EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

FINAL DRAINAGE REPORT

FOX RUN NATURE CENTER & ROAD RECLAMATION PROJECT

Fox Run Regional Park
2108 Stella Drive
El Paso County, Colorado 80921

PPR2349

Prepared For:

El Paso County Parks
2002 Creek Crossing Street
Colorado Springs, Colorado 80905

Prepared By:

Baseline Engineering Corporation
1046 Elkton Drive
Colorado Springs, Colorado 80907

Steven Baggs, PE

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Date: October 31, 2024

BASELINE
Engineering · Planning · Surveying

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

October 31, 2024

Re: Final Drainage Report
Fox Run Nature Center & Road Reclamation
Located in the Fox Run Regional Park
2108 Stella Drive
El Paso County, Colorado 80921

To Whom It May Concern:

Transmitted herewith is the Final Drainage Report for the Fox Run Nature Center & Road Reclamation project, located within the Fox Run Regional Park, an unplatted parcel addressed 2108 Stella Dr, El Paso County, Colorado 80921. The Fox Run Nature Center and Road Reclamation project consists of approximately 4.25 acres near the center of the 389.5 acres regional park property. The site is an El Paso County regional park with an RR-5 zoning designation with existing park buildings, playgrounds, trails, roadways, and other park features. The purpose of this project is to construct a new nature center within the Fox Run Regional Park and reclaim some existing gravel roads and parking back to natural forest conditions.

This drainage analysis was prepared in accordance with the most current El Paso County Drainage Criteria Manual. If there are any comments or questions regarding any part of this drainage analysis, please contact the undersigned.

Very truly yours,

BASELINE ENGINEERING CORP.

Steven G Baggs

Steven G. Baggs
Colorado P.E. 26020

Certification Statements

Engineer's Statement

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable 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.

_____

Steven G Baggs, P.E. Colorado 26020

Developer's Statement

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

Name of Developer: __El Paso County_____

Authorized Signature/Date: _____

Printed Name: _____

Title: _____

Address: _____

El Paso County Certification

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

_____ _____

County Engineer / ECM Administrator Date

1) General Location and Description

a) Location

This Final Drainage Report has been prepared for the Fox Run Nature Center (FRNC) and Road Reclamation project. The proposed project is located on approximately 4.25 acres in the central portion of the 389.5 acres Fox Run Regional Park in El Paso County. The park is identified as parcel number 6100000297 and is owned and operated by El Paso County as will be the proposed nature center. The park is bounded by Baptist Road to the north and west, Roller Coaster Road to the east and Stella Drive to the south. Additionally, two platted subdivisions, The Ridge at Fox Run Filing No. 1 and Pleasant View Estates Filing 2 are adjacent to the southeast corner of the park. A small enclave of Crowe Subdivision Filing No 1 and Andrene Subdivision is located to the east of the FRNC location. Platted subdivisions across the adjacent roads include the Sanctuary Point filings and Curtis Subdivision Filing No 1 across Baptist Road and Pleasant View Estates across Stella Drive. There are multiple platted and unplatted lots across Roller Coaster Road.

The site is located within Section 28, Township 11 S, Range 66 West of the 6th Principal Meridian. There are no major named drainage ways within the project limits. The park does include hilly forested terrain which creates natural drainage ways throughout the park. Additionally, roads and trails throughout the park influence drainage patterns. Existing drainage facilities in the park generally consist of roadside ditches and culverts in the area of the proposed FRNC site.

b) Description of Property

For the purposes of this report "the site" will refer to the Fox Run Nature Center site and the reclamation area, which is approximately 4.25 acres. The entirety of the property known as Fox Run Regional Park consists of 389.5 acres. The project acreage can be represented more specifically as approximately 2 acres of new development for the FRNC building and associated improvements, approximately 2 acres of developed area (gravel roads/parking and restroom facilities) to be reclaimed to native forest and approximately 0.25 acre of temporary disturbance for Canopy Walk construction.

The existing condition of the FRNC and Canopy Walk area is native forest with poor to medium understory vegetation. The reclamation area consists of gravel road access to a loop with gravel parking and a restroom facility. This area will be reclaimed to native forest conditions.

The existing site drains generally from North to South via overland flow, natural drainage ways, and road ditches along park access roads. Slopes vary greatly throughout the park areas within project limits including road ditches at 5-10%, natural drainages at 3-6% and hillsides at 10-25% or greater. Runoff from the project site continues south through the park to its existing outfall at Stella Drive on the southern border of the Fox Run Regional Park.

Soil data for the Fox Run Nature Center site was taken from the United Stated Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey. The soil type at the site was identified as Kettle Gravelly Loamy Sand, with slopes ranging from 8-40%, and a hydrologic soil grouping of "B". Soils associated with hydrologic soil group B have a moderate infiltration rate when thoroughly

wet. These are moderately deep, well-draining soils with a moderate rate of water transmission. The soils map is included in the Appendix.

There are no major drainageways within the project limits. The various natural gullies and drainageways do combine to create unnamed tributaries to Smith Creek at the southerly end of the Fox Run Regional Park. There are no designated FEMA floodplains within the Fox Run Regional Park. A copy of the FIRM Map is included in the Appendix.

There are no known existing irrigation facilities located within the project limits. Permanent and temporary irrigation facilities are proposed for this project.

There is an existing water main that extends through the reclamation area and through the FRNC area and continues south in the access to the southern portion of the park. This water main will be upsized and re-routed around the FRNC building. It will be designed to not impact existing or proposed drainage facilities. There are no other known utilities or encumbrances on this portion of the park.

2) Drainage Basins and Sub-Basins

a) Major Basin Descriptions

This project is within the Smith Creek Drainage Basin. The operable DBPS for this basin is the "Smith Creek Drainage Basin Planning Study" prepared by JR Engineering dated August 2002. Stormwater from the project site drains from North to South to the southerly boundary of the park. The outfall for the nature center portion of the park is noted as Tributary D to Smith Creek in the Smith Creek Drainage Basin Planning Study. This drainage pattern will be unchanged in water quality and quantity. Tributary D combines with the main stem of Smith Creek to the south of Stella Drive and Smith Creek then continues southwest with the ultimate receiving water being Monument Creek.

According to the FEMA Flood Insurance Rate Map (FIRM) Panel No. 08041C1285G, effective 12/07/2018, the disturbed area of the site is located within an area of minimal flood hazard (Zone X). Refer to the Appendix for FIRM Map.

There are no known irrigation facilities or other obstructions which could influence or be influenced by the local drainage patterns.

b) Sub-basin Description

The drainage conditions at the FRNC and Road Reclamation have been analyzed in order to evaluate three main conditions relative to the proposed development of the nature center.

Subbasin Overall (174.32 ac.) An Overall Basin Map has been included in the Appendix to demonstrate that the development of the FRNC will not increase the runoff leaving the site at the southerly end of the park at Stella Drive. The drainage subbasin designated as Overall consists of approximately 174.32 acres and includes the FRNC, the Canopy Walk and the Road Reclamation area. This subbasin outfalls at Stella Drive at the southern end of the Fox Run Regional Park. This outfall location corresponds with

Design Point 217 in the Smith Creek DBPS. The DBPS does not recommend any drainage improvements for this outfall location or within the Fox Run Regional Park.

For purposes of this report, Subbasin Overall has been analyzed in the existing and proposed condition. The impervious area for the existing and proposed condition has remained the same at approximately 2% since the road reclamation portion of the project is offsetting the proposed construction portion of the project. As a result, runoff quantities have remained virtually the same at the outfall point. Runoff quantities at DP FR-1 are Q_5=19.5 cfs and Q_{100}=163.5 cfs in the existing condition and Q_5=19.8 cfs and Q_{100}=164.1 cfs in the proposed condition. This statistically insignificant increase indicates that there will be no detention requirement for this project.

An **Existing Conditions Drainage Plan** and an **Offsite Basin Map** has been included in the Appendix of this report. A description of the existing and offsite subbasins is as follows:

Subbasin RE-1 **(2.02 acres)** consists of the entirety of the disturbed area for the road reclamation portion of this project in its existing condition. This subbasin drains from North to South generally at slopes between 5-10% through natural gullies and existing road ditches. This subbasin generates runoff quantities of Q_5=1.42 cfs and Q_{100}=5.9 cfs in the minor and major storms that flow to Design Point 1-E.

Subbasin E-1 **(2.01 acres)** consists of the existing area to be developed into the nature center. This subbasin is similar to Subbasin RE1 as it generally drains North to south utilizing natural flow paths and the existing road ditches. Slopes of 5-10% are typical in this subbasin also. The determined existing runoff quantities for Subbasin E-1 are Q_5=0.89 cfs and Q_{100}=5.01 cfs in the minor and major storms that flow to Design Point 2-E.

Subbasin OS-1A **(78.8 acres)** consists of the main offsite tributary area to the FRNC site. This subbasin consists of hilly forested area with natural drainage gullies. The main drainage channel in this subbasin routes toward the existing road and then continues south towards the ultimate outfall of the park at Stella Drive. The determined existing runoff quantities for Subbasin OS-1A are Q_5=16.33 cfs and Q_{100}=94.84 cfs in the minor and major storms that flow to Design Point 1-E.

Please include a separate design point for these basins

-1B **(1.57 acres)** consists of a small offsite drainage that generates runoff that flows towards ion area. The forested and sloped area has a natural gully that directs runoff along the west edge of the reclamation area. The determined existing runoff quantities for Subbasin OS-1B are Q_5=0.6 cfs and Q_{100}=4.42 cfs in the minor and major storms that flow to Design Point 1-E.

Subbasin OS-2 **(2.85 acres)** consists of an offsite drainage area that generates runoff that also flows towards the reclamation area. The forested and hilly area has several poorly defined natural gullies that direct runoff along the east edge of the reclamation area. The determined existing runoff quantities for Subbasin OS-2 are Q_5=0.75 cfs and Q_{100}=5.5 cfs in the minor and major storms that flow to Design Point 2-E.

Subbasin OS-3 **(4.36 acres**) consists of an area to the east of the reclamation area and the nature center. The forested and hilly area has several poorly defined natural drainage paths that direct runoff generally

to the south along the east edge of the project site. The determined existing runoff quantities for Subbasin OS-3 are Q_5=1.11 cfs and Q_{100}=9.84 cfs in the minor and major storms that flow to Design Point 2-E.

Subbasin OS-4 **(2.07 acres)** consists of an area to the east of the nature center parking area. The forested and hilly area has several poorly defined natural drainage paths that direct runoff generally to the south along the east edge of the project site. The determined existing runoff quantities for Subbasin OS-4 are Q_5=0.59 cfs and Q_{100}=5.2 cfs in the minor and major storms that flow to Design Point 2-E.

Subbasin OS-5 **(0.18 acre)** consists of a small area to the north of the nature center. This area drains to the existing road ditch. The determined existing runoff quantities for Subbasin OS-5 are Q_5=0.05 cfs and Q_{100}=0.48 cfs in the minor and major storms that flow to Design Point 1-E.

Design Point 1-E **(Subbasins RE-1, OS-1A, OS-1B, OS-5)** represents the existing conditions runoff summary at the main natural channel at the FRNC site. The contributing area to this Design Point is 82.57 acres and the existing runoff quantities are Q_5=18.4 cfs and Q_{100}=105.64 cfs in the minor and major storms that flow to Design Point 1-E.

Design Point 2-E **(Subbasins E-1, OS-2, OS-3, OS-4)** represents the existing conditions runoff summary at the south end of the nature center site on the east side of the existing road. The contributing area to this Design Point is 11.29 acres and the existing runoff quantities for are Q_5=3.34 cfs and Q_{100}=25.55 cfs in the minor and major storms that flow to Design Point 2-E.

Design Point 3-E **(DP 1-E, DP 2-E)** represents the existing conditions runoff summary at the south end of the FRNC and Road Reclamation project. The contributing area to this Design Point is 93.86 acres and the existing runoff quantities for are Q_5=21.74 cfs and Q_{100}=131.19 cfs in the minor and major storms

A **Proposed Conditions Drainage Plan** the proposed subbasins is as follows:

Please include additional basins and design points for the roof drains and patio drains in order to determine if the proposed culverts are able to handle these flows.

Subbasin RP-1 (0.61 acre) consists of the reclaimed west half of the existing loop and parking area for the restroom and picnic area. This subbasin's developed condition will be the re-contoured and revegetated reclamation of the existing condition to match the existing forest. This subbasin will maintain existing drainage patterns and flow into Subbasin OS-1A. The determined proposed runoff quantities from Subbasin RP-1 draining to Subbasin OS-1A are Q_5=0.14 cfs and Q_{100}=1.3 cfs in the minor and major storms.

State that this Subbasin is excluded from WQ treatment per ECM App I.7.1.B.7

Subbasin RP-2 (1.04 acres) consists of the reclaimed east half of the existing loop and parking area for the restroom and picnic area. This subbasin's developed condition will be the re-contoured and revegetated reclamation of the existing condition to match the existing forest. This subbasin will maintain existing drainage patterns and also flow into Subbasin OS-1A. The determined proposed runoff quantities from Subbasin RP-2 draining to Subbasin OS-1A are Q_5=0.22 cfs and Q_{100}=2.09 cfs in the minor and major storms. The total accumulative flows from subbasins RP-1 and RP-2 draining to Design Point 1 are Q_5=0.36 cfs and Q_{100}=3.39 cfs in the minor and major storms.

State that this Subbasin is excluded from WQ treatment per ECM App I.7.1.B.7

Subbasin RP-3 (0.37 acre) consists of the reclaimed road that extends from the FRNC site up to the loop of the former parking and restroom area. This subbasin's developed condition will be the re-contoured and revegetated reclamation of the existing road to match the surrounding existing forest. This subbasin will maintain existing drainage patterns and also flow into Subbasin OS-1A at Design Point 2. The determined proposed runoff quantities from Subbasin RP-3 draining to Subbasin OS-1A are Q_5=0.08 cfs and Q_{100}=0.77 cfs in the minor and major storms.

State that this Subbasin is excluded from WQ treatment per ECM App I.7.1.B.7

Subbasin P-1 (1.46 acres) consists of the Fox Run Nature Center buildings, plaza, access road and parking. This subbasin represents the main developed area for this project. The determined proposed runoff quantities for Subbasin P-1 are Q_5=2.94 cfs and Q_{100}=8.0 cfs in the minor and major storms that flow to Design Point 4 at the proposed water quality facility (WQ-1) within the subbasin. Proposed stormwater facilities within this subbasin including the water quality facility will be discussed in the drainage facility section of this report.

Subbasin P-2 (0.22 acres) consists of a small area along the north side of the proposed nature center building. A vegetated swale is proposed in this subbasin to convey runoff around the building. The determined proposed runoff quantities for Subbasin P-2 are Q_5=0.11 cfs and Q_{100}=0.76 cfs in the minor and major storms that flow to Design Point 2. This generated runoff will combine with Subbasin OS-5 runoff for a total flow quantity of Q_5=0.16 cfs and Q_{100}=0.1.24 cfs in the minor and major storms that flow to Design Point 2 in the proposed swale.

State that this Subbasin is excluded from WQ treatment per ECM App I.7.1.B.7

Subbasin P-3 (0.34 acres) consists of small area at the entrance to the FRNC site. This area is below all proposed drainage facilities at the site but will be conveyed in the existing road ditches along the existing access road. This runoff pattern represents no change The determined proposed runoff quantities for Subbasin P-3 are Q_5=0.41 cfs and Q_{100}=1.53 cfs in the minor and major storms that flow to Design Point 6.

State that this Subbasin is excluded from WQ treatment per ECM App I.7.1.C.1

Design Point 1 **(Subbasins RP-1, RP-2, OS-1B)** represents the proposed conditions runoff summary at the upper loop road after the reclamation is completed. The contributing area to this Design Point is 3.22 acres and the proposed runoff quantities are Q_5=0.94 cfs and Q_{100}=7.82 cfs in the minor and major storms that flow to Design Point 1.

Design Point 2 **(Subbasins RP-3, OS-2, OS-5, P-2)** represents the proposed conditions runoff summary at Design Point 2. The contributing area to this Design Point is 3.62 acres and the proposed combined runoff quantities are Q_5=0.99 cfs and Q_{100}=7.51 cfs in the minor and major storms at Design Point 2.

Design Point 3 **(Subbasin OS-1A, DP-1, DP-2)** represents the proposed conditions runoff summary at the main natural channel at the FRNC site. The contributing area to this Design Point is 85.64 acres and the proposed runoff quantities are Q_5=18.26 cfs and Q_{100}=110.17 cfs in the minor and major storms at Design Point 3.

Design Point 4 **(Subbasin P-1)** represents the proposed conditions runoff summary entering the water quality facility designated as WQ-1. The contributing area to this Design Point is 1.46 acres and the

proposed runoff quantities are Q_5=2.94 cfs and Q_{100}=8.0 cfs in the minor and major storms that flow to Design Point 4.

Design Point 5 **(Subbasin P-3, OS-3, OS-4)** represents the proposed conditions runoff summary for the easterly offsite subbasins and the small entrance road area below the water quality pond. The contributing area to this Design Point is 6.76 acres and the proposed runoff quantities are Q_5=2.11 cfs and Q_{100}=16.57 cfs in the minor and major storms at Design Point 5.

Design Point 6 **(DP-3, DP-4, DP-5)** represents the proposed conditions runoff summary at the south end of the proposed project. The contributing area to this Design Point is 93.86 acres and the proposed runoff quantities are Q_5=23.31 cfs and Q_{100}=134.74 cfs in the minor and major storms at Design Point 6. It should be noted that the localized increase in runoff at DP-6 (1.57 cfs-5yr, 3.56 cfs-100yr) is diluted to essentially no increased when considered in the overall 174.32 acres drainage basin.

3) Drainage Design Criteria

a) Development Criteria Reference

This drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual Volumes 1 & 2, as well as applicable portions of the City of Colorado Springs Drainage Criteria Manual Volumes 1 & 2.

This site is located within the Smith Creek Drainage Basin. The operable DBPS for this basin is the "Smith Creek Drainage Basin Planning Study" prepared by JR Engineering dated August 2002. The Fox Run Regional Park is exempt from Drainage Fees. No other site specific drainage reports were identified for this site.

b) Hydrologic Criteria

The design rainfall depths for the site were determined from the NOAA Atlas 14, Volume 8, Version 2. Design rainfall depths have been included in the appendix of this report.

The Rational Method was used to determine developed flow volumes for historic and developed conditions. The Rational Formula is Q = CiA, where Q, the maximum rate of runoff is equal to the runoff coefficient C, times the rainfall intensity (I), times the area (A).

The minor and major design storms were analyzed as the 5-yr and 100-yr storm events in this report. A summary of calculated direct runoff flows has been provided below, refer to the Appendix for additional Rational Method calculations.

There are no detention requirements for this project since it was determined that the combination of reclamation and development resulted in no runoff increase leaving the Fox Run Regional Park at Stella Drive. However, the MHFD Detention Workbook v4.06 was utilized to analyze the functionality of the proposed bioretention facility as storm runoff is routed through it.

4) Four Step Process

The four-step process for minimizing adverse impacts of urbanization must be applied to all new or redevelopment projects for which construction activities disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale. The four steps have been applied to this site as follows:

Step 1: Reduce runoff by disconnecting impervious area, eliminating "unnecessary" impervious area and encouraging infiltration into soils that are suitable.

The stormwater management for the Fox Run Nature Center and Road Reclamation Project does employ runoff reduction practices. The road reclamation portion of the project reduces impervious area and restores that area to natural forested conditions. This restoration includes eliminating existing culverts and grading in natural contours. This accomplishes runoff reduction in this portion of the project. The nature center portion of the site addresses runoff reduction by conveying runoff around the nature center in natural swales/channels to keep runoff in a more natural state. Additionally, runoff collected in storm sewer and on impervious surfaces is directed at multiple locations into the center of the access road loop where it is conveyed overland through a natural forested condition to the water quality facility. This provides a pervious disconnect between the developed impervious areas of the nature center and the water quality facility.

Step 2: Treat and slowly release the WQCV.

No water quality treatment is required for the reclamation portion of the project. The nature center portion of the project does disturb over an acre of the site while creating some impervious areas and will therefore require water quality treatment. A bioretention water quality facility is proposed at this site. Since consideration of the natural forest conditions surrounding the nature center is of paramount importance, the bioretention facility was determined to be the most compatible. This facility designated as WQ-1 will treat and slow release the WQCV for the nature center site.

Step 3: Stabilize stream channels.

All new and re-development projects are required to construct or participate in the funding of channel stabilization measures. There are no channel stabilization requirements within the Fox Run Regional Park per the most recent DBPS and by maintaining existing drainage conditions the development of the Fox Run Nature Center will not require any channel stabilization measures. The County is exempt from Drainage Fee requirements for the Smith Creek Drainage Basin. There are no channel stabilization requirements for the Smith Creek tributaries within the Fox Run Regional Park.

Step 4: Implement source controls.

This development will implement a Stormwater Management Plan utilizing construction control measures, proper housekeeping practices, and spill containment procedures. There is no outdoor storage of contaminants or outside pollutant sources anticipated at this site.

5) Drainage Facility Design

a) General Concept

The proposed drainage patterns will remain generally the same as runoff is directed north to south through the project site. While this is true for the nature center and the reclamation portions of the project, the drainage concept for each will vary.

The goal of the reclamation portion of the project is to create the natural drainage condition of the current forest. The road and building area will be removed and regraded to connect to the existing adjacent forest. Grading will be shaped to accommodate natural drainage paths and unnecessary drainage culverts will be removed.

The nature center portion of the site requires both onsite and offsite considerations for drainage facilities. Offsite runoff will be directed around the nature center and routed back into its existing drainage patterns. A vegetated drainage swale (S-1) on the north side of the building will direct localized runoff from DP-2 (Q_5=0.99 cfs and Q_{100}=7.51 cfs) west around the building. A second swale (S-2) will direct the runoff summarized at DP- 3 (Q_5=18.26 cfs/Q_{100}=110.17 cfs) along the west edge of the nature center site. The majority of this runoff is from the natural drainage way in Subbasin OS-1A. Swale S-2 will direct this runoff back into its existing drainage path once it bypasses the nature center. Grading and wall features along the east side of the loop will direct offsite runoff from the east of the site to DP-5 (Q_5=2.11 cfs and Q_{100}=16.57 cfs) where it will continue in the existing road ditch as it currently does. Offsite runoff will be accommodated and follow existing drainage patterns with no changed conditions for existing park facilities. Swale calculations are included in the Appendix.

Drainage facilities and water quality facilities will be utilized to manage stormwater in the developed areas of the nature center site. Roof drains and area inlets will collect the runoff from the buildings and plaza areas. Runoff will be directed into the center of the access road loop to outlet runoff into a pervious area prior to entering the water quality facility. Runoff from the paved access road will be conveyed in curb/gutter and cross pans to outfall locations at the WQ-1 water quality facility. Additionally trench drains will collect runoff in the access road to direct runoff to WQ-1. WQ-1 is proposed to be a bioretention water quality facility that will treat the nature center runoff while still maintaining an appearance that is compatible with the forest environment.

b) Specific Details

The offsite runoff on the north side of the nature center is identified at DP-2 with runoff quantities of Q_5=0.99 cfs and Q_{100}=7.51 cfs. A vegetated swale designated as S-1 will be graded on the north side of the nature center. The swale will be 1.5’ deep with 4:1 side slopes. It will convey the 5yr runoff at depth of 0.31’ and the 100yr runoff at a depth of 0.65’. The proposed swale will be revegetated utilizing erosion control blankets. Swale S-1 calculations are included in the Appendix.

