CHRIS TEAM SUBDIVISION

FINAL DRAINAGE REPORT

EL PASO COUNTY PROJECT NO: SF246

ALL TERRAIN ENGINEERING PROJECT NO: 24019

AUGUST 2024

PREPARED FOR:

CHRIS TEAM LIVING TRUST

CONTACT: CHRISTINE TSCHAMLER

PREPARED BY:

ALL TERRAIN ENGINEERING LLC

CONTACT: NICHOLAS Q. JOKERST

NJOKERST@ALLTERRAINENG.COM

(530) 391-7635

ENGINEER'S STATEMENT

Please update typos

The attacked 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 accts, errors or omissions on my part in preparing this report.

_____

Nicholas Q. Jokerst, PE Date

State of Colorado No. 59273

For and on behalf of All Terrain Engineering LLC

DEVELOPER'S STATEMENT

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

_____

Christine Tschamler Date

Chris Team Living Trust

6275 Montarbor Drive, Colorado Springs, CO 80918

EL PASO COUNTY ONLY

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.

_____

Joshua Palmer, PE Date
County Engineer/ECM Administrator
Conditions:

Table of Contents

Appendices

I. General Purpose, Location & Description

a. Purpose & Project Description

The purpose of the Final Drainage Report (FDR) for the CHRIS TEAM SUBDIVISION is to describe the site's onsite and offsite drainage patterns, existing and proposed storm infrastructure, and to safely route developed stormwater to adequate outfalls.

b. Location

CHRIS TEAM SUBDIVISION, referred to as 'the site' herein, is in a portion of the northeast quarter of Section 14, Township 11 South, Range 65 West of the 6th P.M., El Paso County, Colorado. The site is bound by unplatted land to the north, west and east, Gerth Subdivision and Beierle Minor Subdivision (R1) to the south, and Hendriks Subdivision to the north. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 19.18 acres and is undeveloped. Existing vegetation consists of native grasses and dense forest. There will be no land disturbance or site improvements associated with this report. The site is currently unplatted and zoned RR-5. The intention of the project is to plat a minor subdivision of three (3) 5+ acre lots. At this time, no additional development will occur on the property.

In general, the site slopes northeasterly. Onsite elevations range from 7415' - 7450' with slopes ranging 1 – 20%. Per a NRCS soil survey, the site is made up of Type B Elbeth sandy loam. An existing drainageway bisects the site and conveys the site's stormwater towards Black Squirrel Road. Per the Land Survey Plat, an underground telecommunication line runs along the site's northern boundary. Two existing 12" PVC culverts discharge onsite along the western property line. An existing drainage map is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0310G dated December 7, 2018, the site is Zone X, which are areas determined to be outside the 0.2% annual chance flood.

II. Drainage Basins

a. Major Basin Description

The site is located within the West Kiowa Creek Drainage Basin. West Kiowa Creek is an unstudied drainage basin. A Drainage Basin Planning Study has not been completed.

b. Existing Subbasin Description

The existing site's drainage patterns are relatively uniform. A drainageway bisects the site and conveys stormwater to a low point in the northeast corner of the site. See below for existing basin descriptions:

Basin A is 19.20 acres of dense forest and native grasses. The basin is bounded by Little Squirrel Lane to the north and west and by existing Black Squirrel Road to the east. Neither Little Squirrel Lane nor Black Squirrel Road have roadside ditches. Stormwater from these roads sheet flows onsite and collects at DP2.

Looks like this is DP7 now. Based on flow arrows, it looks like a portion of the roadways flow offsite and not onsite

Please add "onsite" or "offsite" to each basin for clarity.

Review 1 unresolved comment: Include a discussion of the existing 12" culvert at the NW corner of the site, as shown on drainage map. There is a comment on the map to identify the culvert of interest.

Basin A stormwater (Q_5 = 4.2 cfs Q_{100} = 22.9 cfs) collects in a low point at DP2 that overtops Black Squirrel Road and continues northeast in an existing drainageway. The existing drainageway ultimately discharges to Kiowa Creek Watershed 1-G-30 Reservoir. The low point is densely vegetated and stable. An overtopping analysis of Black Squirrel Road is presented in Appendix C. Photos of the culvert outfall and low point are presented in Appendix E.

What is overtopping depth/width/velocity? Does it meet overtopping criteria per DCM table 6-4?

Please include the overtop depth in narrative.

Basin B is 11.02 acres of Little Squirrel Lane, offsite large lots and undeveloped area. Stormwater from this basin (Q_5 = 3.7 cfs Q_{100} = 22.4 cfs) flows east across the basin to a low point adjacent to Black Squirrel Road and north of Little Squirrel Lane (DP8). DP8 overtops Black Squirrel Road and continues northeast in an existing drainageway. The existing drainageway ultimately discharges to Kiowa Creek Watershed 1-G-30 Reservoir. This basin will remain undeveloped and follow historic drainage patterns. The existing culverts will not be affected. A picture of the downstream drainageway after stormwater overtops Black Squirrel Road is presented as Figure 2 in Appendix E.

add "onsite". Flows do run through existing culverts on north side of road, but they are not within the project area.

Basin C is 0.26 acres of dirt road. Stormwater from this basin (Q_5 = 0.7 cfs Q_{100} = 1.4 cfs where dual, existing, private 12" PVC culverts convey the flow to the onsite drainageway enters this basin from offsite areas to the west, see Basin D. Basin C will remain unchanged and follow historic drainage patterns.

Previous report stated there was a roadside ditch along road, directing flows to culvert. This was deleted, so how are flows being directed to low point? Also provide discussion of existing culvert at NW corner of site in Basin C.

Basin D is 140.80 acres of off…n, StreamStats is used to define the basin limits. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin D stormwater (Q_5 = 28.0 cfs Q_{100} = 118.7 cfs) discharges onsite at DP1. Existing, private dual 12" PVC culverts at DP1 are undersized and the majority of the flow overtops Little Squirrel Lane. A no build easement is proposed to encompass the limits of the flow …Lots 1-3 develop in the future, these culverts must be cleaned out from sediment ~~that may~~ …nstruction. However, in the existing condition the culverts and outfall are stable. An …sis of Little Squirrel Lane is presented in Appendix C.

Expand discussion on culvert overtopping. What is depth/width/velocity? Does it meet EPC criteria in DCM section 6.4?

existing

Basin E is 0.51 acres of offsite area to the south of the site. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin E stormwater (Q_5 = 0.4 cfs Q_{100} = 1.6 cfs) discharges onsite at DP2 and continues to DP7.

Basin F is 15.12 acres of offsite area to the south of the site. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin F stormwater (Q_5 = 5.9 cfs Q_{100} = 25.2 cfs) discharges onsite at DP3 and continues to DP7.

Basin G is 1.22 acres of offsite area to the south of the site. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin F stormwater (Q_5 = 2.2 cfs Q_{100} = 9.6 cfs) discharges onsite at DP4 and continues to DP7.

Basin H is 3.77 acres of offsite area to the south of the site. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin F stormwater (Q_5 = 0.5 cfs Q_{100} = 2.3 cfs) discharges onsite at DP5 and continues to DP7.

Basin I is 9.08 acres of offsite area to the south of the site. Based upon County GIS data, this basin has been analyzed as 5+ acre lot subdivisions with a maximum imperviousness of 10%. Basin I stormwater (Q_5 = 3.7 cfs Q_{100} = 16.0 cfs) discharges onsite at DP6 and continues to DP7.

Please include the total flows at DP7 from the other basins.

c. Proposed Subbasin Description

The project will not be performing any site improvements nor disturbing land. Drainage basins will not be disturbed and will remain unchanged. However, to account for the potential of development in the future, Lots 1 – 3 are analyzed for stormwater impacts based upon 5+ acre lots. If future lot development exceed these assumptions, an additional lot specific drainage report will be required to analyze the impacts on stormwater.

Basin A1 is 6.03 acres and corresponds to Lot 1. Basin A1 stormwater (Q_5 = 1.7 cfs Q_{100} = 7.8 cfs) is captured in the onsite drainageway and conveyed to DP7. Basin A1 is assumed to have a future imperviousness of 9.5%. If Basin A1 develops, a lot specific drainage report will be required to show conformance. Additionally, the report must size a driveway culvert and any other infrastructure to maintain historic drainage patterns.

Basin A2 is 6.19 acres and corresponds to Lot 2. Basin A2 stormwater (Q_5 = 2.1 cfs Q_{100} = 9.7 cfs) is captured in the onsite drainageway and conveyed to DP7. Basin A2 is assumed to have a future imperviousness of 9.5%. If Basin A2 develops, a lot specific drainage report will be required to show conformance. Additionally, the report must size a driveway culvert and any other infrastructure to maintain historic drainage patterns.

Basin A3 is 6.98 acres and corresponds to Lot 3. Basin A3 stormwater (Q_5 = 2.6 cfs Q_{100} = 12.1 cfs) is captured in the onsite drainageway and conveyed to DP7. Basin A3 is assumed to have a future imperviousness of 9.5%. If Basin A3 develops, a lot specific drainage report will be required to show conformance. Additionally, the report must size a driveway culvert and any other infrastructure to maintain historic drainage patterns.

Please provide minimum driveway culvert sizing for driveways. You can do just one worse case scenario and then add caveat that sizes will be finalized with lot specific drainage reports.

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iteria from the "Drainage Criteria Manual County of El Paso, Colorado" Volumes 1 and 2," as amended.

b. Hydrologic Criteria

Hydrologic data was obtained from the NOAA Atlas 14 for the site area. Onsite drainage analysis included the 5-year storm (minor event) and 100-year storm (major event) using 1-hr duration rainfall depths from NOAA Atlas 14. Runoff was calculated per EPCDCM Chapter 5 – Storm Runoff Method of Analysis.

d. Hydraulic Criteria

Hydraulic criteria for channel analysis was obtained from EPCDCM Chapter 10 - Open Channels and Structures.

IV. Drainage Facility Design

a. General Concept

The site will remain in its existing condition. No stormwater improvements will be made in conjunction with this FDR. However, the Lots 1 – 3 have been analyzed with future assumptions for development.

b. Water Quality & Detention

Basin A1 – A3 are 5+ acre lots with a total impervious of 9.5% and is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. However, the exclusion does not relinquish detention requirements for the site. The development of the site has a marginal increase on peak flows in the 5-year and 100-year scenarios, 14.6% and 4.4%, respectively. The marginal increase in flows will not adversely affect downstream drainageways and associated facilities.

Please update this comparison based on drainage map and other comments.

EXISTING V. PROPOSED FLOW COMPARISON - BASIN A		
CONDITION	**$Q_{5\text{-YR}}$**	**$Q_{100\text{-YR}}$**
EXISITNG	4.1	22.8
PROPOSED	4.7	23.8
% Difference	14.6%	4.4%

Table should compare flows at DP7, not Basin A

c. Major Drainageways

An unnamed major drainageway bisects the site and drains to the east. This drainageway discharges to Kiowa Creek Watershed 1-G-30 Reservoir and ultimately to West Kiowa Creek. 16 channel cross sections were analyzed for the 100-year offsite channel flow and onsite developed flow to determine the stability of the channel and to determine the 100-year water surface elevation. A "No-Build" easement is proposed along the drainageway to encompass the 100-year water surface elevation and 1.0' of freeboard. The existing onsite drainageway is stable. An overtopping analysis at Black Squirrel Road and Little Squirrel Lane are presented in Appendix C.

Please include 5-year as well.

Include discussion of channel analysis, what parameters meet criteria, what to do for items that do not, etc.

d. Operations & Maintenance

An Operations and Maintenance Manual will not be required as no stormwater facilities are proposed. Maintenance of the existing channel will be the responsibility of the future lot owners. The portion of the channel adjacent to or on each lot must be maintained by the corresponding lot owner and ensure historic drainage patterns are maintained.

e. Grading & Erosion Control Plan

A Grading and Erosion Control plan is not required as no land disturbance will occur with this project.

f. Four Step Method

Step 1 – Reducing Runoff Volumes: Roof drains should route across landscape areas whenever possible to promote infiltration. In addition, a vegetated, drainageway captures and conveys stormwater to the historic outfall at the northeast corner of the site.

Step 2 – Treat and slowly release the WQCV: The site is exempt from permanent water quality per the Large Lot Single Family Site exclusion in Appendix I of the EPC DCM.

Step 3 – Stabilize stream channels: All new and re-development projects are required to construct or participate in the funding of channel stabilization measures. Drainage basin fees paid, at the time of platting, go towards channel stabilization with the drainage basin. However, the site is within the West Kiowa Creek Drainage Basin which does not have established basin or bridge fees.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

g. Drainage Basin & Bridge Fees

The site is within the West Kiowa Creek Drainage Basin which does not have established basin or bridge fees. Therefore, no drainage fees will be paid at time of platting.

h. Engineer's Opinion of Probable Cost

An OPC will not be provided as there are no improvements associated with this FDR.

V. Summary

CHRIS TEAM SUBDIVISION remains consistent with pre-development drainage conditions. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. This report is in accordance with the latest El Paso County Drainage criteria.

