH NO GRADING SHALL OCCUR TO MAKE SUFFICIENT TIE IN BETWEEN THE PROPOSED GRADE AND EXISTING GRADE WHICH MAY NOT BE CLEARLY ILLUSTRATED ON THIS PLAN.

LEGEND

	PROP MAJ CONT		STABILIZED STAGING AREA - INTERIM
	PROP MIN CONT		CUT/FILL LINE
	EXIST MAJ CONT		EX. FLOW ARROW
	EXIST MIN CONT		PROP. FLOW ARROW
	EXISTING		PROPERTY LINE
	FUTURE		PROPOSED SUBDIVISION LINE
	PROPOSED		100 YEAR FLOOD STAGE
	LOW POINT/HIGH POINT		6", 100 YR FLOOD DEPTH
	ADJ. PROPERTY BOUNDARY		12", 100 YR FLOOD DEPTH
	OVERHEAD ELECTRIC		24", 100 YR FLOOD DEPTH
	TEMPORARY SEDIMENT BASIN - INTERIM		PHASE 2 BOUNDARY
	SILT FENCE - INTERIM		PHASE 1 BOUNDARY
	STRAW BALE DITCH CHECK - INTERIM		PROP CONCRETE FENCE
	TEMPORARY OUTLET PROTECTION - INTERIM		EMERGENCY OVERFLOW DIRECTION
			LIMITS OF DISTURBANCE/ CONSTRUCTION BOUNDARY
			VEHICLE TRACKING CONTROL - INTERIM
			PROPOSED RIPRAP



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

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

BRADLEY POINT FILING NO. 1

GRADING & EROSION CONTROL PLAN

PROJECT NO. 70-074
DESIGNED BY: CWM
DRAWN BY: CWM
CHECKED BY: VAS

DATE: 11/30/20
SCALE: HORIZONTAL: 1" = 60'
VERTICAL: N/A

SHEET 2 OF 5
GR02

212 N. WARSATCH AVE. STE 305
COLORADO SPRINGS, CO 80903
PHONE 719.955.5465

CIVIL CONSULTANTS, INC.

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

APPROVED BY: [Signature]
DATE: [Blank]
DESCRIPTION: [Blank]
NO. [Blank]

REVISIONS: [Table with 3 columns: NO., DATE, DESCRIPTION]

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

CAUTION