Show all ECB on GEC Plans

The offsite runoff on the west side of the nature center is identified at DP-3 with runoff quantities of Q_5=18.26 cfs and Q_{100}=110.17 cfs. A vegetated swale designated as S-2 will be graded on the west side of the nature center. This will route the natural drainage from Subbasin OS-1A as well as DP-2 runoff past the nature center and back into its existing flow path. The swale will be between 2.8' and 3' deep with 4:1 side slopes. It will convey the 5yr runoff at depth of 1.05' and the 100yr runoff at a depth of 2.06'. It should be noted that the existing natural drainage channel from Subbasin OS-1A has a separate sandy bottom that will not be altered by this project and will essentially reduce flow quantity in Swale S-2. The proposed swale will be revegetated utilizing erosion control blankets. Swale S-2 calculations are included in the Appendix.

Show all ECB on GEC Plans

Make these area inlets design points

The storm sewer facilities that will collect runoff from the building and plaza area of the nature center will collect approximately 20% of Subbasin P-1 runoff(Q_5=0.6 cfs and Q_{100}=1.6 cfs). The rest of the runoff from P-1 will be generated from the access road and parking portion of the subbasin. Two 24" diameter area inlets in the plaza area will collect localized areas of runoff. These inlets have a capacity of 1.5 cfs which exceeds the runoff requirements in this area. Additionally, 8" diameter area inlets will be provided in the tree wells in the plaza. All inlets will connect to a 12" HDPE storm sewer pipe that outfalls into the center area of the access loop. Roof drain systems for both buildings will connect to this 12" HDPE storm sewer as well. These facilities are detailed in the Stormwater Plans included in the Appendix of this report.

The access road will convey runoff from the remainder of Subbasin P-1 to riprap rundowns on each side of the loop. Runoff will be conveyed in curb and gutter and cross pans to the rundown locations. Runoff on each side of the loop is anticipated to be approximately Q_5=1.2 cfs and Q_{100}=3.2 cfs. This runoff will flow directly into the water quality facility. Any remaining runoff in the access road below the rundowns will be collected by trench drains that extend across the roads as shown on the stormwater plans. These trench drains together with the riprap rundowns will direct the most possible runoff into the water quality facility from Subbasin P-1. Trench drain details are included on the Stormwater Plans in the Appendix.

The water quality facility is designated as WQ-1 and is proposed to be a bioretention facility without a detention requirement. The facility is located at the bottom of the access road loop to accommodate the most possible developed runoff from the nature center site. The WQ-1 facility has also been designed to have minimal impact on the existing trees in the area that is considered the entrance to the nature center. In order to reduce the footprint of the facility, internal water storage zone (IWSZ) calculations as detailed in Section 4.3.3 of MHFD Volume 3 have been utilized. The WQCV depth has been reduced by utilizing a 24" thick gravel layer and a 6" thick sand layer as storage areas below the growing media of the bioretention facility. The IWSZ calculations, the bioretention cross-section and outlet details are included in the Appendix. WQ-1 will utilize a non-standard spillway condition to minimize the visual impact of the WQ-1 facility and maintain the reduced depth. Should the 100yr overflow grate become completely clogged, the trench drain on the west side of WQ-1 will function as the overflow route. The emergency overflow will backup into the trench drain and flow into the access road with the trench drain functioning as a level spreader. The overflow will then continue south in the access road and enter the road ditch. This road ditch is the outfall point for the normal function of WQ-

Please include a statement to discuss if armoring is required for the overflow route.

1 and the emergency overflow routing. WQ-1 will be an El Paso County Parks facility with maintenance to be coordinated between County departments.

The construction of the Fox Run Nature Center and Road Reclamation will create an exciting new facility for the regional park. The drainage facilities proposed together with the reclamation of a portion of the existing improvements in the vicinity of the nature center will allow this project to be completed without any negative drainage or water quality impact to the regional park or properties downstream. Drainage facilities direct offsite runoff around the proposed nature center and allow those flows to continue to follow their existing flow patterns. Onsite storm sewer facilities allow developed runoff to be collected and directed to a water quality facility before leaving the project area and continuing through the park. There are no known environmental or drainage issues existing on site. Maintenance of the proposed stormwater management facilities will be the responsibility of the County with interdepartmental responsibilities to be determined.

The construction of the Fox Run Nature Center together with the reclamation of the road, parking and restroom facilities results in a statistically insignificant increase in runoff leaving the park. As a result, there is no permanent detention requirement for this project. A permanent water quality facility is proposed and the MHFD spreadsheets were utilized in the design of the facility. Those spreadsheets are included in the Appendix. Temporary erosion control measures will be in place prior to final stabilization of the site. Grading and Erosion Control Plans for the site will be submitted separately.

The facilities proposed for the Fox Run Nature Center will be part of the Fox Run Regional Park facilities and would be considered public facilities. An opinion of probable cost is included below:

Drainage Facilities Cost Estimate

Item	Quantity	Unit	Cost/Unit	Total Cost
4" HDPE	156.5	LF	$45.00	$7,042.50
6" HDPE	27.8	LF	$60.00	$1,668.00
12" HDPE	108.4	LF	$75.00	$8,130.00
18" RCP	76.4	LF	$120.00	$9,168.00
Type L Riprap	0.925	CY	$165.00	$152.63
8" Area Inlet	3	EA	$220.00	$660.00
24" Area Inlet	2	EA	$675.00	$1,350.00
Riprap Rundown	2	EA	$2,000.00	$4,000.00
Trench Drain w/Riprap	2	EA	$6,000.00	$12,000.00
Rain Garden	1	LUMP	$20,000.00	$20,000.00
20% Contingency				$12,834.23
			TOTAL	$77,005.36

There are Drainage and Bridge Fees for the Smith Creek Drainage Basin. However, the County is exempt from those fees.

c) Other Government Agency Requirements

Federal Emergency Management Agency (FEMA)

According to the FEMA Flood Insurance Rate Map (FIRM) Panel No. 08041C1285G, effective 12/07/2018, this site is located within an area of minimal flood hazard (Zone X). A copy of a portion of the appropriate FIRM panel is included in the Appendix.

Army Corps of Engineers (COE)

N/A

Colorado State Engineer

N/A

Colorado Water Conservation Board (CWCB)

N/A

Drawings/Appendix

A. General Location (Vicinity) Map

B. Floodplain Map

C. Soils Map

D. Hydrologic Calculations

E. Hydraulic Calculations

F. Drainage & Stormwater Facility Plans

APPENDIX A

BASELINE
Engineering · Planning · Surveying

Fox Run Nature Center

0.2 0 0.12 Miles

NAD_1983_StatePlane_Colorado_Central_FIPS_0502_Feet

APPENDIX B

BASELINE
Engineering · Planning · Surveying

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/14/2024 at 6:48 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C

BASELINE
Engineering · Planning · Surveying

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado

Fox Run Nature Center

October 10, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,240 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Jun 9, 2021—Jun 12, 2021

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	11.9	100.0%
Totals for Area of Interest		**11.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:

Hydric soil rating: No

Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

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 four hydrologic soil groups are:

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.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

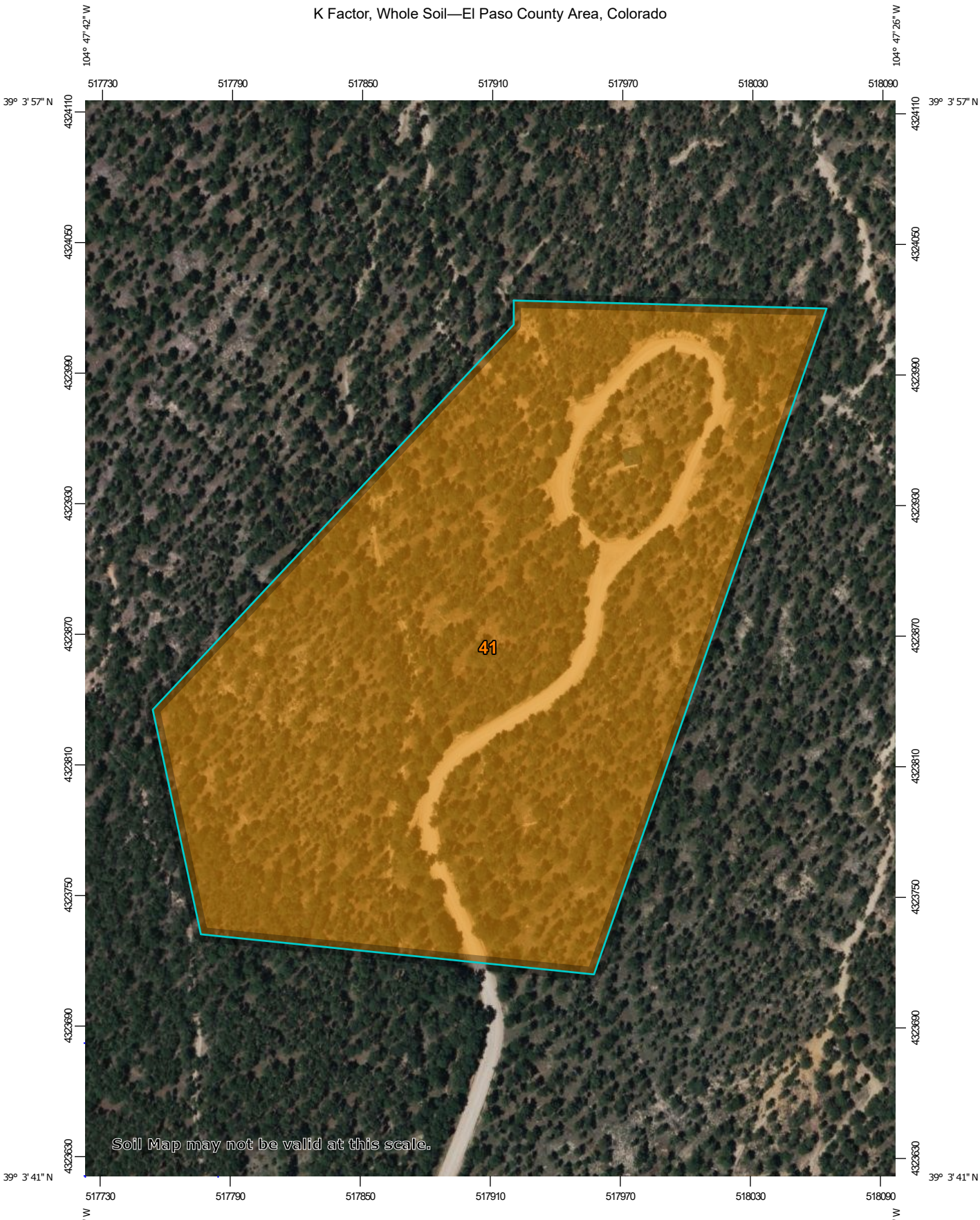
Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

Hydrologic Soil Group and Surface Runoff–El Paso County Area, Colorado			
Map symbol and soil name	**Pct. of map unit**	**Surface Runoff**	**Hydrologic Soil Group**
41—Kettle gravelly loamy sand, 8 to 40 percent slopes			
Kettle	85	Medium	B

Data Source Information

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



Map Scale: 1:2,410 if printed on A portrait (8.5" x 11") sheet.

N

0 35 70 140 210 Meters

0 100 200 400 600 Feet

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Soil Rating Lines
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- Not rated or not available

Soil Rating Points
- .02
- .05
- .10
- .15
- .17
- .20
- .24
- .28
- .32
- .37
- .43
- .49
- .55
- .64
- 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.

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

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Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	.10	14.8	100.0%
Totals for Area of Interest			**14.8**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)

Include calculations for riprap rundowns and all culverts

APPENDIX D

BASELINE
Engineering · Planning · Surveying

BASELINE
Engineering · Planning · Surveying

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/31/2024

= FORMULA CELLS
= USER INPUT CELLS

Project Location
User Input

IDF Rainfall Data

D	P_1: 1-hour Rainfall Depths (inches)	
	Minor Storm	**Major Storm**
	5-Year	100-Year
Minutes	**1.27**	**2.73**
5	5.54	8.34
10	4.66	6.45
20	3.78	4.56
30	3.26	3.45
40	2.90	2.66
50	2.61	2.06
60	2.38	1.56

Figure 6-5 $I_5=-P_1 \ln(D) + 7.583$; $I_{100}= -P_1 \ln(D) + 12.735$

I = rainfall intensity (inches per hour)

P_1 = 1-hour point rainfall depth (inches)

D = storm duration (minutes)

Reference:

1) El Paso County - Drainage Criteria Manual Volume I, Revised 1987
2) City of Colorado Springs - Drainage Criteria Manual Volume I, May 2014
3) Rainfall depths determined via the NOAA Atlas 14, Volume 8, Version 2 (https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=co)

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/31/2024

= FORMULA CELLS
= USER INPUT CELLS

Runoff Coefficients & Impervious Values for Rational Method - per CS DCM Vol I, Table 6-6.

	Impervious Percentage	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}
UA- Forest	0%	0.02	0.08	0.15	0.25	0.30	0.35
Drive and Walks	100%	0.89	0.90	0.92	0.94	0.95	0.96
Roofs	90%	0.71	0.73	0.75	0.78	0.80	0.81
S- Gravel	80%	0.57	0.59	0.63	0.66	0.68	0.70

	Impervious Percentage	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}
Lawns	0%	0.02	0.08	0.15	0.25	0.30	0.35
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00

Hydrologic Soil Group: A or B

PROPOSED COMPOSITE IMPERVIOUSNESS

		Weighted Impervious and C Values							Areas (ac)							
Basin	**Area (ac)**	**Imp.**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**UA- Forest**	**Drive and Walks**	**Roofs**	**S- Gravel**	**Lawns**	**Land Use**	**Land Use**	**Land Use**
Existing Conditions Subbasins																
OS1A	78.80	3%	0.05	0.11	0.18	0.27	0.32	0.37	76.19	2.48	0.13					
OS1B	1.57	0%	0.02	0.08	0.15	0.25	0.30	0.35	1.57							
OS2	2.85	0%	0.02	0.08	0.15	0.25	0.30	0.35	2.85							
OS3	4.36	0%	0.02	0.08	0.15	0.25	0.30	0.35	4.36							
OS4	2.07	0%	0.02	0.08	0.15	0.25	0.30	0.35	2.07							
OS5	0.18	0%	0.02	0.08	0.15	0.25	0.30	0.35	0.18							
E1	2.01	12%	0.10	0.15	0.22	0.31	0.35	0.40	1.72			0.29				
RE1	2.02	25%	0.19	0.24	0.30	0.38	0.42	0.46	1.40		0.02	0.60				
P1	1.46	59%	0.52	0.55	0.59	0.64	0.67	0.70	0.58	0.66	0.22					
P2	0.22	5%	0.06	0.12	0.19	0.28	0.33	0.38		0.01			0.21			
P3	0.34	26%	0.25	0.30	0.35	0.43	0.47	0.51		0.09			0.25			
RP1	0.61	0%	0.02	0.08	0.15	0.25	0.30	0.35	0.61							
RP2	1.04	0%	0.02	0.08	0.15	0.25	0.30	0.35	1.04							
RP3	0.37	0%	0.02	0.08	0.15	0.25	0.30	0.35	0.37							
Overall Basin - Ex	174.32	2%	0.03	0.09	0.16	0.26	0.31	0.36	170.27		0.06	3.99				

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/31/2024

= FORMULA CELLS
= USER INPUT CELLS

BASELINE
Engineering · Planning · Surveying

Runoff Coefficients & Impervious Values for Rational Method - per CS DCM Vol I, Table 6-6.

	Impervious Percentage	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}
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Drive and Walks	100%	0.89	0.90	0.92	0.94	0.95	0.96
Roofs	90%	0.71	0.73	0.75	0.78	0.80	0.81
S- Gravel	80%	0.57	0.59	0.63	0.66	0.68	0.70

	Impervious Percentage	C_2	C_5	C_{10}	C_{25}	C_{50}	C_{100}
Lawns	0%	0.02	0.08	0.15	0.25	0.30	0.35
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00
Land Use	0%	0.00	0.00	0.00	0.00	0.00	0.00

Hydrologic Soil Group: A or B

PROPOSED COMPOSITE IMPERVIOUSNESS

		Weighted Impervious and C Values							Areas (ac)							
Basin	**Area (ac)**	**Imp.**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**UA- Forest**	**Drive and Walks**	**Roofs**	**S- Gravel**	**Lawns**	**Land Use**	**Land Use**	**Land Use**
Overall Basin - Prop	174.32	2%	0.03	0.09	0.16	0.26	0.31	0.36	170.25	0.73	0.25	3.09				

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STANDARD FORM SF-1

TIME OF CONCENTRATION SUMMARY

Project: Fox Run Nature Center
Job No.: 35063
Checked By: SGB

Calculated By: AJL
Date: 10/31/2024

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)				FINAL t_c	REMARKS
Basin	i	C_5	AREA Ac	LENGTH Ft	SLOPE %	t_i Min	LENGTH Ft	Cv	SLOPE %	VEL. FPS	t_t Min	COMP. t_c	TOT. LENGTH Ft	S_o %	tc (Equation 6-7) Min	Min	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
Existing Conditions Subbasins																	
OS1A	0.03	0.11	78.80	100	2.7	12.92	3,946	10	4.8	2.18	30.14	43.1	4,046	4.71	58.3	43.06	
OS1B	0.00	0.08	1.57	45	17.7	4.79	400	10	16.9	4.11	1.62	6.4	445	16.98	28.0	6.41	
OS2	0.00	0.08	2.85	243	11.2	12.93	734	10	7.1	2.66	4.59	17.5	977	8.12	32.3	17.53	
OS3	0.00	0.08	4.36	75	12.7	6.89	819	10	6.8	2.61	5.23	12.1	894	7.29	32.1	12.13	
OS4	0.00	0.08	2.07	65	15.4	6.02	517	10	7.9	2.81	3.07	9.1	582	8.74	29.6	9.09	
OS5	0.00	0.08	0.18	111	9.1	9.36	0	20	0.0	0.20	0.00	9.4	111	9.10	26.7	9.36	
E1	0.12	0.15	2.01	255	8.5	13.47	280	15	4.9	3.32	1.41	14.9	535	6.62	27.3	14.87	
RE1	0.25	0.24	2.02	290	9.3	12.70	384	15	8.9	4.47	1.43	14.1	674	9.07	24.8	14.13	
P1	0.59	0.55	1.46	58	2.1	5.94	351	10	5.6	2.37	2.47	8.4	409	5.10	17.8	8.41	
P2	0.05	0.12	0.22	25	25.0	3.07	342	15	3.2	2.68	2.12	5.2	367	4.69	28.2	5.19	
P3	0.26	0.30	0.34	77	10.0	5.95	0	20	0.0	0.20	0.00	6.0	77	10.00	21.8	5.95	
RP1	0.00	0.08	0.61	279	7.7	15.68	0	10	10.0	3.16	0.00	15.7	279	7.70	27.9	15.68	
RP2	0.00	0.08	1.04	360	8.0	17.59	0	10	10.0	3.16	0.00	17.6	360	8.00	28.4	17.59	
RP3	0.00	0.08	0.37	347	9.1	16.55	0	10	10.0	3.16	0.00	16.6	347	9.10	28.1	16.55	
Overall Basin - Ex	0.02	0.09	174.32	100	2.7	13.11	6,796	10	4.8	2.19	51.70	64.8	6,896	4.77	82.5	64.81	
Overall Basin - Prop	0.02	0.09	174.32	100	2.7	13.09	6,796	10	4.8	2.19	51.70	64.8	6,896	4.77	82.4	64.79	

$t_c = t_i + t_t$

$t_i=((0.395(1.1-C_5)SQRT(L))/(S_o\text{^}0.33))$

$V=C_v*S_w^{0.5}$

Table 6-7. Conveyance Coefficient, C_v	
Heavy meadow	2.5
Tillage/Field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For bured riprap, select C_v value based on type of vegetative cover.