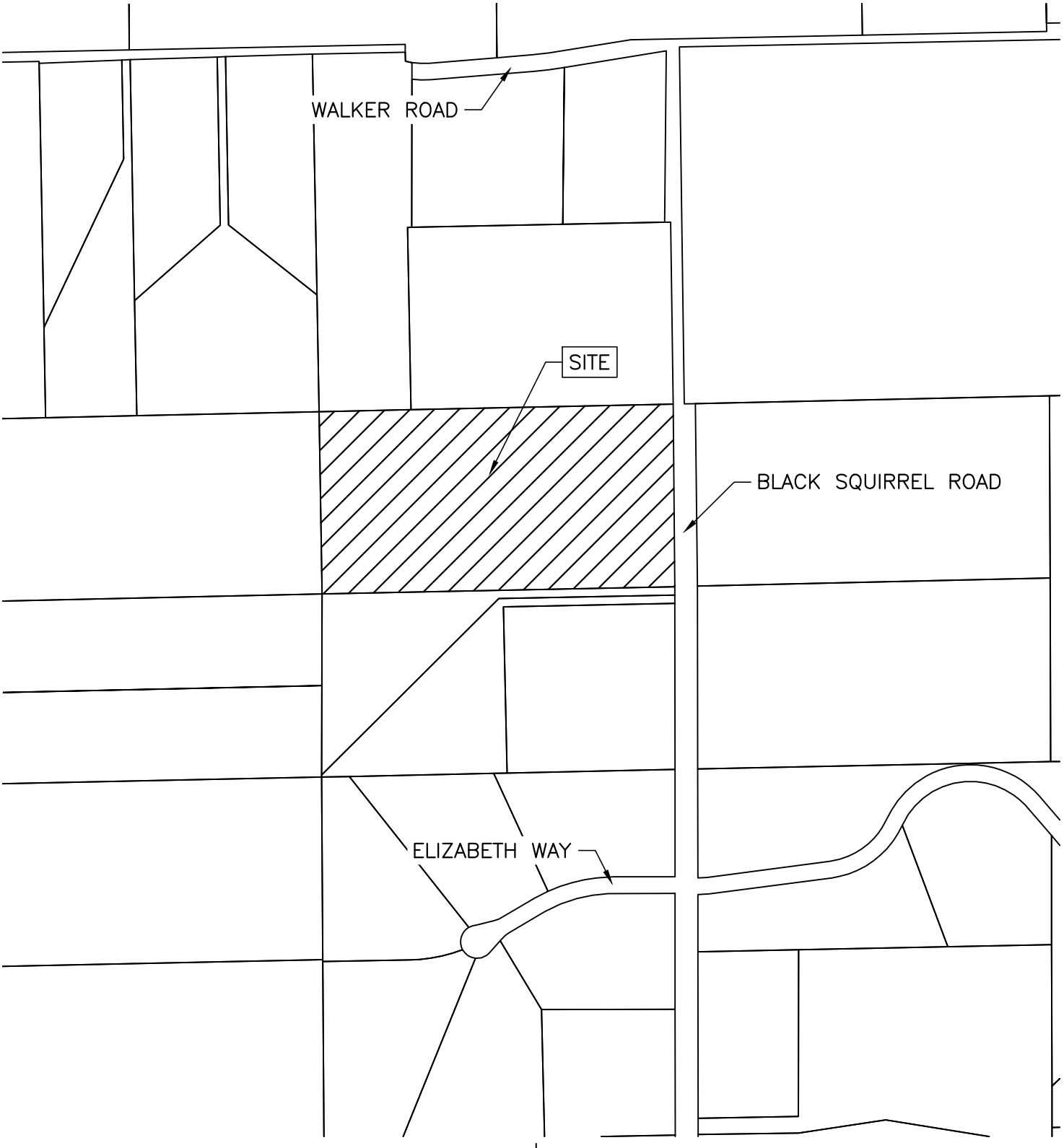
VI. References

1. El Paso County – Drainage Criteria Manual, 2018 as amended.
2. Urban Storm Drainage Criteria Manual, Mile High Flood District, March 2024.
3. USGS - Colorado StreamStats, https://www.usgs.gov/streamstats/colorado-streamstats.
4. TopoZone – Topo Map of Stream in El Paso County, Colorado, https://www.topozone.com/colorado/el-paso-co/stream.

APPENDIX A – VICINITY MAP, FEMA MAP, NRCS WEB SOIL SURVEY & NOAA ATLAS 14

CHRIS TEAM SUBDIVISION

VICINITY MAP



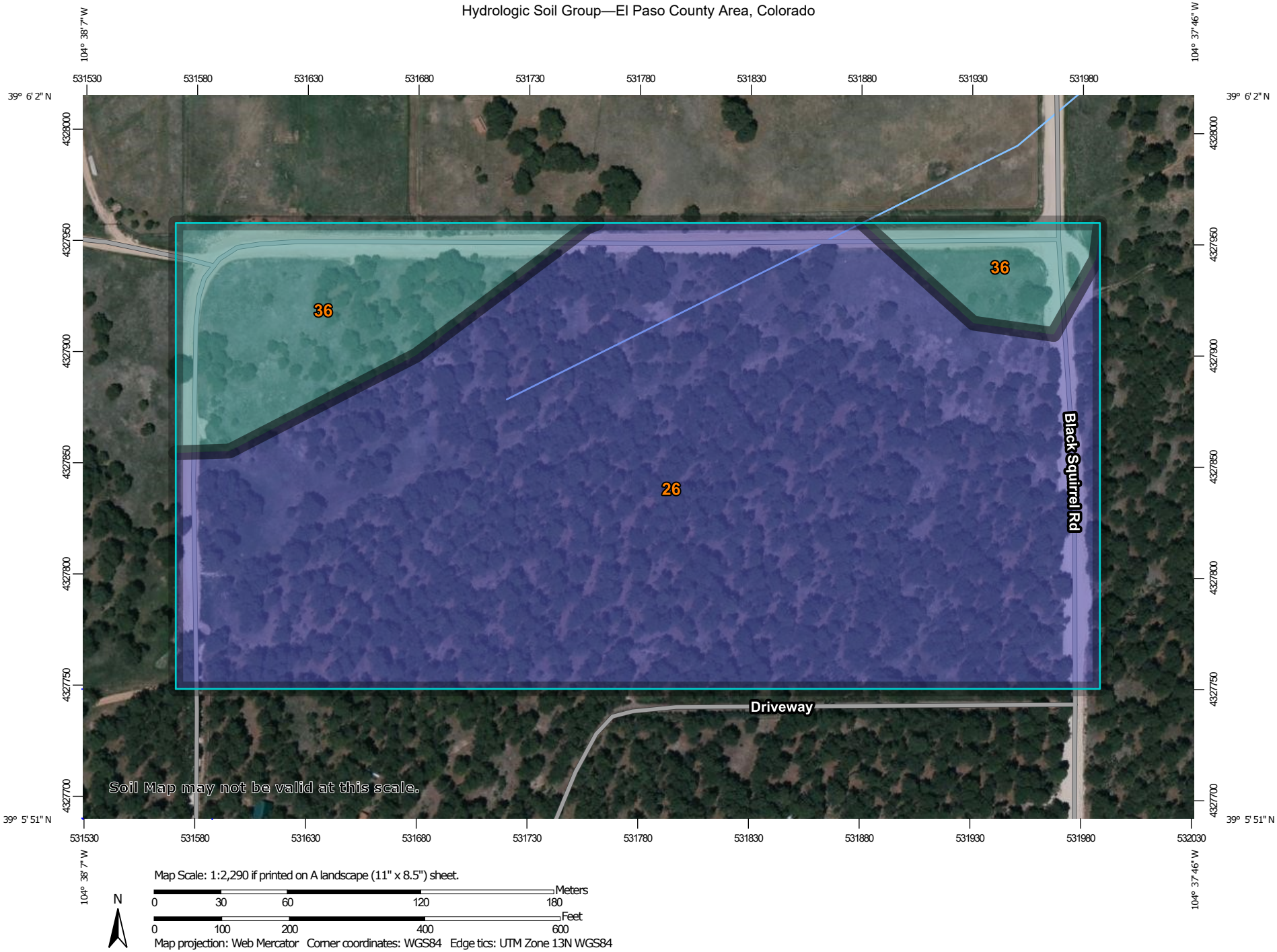
N

500 250 0 500 1000

ORIGINAL SCALE: 1" = 500'

VICINITY MAP	
CHRIS TEAM SUBDIVISION	
JOB NO. 24019	
LOCATION: EPC	SHEET
08/27/2024	

ALL TERRAIN ENGINEERING
1004 WEST VAN BUREN STREET
COLORADO SPRINGS, CO 80907



Map Scale: 1:2,290 if printed on A landscape (11" x 8.5") 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 Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
26	Elbeth sandy loam, 8 to 15 percent slopes	B	17.9	82.6%
36	Holderness loam, 8 to 15 percent slopes	C	3.8	17.4%
Totals for Area of Interest			**21.7**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Hydrologic Soil Group—El Paso County Area, Colorado

Map Scale: 1:3,570 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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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)

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
26	Elbeth sandy loam, 8 to 15 percent slopes	B	46.1	100.0%
Totals for Area of Interest			**46.1**	**100.0%**

Description

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

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

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

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

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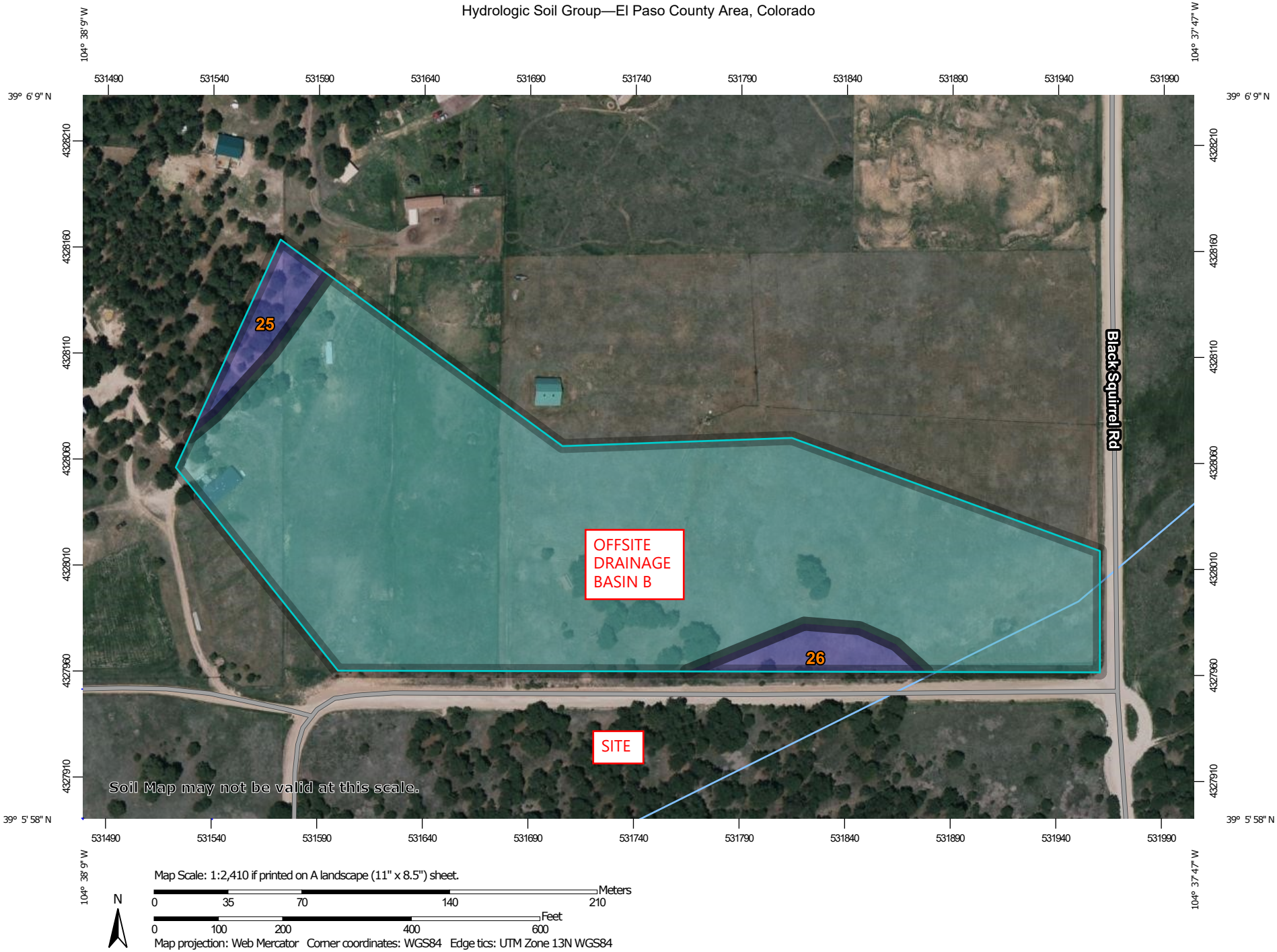
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified



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

N

Meters: 0 35 70 140 210

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
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Soil Rating Lines

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

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
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Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
25	Elbeth sandy loam, 3 to 8 percent slopes	B	0.4	3.4%
26	Elbeth sandy loam, 8 to 15 percent slopes	B	0.4	3.3%
36	Holderness loam, 8 to 15 percent slopes	C	11.2	93.3%
Totals for Area of Interest			**12.0**	**100.0%**

Description

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

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

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

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

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

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

National Flood Hazard Layer FIRMette

FEMA

104°38'10"W 39°6'4"N

104°37'32"W 39°5'36"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

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 / 17.5 Cross Sections with 1% Annual Chance / 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

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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.