= FORMULA CELLS
= USER INPUT CELLS

Please separate the existing and proposed conditions calculations to their own sheets

Calculated By: AJL
Date: 10/31/2024
Checked By: SGB
5-Year 1-hour rainfall= 1.27

STANDARD FORM SF-2

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: Fox Run Nature Center
Job No.: 35063
Design Storm: 5-Year

= FORMULA CELLS
= USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Existing Conditions Subbasins																					
OS1A			78.80	0.11	43.1	8.42	1.94	**16.33**													
OS1B			1.57	0.08	6.4	0.13	4.80	**0.60**													
OS2			2.85	0.08	17.5	0.23	3.29	**0.75**													
OS3			4.36	0.08	12.1	0.35	3.17	**1.1**													
OS4			2.07	0.08	9.1	0.17	3.56	**0.6**													
OS5			0.18	0.08	9.4	0.01	3.52	**0.1**													
E1			2.01	0.15	14.9	0.31	2.89	**0.9**													
RE1			2.02	0.24	14.1	0.48	2.96	**1.4**													
P1			1.46	0.55	8.4	0.80	3.67	**2.9**													
P2			0.22	0.12	5.2	0.03	4.27	**0.1**													
P3			0.34	0.30	6.0	0.10	4.10	**0.4**													
RP1			0.61	0.08	15.7	0.05	2.82	**0.1**													
RP2			1.04	0.08	17.6	0.08	2.67	**0.2**													
RP3			0.37	0.08	16.6	0.03	2.75	**0.1**													
Overall Basin - Ex	FR-1		174.32	0.09	64.8	16.02	1.22	**19.5**													
Overall Basin - Prop	FR-1		174.32	0.09	64.8	16.28	1.22	**19.8**													

Calculated By: AJL
Date: 10/31/2024
Checked By: SGB
100-Year 1-hour rainfall= 2.73

STANDARD FORM SF-2

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: Fox Run Nature Center
Job No.: 35063
Design Storm: 100-Year

= FORMULA CELLS
= USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Existing Conditions Subbasins																					
OS1A			78.80	0.37	43.1	29.15	3.25	**94.84**													
OS1B			1.57	0.35	6.4	0.55	8.05	**4.42**													
OS2			2.85	0.35	17.5	1.00	5.52	**5.50**													
OS3			4.36	0.35	12.1	1.53	6.45	**9.84**													
OS4			2.07	0.35	9.1	0.72	7.17	**5.20**													
OS5			0.18	0.35	9.4	0.06	7.58	**0.5**													
E1			2.01	0.40	14.9	0.81	6.22	**5.0**													
RE1			2.02	0.46	14.1	0.93	6.37	**5.9**													
P1			1.46	0.70	8.4	1.01	7.88	**8.0**													
P2			0.22	0.38	5.2	0.08	9.17	**0.8**													
P3			0.34	0.51	6.0	0.17	8.82	**1.5**													
RP1			0.61	0.35	15.7	0.21	6.07	**1.3**													
RP2			1.04	0.35	17.6	0.36	5.74	**2.1**													
RP3			0.37	0.35	16.6	0.13	5.91	**0.8**													
Overall Basin - Ex	FR-1		174.32	0.36	64.8	62.44	2.62	**163.5**													
Overall Basin - Prop	FR-1		174.32	0.36	64.8	62.65	2.62	**164.1**													

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/31/2024

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DIRECT RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS)		ACCUMULATIVE (CFS)		Notes
						Q5	Q100	Q5	Q100	
Subbasins										
OS1A	0	78.80	3%	0.11	0.37	16.33	94.84			
OS1B	0	1.57	0%	0.08	0.35	0.60	4.42			
OS2	0	2.85	0%	0.08	0.35	0.75	5.50			
OS3	0	4.36	0%	0.08	0.35	1.11	9.84			
OS4	0	2.07	0%	0.08	0.35	0.59	5.20			
OS5	0	0.18	0%	0.08	0.35	0.05	0.48			
E1	0	2.01	12%	0.15	0.40	0.89	5.01			
RE1	0	2.02	25%	0.24	0.46	1.42	5.90			
P1	0	1.46	59%	0.55	0.70	2.94	8.00			
P2	0	0.22	5%	0.12	0.38	0.11	0.76			
P3	0	0.34	26%	0.30	0.51	0.41	1.53			
RP1	0	0.61	0%	0.08	0.35	0.14	1.30			
RP2	0.0	1.04	0.00	0.08	0.35	0.22	2.09			
RP3	0.0	0.37	0.00	0.08	0.35	0.08	0.77			
Overall Basin - Ex	FR-1	174.32	0.02	0.09	0.36	19.51	163.49			
Overall Basin - Prop	FR-1	174.32	0.02	0.09	0.36	19.84	164.10			

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/31/2024

BASELINE Engineering · Planning · Surveying

DESIGN POINT SUMMARY

DESIGN POINT	LOCATION / STRUCTURE	CATCHMENT DESCRIPTION	TOTAL FLOW (CFS)		CONTRIBUTING BASINS
			Q5	Q100	
EXISTING CONDITIONS DESIGN POINT SUMMARY					
1E	Existing Main Natural Channel at FRNC Site	Upslope contributing areas to the future location of the nature center building at the main natural channel	18.4	105.6	**RE-1, OS-1A, OS-1B, OS-5**
2E	Existing Main Natural Channel at south End of Site	Upslope contributing areas to the future location of the south end of improvements on the eastern side of road	3.3	25.5	**E-1, OS-2, OS-3, OS-4**
3E	Existing Main Natural Channel	Combined area of 1E and 2E	21.8	131.2	**RE-1, OS-1A, OS-1B, OS-5, E-1, OS-2, OS-3, OS-4**
PROPOSED CONDITIONS DESIGN POINT SUMMARY					
1	Reclaimed Gravel Loop Low Point	The contributing area to the upper loop road after the reclamation is completed	0.96	7.8	**RP-1, RP-2, OS-1B**
2	Reclaimed Gravel Road Low Point North of Nature Center, Swale S-1	Upslope areas of the North side of the FRNC building	0.99	7.5	**RP-3, OS-2, OS-5, P-2**
3	End of Swale S-2	Contributing areas to the main natural channel at the FRNC site	18.3	110.2	**OS-1A, DP-1, DP-2**
4	Proposed Bioretention Facility	Catchment of the Bioretention facility designated WQ-1	2.9	8.0	**P-1**
5	East Side of Entrance Road to Site	Easterly offsite basins and entrance road south of WQ-1	2.1	16.6	**OS-3, OS-4, P-3**
6	South End of Project Site	Combined area of 3, 4, & 5	23.3	134.7	**DP-3,DP-4, DP-5**
OVERALL DESIGN POINT SUMMARY					
FR1-Existing	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.51	163.49	**OVERALL BASIN-EX**
FR1-Proposed	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.84	164.10	**OVERALL BASIN - PRO**

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.063°, Longitude: -104.7931°
Elevation: 7374 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.235** (0.194-0.287)	**0.291** (0.239-0.355)	**0.387** (0.317-0.474)	**0.471** (0.383-0.578)	**0.592** (0.467-0.756)	**0.690** (0.530-0.890)	**0.792** (0.587-1.04)	**0.900** (0.638-1.22)	**1.05** (0.714-1.45)	**1.17** (0.771-1.63)
10-min	**0.345** (0.284-0.420)	**0.427** (0.351-0.520)	**0.567** (0.464-0.693)	**0.690** (0.561-0.847)	**0.867** (0.684-1.11)	**1.01** (0.776-1.30)	**1.16** (0.859-1.53)	**1.32** (0.934-1.78)	**1.54** (1.04-2.13)	**1.71** (1.13-2.39)
15-min	**0.420** (0.346-0.512)	**0.520** (0.428-0.635)	**0.692** (0.566-0.846)	**0.841** (0.684-1.03)	**1.06** (0.834-1.35)	**1.23** (0.946-1.59)	**1.42** (1.05-1.86)	**1.61** (1.14-2.17)	**1.87** (1.27-2.59)	**2.08** (1.38-2.92)
30-min	**0.593** (0.488-0.723)	**0.734** (0.603-0.895)	**0.974** (0.797-1.19)	**1.18** (0.963-1.45)	**1.49** (1.17-1.90)	**1.73** (1.33-2.24)	**1.99** (1.47-2.62)	**2.26** (1.60-3.05)	**2.64** (1.79-3.65)	**2.93** (1.94-4.10)
60-min	**0.756** (0.622-0.921)	**0.916** (0.753-1.12)	**1.20** (0.983-1.47)	**1.46** (1.19-1.79)	**1.84** (1.46-2.37)	**2.17** (1.67-2.81)	**2.51** (1.87-3.33)	**2.89** (2.05-3.92)	**3.42** (2.33-4.74)	**3.84** (2.54-5.37)
2-hr	**0.918** (0.760-1.11)	**1.10** (0.907-1.33)	**1.43** (1.18-1.73)	**1.73** (1.42-2.11)	**2.20** (1.76-2.82)	**2.60** (2.02-3.36)	**3.04** (2.27-4.01)	**3.51** (2.52-4.75)	**4.20** (2.88-5.80)	**4.75** (3.16-6.60)
3-hr	**1.01** (0.841-1.22)	**1.19** (0.988-1.44)	**1.53** (1.26-1.85)	**1.86** (1.52-2.26)	**2.37** (1.91-3.05)	**2.82** (2.21-3.65)	**3.32** (2.50-4.38)	**3.87** (2.79-5.23)	**4.67** (3.23-6.45)	**5.33** (3.56-7.38)
6-hr	**1.20** (1.00-1.44)	**1.39** (1.16-1.66)	**1.76** (1.46-2.12)	**2.13** (1.76-2.57)	**2.73** (2.22-3.50)	**3.27** (2.57-4.20)	**3.86** (2.93-5.07)	**4.53** (3.29-6.08)	**5.51** (3.83-7.57)	**6.32** (4.25-8.69)
12-hr	**1.43** (1.20-1.70)	**1.66** (1.39-1.98)	**2.10** (1.76-2.51)	**2.54** (2.10-3.03)	**3.22** (2.63-4.09)	**3.83** (3.03-4.88)	**4.50** (3.44-5.86)	**5.25** (3.84-7.00)	**6.35** (4.44-8.66)	**7.25** (4.90-9.91)
24-hr	**1.70** (1.44-2.00)	**2.00** (1.68-2.35)	**2.54** (2.13-3.00)	**3.04** (2.54-3.61)	**3.82** (3.12-4.77)	**4.48** (3.56-5.64)	**5.20** (3.98-6.70)	**6.00** (4.40-7.91)	**7.14** (5.02-9.64)	**8.07** (5.49-10.9)
2-day	**1.99** (1.69-2.33)	**2.36** (2.00-2.76)	**3.00** (2.54-3.52)	**3.58** (3.00-4.22)	**4.44** (3.63-5.46)	**5.15** (4.10-6.40)	**5.91** (4.54-7.51)	**6.72** (4.94-8.76)	**7.86** (5.55-10.5)	**8.78** (6.02-11.8)
3-day	**2.18** (1.86-2.54)	**2.58** (2.19-3.00)	**3.26** (2.76-3.81)	**3.88** (3.26-4.55)	**4.78** (3.92-5.85)	**5.52** (4.41-6.83)	**6.31** (4.86-7.98)	**7.15** (5.28-9.28)	**8.33** (5.91-11.1)	**9.28** (6.38-12.5)
4-day	**2.34** (1.99-2.71)	**2.74** (2.34-3.19)	**3.45** (2.93-4.02)	**4.09** (3.45-4.78)	**5.02** (4.12-6.12)	**5.79** (4.63-7.14)	**6.60** (5.10-8.33)	**7.48** (5.53-9.67)	**8.70** (6.18-11.5)	**9.67** (6.67-13.0)
7-day	**2.74** (2.34-3.16)	**3.16** (2.71-3.65)	**3.91** (3.34-4.53)	**4.58** (3.89-5.33)	**5.58** (4.60-6.75)	**6.40** (5.14-7.83)	**7.26** (5.64-9.11)	**8.20** (6.10-10.5)	**9.50** (6.80-12.5)	**10.6** (7.32-14.1)
10-day	**3.09** (2.65-3.55)	**3.54** (3.04-4.08)	**4.34** (3.72-5.01)	**5.05** (4.30-5.85)	**6.10** (5.05-7.36)	**6.97** (5.62-8.49)	**7.88** (6.14-9.83)	**8.86** (6.61-11.3)	**10.2** (7.34-13.4)	**11.3** (7.88-15.0)
20-day	**4.09** (3.53-4.66)	**4.68** (4.04-5.34)	**5.68** (4.89-6.50)	**6.55** (5.60-7.52)	**7.79** (6.46-9.27)	**8.78** (7.11-10.6)	**9.81** (7.67-12.1)	**10.9** (8.17-13.8)	**12.4** (8.92-16.1)	**13.5** (9.48-17.8)
30-day	**4.92** (4.26-5.58)	**5.64** (4.88-6.40)	**6.82** (5.89-7.77)	**7.82** (6.71-8.95)	**9.22** (7.65-10.9)	**10.3** (8.36-12.3)	**11.4** (8.94-14.0)	**12.5** (9.43-15.8)	**14.1** (10.2-18.2)	**15.2** (10.7-20.0)
45-day	**5.96** (5.19-6.74)	**6.84** (5.94-7.74)	**8.26** (7.15-9.36)	**9.42** (8.11-10.7)	**11.0** (9.13-12.8)	**12.2** (9.90-14.5)	**13.4** (10.5-16.2)	**14.5** (10.9-18.1)	**16.1** (11.6-20.6)	**17.2** (12.2-22.5)
60-day	**6.85** (5.98-7.72)	**7.86** (6.85-8.86)	**9.47** (8.22-10.7)	**10.8** (9.29-12.2)	**12.5** (10.4-14.5)	**13.7** (11.2-16.2)	**14.9** (11.8-18.1)	**16.1** (12.2-20.0)	**17.6** (12.8-22.5)	**18.7** (13.3-24.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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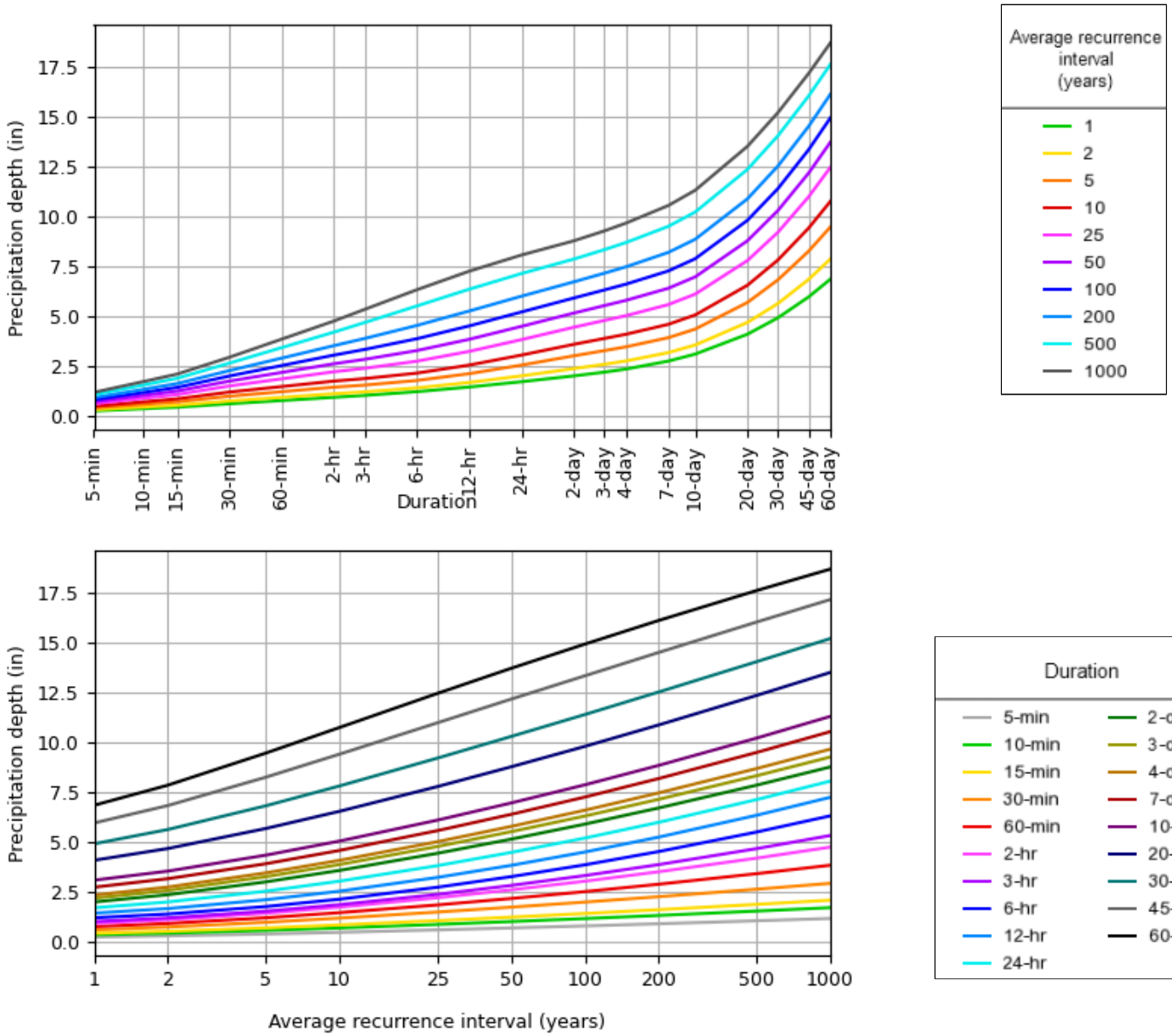
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.0630°, Longitude: -104.7931°



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Tue Mar 5 00:35:47 2024

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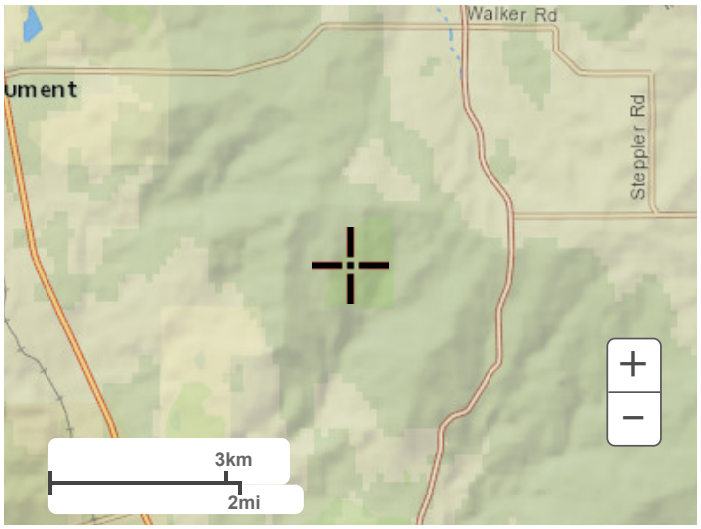
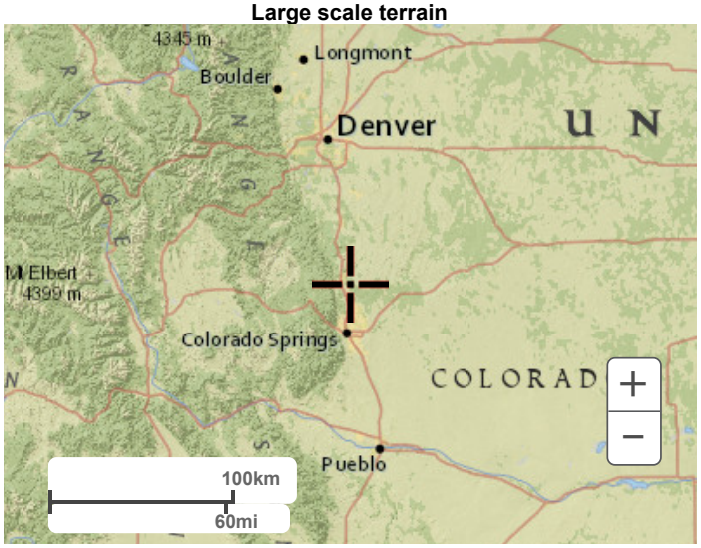
Maps & aerials

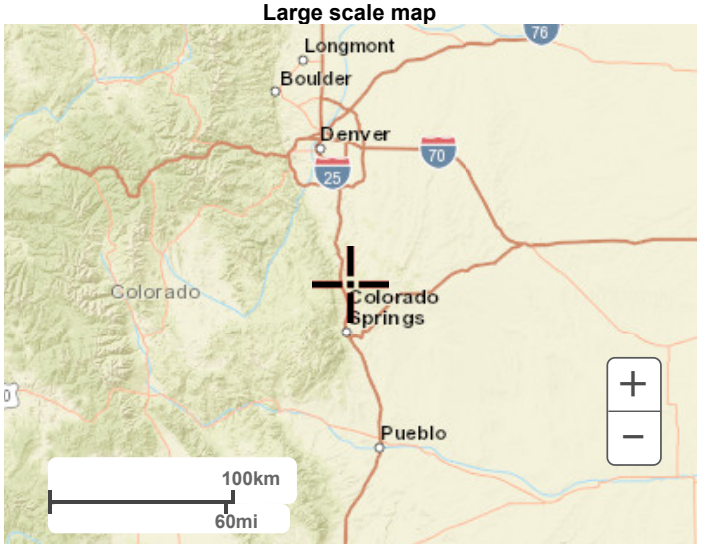
Small scale terrain



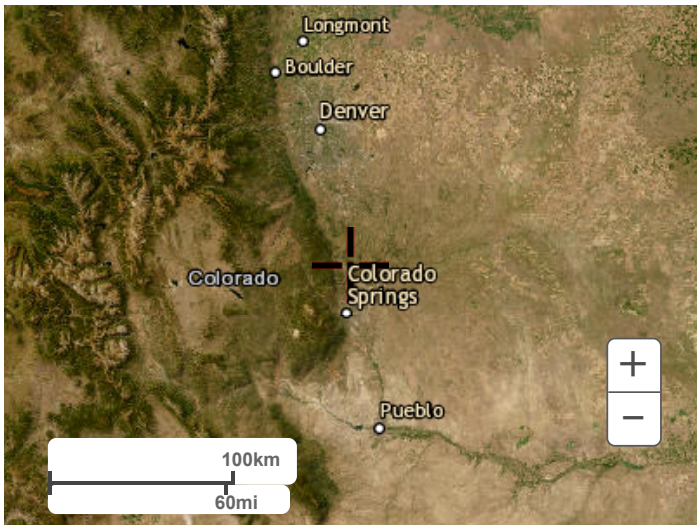
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX E

BASELINE
Engineering · Planning · Surveying

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 31 2024

North Channel S-1 5yr

Triangular

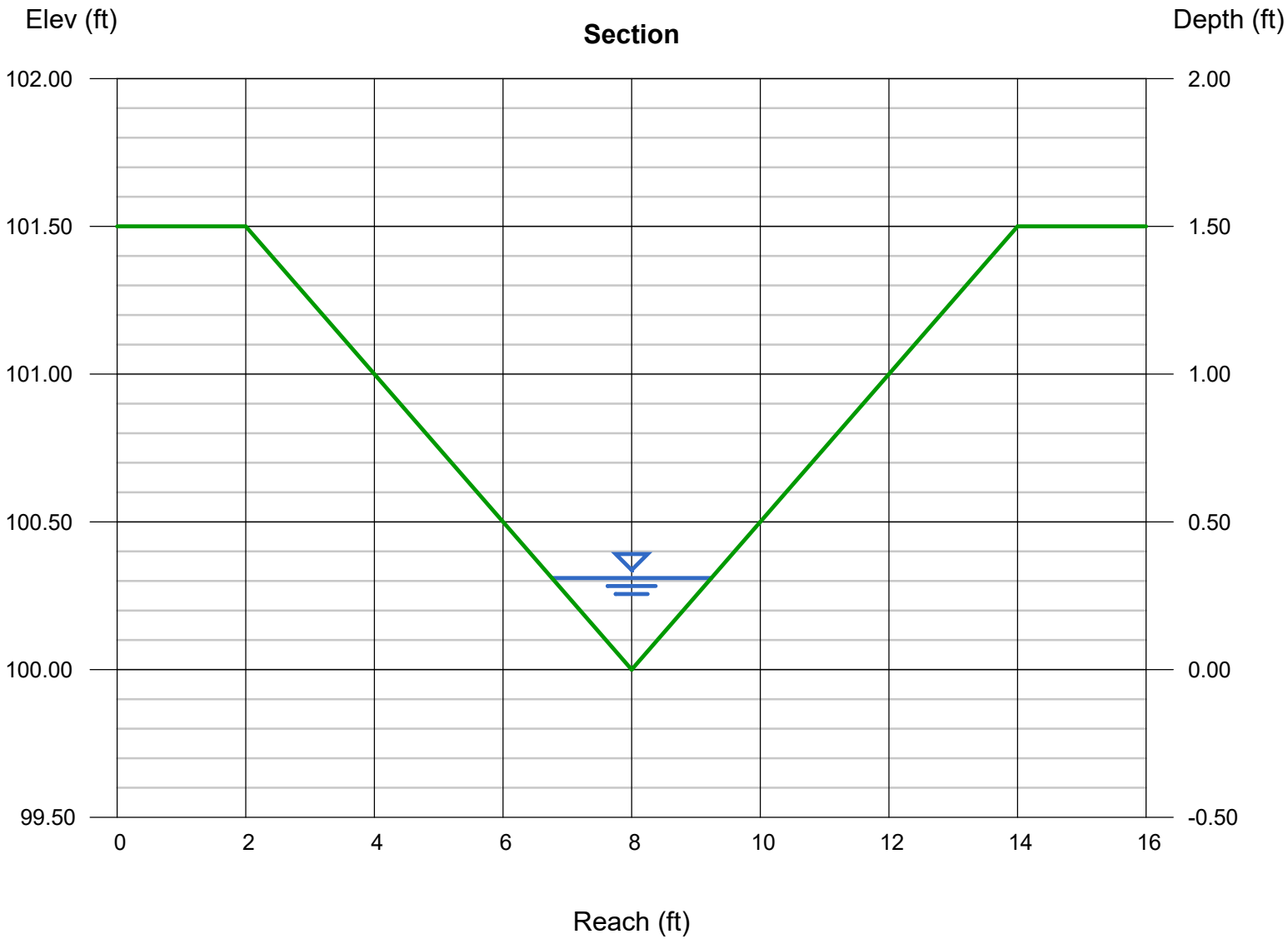
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 5.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.99

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 0.990
Area (sqft)	= 0.38
Velocity (ft/s)	= 2.58
Wetted Perim (ft)	= 2.56
Crit Depth, Yc (ft)	= 0.33
Top Width (ft)	= 2.48
EGL (ft)	= 0.41



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 31 2024

Fox Run NC Channel S-2 5yr

Triangular

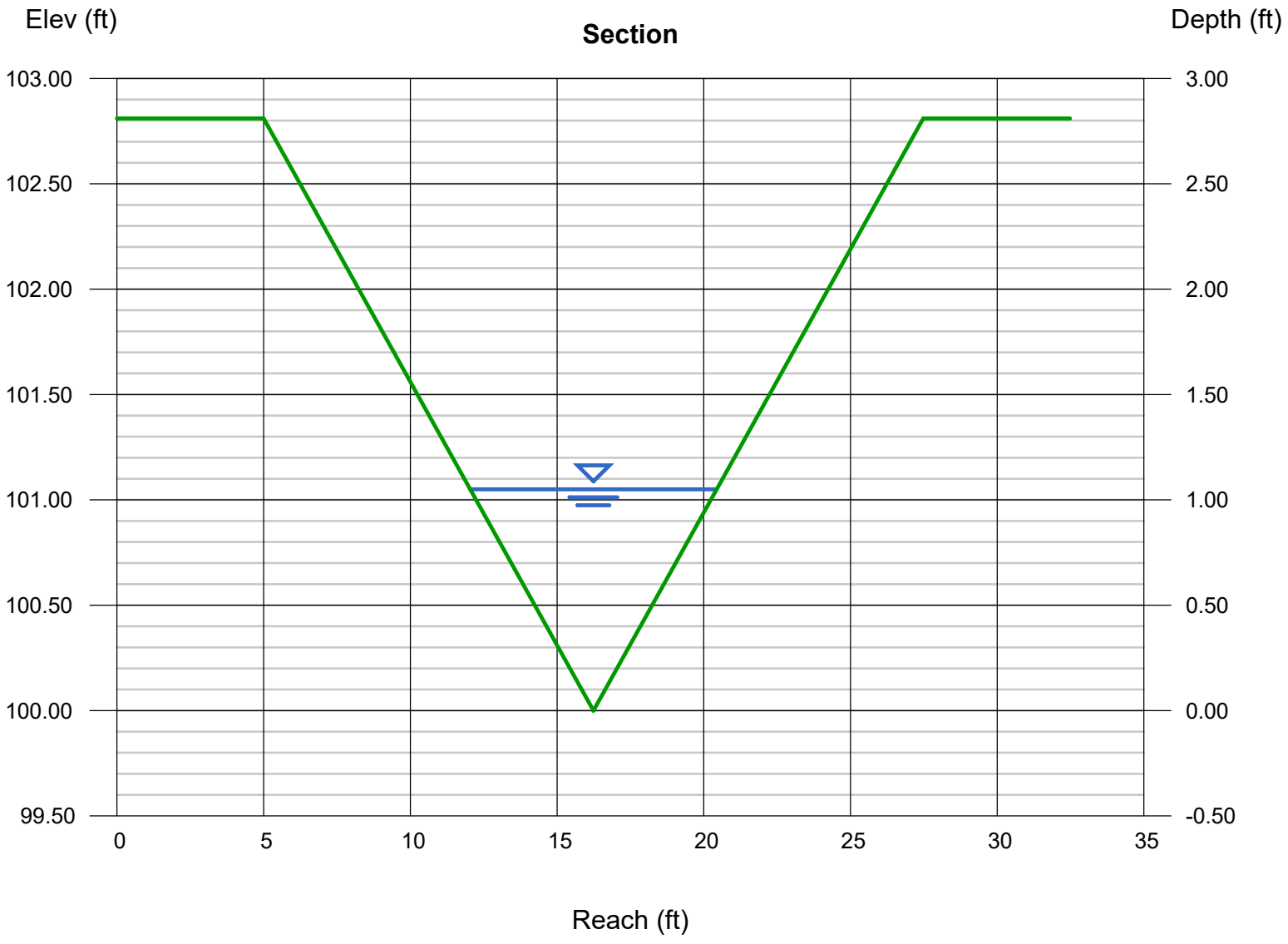
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.81
Invert Elev (ft)	= 100.00
Slope (%)	= 3.12
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.30

Highlighted

Depth (ft)	= 1.05
Q (cfs)	= 18.30
Area (sqft)	= 4.41
Velocity (ft/s)	= 4.15
Wetted Perim (ft)	= 8.66
Crit Depth, Yc (ft)	= 1.06
Top Width (ft)	= 8.40
EGL (ft)	= 1.32



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 31 2024

North Channel S-1 100yr

Triangular

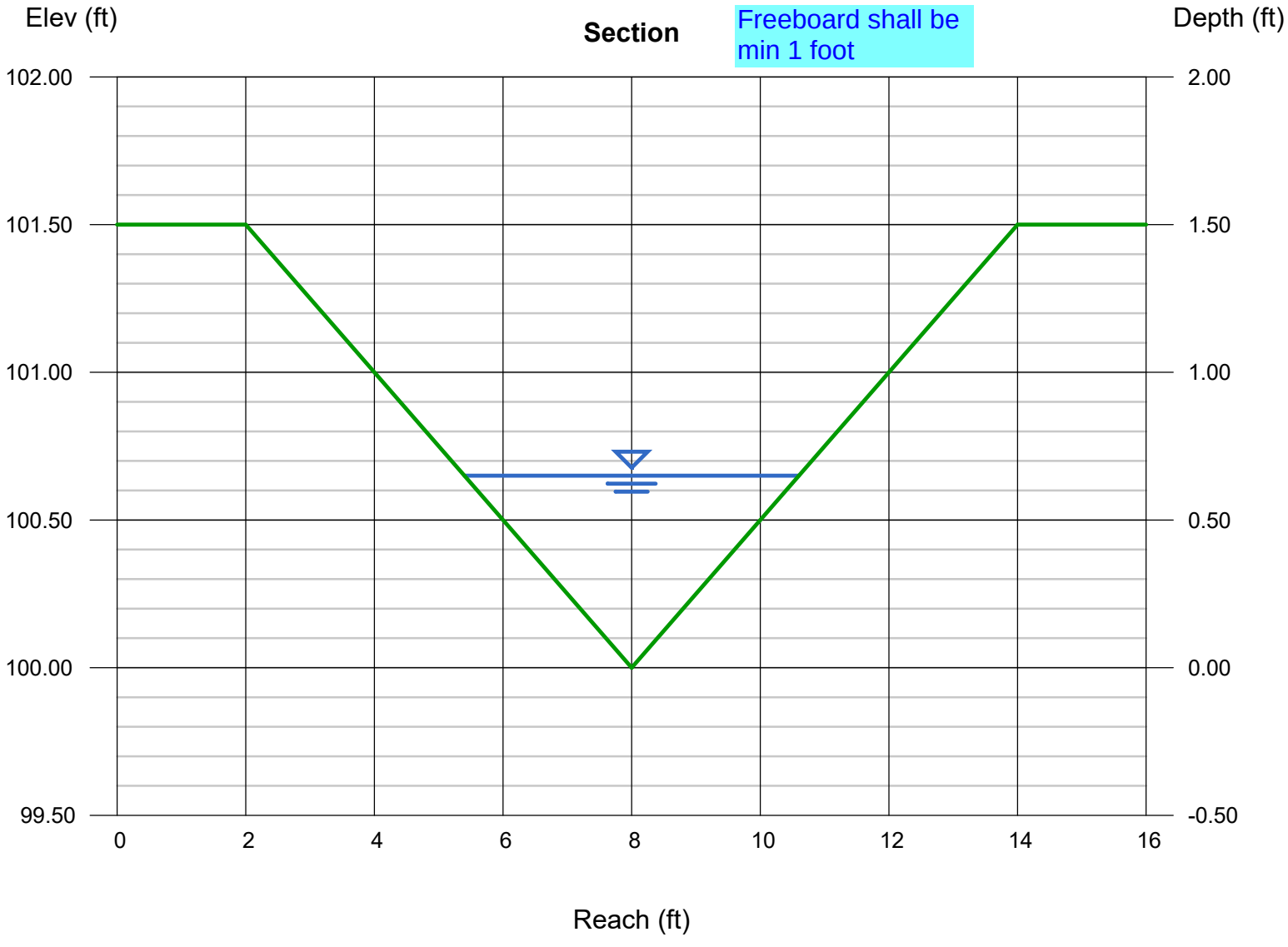
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 5.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.50

Highlighted

Depth (ft)	= 0.65
Q (cfs)	= 7.500
Area (sqft)	= 1.69
Velocity (ft/s)	= 4.44
Wetted Perim (ft)	= 5.36
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 5.20
EGL (ft)	= 0.96



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Oct 31 2024

Fox Run NC Channel S-2 100Yr

Triangular

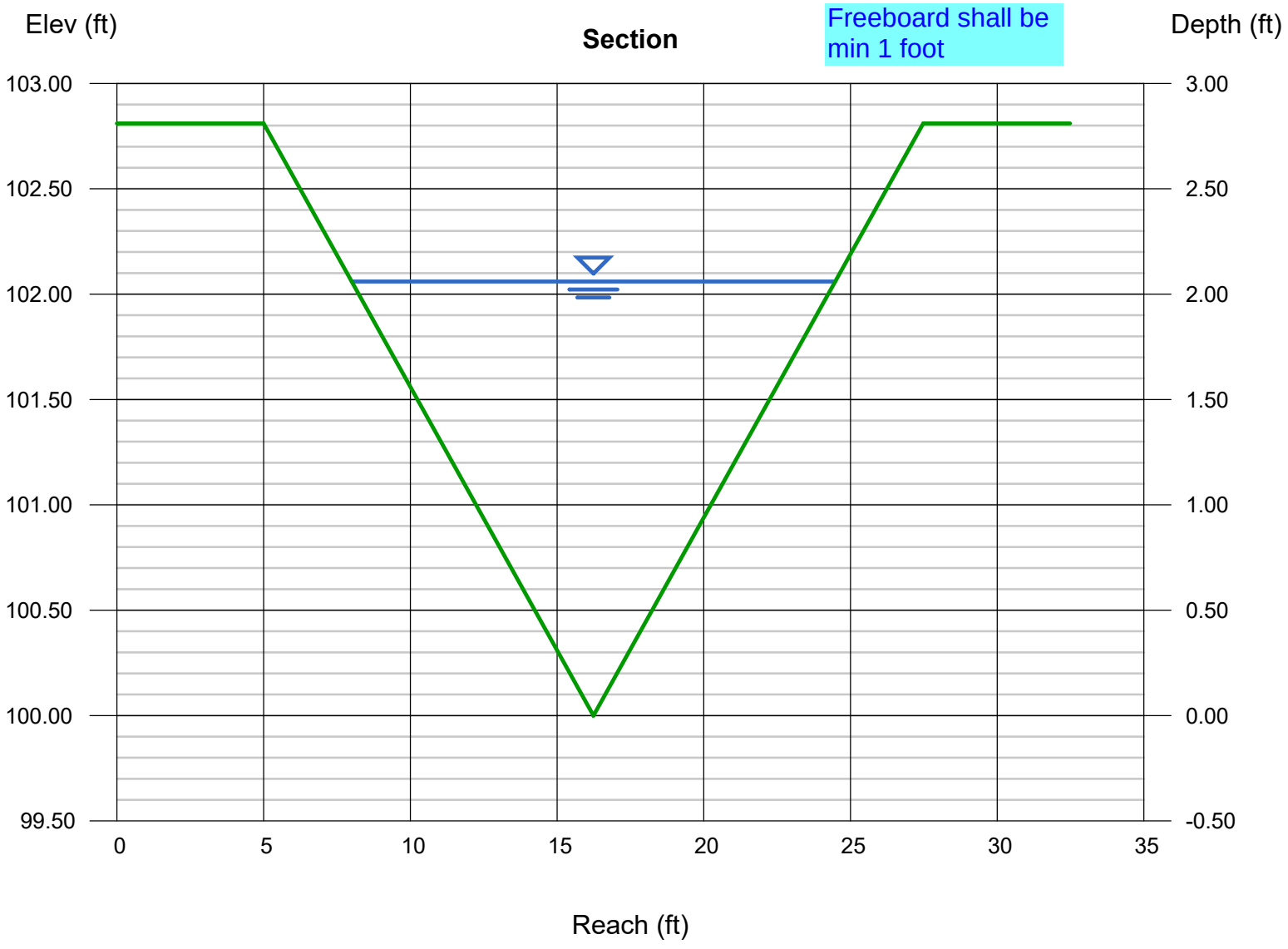
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.81
Invert Elev (ft)	= 100.00
Slope (%)	= 3.12
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 110.20

Highlighted

Depth (ft)	= 2.06
Q (cfs)	= 110.20
Area (sqft)	= 16.97
Velocity (ft/s)	= 6.49
Wetted Perim (ft)	= 16.99
Crit Depth, Yc (ft)	= 2.17
Top Width (ft)	= 16.48
EGL (ft)	= 2.72

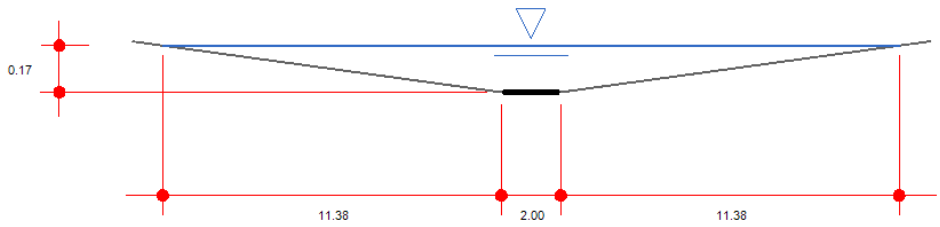


Inlet Report

Patio Area Inlet Capacity

Drop Grate Inlet		**Calculations**	
Location	= Sag	Compute by:	Q vs Depth
Curb Length (ft)	= -0-	Max Depth (in)	= 2
Throat Height (in)	= -0-		
Grate Area (sqft)	= 2.20	**Highlighted**	
Grate Width (ft)	= 1.77	Q Total (cfs)	= 1.50
Grate Length (ft)	= 1.77	Q Capt (cfs)	= 1.50
		Q Bypass (cfs)	= -0-
Gutter		Depth at Inlet (in)	= 2.05
Slope, Sw (ft/ft)	= 0.015	Efficiency (%)	= 100
Slope, Sx (ft/ft)	= 0.015	Gutter Spread (ft)	= 24.76
Local Depr (in)	= -0-	Gutter Vel (ft/s)	= -0-
Gutter Width (ft)	= 2.00	Bypass Spread (ft)	= -0-
Gutter Slope (%)	= -0-	Bypass Depth (in)	= -0-
Gutter n-value	= -0-		

All dimensions in feet



Inlet Section

BASELINE
Engineering · Planning · Surveying

PROJECT: Fox Run Nature Center
JOB NO.: 35063
CALC. BY: AJL
DATE: 10/24/2024

= FORMULA CELLS
= USER INPUT CELLS

Internal Water Storage Zone Calculation

~3,300sf shown on CDs. Revise to remove discrepancy.

Bottom of Bioretention Area:	835	sf			
Total Depth of Sand:	0.5	ft	Sand Volume	417.5	cf
Total Depth of Gravel:	2	ft	Gravel Volume	1670	cf
Sand Pore Storage:	20%	*	Sand Pore Volume:	83.5	cf
Gravel Pore Storage:	30%	**	Gravel Pore Volume:	501	cf
Total Volume Required:	1010	cf			
Underground Volume Provided:	584.5	cf			
Above Ground Volume Required:	425.5	cf			
Above Ground Volume Provided:	463.5	cf			
Depth of WQCV Orifice Hole:	12	in***			

* MHFD Section 4.3.3
** MHFD Section 4.3.3
*** The top of the elbow should be at least 12 inches below the lowest elevation of the surface of the SCM in areas with highly permeable soils and 18 to 24 inches below the surface for lower permeability soils

Since soils for this project are known, make this a less generic statement. State the exact depth of the top of elbow for this project. And show this depth of CDs.

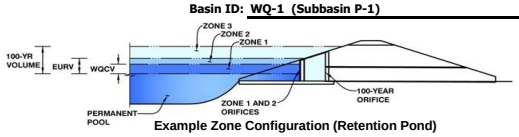
But why does the depth of the top of the elbow even matter? Because on the CDs it is shown as capped. The only depth that matters is the depth/elev of the orifice hole. Did you mean orifice hole instead of top of elbow? Please clarify.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Fox Run Nature Center

Basin ID: WQ-1 (Subbasin P-1)



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**RG**	
Watershed Area =	1.46	acres
Watershed Length =	409	ft
Watershed Length to Centroid =	168	ft
Watershed Slope =	0.051	ft/ft
Watershed Imperviousness =	59.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.010	acre-feet	0.010	acre-feet
Excess Urban Runoff Volume (EURV) =	0.093	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.057	acre-feet	0.92	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	0.081	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.46 in.) =	0.107	acre-feet	1.46	inches
25-yr Runoff Volume (P1 = 1.85 in.) =	0.156	acre-feet	1.85	inches
50-yr Runoff Volume (P1 = 2.17 in.) =	0.193	acre-feet	2.17	inches
100-yr Runoff Volume (P1 = 2.51 in.) =	0.237	acre-feet	2.51	inches
500-yr Runoff Volume (P1 = 3.42 in.) =	0.345	acre-feet	3.42	inches
Approximate 2-yr Detention Volume =	0.055	acre-feet		
Approximate 5-yr Detention Volume =	0.077	acre-feet		
Approximate 10-yr Detention Volume =	0.104	acre-feet		
Approximate 25-yr Detention Volume =	0.125	acre-feet		
Approximate 50-yr Detention Volume =	0.136	acre-feet		
Approximate 100-yr Detention Volume =	0.154	acre-feet		

Why do you have an input for Zone 2? If detention isn't required (as stated in text above) then Zone 1 is all that is needed.

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.010	acre-feet
Zone 2 Volume (100-year - Zone 1) =	0.144	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.154	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

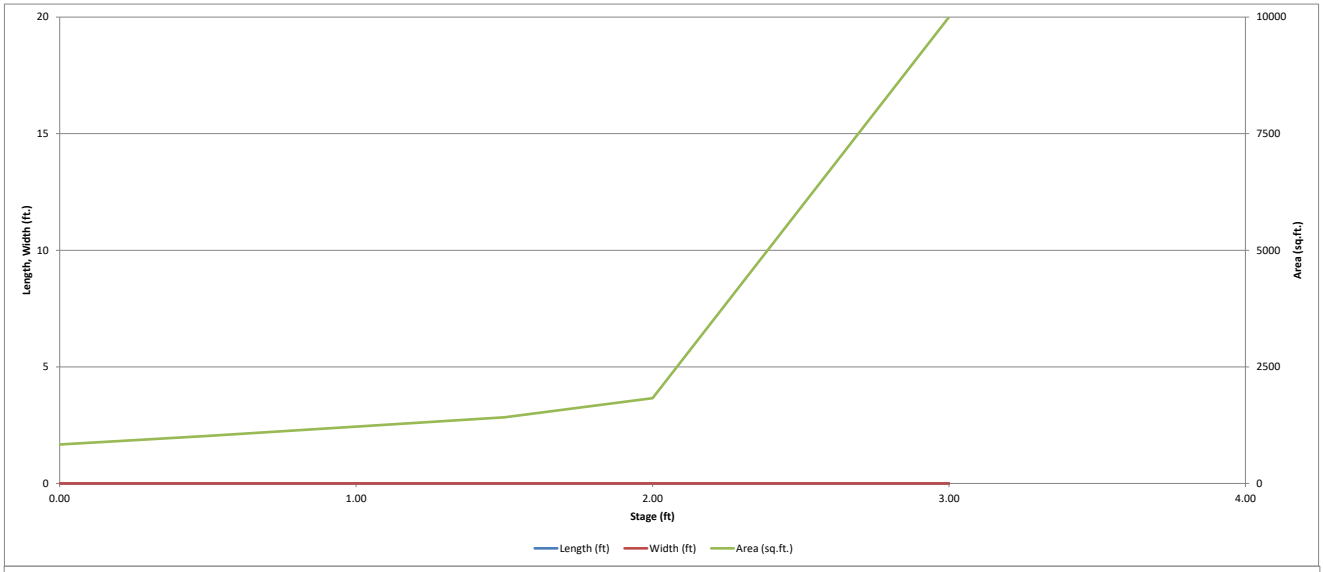
***Please consider using MHFD's new SCM workbook to design and size the rain garden. The new workbook has lots of good features that would be useful for minimizing the size of this RG, including allowing for infiltration, which previous workbooks did not account for.

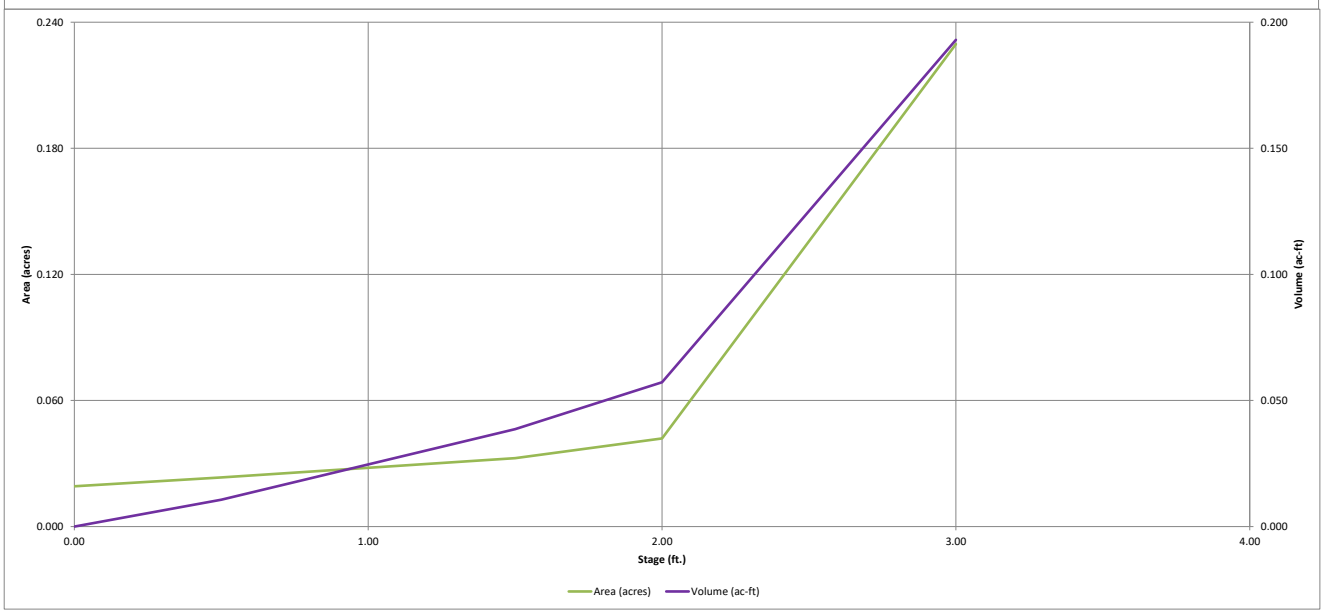
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	835	0.019		
	--	0.50	--	--	--	1,019	0.023	463	0.011
	--	1.50	--	--	--	1,418	0.033	1,682	0.039
	--	2.00	--	--	--	1,827	0.042	2,493	0.057
	--	3.00	--	--	--	10,000	0.230	8,407	0.193

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)





✓ = calcs match details in plans

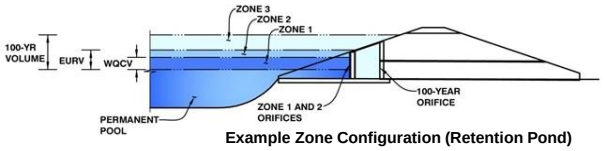
X = calcs do not match details in plans

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Fox Run Nature Center**

Basin ID: **WQ-1 (Subbasin P-1)**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.48	0.010	Filtration Media
Zone 2 (100-year)	2.82	0.144	Weir (No Pipe)
Zone 3			
Total (a			

show this dimension on Sheet C18 of CDs. This doesn't appear to match what is shown on CDs.