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0977°, Longitude: -104.6314°
Elevation: 7471 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	**0.240** (0.188-0.306)	**0.291** (0.228-0.371)	**0.379** (0.296-0.485)	**0.456** (0.355-0.587)	**0.570** (0.431-0.764)	**0.662** (0.489-0.898)	**0.760** (0.542-1.05)	**0.864** (0.592-1.23)	**1.01** (0.665-1.47)	**1.12** (0.720-1.65)
10-min	**0.351** (0.276-0.448)	**0.425** (0.334-0.544)	**0.554** (0.433-0.710)	**0.668** (0.519-0.860)	**0.834** (0.631-1.12)	**0.970** (0.716-1.32)	**1.11** (0.794-1.54)	**1.26** (0.866-1.80)	**1.48** (0.973-2.15)	**1.64** (1.05-2.42)
15-min	**0.428** (0.336-0.547)	**0.519** (0.407-0.663)	**0.676** (0.529-0.866)	**0.815** (0.633-1.05)	**1.02** (0.770-1.36)	**1.18** (0.873-1.60)	**1.36** (0.969-1.88)	**1.54** (1.06-2.19)	**1.80** (1.19-2.63)	**2.00** (1.28-2.95)
30-min	**0.607** (0.477-0.775)	**0.736** (0.577-0.940)	**0.957** (0.749-1.23)	**1.15** (0.896-1.48)	**1.44** (1.09-1.92)	**1.67** (1.23-2.26)	**1.91** (1.36-2.65)	**2.17** (1.48-3.08)	**2.52** (1.66-3.68)	**2.81** (1.80-4.14)
60-min	**0.768** (0.603-0.981)	**0.922** (0.724-1.18)	**1.20** (0.935-1.53)	**1.44** (1.12-1.86)	**1.81** (1.38-2.44)	**2.12** (1.57-2.88)	**2.45** (1.75-3.40)	**2.80** (1.92-3.99)	**3.30** (2.18-4.82)	**3.70** (2.37-5.45)
2-hr	**0.928** (0.735-1.18)	**1.11** (0.877-1.40)	**1.43** (1.13-1.82)	**1.73** (1.36-2.21)	**2.19** (1.68-2.93)	**2.57** (1.92-3.48)	**2.98** (2.15-4.13)	**3.43** (2.38-4.87)	**4.07** (2.72-5.92)	**4.59** (2.97-6.72)
3-hr	**1.01** (0.805-1.28)	**1.20** (0.953-1.51)	**1.55** (1.22-1.95)	**1.87** (1.47-2.38)	**2.38** (1.84-3.18)	**2.81** (2.11-3.80)	**3.29** (2.39-4.54)	**3.81** (2.66-5.39)	**4.56** (3.06-6.62)	**5.17** (3.36-7.54)
6-hr	**1.18** (0.941-1.46)	**1.38** (1.10-1.72)	**1.76** (1.41-2.21)	**2.14** (1.70-2.69)	**2.73** (2.13-3.64)	**3.24** (2.46-4.36)	**3.81** (2.80-5.24)	**4.44** (3.13-6.26)	**5.36** (3.64-7.75)	**6.12** (4.02-8.88)
12-hr	**1.37** (1.11-1.70)	**1.60** (1.29-1.98)	**2.04** (1.64-2.54)	**2.47** (1.97-3.07)	**3.14** (2.47-4.14)	**3.72** (2.85-4.95)	**4.36** (3.23-5.95)	**5.08** (3.61-7.10)	**6.12** (4.19-8.77)	**6.97** (4.62-10.0)
24-hr	**1.61** (1.31-1.97)	**1.88** (1.53-2.31)	**2.40** (1.94-2.94)	**2.88** (2.32-3.55)	**3.62** (2.86-4.72)	**4.26** (3.28-5.60)	**4.95** (3.69-6.68)	**5.72** (4.10-7.91)	**6.81** (4.70-9.69)	**7.71** (5.16-11.0)
2-day	**1.88** (1.54-2.27)	**2.22** (1.81-2.69)	**2.82** (2.30-3.43)	**3.37** (2.74-4.12)	**4.20** (3.33-5.38)	**4.88** (3.78-6.34)	**5.62** (4.22-7.49)	**6.42** (4.63-8.79)	**7.55** (5.25-10.6)	**8.46** (5.71-12.0)
3-day	**2.05** (1.69-2.47)	**2.43** (2.00-2.93)	**3.10** (2.54-3.75)	**3.70** (3.02-4.50)	**4.59** (3.66-5.84)	**5.32** (4.14-6.86)	**6.10** (4.59-8.07)	**6.94** (5.02-9.44)	**8.11** (5.66-11.4)	**9.04** (6.14-12.8)
4-day	**2.20** (1.82-2.64)	**2.60** (2.15-3.13)	**3.31** (2.72-3.99)	**3.94** (3.22-4.77)	**4.87** (3.89-6.17)	**5.63** (4.39-7.23)	**6.44** (4.86-8.48)	**7.30** (5.31-9.90)	**8.51** (5.97-11.9)	**9.48** (6.46-13.4)
7-day	**2.60** (2.16-3.10)	**3.03** (2.51-3.61)	**3.77** (3.12-4.50)	**4.43** (3.65-5.32)	**5.41** (4.35-6.80)	**6.22** (4.88-7.92)	**7.08** (5.39-9.26)	**8.00** (5.86-10.8)	**9.29** (6.56-12.9)	**10.3** (7.09-14.5)
10-day	**2.97** (2.48-3.52)	**3.42** (2.85-4.05)	**4.20** (3.49-5.00)	**4.90** (4.05-5.86)	**5.93** (4.79-7.41)	**6.78** (5.35-8.59)	**7.68** (5.87-10.0)	**8.63** (6.35-11.6)	**9.98** (7.08-13.8)	**11.0** (7.63-15.5)
20-day	**3.99** (3.36-4.68)	**4.60** (3.86-5.40)	**5.61** (4.70-6.61)	**6.48** (5.40-7.67)	**7.71** (6.25-9.49)	**8.69** (6.90-10.9)	**9.70** (7.46-12.5)	**10.7** (7.96-14.2)	**12.2** (8.70-16.6)	**13.3** (9.26-18.5)
30-day	**4.81** (4.06-5.61)	**5.55** (4.69-6.48)	**6.76** (5.70-7.92)	**7.77** (6.51-9.15)	**9.17** (7.44-11.2)	**10.2** (8.15-12.7)	**11.3** (8.74-14.4)	**12.4** (9.23-16.3)	**13.9** (9.96-18.8)	**15.0** (10.5-20.7)
45-day	**5.80** (4.93-6.73)	**6.70** (5.68-7.77)	**8.13** (6.88-9.46)	**9.29** (7.82-10.9)	**10.9** (8.83-13.1)	**12.0** (9.60-14.8)	**13.2** (10.2-16.6)	**14.3** (10.7-18.7)	**15.8** (11.4-21.2)	**16.8** (11.9-23.2)
60-day	**6.63** (5.65-7.65)	**7.63** (6.49-8.82)	**9.22** (7.82-10.7)	**10.5** (8.85-12.2)	**12.2** (9.91-14.6)	**13.4** (10.7-16.3)	**14.6** (11.3-18.3)	**15.7** (11.8-20.4)	**17.2** (12.4-23.0)	**18.2** (12.9-25.0)

[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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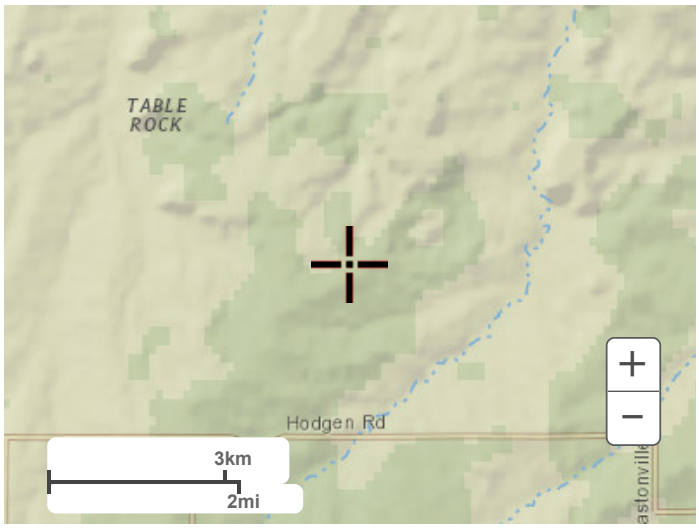
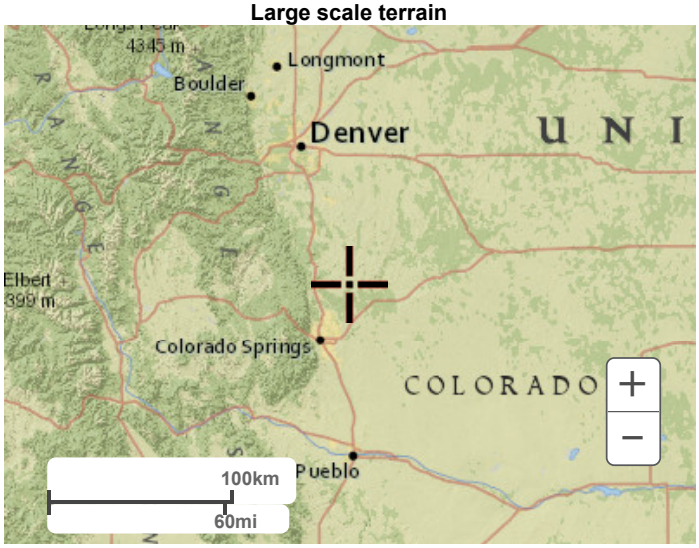
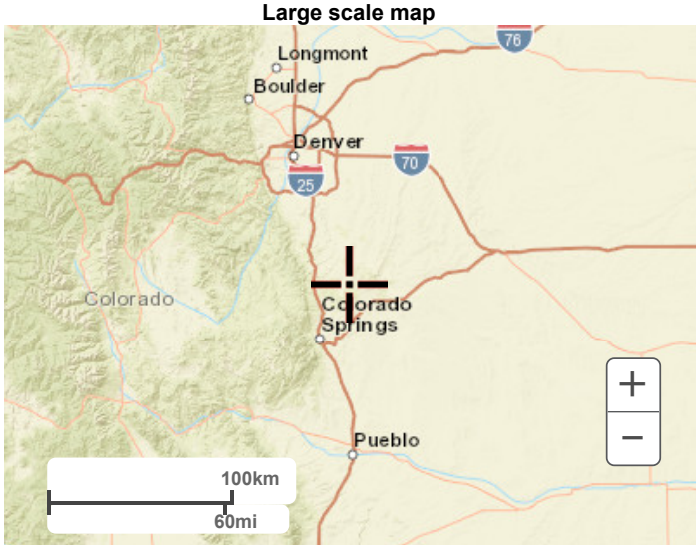
PF graphical



Large scale terrain



Large scale map



Large scale aerial

APPENDIX B – HYDROLOGIC CALCULATIONS

Subdivision:	Chris Team Subdivsion
Location:	El Paso County
Project Name:	Black Squirrel Road
Project Number:	24019
Calculated By:	NQJ
Checked By:	REB
Date:	11/29/2024

EXISTING CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	19.20	6%	0.11	0.38	44.5	4.2	22.9
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	2.2	9.6
5	0.5	2.3
6	3.7	16.0
7	35.5	126.9
8	3.7	22.4

COMPOSITE % IMPERVIOUS CALCULATIONS - EXISTING CONDITIONS

Subdivision: Chris Team Subdivision
Location: El Paso County

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

		Dirt Roadway				Roofs				Historic Greenbelt				Weighted C_5 & C_{100}		Basins Total Weighted % Imp.
Basin ID	Total Area (ac)	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	
A	19.20	0.59	0.70	0.95	80.0%	0.73	0.81	0.00	90.0%	0.09	0.36	18.25	2.0%	0.11	0.38	5.9%
B	11.02	0.59	0.70	0.27	80.0%	0.73	0.81	0.00	90.0%	0.09	0.36	10.75	2.0%	0.10	0.37	3.9%
C	0.26	0.63	0.74	0.26	80.0%	0.75	0.83	0.00	90.0%	0.16	0.51	0.00	2.0%	0.63	0.74	80.0%
D	140.80	0.61	0.72	-	80.0%	0.74	0.82	-	90.0%	0.12	0.44	-	2.0%	0.19	0.48	10.0%
E	0.51	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
F	15.12	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
G	3.77	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
H	1.22	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
I	9.08	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
Total	**200.98**															**9.4%**

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision: Chris Team Subdivision
Location: El Paso County

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

SUB-BASIN DATA					INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C_5	Impervious (%)	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A	19.20	B	0.11	5.9%	300	5.0%	18.1	1540	1.8%	7.0	0.9	27.3	45.4	1840.0	44.5	44.5
B	11.02	B	0.10	3.9%	17	2.0%	5.9	1058	4.7%	7.0	1.5	11.7	17.6	1075.0	33.9	17.6
C	0.26	B	0.63	80.0%	11	2.0%	2.2	635	3.5%	10.0	1.9	5.7	7.9	646.0	15.2	7.9
D	140.80	B	0.19	10.0%	-	-	-	-	-	-	-	-	-	-	-	78.0
E	0.51	B	0.16	10.0%	75	10.0%	6.9	135	8.0%	7.0	2.0	1.1	8.0	210.0	25.1	8.0
F	15.12	B	0.16	10.0%	300	3.3%	19.8	1050	4.9%	7.0	1.5	11.3	31.1	1350.0	31.9	31.1
G	3.77	B	0.16	10.0%	200	13.0%	10.3	250	4.0%	7.0	1.4	3.0	13.3	450.0	26.3	13.3
H	1.22	B	0.16	10.0%	300	2.6%	21.4	450	8.4%	7.0	2.0	3.7	25.1	750.0	26.8	25.1
I	9.08	B	0.16	10.0%	300	6.0%	16.3	980	3.6%	7.0	1.3	12.3	28.6	1280.0	32.6	28.6

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Eq
$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$
Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $(26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ Equation 6-5

:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

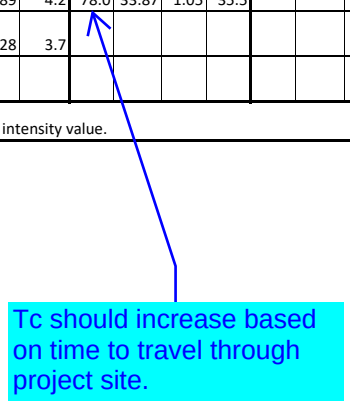
(RATIONAL METHOD PROCEDURE)

Subdivision: Chris Team Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREAM			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{stream} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		D	140.80	0.19	78.00	26.75	1.05	28.0															BASIN D HISTORIC FLOW @ DP1
	1	C	0.26	0.63	7.90	0.16	4.48	0.7	78.0	26.92	1.05	28.2	28.2	26.92	1.60								COMBINED BASIN C & D FLOW @ DP1 (EX DUAL 12" PVC CULVERTS), FLOWS ONSITE TO DP7
	2	E	0.51	0.16	8.01	0.08	4.46	0.4					0.4	0.08	1.60					1490	1.3	19.6	BASIN E FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	3	F	15.12	0.16	31.12	2.42	2.43	5.9					5.9	2.42	1.60					1275	1.3	16.8	BASIN F FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	4	G	3.77	0.16	13.27	0.60	3.70	2.2					2.2	0.60	1.60					1121	1.3	14.8	BASIN G FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	5	H	1.22	0.16	25.14	0.20	2.75	0.5					0.5	0.20	1.60					1083	1.3	14.3	BASIN H FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	6	I	9.08	0.16	28.57	1.45	2.55	3.7					3.7	1.45	1.60					621	1.3	8.2	BASIN I FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	7	A	19.20	0.11	44.48	2.20	1.89	4.2	78.0	33.87	1.05	35.5											BASIN A & DP1-6 FLOW @ DP7
	8	B	11.02	0.10	17.57	1.13	3.28	3.7															BASIN B FLOW @ DP8

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.



STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Chris Team Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREAM			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{stream}(cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		D	140.80	0.48	78.00	67.58	1.76	118.7															BASIN D HISTORIC FLOW @ DP1
	1	C	0.26	0.74	7.90	0.19	7.53	1.4	78.0	67.78	1.76	119.0	119.0	67.78	1.60					750	1.3	9.9	COMBINED BASIN C & D FLOW @ DP1 (EX DUAL 12" PVC CULVERTS), FLOWS ONSITE TO DP7
	2	E	0.51	0.41	8.01	0.21	7.49	1.6					1.6	0.21	1.60					1490	1.3	19.6	BASIN E FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	3	F	15.12	0.41	31.12	6.20	4.07	25.2					25.2	6.20	1.60					1275	1.3	16.8	BASIN F FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	4	G	3.77	0.41	13.27	1.55	6.22	9.6					9.6	1.55	1.60					1121	1.3	14.8	BASIN G FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	5	H	1.22	0.41	25.14	0.50	4.61	2.3					2.3	0.50	1.60					1083	1.3	14.3	BASIN H FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	6	I	9.08	0.41	28.57	3.72	4.29	16.0					16.0	3.72	1.60					621	1.3	8.2	BASIN I FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	7	A	19.20	0.38	44.48	7.24	3.17	22.9	87.9	87.19	1.46	126.9											BASIN A & DP1-6 FLOW @ DP7
	8	B	11.02	0.37	17.57	4.06	5.51	22.4															BASIN B FLOW @ DP8

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Subdivision:	Chris Team Subdivsion
Location:	El Paso County
Project Name:	Black Squirrel Road
Project Number:	24019
Calculated By:	NQJ
Checked By:	REB
Date:	11/29/2024

PROPOSED CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	6.03	10%	0.14	0.40	42.9	1.7	7.8
A2	6.19	9%	0.14	0.40	36.1	2.1	9.7
A3	6.98	10%	0.14	0.40	33.6	2.6	12.1
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

PROPOSED CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	2.2	9.6
5	0.5	2.3
6	3.7	16
7	40.4	133.3
8	3.7	22.4

COMPOSITE % IMPERVIOUS CALCULATIONS - PROPOSED CONDITIONS

Subdivision: Chris Team
Location: El Paso County

Project Name: Chris Team
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

		Dirt Roadway				Roofs				Historic Greenbelt				Weighted C_5 & C_{100}		Basins Total Weighted % Imp.
Basin ID	Total Area (ac)	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	
A1	6.03	0.59	0.70	0.30	80.0%	0.73	0.81	0.25	90.0%	0.09	0.36	5.48	2.0%	0.14	0.40	9.5%
A2	6.19	0.59	0.70	0.31	80.0%	0.73	0.81	0.25	190.0%	0.09	0.36	5.63	102.0%	0.14	0.40	9.5%
A3	6.98	0.59	0.70	0.39	80.0%	0.73	0.81	0.25	290.0%	0.09	0.36	6.34	202.0%	0.14	0.40	9.5%
B	11.02	0.59	0.70	0.27	80.0%	0.73	0.81	0.00	90.0%	0.09	0.36	10.75	2.0%	0.10	0.37	3.9%
C	0.26	0.63	0.74	0.26	80.0%	0.75	0.83	0.00	90.0%	0.16	0.51	0.00	2.0%	0.63	0.74	80.0%
D	140.80	0.61	0.72	-	80.0%	0.74	0.82	-	90.0%	0.12	0.44	-	2.0%	0.19	0.48	10.0%
E	0.51	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
F	15.12	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
G	3.77	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
H	1.22	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
I	9.08	0.59	0.70	-	80.0%	0.73	0.81	-	90.0%	0.09	0.36	-	2.0%	0.16	0.41	10.0%
Total	**200.98**															**15.7%**
Lot 1 - 3 Basins	**19.20**															**9.5%**

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Chris Team
Location: El Paso County

Project Name: Chris Team
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

SUB-BASIN DATA					INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C_5	Impervious (%)	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	6.03	B	0.14	9.5%	300	5.0%	17.6	1540	1.8%	7.0	0.9	27.3	45.0	1840.0	42.9	42.9
A2	6.19	B	0.14	9.5%	300	8.0%	15.1	970	1.8%	7.0	0.9	17.2	32.3	1270.0	36.1	32.3
A3	6.98	B	0.14	9.5%	300	10.0%	14.0	765	1.8%	7.0	0.9	13.6	27.6	1065.0	33.6	27.6
B	11.02	B	0.10	3.9%	17	2.0%	5.9	1058	4.7%	7.0	1.5	11.7	17.6	1075.0	33.9	17.6
C	0.26	B	0.63	80.0%	11	2.0%	2.2	635	3.5%	10.0	1.9	5.7	7.9	646.0	15.2	7.9
D	140.80	B	0.19	10.0%	-	-	-	-	-	-	-	-	-	-	-	78.0
E	0.51	B	0.16	10.0%	75	10.0%	6.9	135	8.0%	7.0	2.0	1.1	8.0	210.0	25.1	8.0
F	15.12	B	0.16	10.0%	300	3.3%	19.8	1050	4.9%	7.0	1.5	11.3	31.1	1350.0	31.9	31.1
G	3.77	B	0.16	10.0%	200	13.0%	10.3	250	4.0%	7.0	1.4	3.0	13.3	450.0	26.3	13.3
H	1.22	B	0.16	10.0%	300	2.6%	21.4	450	8.4%	7.0	2.0	3.7	25.1	750.0	26.8	25.1
I	9.08	B	0.16	10.0%	300	6.0%	16.3	980	3.6%	7.0	1.3	12.3	28.6	1280.0	32.6	28.6

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Eq
$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$
Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $(26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ Equation 6-5

:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Chris Team
Location: El Paso County
Design Storm: 5-Year

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREAM			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{stream} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
		D	140.80	0.19	78.00	26.75	1.05	28.0															BASIN D HISTORIC FLOW @ DP1
	1	C	0.26	0.63	7.90	0.16	4.48	0.7	78.0	26.91	1.05	28.2	28.2	26.91	1.40								COMBINED BASIN C & D FLOW @ DP1 (EX DUAL 12" PVC CULVERTS), FLOWS ONSITE IN EXISTING DRAINAGEWAY TO DP7
	2	E	0.51	0.16	8.01	0.08	4.46	0.4					0.4	0.08	1.60					1490	1.3	19.6	BASIN E FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	3	F	15.12	0.16	31.12	2.42	2.43	5.9					5.9	2.42	1.60					1275	1.3	16.8	BASIN F FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	4	G	3.77	0.16	13.27	0.60	3.70	2.2					2.2	0.60	1.60					1121	1.3	14.8	BASIN G FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	5	H	1.22	0.16	25.14	0.20	2.75	0.5					0.5	0.20	1.60					1083	1.3	14.3	BASIN H FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	6	I	9.08	0.16	28.57	1.45	2.55	3.7					3.7	1.45	1.60					621	1.3	8.2	BASIN I FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
		A1	6.03	0.14	42.89	0.85	1.94	1.7															BASIN A1 FLOW, DRAINAGEWAY FLOW TO DP7
		A2	6.19	0.14	32.32	0.87	2.37	2.1															BASIN A2 FLOW, DRAINAGEWAY FLOW TO DP7
		A3	6.98	0.14	27.61	0.98	2.61	2.6	42.9	2.70	1.94	**5.3**											BASIN A1 FLOW, DRAINAGEWAY FLOW TO DP7 **(TOTAL A BASIN DEVELOPED FLOW)**
	7								78.0	38.58	1.05	40.4											TOTAL FLOW @ DP7
	8	B	11.02	0.10	17.57	1.13	3.28	3.7															BASIN B FLOW @ DP8

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Verify value. Seems like it might be a bit high.

Tc should increase based on time to travel through project site.

STANDARD FORM SF-3 - PROPOSED CONDITIONS

1030

(RATIONAL METHOD PROCEDURE)

Subdivision: Chris Team
Location: El Paso County
Design Storm: 100-Year

Project Name: Chris Team Subdivision
Project No.: 24019.00
Calculated By: NQJ
Checked By:
Date: 11/29/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREAM			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{stream} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		D	140.80	0.48	78.00	67.58	1.76	118.7															BASIN D HISTORIC FLOW @ DP1
	1	C	0.26	0.74	7.90	0.19	7.53	1.4	78.0	67.78	1.76	118.7	118.7	67.78	1.60					750	1.3	9.9	COMBINED BASIN C & D FLOW @ DP1 (EX DUAL 12" PVC CULVERTS), FLOWS ONSITE IN EXISTING DRAINAGEWAY TO DP7
	2	E	0.51	0.41	8.01	0.21	7.49	1.6					1.6	0.21	1.60					1490	1.3	19.6	BASIN E FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	3	F	15.12	0.41	31.12	6.20	4.07	25.2					25.2	6.20	1.60					1275	1.3	16.8	BASIN F FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	4	G	3.77	0.41	13.27	1.55	6.22	9.6					9.6	1.55	1.60					1121	1.3	14.8	BASIN G FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	5	H	1.22	0.41	25.14	0.50	4.61	2.3					2.3	0.50	1.60					1083	1.3	14.3	BASIN H FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
	6	I	9.08	0.41	28.57	3.72	4.29	16.0					16.0	3.72	1.60					621	1.3	8.2	BASIN I FLOW @ DP2, DRAINAGEWAY FLOW TO DP7
		A1	6.03	0.40	42.89	2.39	3.26	7.8															BASIN A1 FLOW, DRAINAGEWAY FLOW TO DP7
		A2	6.19	0.40	32.32	2.45	3.98	9.7															BASIN A2 FLOW, DRAINAGEWAY FLOW TO DP7
		A3	6.98	0.40	27.61	2.76	4.37	12.1	42.9	7.59	3.26	**24.8**											BASIN A1 FLOW, DRAINAGEWAY FLOW TO DP7 **(TOTAL A BASIN DEVELOPED FLOW)**
	7								87.9	91.57	1.46	133.3											TOTAL FLOW @ DP7
	8	B	11.02	0.37	17.57	4.06	5.51	22.4															BASIN B FLOW @ DP8

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

Verify value. Seems like it might be a bit high.

APPENDIX C – HYDRAULIC CALCULATIONS

Channel Report

Include 5 year analysis as well as 100 year analysis.

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 1 (Q100 = 133.3 cfs)

User-defined

Invert Elev (ft)	= 7438.00
Slope (%)	= 1.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.30

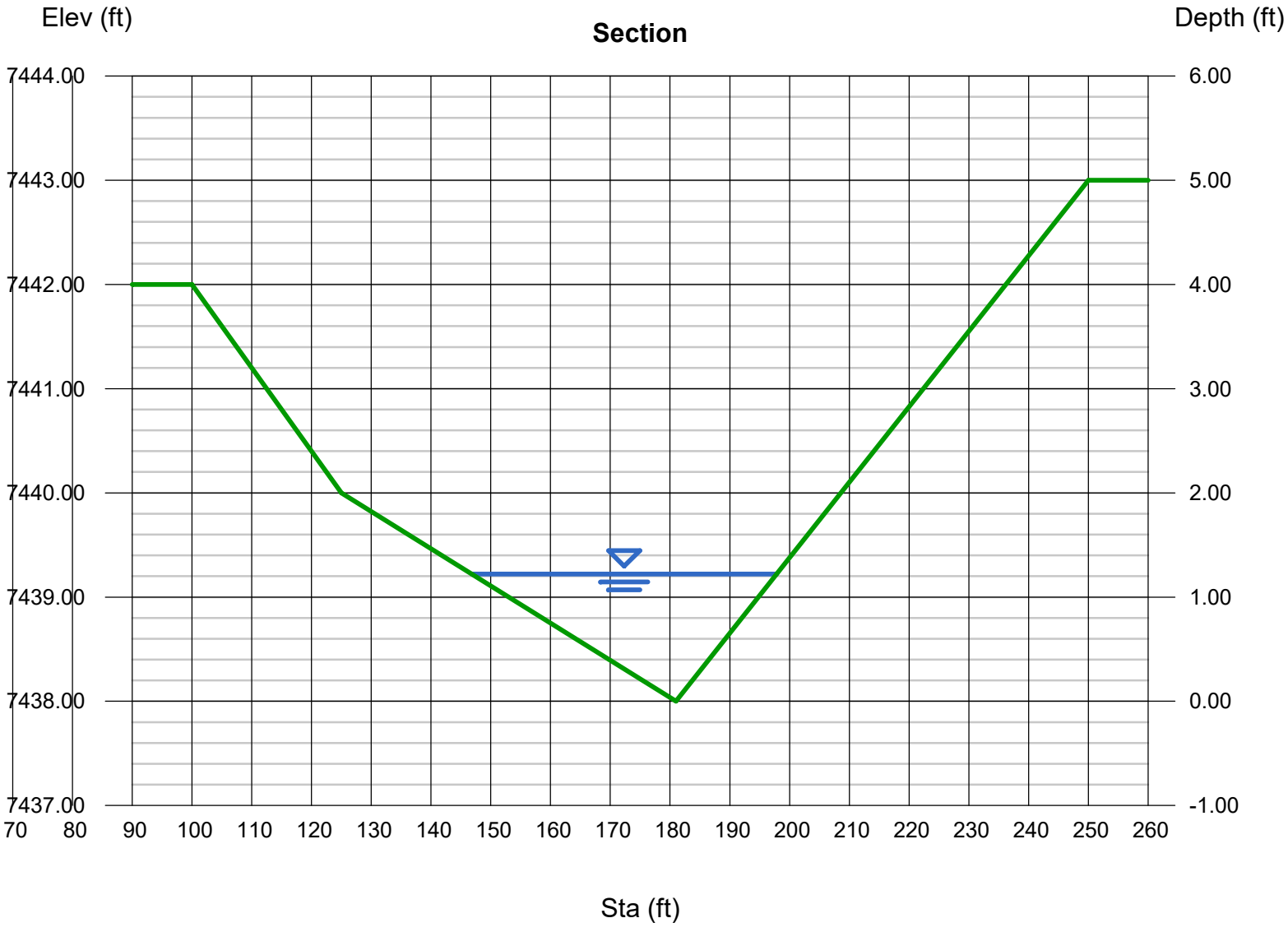
Highlighted

Depth (ft)	= 1.22
Q (cfs)	= 133.30
Area (sqft)	= 31.12
Velocity (ft/s)	= 4.28
Wetted Perim (ft)	= 51.07
Crit Depth, Yc (ft)	= 1.21
Top Width (ft)	= 51.00
EGL (ft)	= 1.51

(Sta, El, n)-(Sta, El, n)...

(100.00, 7442.00)-(125.00, 7440.00, 0.030)-(181.00, 7438.00, 0.030)-(250.00, 7443.00, 0.030)

Include Fr # and shear stress for each section also.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 2 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7437.20
Slope (%)	= 1.50
N-Value	= 0.030

Calculations

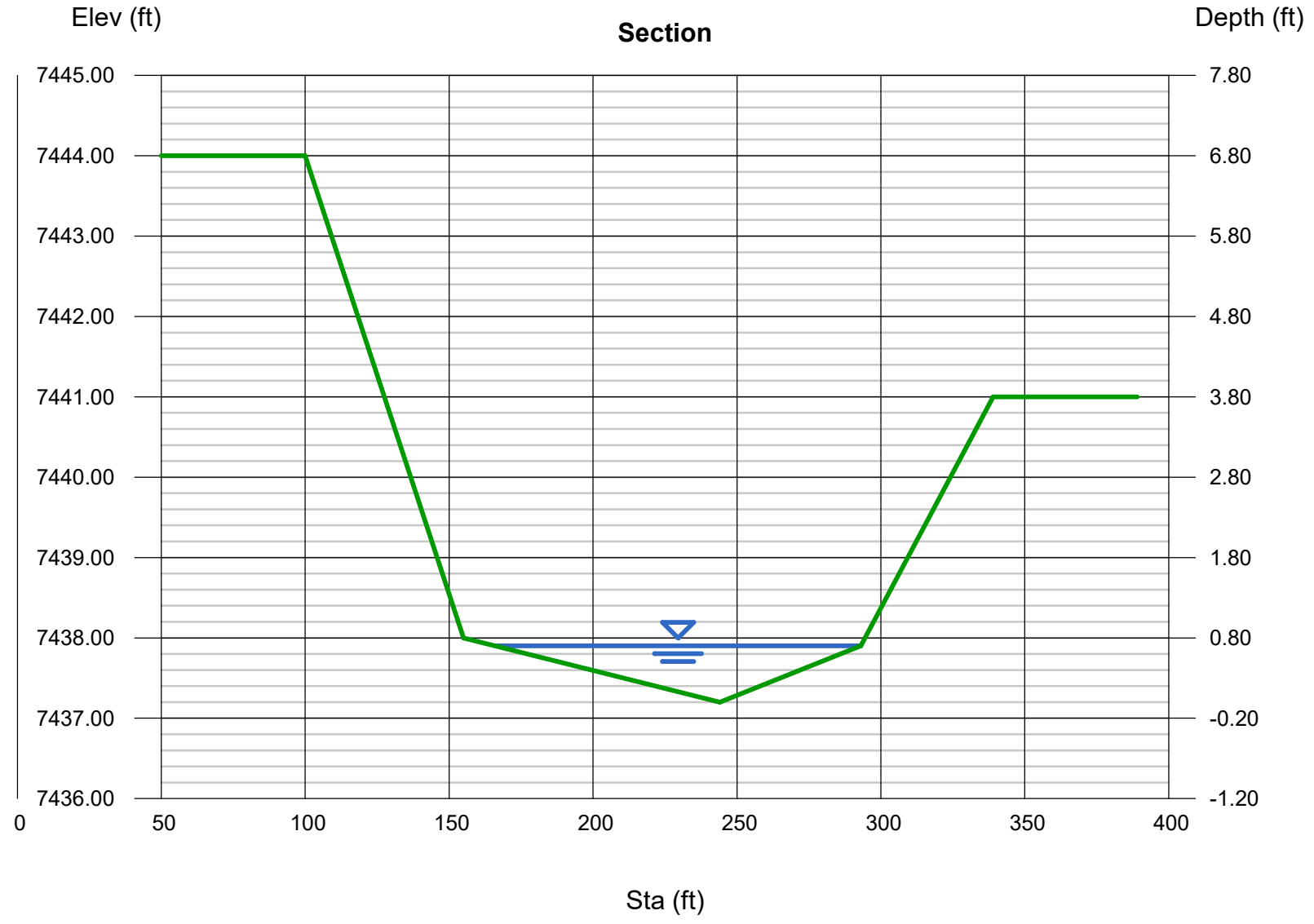
Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 133.00
Area (sqft)	= 44.44
Velocity (ft/s)	= 2.99
Wetted Perim (ft)	= 126.93
Crit Depth, Yc (ft)	= 0.67
Top Width (ft)	= 126.92
EGL (ft)	= 0.84

(Sta, El, n)-(Sta, El, n)...

(100.00, 7444.00)-(155.00, 7438.00, 0.030)-(244.00, 7437.20, 0.030)-(293.00, 7437.90, 0.030)-(339.00, 7441.00, 0.030)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 3 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7438.00
Slope (%)	= 1.50
N-Value	= 0.030

Calculations

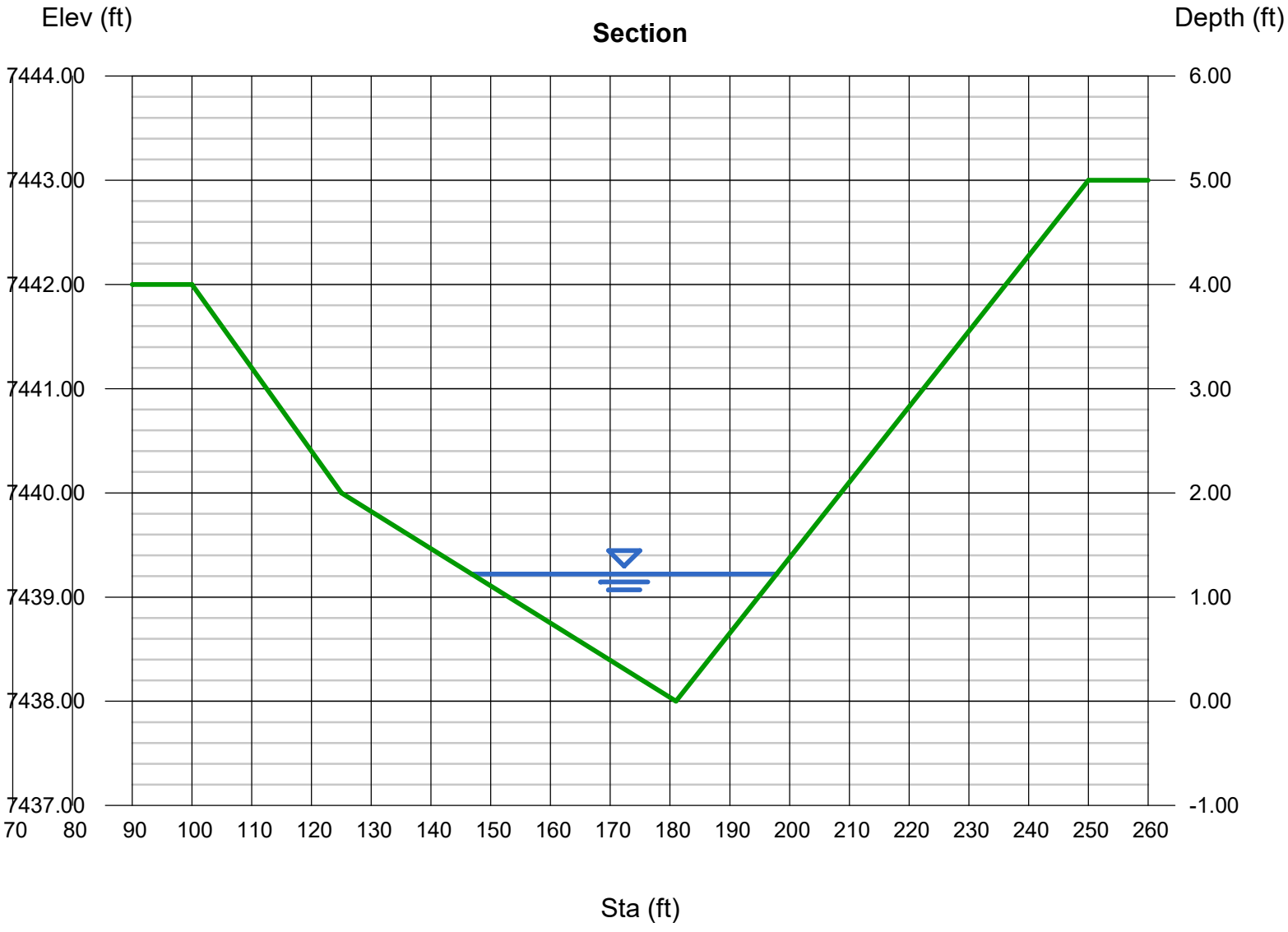
Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 1.22
Q (cfs)	= 133.00
Area (sqft)	= 31.12
Velocity (ft/s)	= 4.27
Wetted Perim (ft)	= 51.07
Crit Depth, Yc (ft)	= 1.21
Top Width (ft)	= 51.00
EGL (ft)	= 1.50

(Sta, El, n)-(Sta, El, n)...

(100.00, 7442.00)-(125.00, 7440.00, 0.030)-(181.00, 7438.00, 0.030)-(250.00, 7443.00, 0.030)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Please correct page orientation.

Drainageway - Onsite Section 4 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7430.00
Slope (%)	= 3.90
N-Value	= 0.030

Calculations

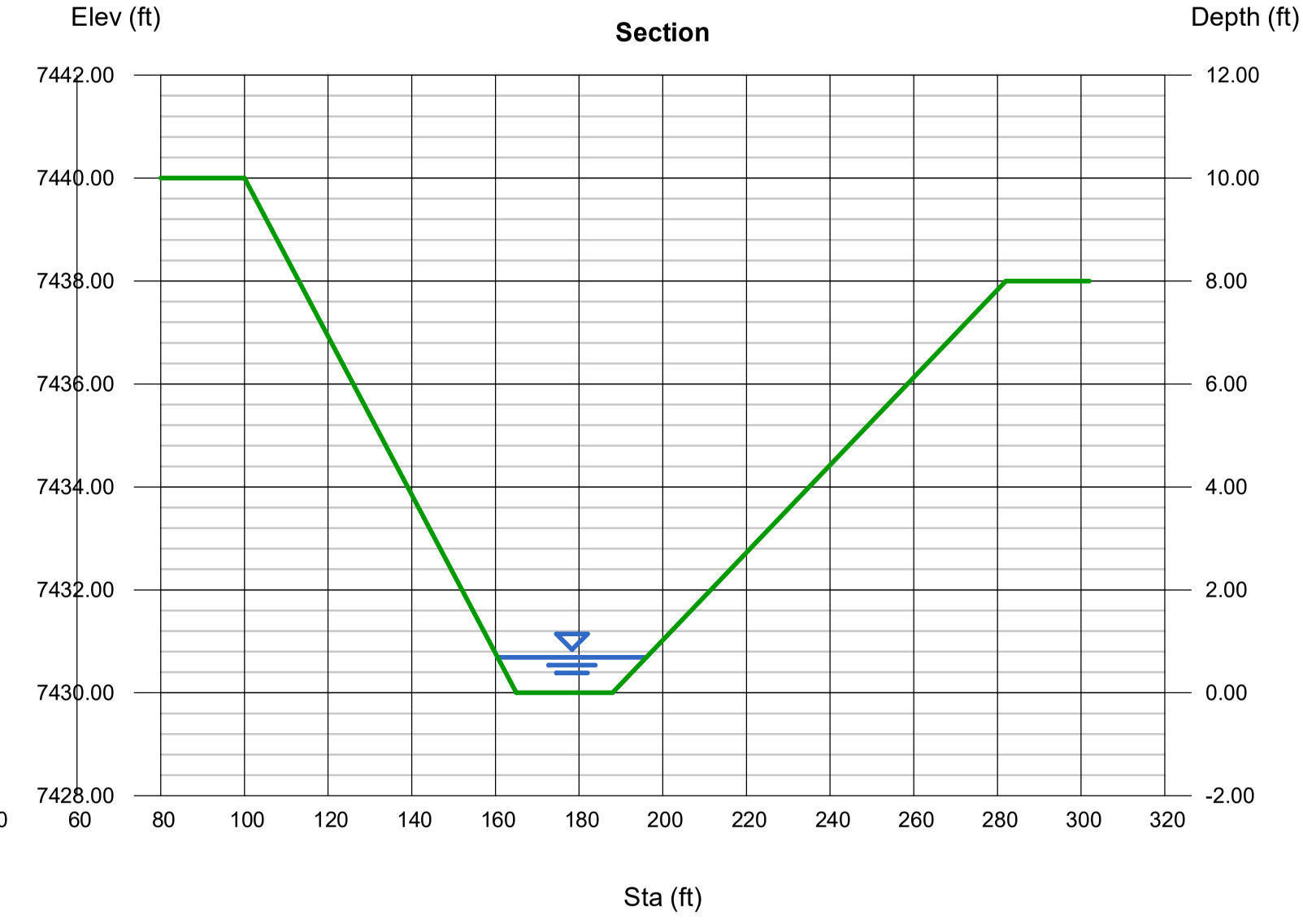
Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.69
Q (cfs)	= 133.00
Area (sqft)	= 20.21
Velocity (ft/s)	= 6.58
Wetted Perim (ft)	= 35.67
Crit Depth, Yc (ft)	= 0.90
Top Width (ft)	= 35.59
EGL (ft)	= 1.36

(Sta, El, n)-(Sta, El, n)...