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

✓ Underdrain Orifice Invert Depth = 1.00 ft (distance below the filtration media surface)

X Underdrain Orifice Diameter = 0.59 inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = 0.0 ft²

Underdrain Orifice Centroid = 0.02 feet

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

Centroid of Lowest Orifice = N/A ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = N/A ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = N/A sq. inches

11/16" on CDs which is 0.69"

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft²

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft²

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

	Row 1 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft²
Vertical Orifice Centroid =			feet

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

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	0.50		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Bottom Length =	9.00		feet
✓ Overflow Weir Side Slopes =	0.00		H:V
Horiz. Length of Weir Sides =	N/A		feet
✓ Overflow Grate Type =	Type C Grate		
Debris Clogging % =	N/A		%

show these dimensions on Sheet C18 of CDs. The inlet doesn't appear to be 9ft long on CDs.

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	N/A		feet
Slope Length =	N/A		feet
yr Orifice Area =	N/A		
ea w/o Debris =	N/A		ft²
Area w/ Debris =	N/A		ft²

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

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	N/A		ft²
Outlet Orifice Centroid =	N/A		feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

fill in these sections

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 position relative to Overflow Weir =

Calculated Parameters for Spillway

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

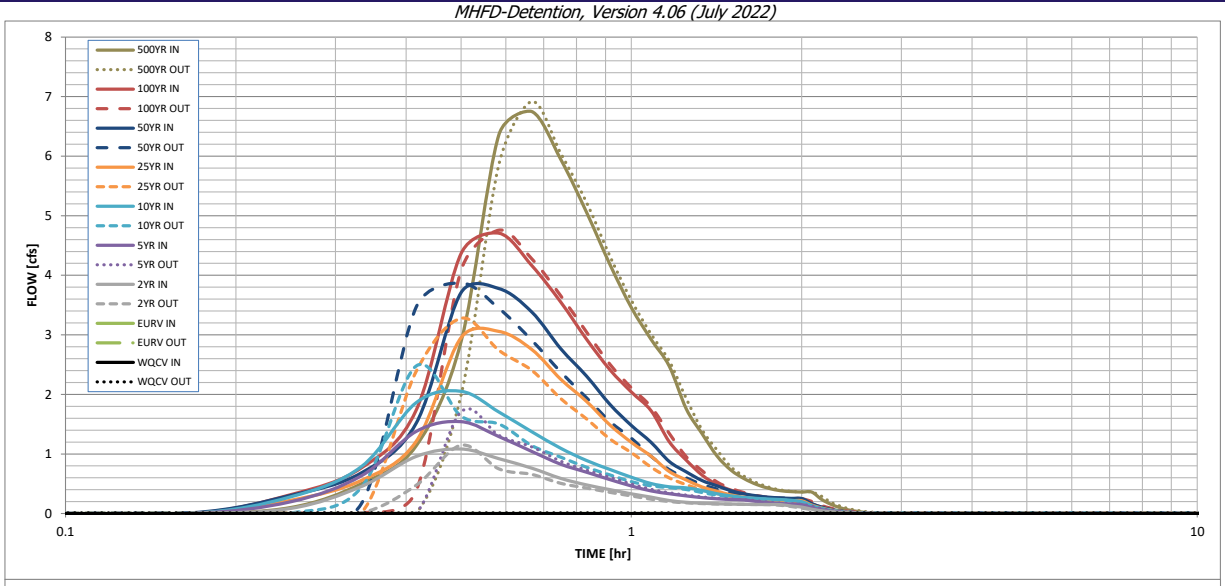
Routed Hydrograph Results

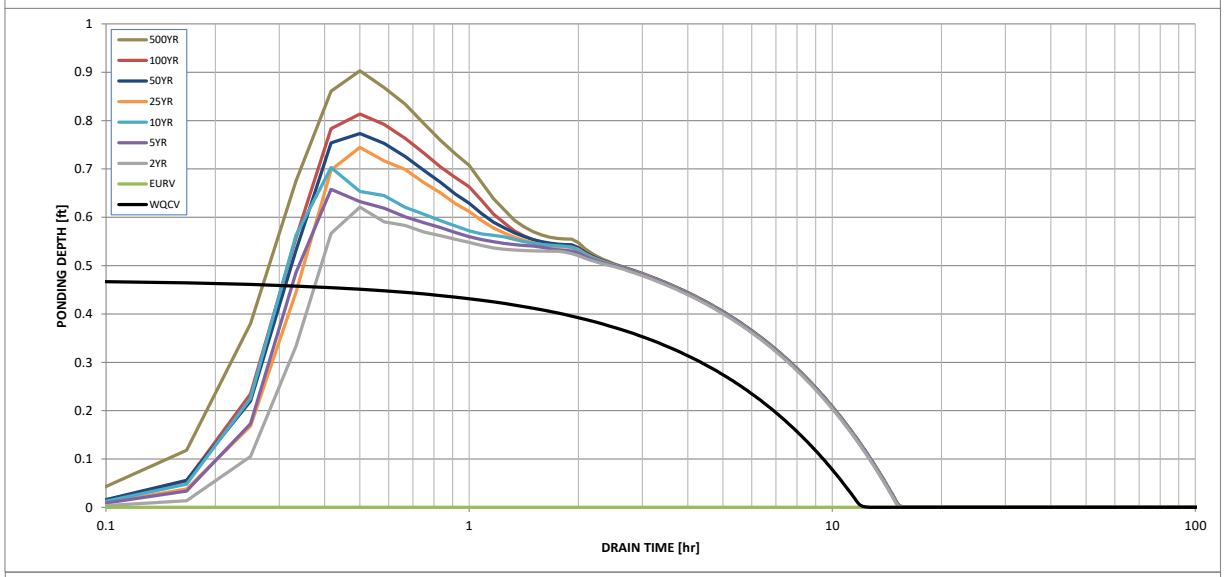
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

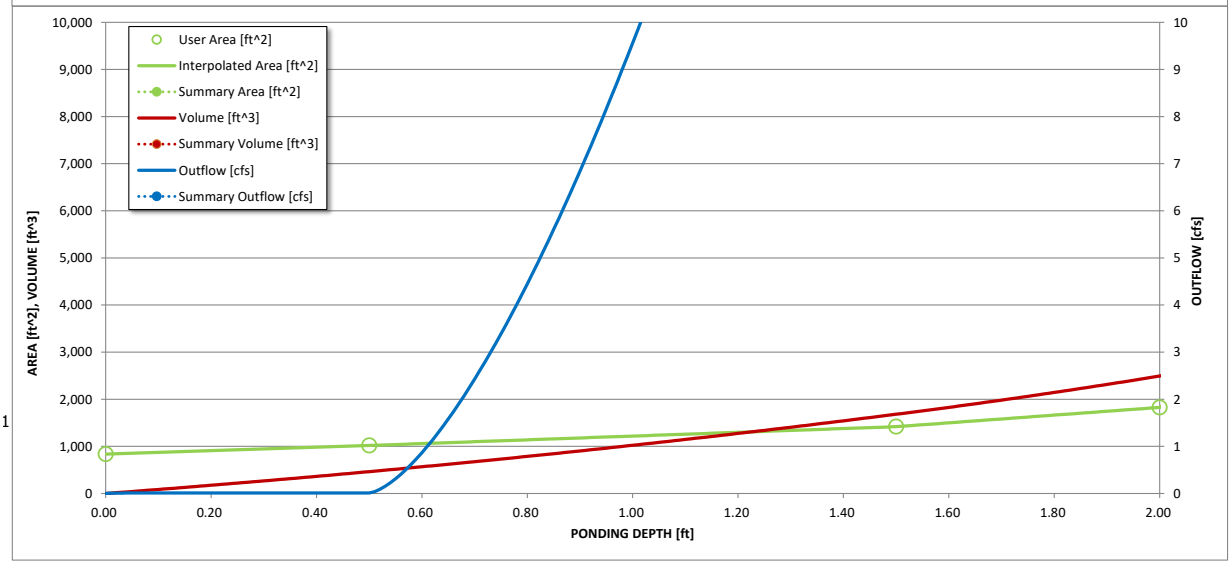
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.92	1.20	1.46	1.85	2.17	2.51	3.42
CUHP Runoff Volume (acre-ft) =	0.010	0.093	0.057	0.081	0.107	0.156	0.193	0.237	0.345
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.057	0.081	0.107	0.156	0.193	0.237	0.345
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.1	0.4	1.2	1.7	2.2	3.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.10	0.30	0.83	1.14	1.51	2.40
Peak Inflow Q (cfs) =	N/A	N/A	1.1	1.5	2.1	3.1	3.8	4.7	6.7
Peak Outflow Q (cfs) =	0.0	18.0	1.1	1.7	2.5	3.3	3.9	4.8	6.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	11.5	5.7	2.7	2.3	2.2	2.0
Structure Controlling Flow =	Filtration Media	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	12	0	13	12	11	9	8	7	3
Time to Drain 99% of Inflow Volume (hours) =	**12**	0	15	14	14	13	13	12	11
Maximum Ponding Depth (ft) =	0.48	2.44	0.62	0.66	0.70	0.74	0.77	0.81	0.90
Area at Maximum Ponding Depth (acres) =	0.02	0.12	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Maximum Volume Stored (acre-ft) =	0.010	0.094	0.014	0.014	0.016	0.017	0.017	0.018	0.021

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.10
	0:15:00	0.00	0.00	0.09	0.20	0.28	0.22	0.30	0.32	0.50
	0:20:00	0.00	0.00	0.45	0.63	0.79	0.56	0.68	0.77	1.14
	0:25:00	0.00	0.00	0.96	1.38	1.86	1.21	1.52	1.74	2.88
	0:30:00	0.00	0.00	1.08	1.54	2.05	2.95	3.71	4.36	6.36
	0:35:00	0.00	0.00	0.92	1.29	1.70	3.06	3.78	4.71	6.75
	0:40:00	0.00	0.00	0.76	1.04	1.37	2.75	3.38	4.16	5.95
	0:45:00	0.00	0.00	0.59	0.83	1.10	2.26	2.77	3.55	5.06
	0:50:00	0.00	0.00	0.48	0.69	0.89	1.88	2.31	2.93	4.18
	0:55:00	0.00	0.00	0.40	0.57	0.74	1.49	1.83	2.41	3.46
	1:00:00	0.00	0.00	0.33	0.46	0.61	1.19	1.48	2.04	2.92
	1:05:00	0.00	0.00	0.28	0.38	0.50	0.96	1.20	1.73	2.47
	1:10:00	0.00	0.00	0.22	0.33	0.45	0.71	0.87	1.21	1.76
	1:15:00	0.00	0.00	0.19	0.30	0.43	0.56	0.70	0.90	1.34
	1:20:00	0.00	0.00	0.17	0.27	0.39	0.45	0.55	0.65	0.97
	1:25:00	0.00	0.00	0.16	0.25	0.33	0.38	0.47	0.49	0.73
	1:30:00	0.00	0.00	0.16	0.24	0.30	0.31	0.38	0.39	0.58
	1:35:00	0.00	0.00	0.16	0.23	0.27	0.27	0.33	0.33	0.49
	1:40:00	0.00	0.00	0.15	0.20	0.25	0.25	0.30	0.29	0.42
	1:45:00	0.00	0.00	0.15	0.18	0.24	0.23	0.27	0.26	0.38
	1:50:00	0.00	0.00	0.15	0.17	0.24	0.22	0.26	0.25	0.37
	1:55:00	0.00	0.00	0.13	0.16	0.22	0.22	0.25	0.25	0.36
	2:00:00	0.00	0.00	0.11	0.15	0.20	0.21	0.25	0.25	0.36
	2:05:00	0.00	0.00	0.07	0.10	0.13	0.14	0.17	0.16	0.24
	2:10:00	0.00	0.00	0.05	0.06	0.09	0.09	0.11	0.11	0.16
	2:15:00	0.00	0.00	0.03	0.04	0.06	0.06	0.07	0.07	0.10
	2:20:00	0.00	0.00	0.02	0.02	0.03	0.04	0.04	0.04	0.06
	2:25:00	0.00	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.04
	2:30:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

APPENDIX F

BASELINE
Engineering · Planning · Surveying

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
81	81	MINOR CONTOUR (1' INTERVAL)
5280	5280	MAJOR CONTOUR (5' INTERVAL)
		EDGE OF ASPHALT
		EDGE OF GRAVEL
		CURB AND GUTTER (SPILL/CATCH)
		EDGE OF BUILDING
		RETAINING WALL
		DITCH FLOWLINE

EXISTING SYMBOLS	PROPOSED SYMBOLS	
3:1	3:1	NOMINAL SLOPE ON CUT OR FILL
		FLOW DIRECTION, TYPICALLY ON PAVED SURFACES
		POND OUTLET STRUCTURE
		CONIFEROUS TREE
		DECIDUOUS TREE
		ADA PARKING STALL

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

RIPRAP

0 — DESIGN POINT DESIGNATION

A = BASIN ID
B = BASIN AREA (ACRES)
C = 100YR COEFFICIENT
D = 10YR COEFFICIENT

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Overall Basins						
Overall Basin - Ex	174.32	2%	0.09	0.36	19.51	163.49
Overall Basin - Prop	174.32	2%	0.09	0.36	19.84	164.10

N

GRAPHIC SCALE
300 0 300 600
(IN FEET)
1 INCH = 300 FT

BASELINE
Engineering · Planning · Surveying
102 N. RUBEY DRIVE, SUITE 210 · GOLDEN, COLORADO 80403
P: 3039403968 · F: 3039403959 · www.baselinecorp.com

DESIGNED BY AJL | DRAWN BY AJL | CHECKED BY SGB

REVISION DESCRIPTION | PREPARED BY | DATE

EL PASO COUNTY PARKS
UNINCORPORATED EL PASO COUNTY
FOX RUN NATURE CENTER
2108 STELLA DRIVE
OVERALL BASIN MAP

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM: BASELINE	SURVEY DATE: XX/XX/XX
JOB NO.	35069
DRAWING NAME: 35069 – DNG MAP.dwg	
SHEET 1 OF 5	

DR1

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
81	81	MINOR CONTOUR (1' INTERVAL)
5280	5280	MAJOR CONTOUR (5' INTERVAL)
		EDGE OF ASPHALT
		EDGE OF GRAVEL
		CURB AND GUTTER (SPILL/CATCH)
		EDGE OF BUILDING
		RETAINING WALL
		DITCH FLOWLINE

EXISTING SYMBOLS	PROPOSED SYMBOLS	
3:1	3:1	NOMINAL SLOPE ON CUT OR FILL
		FLOW DIRECTION, TYPICALLY ON PAVED SURFACES
		POND OUTLET STRUCTURE
		CONIFEROUS TREE
		DECIDUOUS TREE
		ADA PARKING STALL

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

RIPRAP

0 — DESIGN POINT DESIGNATION

A = BASIN ID
B = BASIN AREA (ACRES)
C = 100YR COEFFICIENT
D = 10YR COEFFICIENT

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Offsite Subbasins						
OS1A	78.80	3%	0.11	0.37	16.33	94.84
OS1B	1.57	0%	0.08	0.35	0.60	4.42
OS2	2.85	0%	0.08	0.35	0.75	5.50
OS3	4.36	0%	0.08	0.35	1.11	9.84
OS4	2.07	0%	0.08	0.35	0.59	5.20
OS5	0.18	0%	0.08	0.25	0.05	0.48

N

GRAPHIC SCALE
200 0 200 400
(IN FEET)
1 INCH = 200 FT

BASELINE
Engineering · Planning · Surveying
102 N. RUBEY DRIVE, SUITE 210 · GOLDEN, COLORADO, 80403
P: 3033403868 · F: 3033403869 · www.baselinecorp.com

DESIGNED BY AJL
DRAWN BY AJL
CHECKED BY SGB

REVISION DESCRIPTION	PREPARED BY	DATE

EL PASO COUNTY PARKS
UNINCORPORATED
EL PASO COUNTY
FOX RUN NATURE CENTER
2108 STELLA DRIVE
OS1 DETAIL MAP

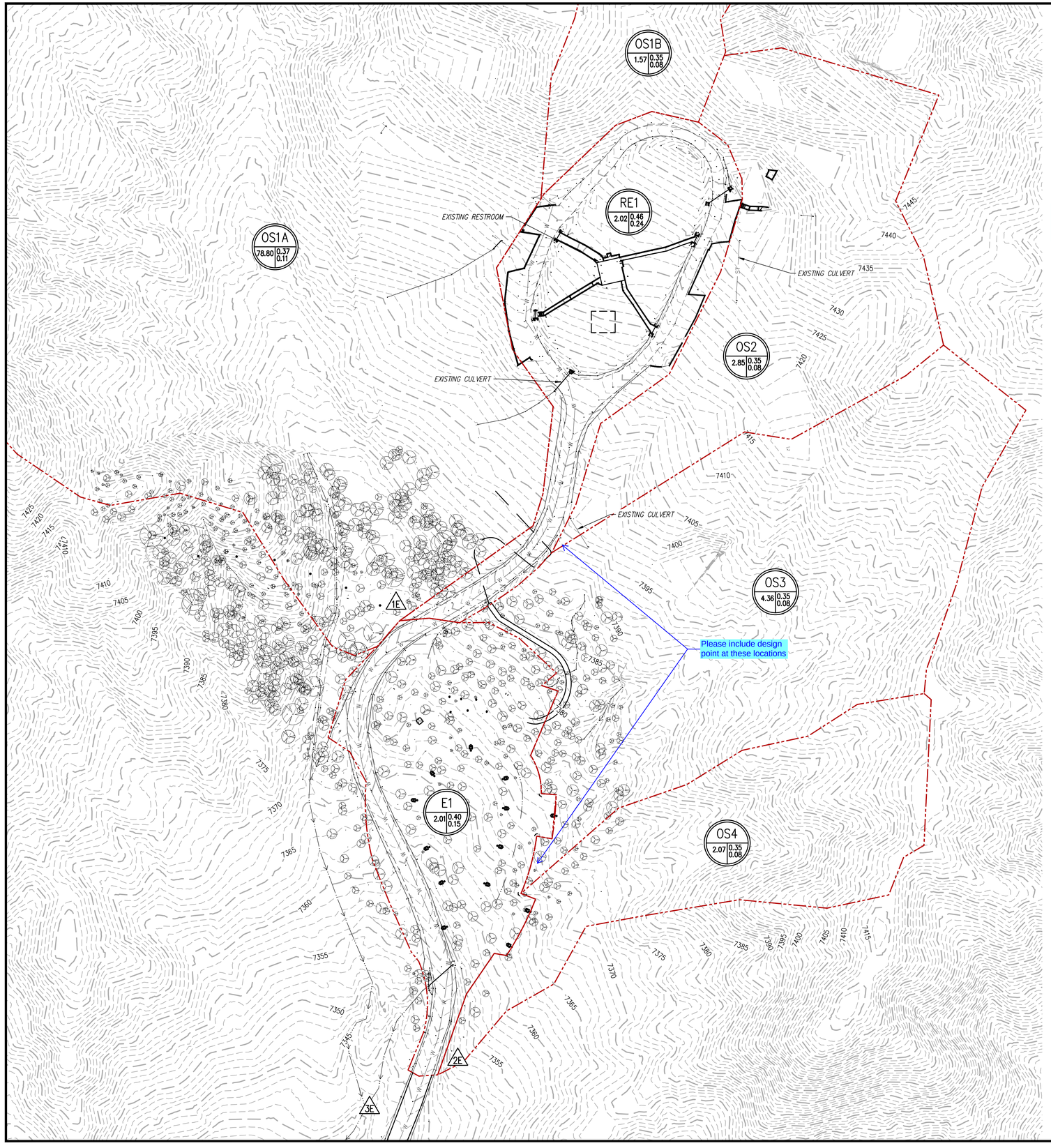
PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	BASELINE
SURVEY DATE	XX/XX/XX
JOB NO.	35069
DRAWING NAME	35069 – DNG MAP.dwg
SHEET	2 OF 5

DR2

R:\35069 Fox Run Nature Center\Drawings\Drainage Maps\35069 – DNG MAP.dwg, 10/31/2024 10:50:55 AM, Alan Lunsford



Please turn off unneeded layers to avoid clutter on the maps such as trees.