(100.00, 7440.00)-(165.00, 7430.00, 0.030)-(188.00, 7430.00, 0.030)-(282.00, 7438.00, 0.030)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 5 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7430.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

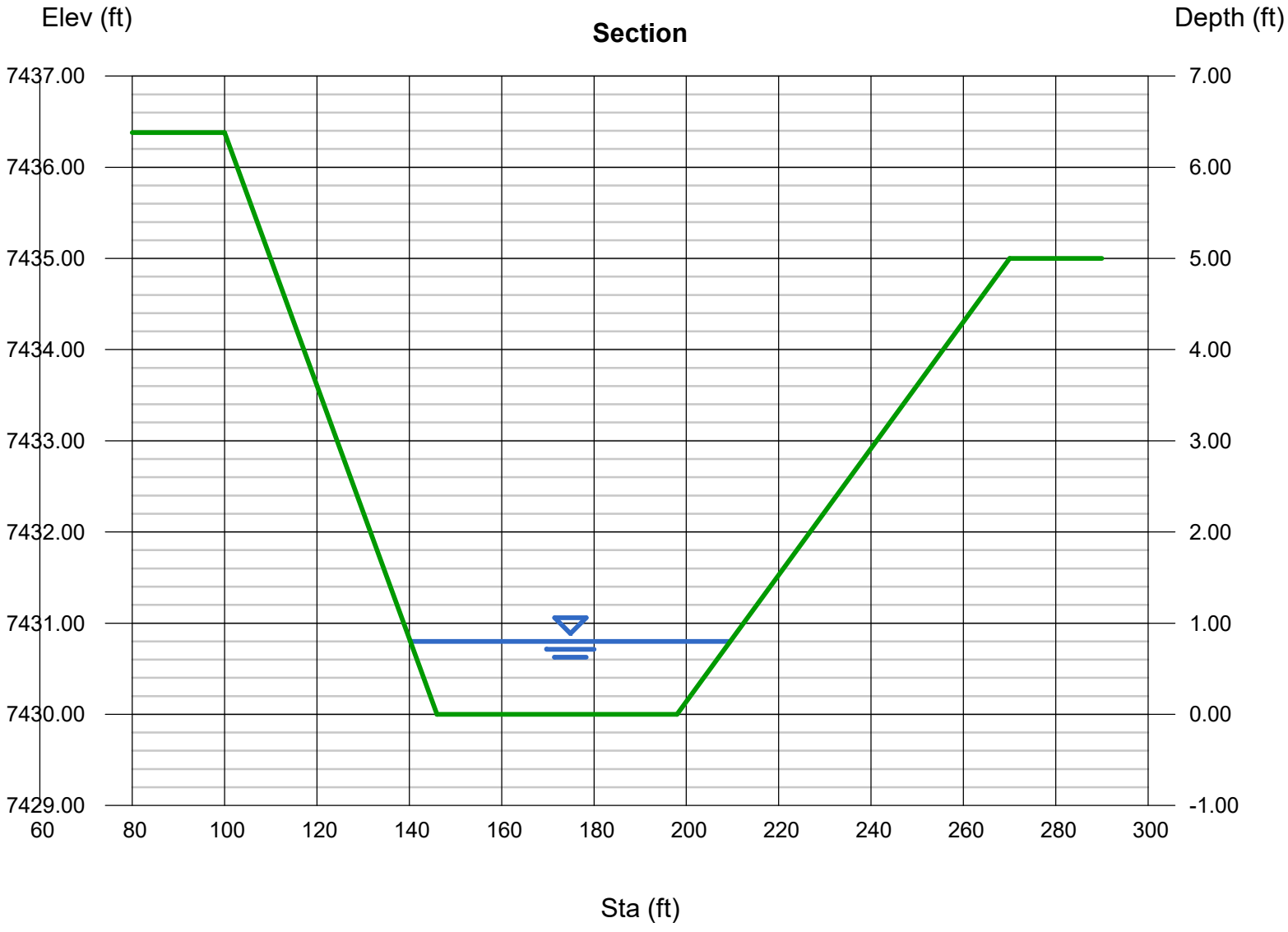
Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 133.00
Area (sqft)	= 48.50
Velocity (ft/s)	= 2.74
Wetted Perim (ft)	= 69.37
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 69.28
EGL (ft)	= 0.92

(Sta, El, n)-(Sta, El, n)...

(100.00, 7436.38)-(146.00, 7430.00, 0.030)-(198.00, 7430.00, 0.030)-(270.00, 7435.00, 0.030)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 6 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7426.00
Slope (%)	= 1.20
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 1.57
Q (cfs)	= 133.00
Area (sqft)	= 28.85
Velocity (ft/s)	= 4.61
Wetted Perim (ft)	= 36.91
Crit Depth, Yc (ft)	= 1.52
Top Width (ft)	= 36.76
EGL (ft)	= 1.90

(Sta, El, n)-(Sta, El, n)...

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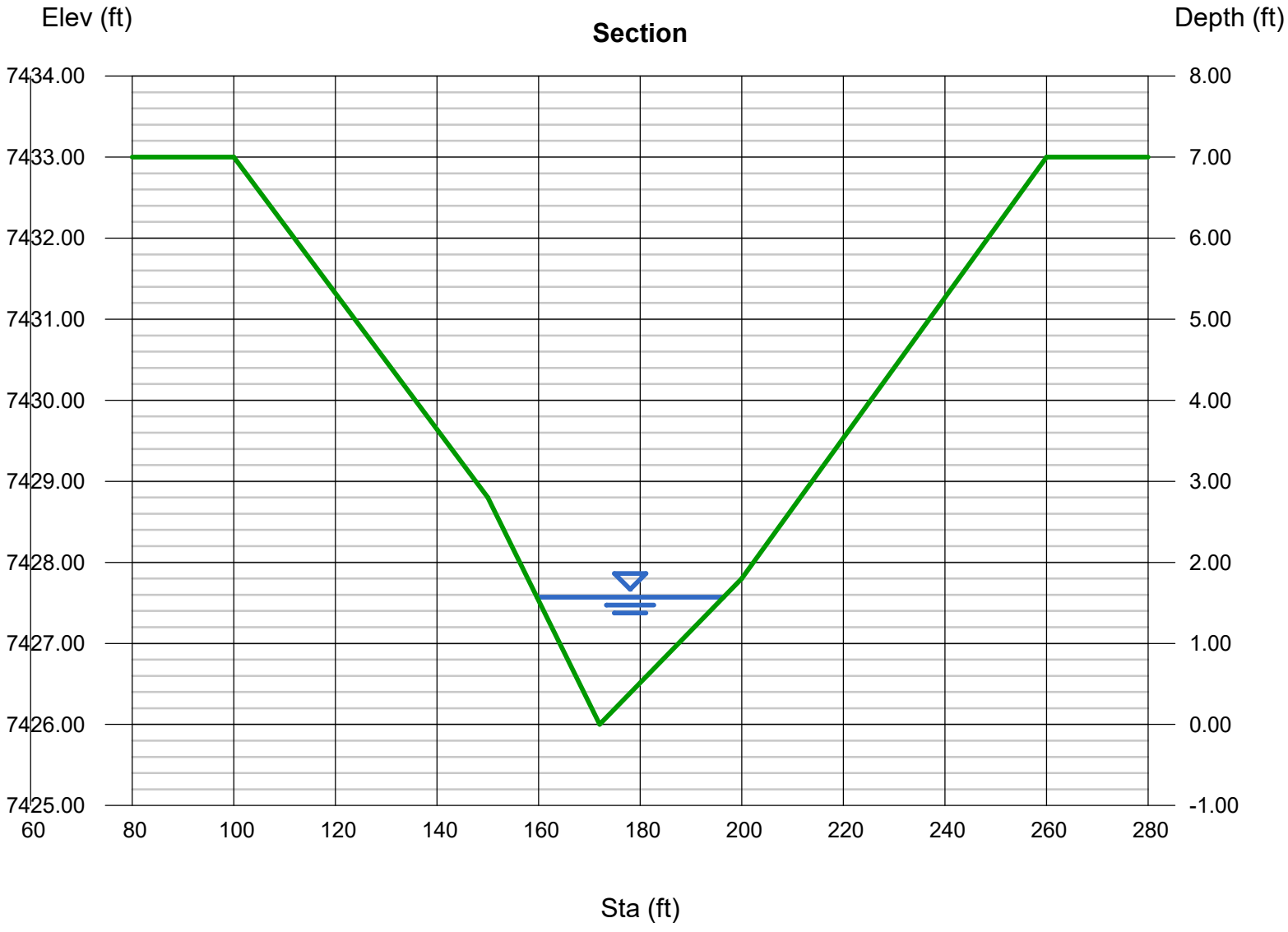

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 7 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7424.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 1.22
Q (cfs)	= 133.00
Area (sqft)	= 40.84
Velocity (ft/s)	= 3.26
Wetted Perim (ft)	= 45.11
Crit Depth, Yc (ft)	= 0.92
Top Width (ft)	= 44.94
EGL (ft)	= 1.38

(Sta, El, n)-(Sta, El, n)...

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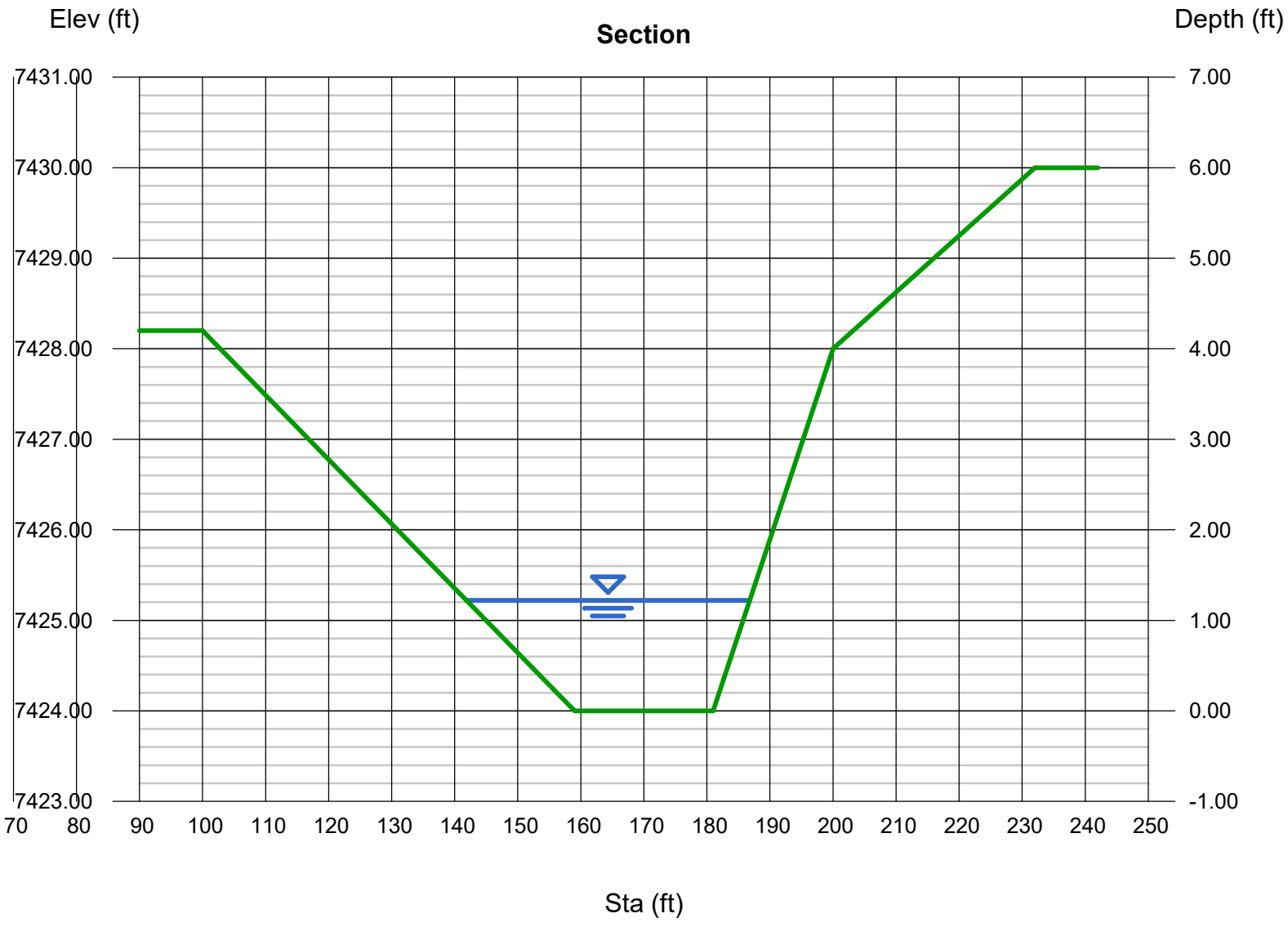

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 8 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7423.80
Slope (%)	= 2.40
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.58
Q (cfs)	= 133.00
Area (sqft)	= 29.57
Velocity (ft/s)	= 4.50
Wetted Perim (ft)	= 65.64
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 65.59
EGL (ft)	= 0.89

(Sta, El, n)-(Sta, El, n)...

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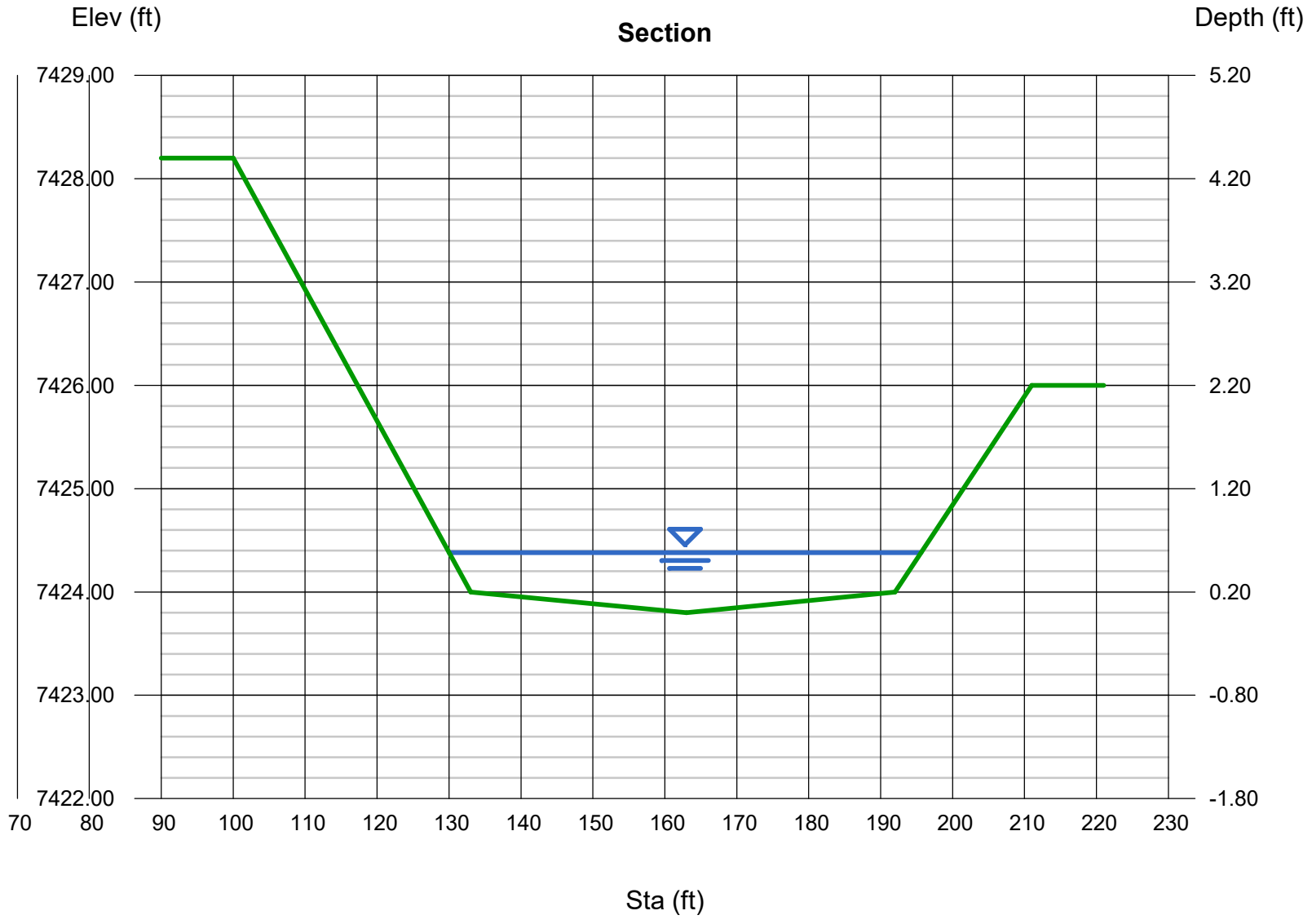

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 9 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7422.00
Slope (%)	= 1.15
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 133.00
Area (sqft)	= 36.76
Velocity (ft/s)	= 3.62
Wetted Perim (ft)	= 63.59
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 63.55
EGL (ft)	= 0.91

(Sta, El, n)-(Sta, El, n)...

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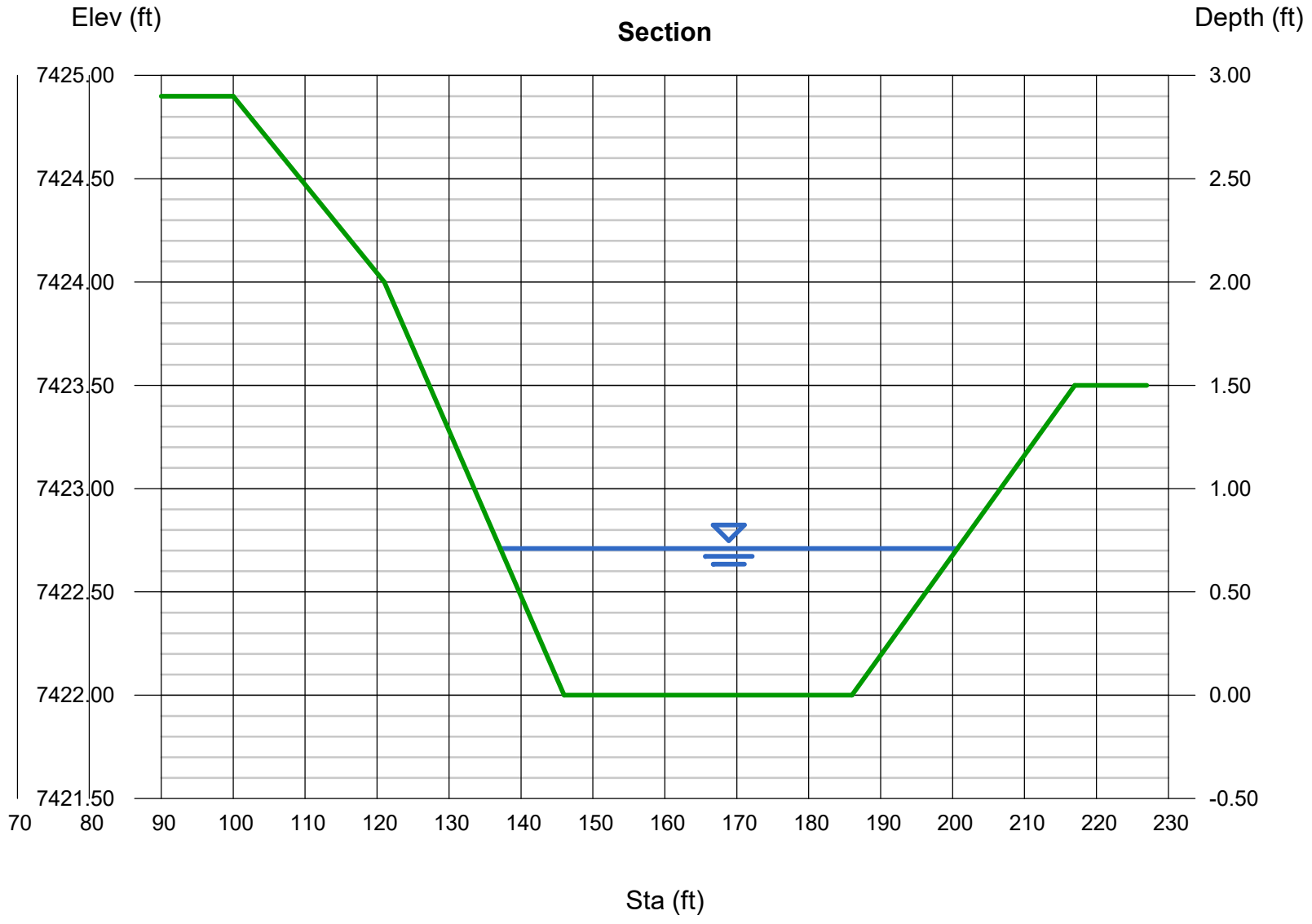

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 10 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7419.84
Slope (%)	= 2.62
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 133.00
Area (sqft)	= 37.82
Velocity (ft/s)	= 3.52
Wetted Perim (ft)	= 127.60
Crit Depth, Yc (ft)	= 0.43
Top Width (ft)	= 127.59
EGL (ft)	= 0.59

(Sta, El, n)-(Sta, El, n)...

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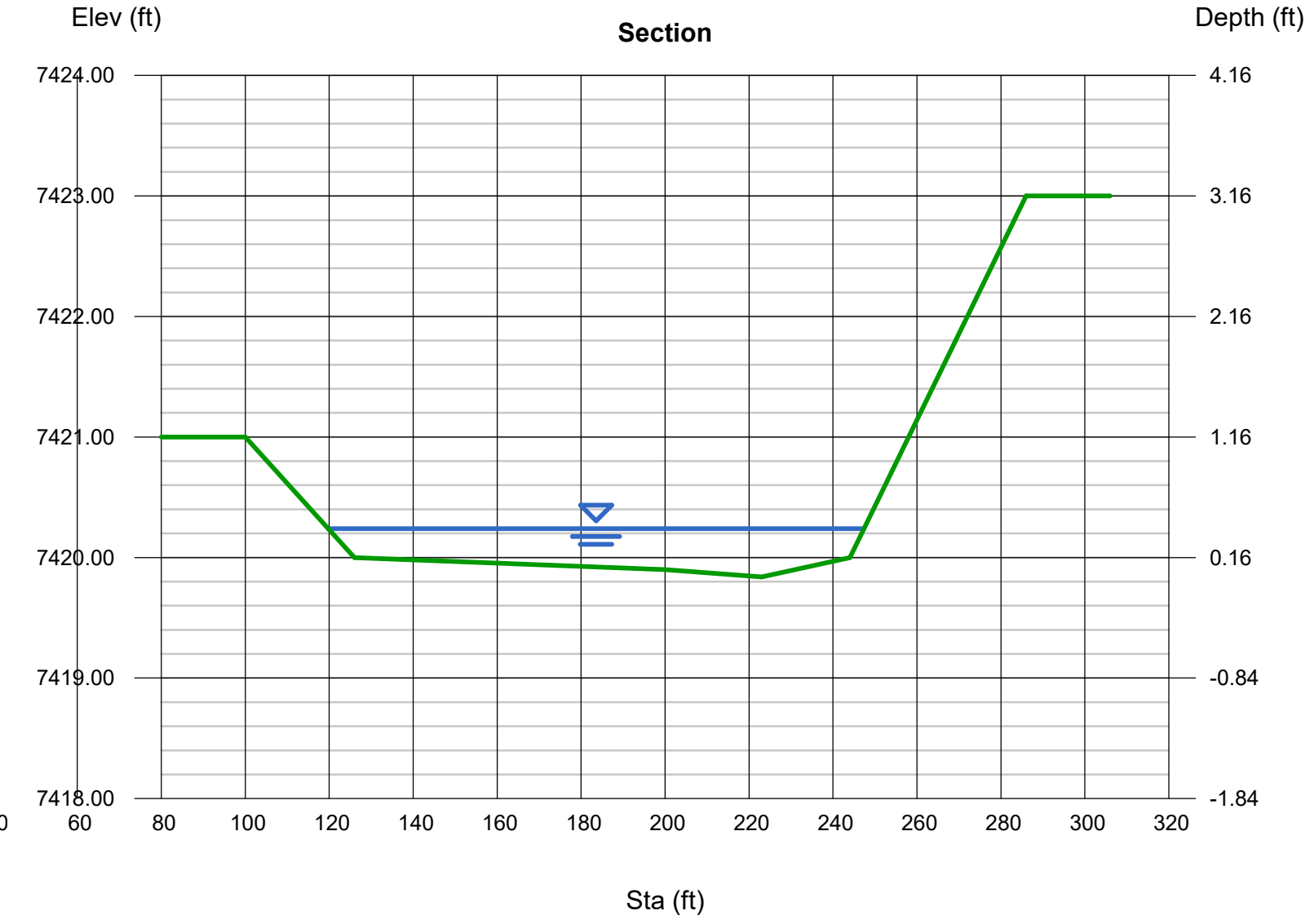

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Drainageway - Onsite Section 11 (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7416.40
Slope (%)	= 1.00
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 0.95
Q (cfs)	= 133.00
Area (sqft)	= 41.63
Velocity (ft/s)	= 3.19
Wetted Perim (ft)	= 79.34
Crit Depth, Yc (ft)	= 0.86
Top Width (ft)	= 79.31
EGL (ft)	= 1.11

(Sta, El, n)-(Sta, El, n)...