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
81	81	MINOR CONTOUR (1' INTERVAL)
5280	5280	MAJOR CONTOUR (5' INTERVAL)
		EDGE OF ASPHALT
		EDGE OF GRAVEL
		CURB AND GUTTER (SPILL/CATCH)
		EDGE OF BUILDING
		RETAINING WALL
		DITCH FLOWLINE

EXISTING SYMBOLS	PROPOSED SYMBOLS	
3:1	3:1	NOMINAL SLOPE ON CUT OR FILL
		FLOW DIRECTION, TYPICALLY ON PAVED SURFACES
		POND OUTLET STRUCTURE
		CONIFEROUS TREE
		DECIDUOUS TREE
		ADA PARKING STALL

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

RIPRAP

0 — DESIGN POINT DESIGNATION

A = BASIN ID
B = BASIN AREA (ACRES)
C = 100YR COEFFICIENT
D = 10YR COEFFICIENT

DESIGN POINT SUMMARY

DESIGN POINT	LOCATION / STRUCTURE	CATCHMENT DESCRIPTION	TOTAL FLOW (CFS) Q5	TOTAL FLOW (CFS) Q100	CONTRIBUTING BASINS
EXISTING CONDITIONS DESIGN POINT SUMMARY					
1E	Existing Main Natural Channel at FRNC Site	Upslope contributing areas to the future location of the nature center building at the main natural channel	18.4	105.6	**RE-1, OS-1A, OS-1B, OS-5**
2E	Existing Main Natural Channel at south End of Site	Upslope contributing areas to the future location of the south end of improvements on the eastern side of road	3.3	25.5	**E-1, OS-2, OS-3, OS-4**
3E	Existing Main Natural Channel	Combined area of 1E and 2E	21.8	131.2	**RE-1, OS-1A, OS-1B, OS-5, E-1, OS-2, OS-3, OS-4**
PROPOSED CONDITIONS DESIGN POINT SUMMARY					
1	Reclaimed Gravel Loop Low Point	The contributing area to the upper loop road after the reclamation is completed	0.96	7.8	**RP-1, RP-2, OS-1B**
2	Reclaimed Gravel Road Low Point North of Nature Center, Swale S-1	Upslope areas of the North side of the FRNC building	0.99	7.5	**RP-3, OS-2, OS-5, P-2**
3	End of Swale S-2	Contributing areas to the main natural channel at the FRNC site	18.3	110.2	**OS-1A, DP-1, DP-2**
4	Proposed Bioretention Facility	Catchment of the Bioretention facility designated WQ-1	2.9	8.0	**P-1**
5	East Side of Entrance Road to Site	Easterly offsite basins and entrance road south of WQ-1	2.1	16.6	**OS-3, OS-4, P-3**
6	South End of Project Site	Combined area of 3, 4, & 5	23.3	134.7	**DP-3,DP-4, DP-5**
OVERALL DESIGN POINT SUMMARY					
FR1-Existing	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.51	163.49	**OVERALL BASIN-EX**
FR1-Proposed	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.84	164.10	**OVERALL BASIN - PRO**

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Offsite Subbasins						
OS1A	78.80	3%	0.11	0.37	16.33	94.84
OS1B	1.57	0%	0.08	0.35	0.60	4.42
OS2	2.85	0%	0.08	0.35	0.75	5.50
OS3	4.36	0%	0.08	0.35	1.11	9.84
OS4	2.07	0%	0.08	0.35	0.59	5.20
OS5	0.18	0%	0.08	0.25	0.05	0.48

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Existing Subbasins						
E1	2.01	12%	0.15	0.40	0.89	5.01
RE1	2.02	25%	0.24	0.46	1.42	5.90

N

GRAPHIC SCALE
60 0 60 120
(IN FEET)
1 INCH = 60 FT

BASELINE
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102 N. RUBEY DRIVE, SUITE 210 · GOLDEN, COLORADO, 80403
P: 3039403868 · F: 3039403869 · www.baselinecorp.com

DESIGNED BY AJL | DRAWN BY AJL | CHECKED BY SGB

REVISION DESCRIPTION	PREPARED BY	DATE

EL PASO COUNTY PARKS

EL PASO COUNTY
UNINCORPORATED

FOX RUN NATURE CENTER
2108 STELLA DRIVE
EXISTING CONDITIONS MAP

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	BASELINE
SURVEY DATE	XX/XX/XX
JOB NO.	35069
DRAWING NAME	35069 – DNG MAP.dwg
SHEET	3 OF 5

DR3

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
81	81	MINOR CONTOUR (1' INTERVAL)
5280	5280	MAJOR CONTOUR (5' INTERVAL)
		EDGE OF ASPHALT
		EDGE OF GRAVEL
		CURB AND GUTTER (SPILL/CATCH)
		EDGE OF BUILDING
		RETAINING WALL
		DITCH FLOWLINE

EXISTING SYMBOLS	PROPOSED SYMBOLS	
3:1	3:1	NOMINAL SLOPE ON CUT OR FILL
		FLOW DIRECTION, TYPICALLY ON PAVED SURFACES
		POND OUTLET STRUCTURE
		CONIFEROUS TREE
		DECIDUOUS TREE
		ADA PARKING STALL

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

RIPRAP

0 DESIGN POINT DESIGNATION

A = BASIN ID
B = BASIN AREA (ACRES)
C = 100YR COEFFICIENT
D = 10YR COEFFICIENT

DESIGN POINT SUMMARY

DESIGN POINT	LOCATION / STRUCTURE	CATCHMENT DESCRIPTION	TOTAL FLOW (CFS) Q5	TOTAL FLOW (CFS) Q100	CONTRIBUTING BASINS
EXISTING CONDITIONS DESIGN POINT SUMMARY					
1E	Existing Main Natural Channel at FRNC Site	Upslope contributing areas to the future location of the nature center building at the main natural channel	18.4	105.6	**RE-1, OS-1A, OS-1B, OS-5**
2E	Existing Main Natural Channel at south End of Site	Upslope contributing areas to the future location of the south end of improvements on the eastern side of road	3.3	25.5	**E-1, OS-2, OS-3, OS-4**
3E	Existing Main Natural Channel	Combined area of 1E and 2E	21.8	131.2	**RE-1, OS-1A, OS-1B, OS-5, E-1, OS-2, OS-3, OS-4**
PROPOSED CONDITIONS DESIGN POINT SUMMARY					
1	Reclaimed Gravel Loop Low Point	The contributing area to the upper loop road after the reclamation is completed	0.96	7.8	**RP-1, RP-2, OS-1B**
2	Reclaimed Gravel Road Low Point North of Nature Center, Swale S-1	Upslope areas of the North side of the FRNC building	0.99	7.5	**RP-3, OS-2, OS-5, P-2**
3	End of Swale S-2	Contributing areas to the main natural channel at the FRNC site	18.3	110.2	**OS-1A, DP-1, DP-2**
4	Proposed Bioretention Facility	Catchment of the Bioretention facility designated WQ-1	2.9	8.0	**P-1**
5	East Side of Entrance Road to Site	Easterly offsite basins and entrance road south of WQ-1	2.1	16.6	**OS-3, OS-4, P-3**
6	South End of Project Site	Combined area of 3, 4, & 5	23.3	134.7	**DP-3,DP-4, DP-5**
OVERALL DESIGN POINT SUMMARY					
FR1-Existing	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.51	163.49	**OVERALL BASIN-EX**
FR1-Proposed	Low point of Fox Run Regional Park at Stella Drive	Western side of Fox Run Regional Park	19.84	164.10	**OVERALL BASIN - PRO**

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Offsite Subbasins						
OS1A	78.80	3%	0.11	0.37	16.33	94.84
OS1B	1.57	0%	0.08	0.35	0.60	4.42
OS2	2.85	0%	0.08	0.35	0.75	5.50
OS3	4.36	0%	0.08	0.35	1.11	9.84
OS4	2.07	0%	0.08	0.35	0.59	5.20
OS5	0.18	0%	0.08	0.25	0.05	0.48

DIRECT RUNOFF SUMMARY

BASIN LABEL	AREA [ac]	Imp. %	C5	C100	LOCAL (CFS) Q5	LOCAL (CFS) Q100
Proposed Subbasins						
P1	1.46	59%	0.55	0.70	2.94	8.00
P2	0.22	5%	0.12	0.38	0.11	0.76
P3	0.34	26%	0.30	0.51	0.41	1.53
RP1	0.61	0%	0.08	0.35	0.14	1.30
RP2	1.04	0%	0.08	0.25	0.22	2.09
RP3	0.37	0%	0.08	0.25	0.08	0.77

N

GRAPHIC SCALE
60 0 60 120
(IN FEET)
1 INCH = 60 FT

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DESIGNED BY AJL | DRAWN BY AJL | CHECKED BY SGB

REVISION DESCRIPTION | PREPARED BY | DATE

EL PASO COUNTY PARKS

EL PASO COUNTY
UNINCORPORATED

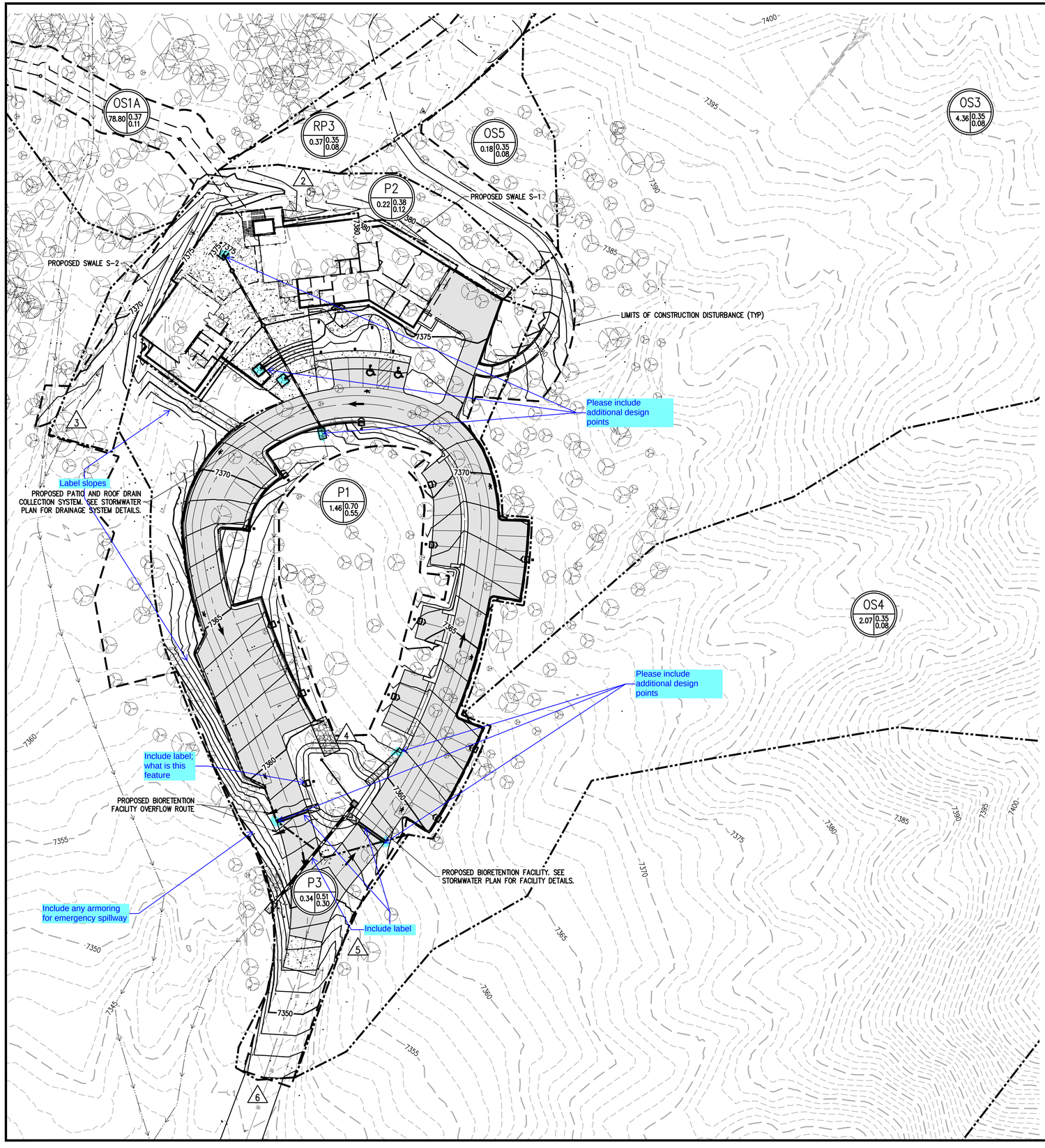
FOX RUN NATURE CENTER
2108 STELLA DRIVE
PROPOSED CONDITIONS MAP

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	BASELINE
SURVEY DATE	XX/XX/XX
JOB NO.	35069
DRAWING NAME	35069 – DNG MAP.dwg
SHEET	4 OF 5

DR4



LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
81	81	MINOR CONTOUR (1' INTERVAL)
5280	5280	MAJOR CONTOUR (5' INTERVAL)
		EDGE OF ASPHALT
		EDGE OF GRAVEL
		CURB AND GUTTER (SPILL/CATCH)
		EDGE OF BUILDING
		RETAINING WALL
		DITCH FLOWLINE

EXISTING SYMBOLS	PROPOSED SYMBOLS	
3:1	3:1	NOMINAL SLOPE ON CUT OR FILL
		FLOW DIRECTION, TYPICALLY ON PAVED SURFACES
		POND OUTLET STRUCTURE
		CONIFEROUS TREE
		DECIDUOUS TREE
		ADA PARKING STALL

Please include flow arrows in basins

Please turn off unneeded layers to avoid clutter on the maps such as trees and pavement markings.

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

RIPRAP

0 DESIGN POINT DESIGNATION

A = BASIN ID
B = BASIN AREA (ACRES)
C = 100YR COEFFICIENT
D = 10YR COEFFICIENT

DESIGN POINT SUMMARY

DESIGN POINT	LOCATION / STRUCTURE	CATCHMENT DESCRIPTION	TOTAL FLOW (CFS) Q5	TOTAL FLOW (CFS) Q100	CONTRIBUTING BASINS
EXISTING CONDITIONS DESIGN POINT SUMMARY					
1E	Existing Main Natural Channel at FRNC Site	Upslope contributing areas to the future location of the nature center building at the main natural channel	18.4	105.6	**RE-1, OS-1A, OS-1B, OS-5**
2E	Existing Main Natural Channel at south End of Site	Upslope contributing areas to the future location of the south end of improvements on the eastern side of road	3.3	25.5	**E-1, OS-2, OS-3, OS-4**
3E	Existing Main Natural Channel	Combined area of 1E and 2E	21.8	131.2	**RE-1, OS-1A, OS-1B, OS-5, E-1, OS-2, OS-3, OS-4**
PROPOSED CONDITIONS DESIGN POINT SUMMARY					
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OS4	2.07	0%	0.08	0.35	0.59	5.20
OS5	0.18	0%	0.08	0.25	0.05	0.48

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P3	0.34	26%	0.30	0.51	0.41	1.53
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RP2	1.04	0%	0.08	0.25	0.22	2.09
RP3	0.37	0%	0.08	0.25	0.08	0.77

NOTE:
SEE STORMWATER PLANS FOR DRAINAGE FACILITY DETAILS

N

GRAPHIC SCALE
30 0 30 60
(IN FEET)
1 INCH = 30 FT

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DESIGNED BY AJL | DRAWN BY AJL | CHECKED BY SGB

PREPARED BY | DATE | REVISION DESCRIPTION

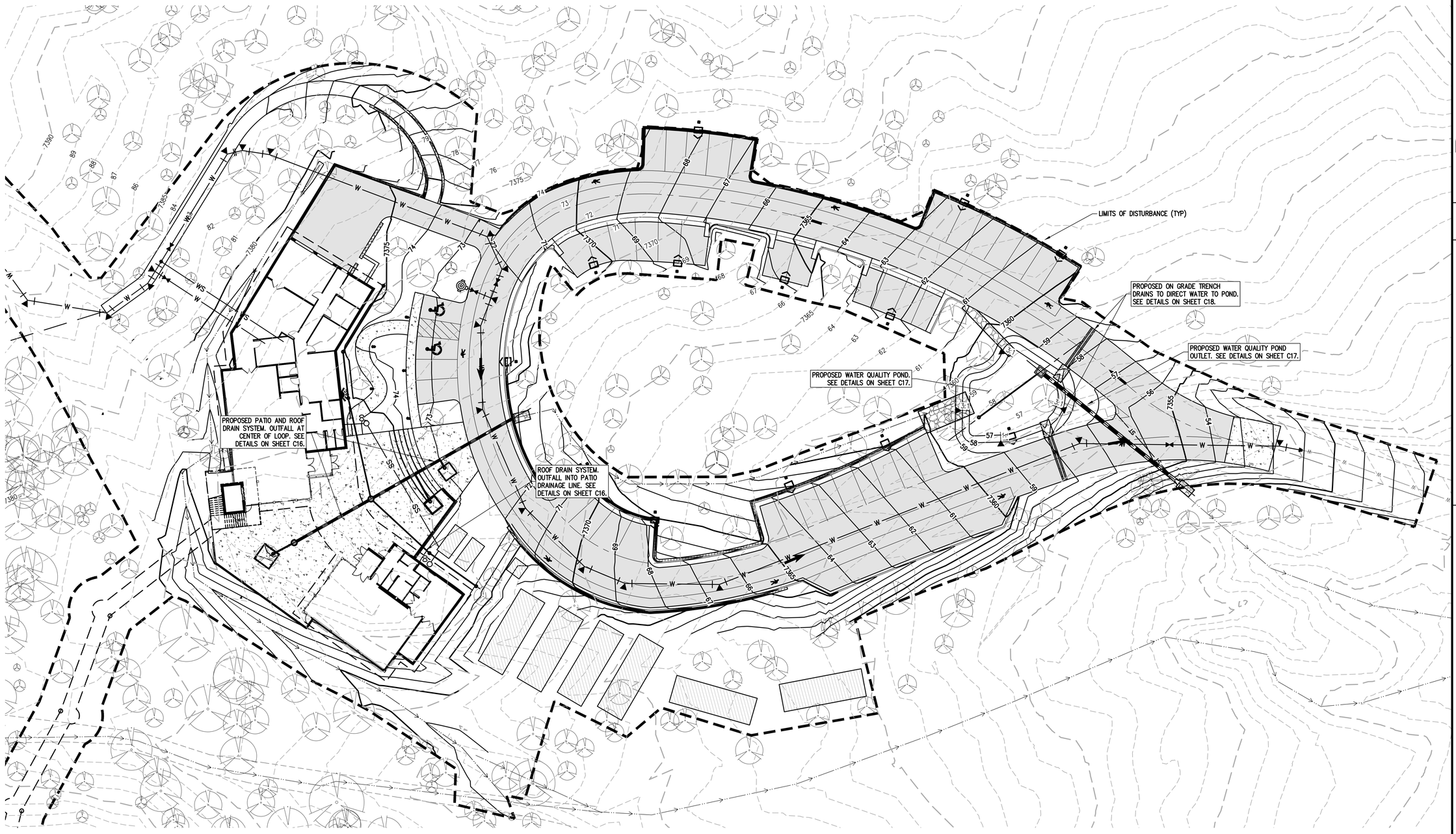
EL PASO COUNTY PARKS
UNINCORPORATED
EL PASO COUNTY
FOX RUN NATURE CENTER
2108 STELLA DRIVE
PROPOSED CONDITIONS DETAIL MAP

PREPARED UNDER THE DIRECT SUPERVISION OF

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	BASELINE
SURVEY DATE	XX/XX/XX
JOB NO.	35069
DRAWING NAME	35069 – DNG MAP.dwg
SHEET	5 OF 5

DR5



LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
5280	5280	MAJOR CONTOUR (5' INTERVAL)
81	81	MINOR CONTOUR (1' INTERVAL)
		EDGE OF GRAVEL
		EDGE OF ASPHALT
SAN	SAN	SANITARY SEWER MAIN
W	W	WATER LINE
ST	ST	STORM SEWER

EXISTING SYMBOLS	PROPOSED SYMBOLS	
		CONIFEROUS TREE
		CLEANOUT
		TYPE 'C' INLET
		ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION
		CONCRETE PAVING

STORMWATER NOTES

1. STORMWATER FACILITIES TO BE CONSTRUCTED TO THE LINES AND GRADES INDICATED ON THE PLANS. IN GENERAL, THE STORMWATER FACILITIES INCLUDE A DIVERSION SWALE TO DIRECT OFFSITE RUNOFF AROUND THE PROPOSED BUILDING AND IMPROVEMENTS; STORM SEWER FACILITIES AS REQUIRED TO COLLECT RUNOFF FROM THE PLAZA AREA, ROOF DRAINS, TREE WELLS AND THE ACCESS ROAD/PARKING LOT; AND A WATER QUALITY FACILITY TO TREAT DEVELOPED RUNOFF.
2. A DIVERSION SWALE WILL BE GRADED AS SHOWN ON THE PLANS TO DIVERT OFFSITE RUNOFF FROM THE NORTH AND NORTHWEST AROUND THE PROPOSED IMPROVEMENTS. SWALE DEPTH VARIES TO A MAXIMUM DEPTH OF 3.15 FEET +/–. SWALE SIDE SLOPE TO BE 4:1 AND WILL BE PROTECTED WITH AN EROSION BLANKET FOR ITS FULL SECTION AS VEGETATION IS RE-ESTABLISHED.
3. STORM SEWER WILL BE CONSTRUCTED IN THE PLAZA AREA TO COLLECT RUNOFF FROM THE PLAZA, ROOF DRAINS AND TREE WELLS. STORM SEWER PIPING WILL BE HDPE PIPE OF THE SIZES INDICATED AND INSTALLED TO THE GRADES SHOWN ON THE PLANS. PLAZA INLETS WILL BE 24" DIAMETER AREA INLETS WITH PEDESTRIAN SAFE GRATES AND TREE WELL INLETS WILL BE 8" DIAMETER AREA INLETS. ROOF DRAINS WILL BE CONNECTED TO THE PLAZA DRAIN AS INDICATED ON THE PLANS. THE PLAZA STORM SEWER WILL OUTFALL INTO THE AREA INSIDE THE ACCESS ROAD LOOP. A RIPRAP PAD WILL PROTECT THE OUTFALL AND THE NATURAL CONTOURS WILL DIRECT THE RUNOFF TO THE WATER QUALITY FACILITY.
4. TRENCH DRAINS WILL BE CONSTRUCTED ACROSS THE ACCESS ROAD ON EACH SIDE OF THE WATER QUALITY FACILITY TO DIRECT ROAD RUNOFF INTO THE FACILITY.
5. THE WATER QUALITY FACILITY WILL BE A RAIN GARDEN FACILITY THAT INCLUDES A GROWING MEDIUM WITH A 4" DIAMETER SLOTTED UNDERDRAIN, TYPE C OUTLET STRUCTURE AND AN 18" RCP OUTLET PIPE. ROCK RIPRAP RUNDOWNS ARE TO BE CONSTRUCTED TO DIRECT ROADWAY RUNOFF INTO THE WATER QUALITY FACILITY. CONSTRUCT WATER QUALITY FACILITY PER APPROVED PLANS AND PER PERTINENT EL PASO COUNTY CRITERIA.
6. ALL STORMWATER CONSTRUCTION TO BE IN ACCORDANCE WITH THE APPROVED DRAINAGE REPORT AND EL PASO COUNTY ENGINEERING CRITERIA MANUAL UNLESS OTHERWISE NOTED.
7. REVEGETATION OF THE WATER QUALITY FACILITY TO BE IN ACCORDANCE WITH RAIN GARDEN REQUIREMENTS AND THE APPROVED LANDSCAPE PLANS.

N

GRAPHIC SCALE
20 0 20 40
(IN FEET)
1 INCH = 20 FT

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DESIGNED BY	DRAWN BY	CHECKED BY
AJL	AJL	SGB

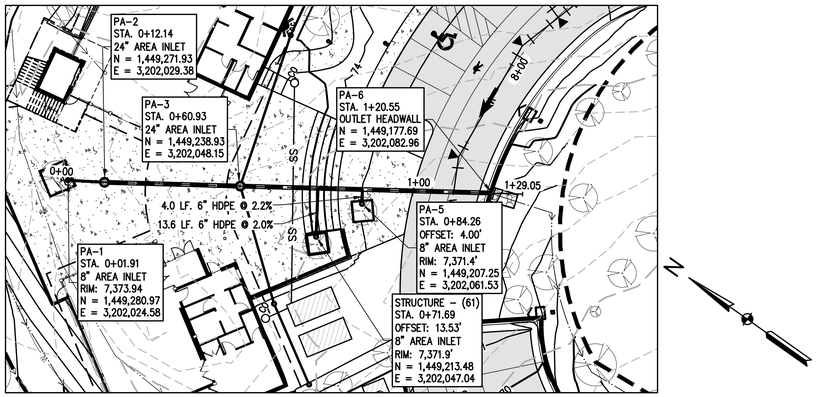
REVISION DESCRIPTION	PREPARED BY	DATE
60 % DESIGN SET		06/26/2024

EL PASO COUNTY PARKS
EL PASO COUNTY
FOX RUN NATURE CENTER
OVERALL STORM SYSTEM PLAN

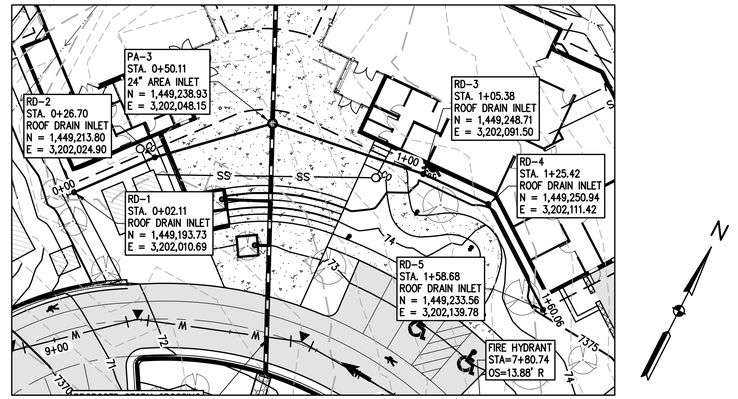
PREPARED UNDER THE DIRECT SUPERVISION OF
PRELIMINARY NOT FOR CONSTRUCTION
FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	BASELINE
SURVEY DATE	10/31/2023
JOB NO.	C035069
DRAWING NAME	35069 Utility Plan.dwg
SHEET	15 OF 16

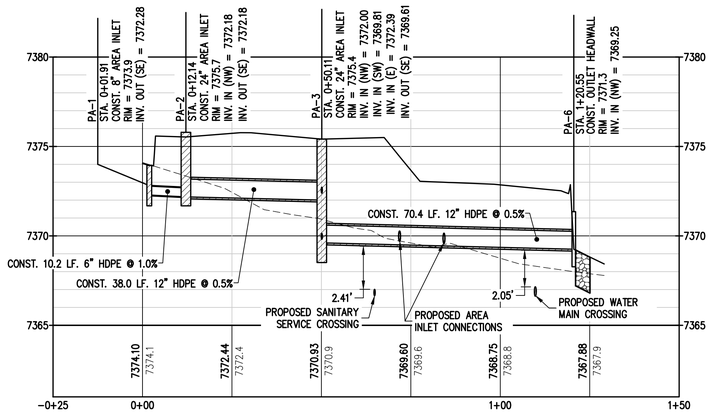
C15



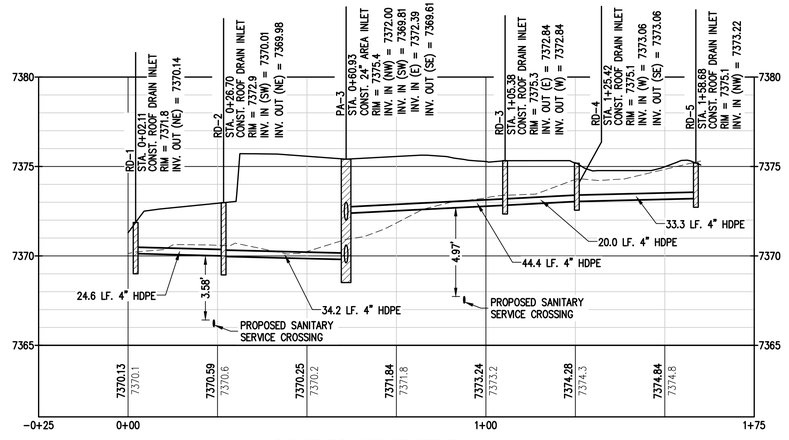
PATIO DRAIN PLAN



ROOF DRAIN PLAN



PATIO DRAIN PROFILE



ROOF DRAIN PROFILE

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
— — —5280— — —	5280	MAJOR CONTOUR (5' INTERVAL)
— — — — 81 — — — —	81	MINOR CONTOUR (1' INTERVAL)
		EDGE OF GRAVEL
		EDGE OF ASPHALT
SAN SAN	SAN	SANITARY SEWER MAIN
W W	W	WATER LINE
ST ST		STORM SEWER

EXISTING SYMBOLS	PROPOSED SYMBOLS	
		CONIFEROUS TREE
		CLEANOUT
		TYPE 'C' INLET

ASPHALT PAVING - REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

GRAPHIC SCALE
20 0 20 40
(IN FEET)
HORIZ: 1 INCH = 20 FT
VERT: 1 INCH = 4 FT

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REVISION DESCRIPTION	PREPARED BY	DATE
60 % DESIGN SET	AJL	06/26/2024

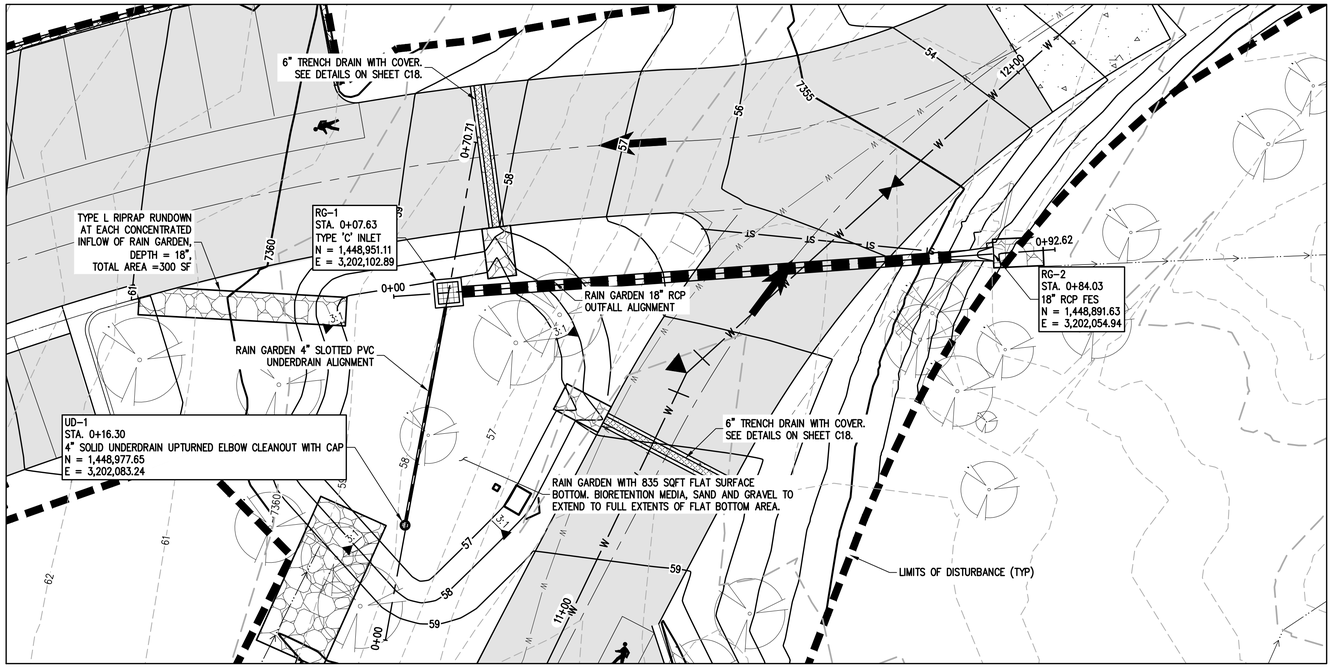
DESIGNED BY AJL
DRAWN BY AJL
CHECKED BY SGB

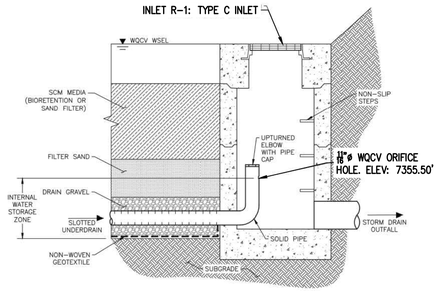
EL PASO COUNTY PARKS
EL PASO COUNTY
FOX RUN NATURE CENTER
ROOF DRAIN AND PATIO PLAN AND PROFILE

PREPARED UNDER THE DIRECT SUPERVISION OF
PRELIMINARY NOT FOR CONSTRUCTION
FOR AND ON BEHALF OF BASELINE CORPORATION

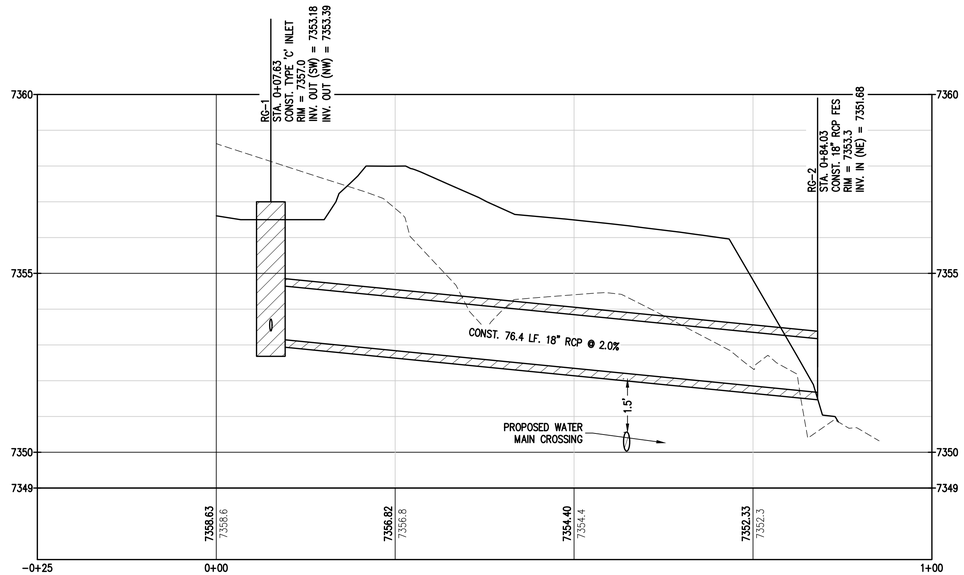
INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	SURVEY DATE
BASELINE	10/31/2023
JOB NO.	C035069
DRAWING NAME	35069 Utility Plan.dwg
SHEET 16 OF 16	

C16

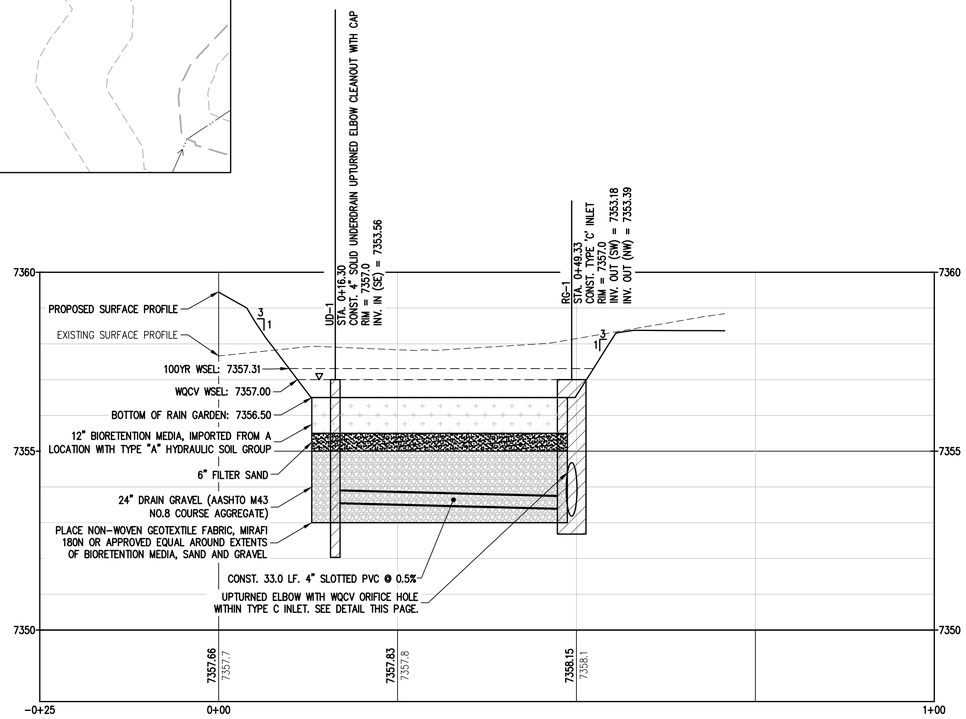




RAIN GARDEN INLET WITH UPTURNED ELBOW



RAIN GARDEN 18" RCP OUTFALL PROFILE



RAIN GARDEN 4" SLOTTED PVC UNDERDRAIN PROFILE

LEGEND

EXISTING LINETYPES	PROPOSED LINETYPES	
—— 5280 ——	5280	MAJOR CONTOUR (5' INTERVAL)
——— 81 ———	81	MINOR CONTOUR (1' INTERVAL)
		EDGE OF GRAVEL
		EDGE OF ASPHALT
SAN SAN	SAN	SANITARY SEWER MAIN
W W	W	WATER LINE
ST ST		STORM SEWER

EXISTING SYMBOLS	PROPOSED SYMBOLS	
		CONIFEROUS TREE
		CLEANOUT
		TYPE 'C' INLET

ASPHALT PAVING – REFER TO SOILS REPORT FOR PAVING SECTION

CONCRETE PAVING

GRAPHIC SCALE
20 0 20 40
(IN FEET)
HORIZ: 1 INCH = 20 FT
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DESIGNED BY	DRAWN BY	CHECKED BY
AJL	AJL	SGB

REVISION DESCRIPTION	PREPARED BY	DATE
60 % DESIGN SET		06/26/2024

EL PASO COUNTY

EL PASO COUNTY PARKS

FOX RUN NATURE CENTER

POND PLAN AND PROFILE

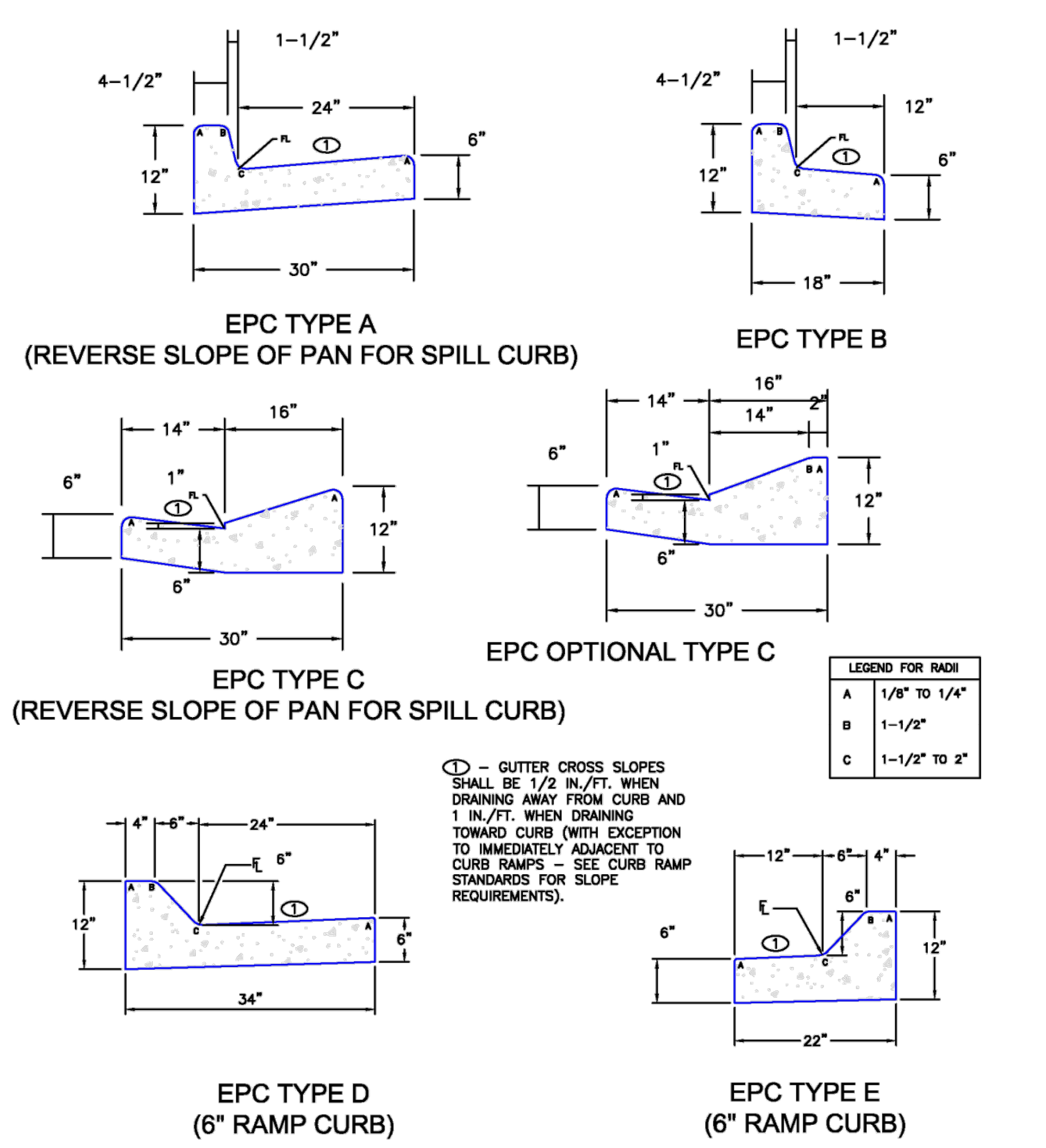
PREPARED UNDER THE DIRECT SUPERVISION OF

PRELIMINARY NOT FOR CONSTRUCTION

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM	SURVEY DATE
BASELINE	10/31/2023
JOB NO.	C035069
DRAWING NAME	35069 Utility Plan.dwg
SHEET 17 OF 16	

C17

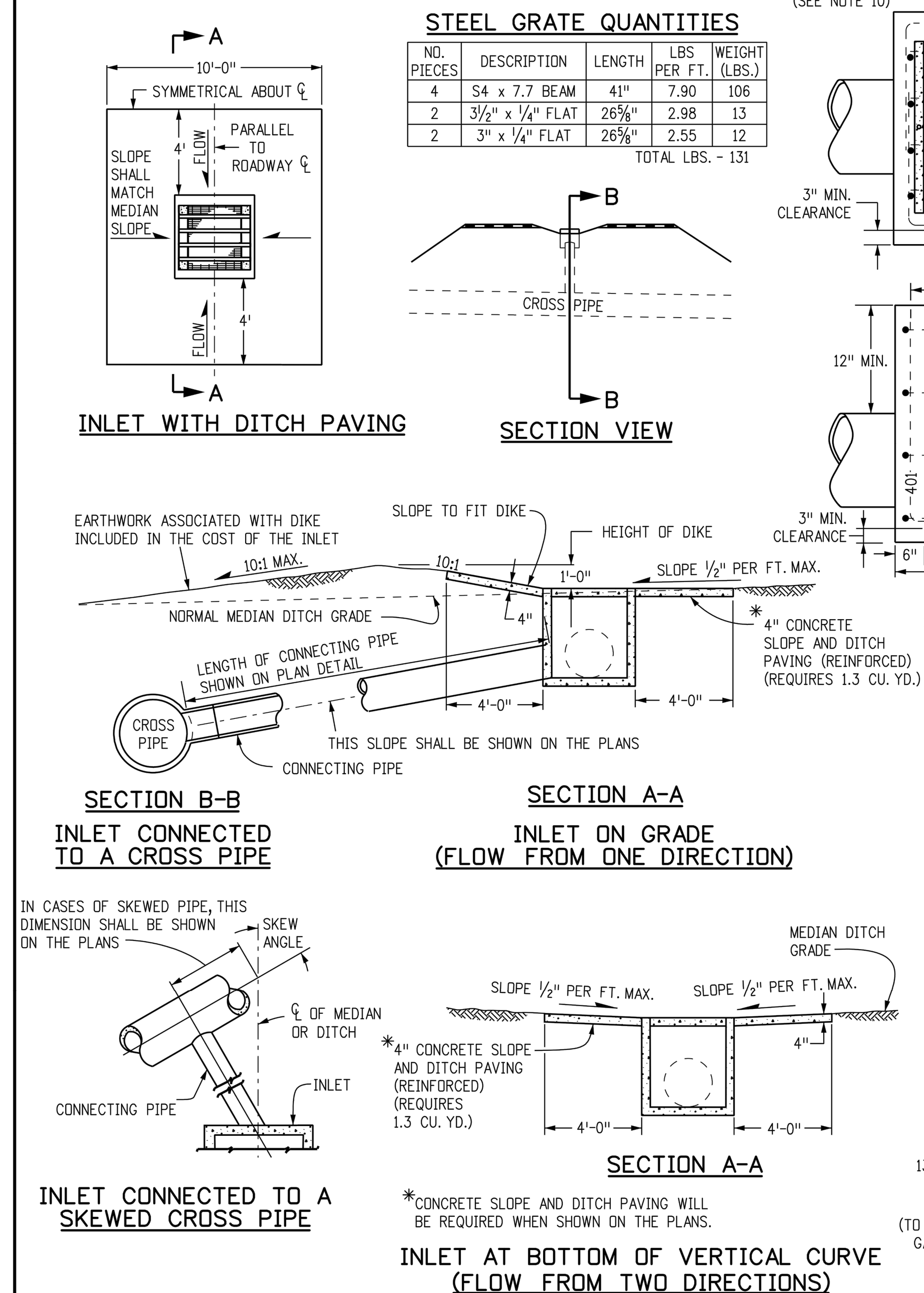


LEGEND FOR RADII	
A	1/8" TO 1/4"
B	1-1/2"
C	1-1/2" TO 2"

① – GUTTER CROSS SLOPES SHALL BE 1/2 IN./FT. WHEN DRAINING AWAY FROM CURB AND 1 IN./FT. WHEN DRAINING TOWARD CURB (WITH EXCEPTION TO IMMEDIATELY ADJACENT TO CURB RAMPS – SEE CURB RAMP STANDARDS FOR SLOPE REQUIREMENTS).

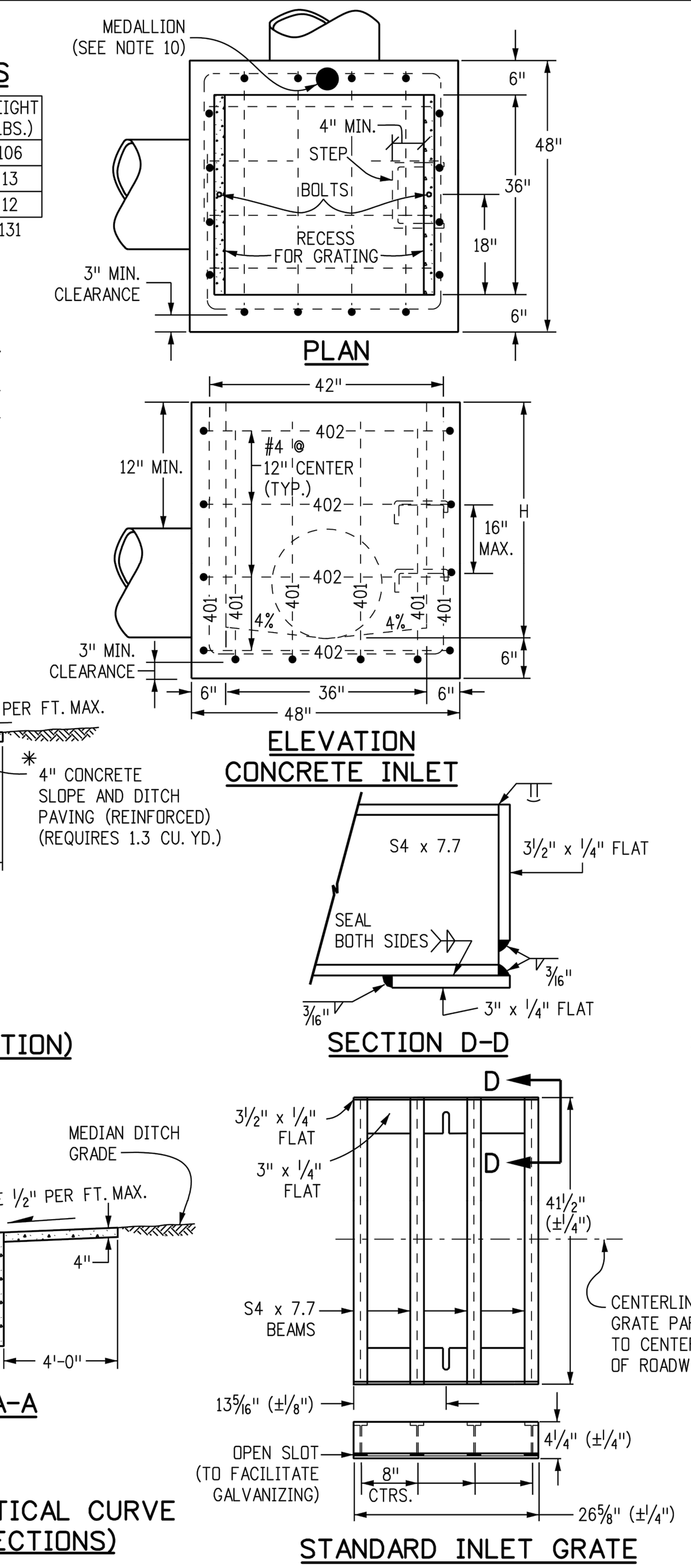
SCALE: NOT TO SCALE

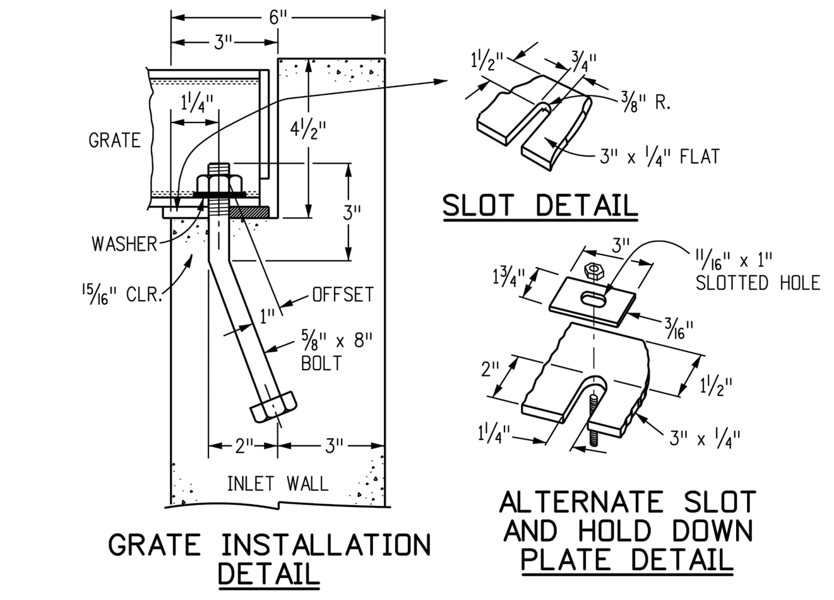
6/23/20 DATE APPROVED:	Typical Curb and Gutter Details Standard Drawing	DEPARTMENT OF EL PASO COUNTY PUBLIC WORKS EST. 1861
Jennifer E. Irvine DEPARTMENT OF PUBLIC WORKS	REVISION DATE: 6/23/20 / FILE NAME: SD_2-20	



STEEL GRATE QUANTITIES

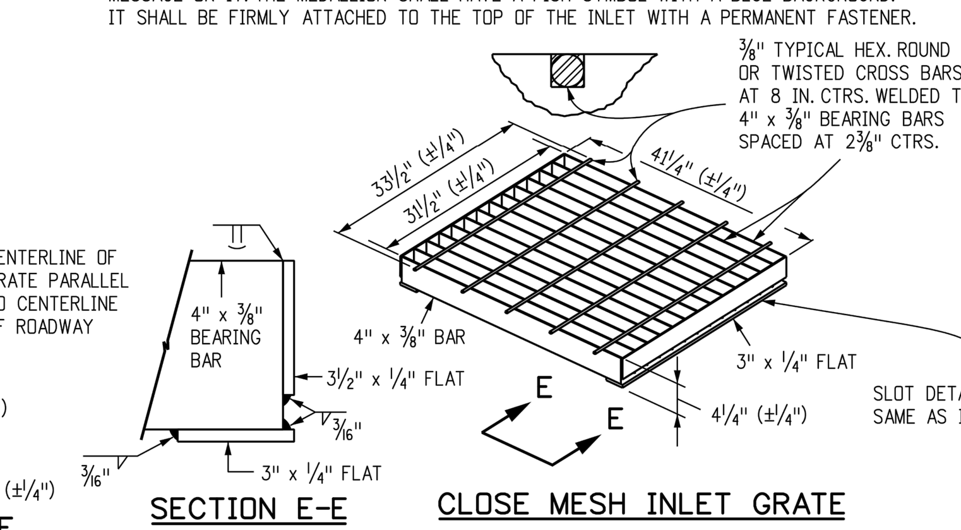
NO. PIECES	DESCRIPTION	LENGTH	LBS PER FT.	WEIGHT (LBS.)
4	S4 x 7.7 BEAM	41"	7.90	106
2	3½" x ¼" FLAT	26⅝"	2.98	13
2	3" x ¼" FLAT	26⅝"	2.55	12
			TOTAL LBS. - 131	





GENERAL NOTES

1. INLET TYPE C IS NOT HS-20 RATED AND SHALL NOT BE PLACED IN PAVED ROADWAYS. THIS INLET SHALL BE USED ONLY OUTSIDE PAVED ROADWAYS.
2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
3. REINFORCING BARS SHALL BE GRADE 60, EPOXY COATED, AND DEFORMED #4, AND SHALL HAVE A MIN. 2 INCH CLEARANCE. CUT OR BEND AROUND PIPES AS REQUIRED.
4. CONCRETE SLOPE AND DITCH PAVING SHALL BE IN ACCORDANCE WITH SECTION 507. REINFORCEMENT FOR CONCRETE SLOPE PAVING SHALL BE 6 X 6 - W1.4 X W1.4 OR 6 X 6 - W2.1 X W2.1.
5. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED, AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
6. THE STANDARD INLET GRATES SHALL BE USED ON ALL TYPE C INLETS UNLESS CLOSE MESH INLET GRATES ARE SPECIFIED ON THE PLANS.
7. CLOSE MESH GRATES ARE RECOMMENDED WHERE FOOT TRAFFIC OR BICYCLE ROUTES ARE IN CLOSE PROXIMITY TO GRATE. THIS GRATE IS NOT ADA COMPLIANT OR BICYCLE FRIENDLY AND SHALL NOT BE PLACED DIRECTLY IN SIDEWALKS, CROSSWALKS OR BIKE PATHS.
8. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FEET - 6 INCHES AND SHALL CONFORM TO AASHTO M 199.
9. SEE STANDARD PLAN M-604-11, FOR REINFORCEMENT AROUND THE PIPE OPENING.
10. ALL INLETS SHALL HAVE A 4 INCH DIA. METAL MEDALLION WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE ON IT. THE MEDALLION SHALL HAVE A FISH SYMBOL WITH A BLUE BACKGROUND. IT SHALL BE FIRMLY ATTACHED TO THE TOP OF THE INLET WITH A PERMANENT FASTENER.



SLOT DETAIL IN 3½" x ¼" FLATS SAME AS IN STANDARD INLET GRATE

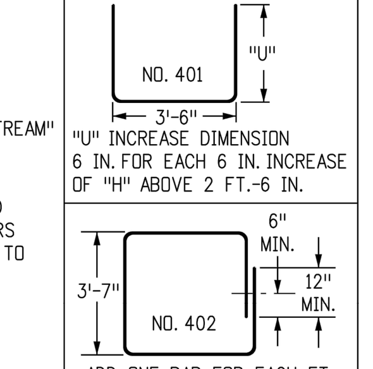
QUANTITIES FOR ONE INLET

H	CONCRETE (CU. YDS.) ▼	STEEL (LBS.) ▼	NO. STEPS REQ'D.
2'-6"	1.0	76	0
3'-0"	1.1	81	0
3'-6"	1.2	97	0
4'-0"	1.3	102	1
4'-6"	1.5	117	2
5'-0"	1.6	123	2
5'-6"	1.7	138	2
6'-0"	1.9	143	3
6'-6"	2.0	159	3
7'-0"	2.1	164	3
7'-6"	2.2	180	4
8'-0"	2.4	185	4
8'-6"	2.5	200	4
9'-0"	2.6	206	5
9'-6"	2.8	221	5
10'-0"	2.9	236	6
11'-6"	3.3	252	6

▼ PIPE INSIDE DIAMETER SHALL BE 30 IN. OR LESS. CONCRETE AND STEEL QUANTITIES ARE FOR ONE ENTIRE INLET BEFORE DEDUCTION FOR VOLUME OCCUPIED BY PIPE. WEIGHT OF STEEL INCLUDES A RING FOR THE MAXIMUM PIPE DIAMETER.

BAR LIST FOR H = 2 FT.-6 IN. AND BENDING DIAGRAM

MARK	NO. REQ'D.	HEIGHT	LENGTH
401	2	2'-2½"	8'-0"
401	6	2'-7"	8'-8"
402	4	"U"	15'-4"



"U" INCREASE DIMENSION 6 IN. FOR EACH 6 IN. INCREASE OF "H" ABOVE 2 FT.-6 IN.

ADD ONE BAR FOR EACH FT. INCREASE OF "H" ABOVE 2 FT. - 6 IN.

402 BARS SHALL BE EQUALLY SPACED FROM EACH OTHER.

Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	(R-X)
Last Modification Date: 07/31/19	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions	
Date:	Comments

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2829 West Howard Place
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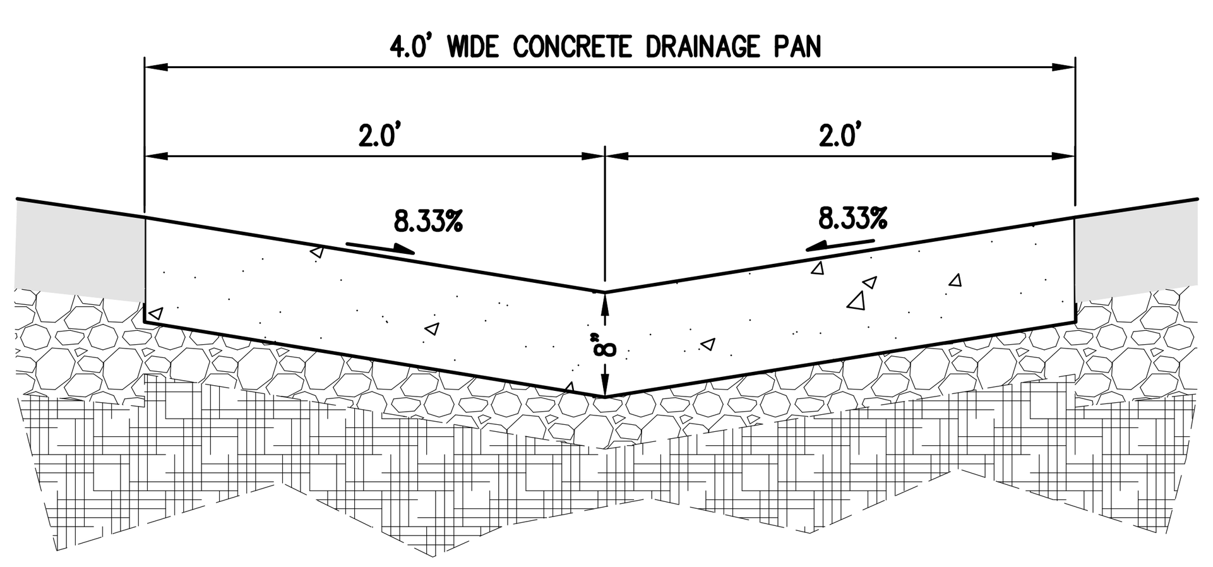
Phone: 303-757-9021 FAX: 303-757-9868
Project Development Branch JBK

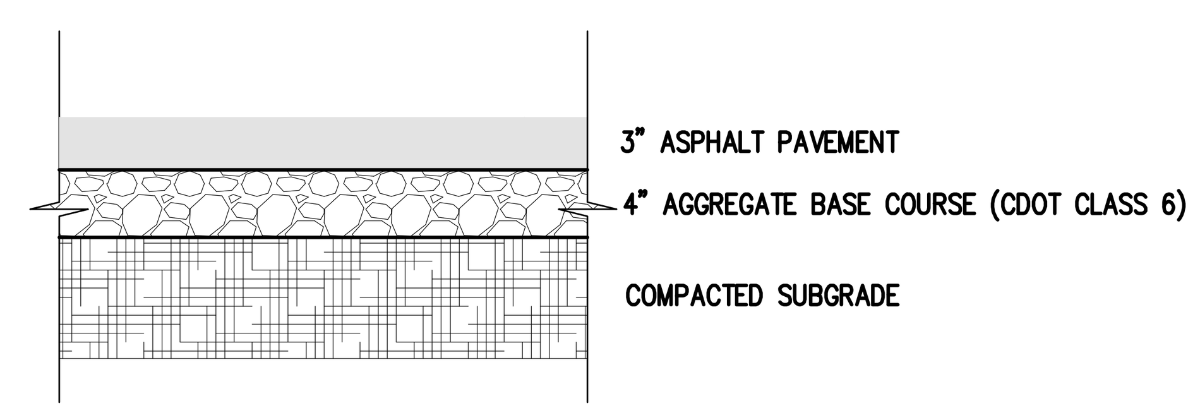
INLET, TYPE C

Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-604-10
Standard Sheet No. 1 of 1
Project Sheet Number:

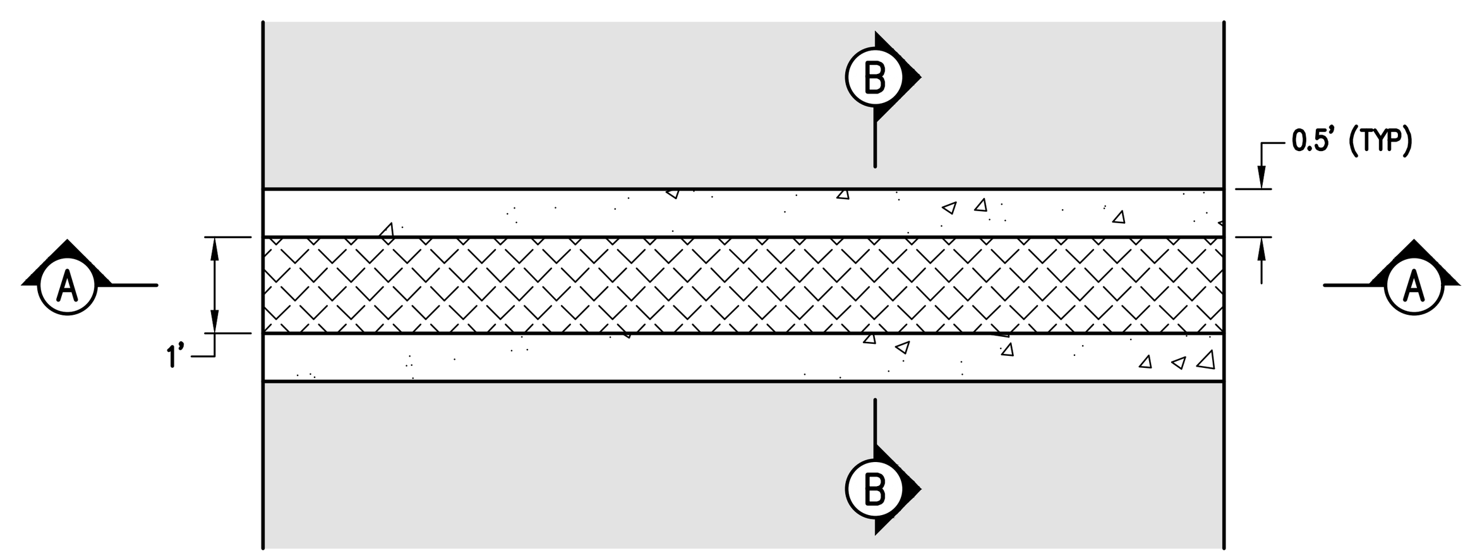


CONCRETE PAN SECTION

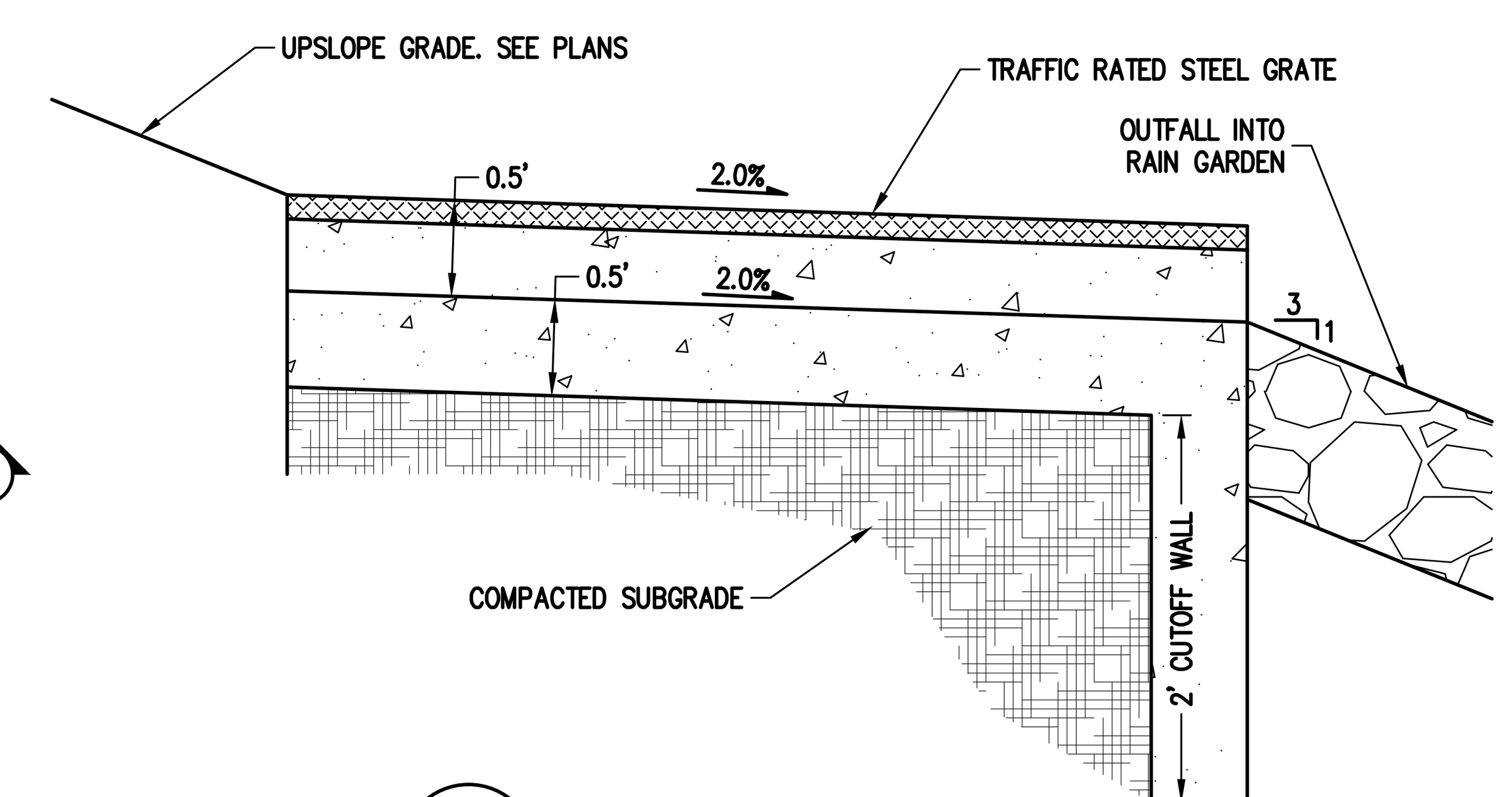


NOTE:
ASPHALT SECTION SHOWN BASED ON TABLE D-2: MINIMUM PAVEMENT SECTIONS IN EL PASO COUNTY ENGINEERING CRITERIA MANUAL FOR LOCAL ROADS. FINAL PAVEMENT SECTION TO BE DETERMINED BY GEOTECHNICAL ENGINEER IN PAVEMENT DESIGN REPORT.

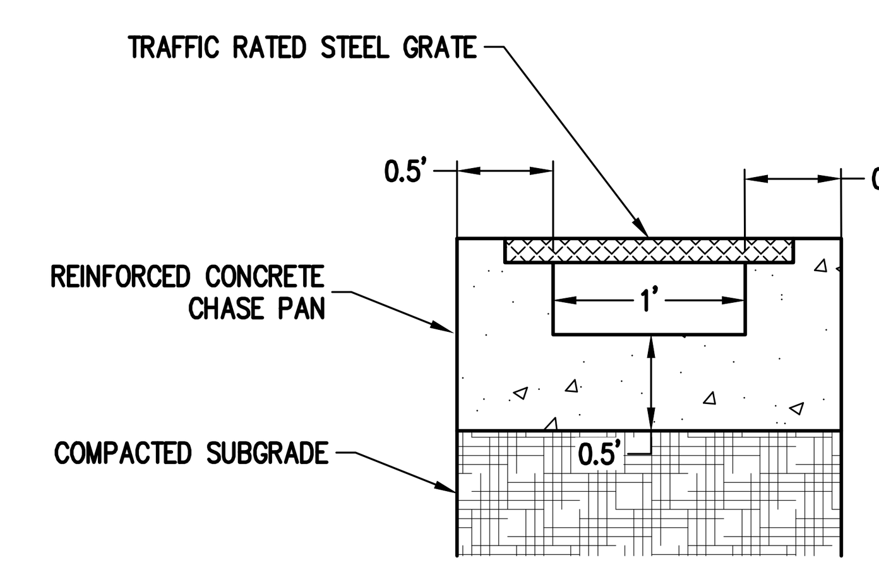
ASPHALT PAVEMENT SECTION



TRENCH DRAIN PLAN



A C18 C18 TRENCH DRAIN SIDE VIEW
NOT TO SCALE



B C18 C18 TRENCH DRAIN SECTION VIEW
NOT TO SCALE

ROADWAY TRENCH DRAIN

BASELINE
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DESIGNED BY	DRAWN BY	CHECKED BY
AJL	AJL	SGB

REVISION DESCRIPTION	PREPARED BY	DATE
60 % DESIGN SET		06/26/2024

EL PASO COUNTY PARKS

EL PASO COUNTY

FOX RUN NATURE CENTER

DETAILS

PREPARED UNDER THE DIRECT SUPERVISION OF

PRELIMINARY NOT FOR CONSTRUCTION

FOR AND ON BEHALF OF BASELINE CORPORATION

INITIAL SUBMITTAL	XX/XX/XX
DRAWING SIZE	24" X 36"
SURVEY FIRM BASELINE	SURVEY DATE 10/31/2023
JOB NO.	C035069
DRAWING NAME 35069 Details.dwg	
SHEET 18 OF 16	

C18