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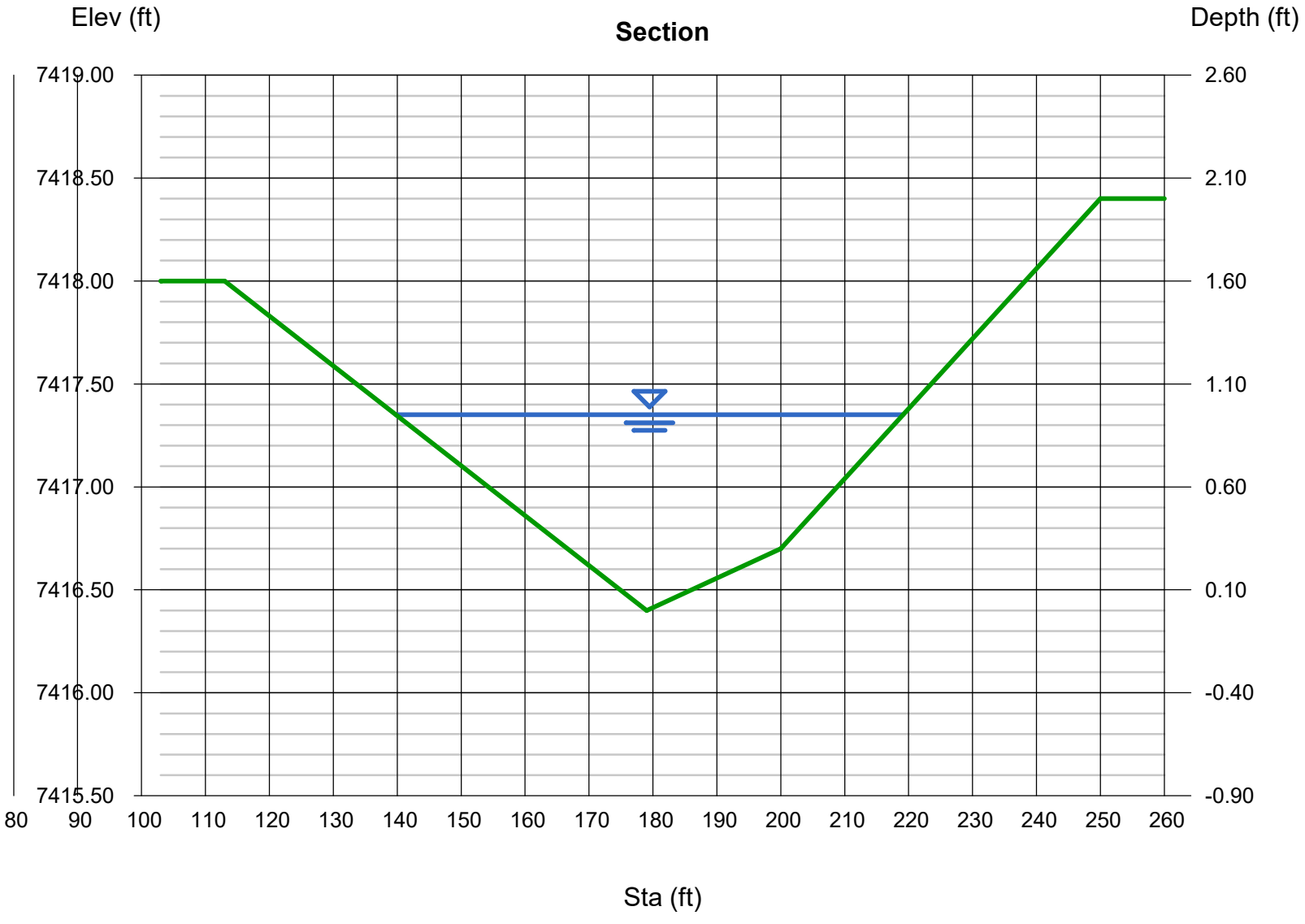


Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Nov 14 2024

Ex Culvert #1 (Q100 = 1.3 cfs)

How was flow determined for this culvert? Provide discussion of this culvert in report

Invert Elev Dn (ft)	=	7459.87
Pipe Length (ft)	=	19.17
Slope (%)	=	0.78
Invert Elev Up (ft)	=	7460.02
Rise (in)	=	12.0
Shape	=	Circular
Span (in)	=	12.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Headwall
Coeff. K,M,c,Y,k	=	0.0078, 2, 0.0379, 0.69, 0.5

Embankment

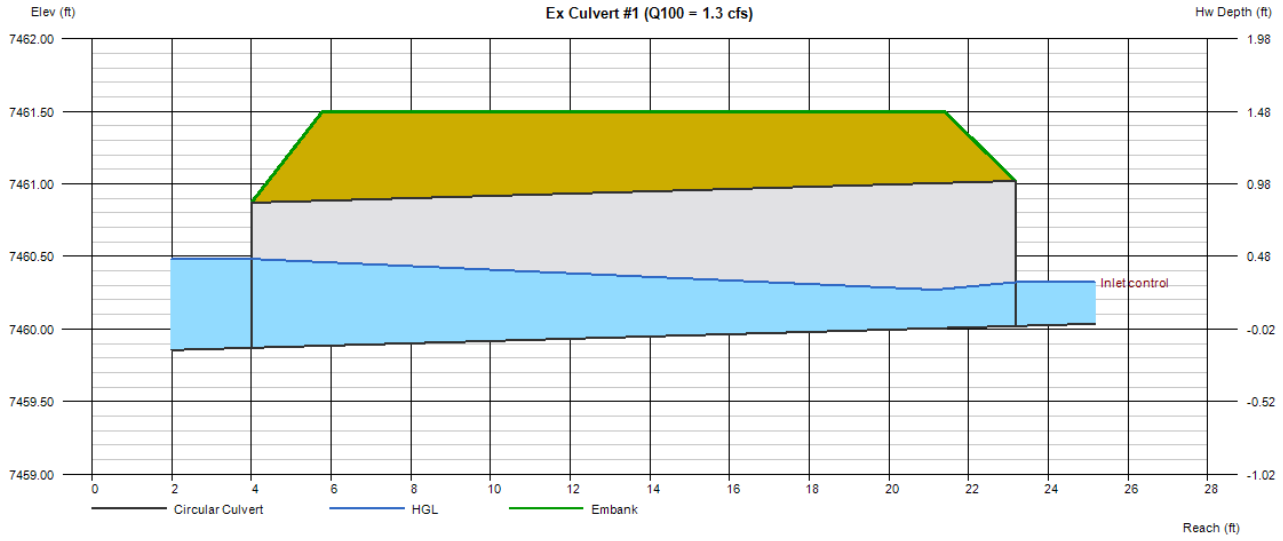
Top Elevation (ft)	=	7461.50
Top Width (ft)	=	15.60
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	0.30
Qmax (cfs)	=	1.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.30
Qpipe (cfs)	=	0.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.59
Veloc Up (ft/s)	=	2.26
HGL Dn (ft)	=	7460.48
HGL Up (ft)	=	7460.25
Hw Elev (ft)	=	7460.32
Hw/D (ft)	=	0.30
Flow Regime	=	Inlet Control



HY-8 Culvert Analysis Report : Ex Culvert #2

Crossing Input: Ex Culvert 2

Parameter	Value	Units
DISCHARGE DATA		
Discharge Method	Minimum, Design, and Maximum	
Minimum Flow	28.200	cfs
Design Flow	118.700	cfs
Maximum Flow	118.700	cfs
TAILWATER DATA		
Channel Type	Irregular Channel	
Irregular Channel	Define...	
Rating Curve	View...	
ROADWAY DATA		
Roadway Profile Shape	Irregular	
Irregular Shape	Define...	
Roadway Surface	Paved	
Top Width	22.000	ft

Culvert Input: Ex Culvert 2

Parameter	Value	Units
CULVERT DATA		
Name	Culvert 1	
Shape	Circular	
Material	PVC	
Diameter	1.000	ft
Embedment Depth	0.000	in
Manning's n	0.011	
Culvert Type	Straight	
Inlet Configuration	Square Edge with Headwall (Ke=0.5)	
Inlet Depression?	No	
SITE DATA		
Site Data Input Option	Culvert Invert Data	
Inlet Station	0.000	ft
Inlet Elevation	7441.600	ft
Outlet Station	32.000	ft
Outlet Elevation	7439.430	ft
Number of Barrels	2	
Computed Culvert Slope	0.067813	ft/ft

Table 2 - Culvert Summary Table: Culvert 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	HW / D (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
28.20	7.85	7443.22	1.62	0.0*	1.62	5-S2n	0.41	0.84	0.45	0.88	11.31	3.73
37.25	8.06	7443.27	1.67	0.0*	1.67	5-S2n	0.42	0.85	0.46	1.02	11.36	4.03
46.30	8.23	7443.32	1.72	0.0*	1.72	5-S2n	0.42	0.86	0.47	1.15	11.41	4.29
55.35	8.39	7443.36	1.76	0.037	1.76	5-S2n	0.43	0.86	0.47	1.26	11.45	4.50
64.40	8.53	7443.40	1.80	0.174	1.80	5-S2n	0.43	0.87	0.48	1.36	11.49	4.69
73.45	8.66	7443.43	1.83	0.312	1.83	5-S2n	0.44	0.87	0.48	1.47	11.52	4.78
82.50	8.77	7443.47	1.87	0.433	1.87	5-S2n	0.44	0.88	0.49	1.57	11.55	4.84
91.55	8.88	7443.50	1.90	0.536	1.90	5-S2n	0.44	0.88	0.49	1.64	11.58	4.91
100.60	8.98	7443.52	1.92	0.626	1.92	5-JS1f	0.45	0.89	1.00	1.71	5.72	4.90
109.65	9.07	7443.55	1.95	0.708	1.95	5-JS1f	0.45	0.89	1.00	1.77	5.78	4.85
~~**118.70**~~	~~9.17~~	~~7682.02~~	~~240.42~~	~~195.983~~	~~240.42~~	~~4-FFf~~	~~1.00~~	~~1.00~~	~~1.00~~	~~1.82~~	~~75.57~~	~~4.80~~
118.70	9.17	7443.58	1.98	0.783	1.98	5-JS1f	0.45	0.89	1.00	1.82	5.83	4.80

Remaining flow ~ 110 cfs overtops Little Squirrel Lane

Erosion protection is needed for flows greater than 5 fps. Please include calcs and discuss in narrative.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 25 2024

Ex Culvert #2 - Roadway Weir (Q = 110 cfs)

Please fix orientation.

User-defined

Invert Elev (ft)	= 7442.00
Slope (%)	= 0.01
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 110.00

Highlighted

Depth (ft)	= 2.23
Q (cfs)	= 110.00
Area (sqft)	= 234.53
Velocity (ft/s)	= 0.47
Wetted Perim (ft)	= 249.74
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 249.58
EGL (ft)	= 2.23

(Sta, El, n)-(Sta, El, n)...

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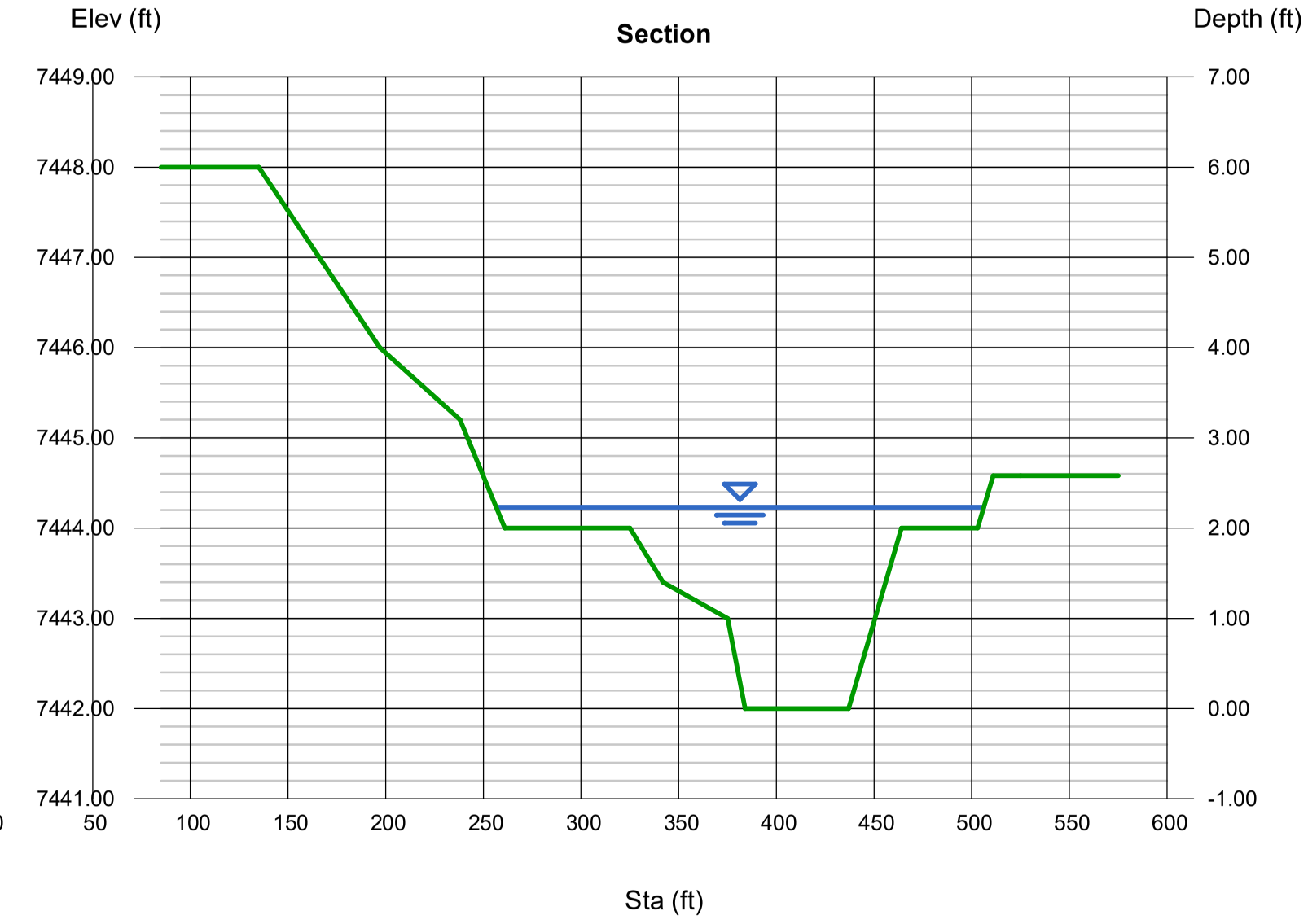

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Nov 25 2024

Ex Culvert #2 - Tailwater Section (Q = 118.7 cfs)

User-defined

Invert Elev (ft)	= 7440.00
Slope (%)	= 0.01
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 118.70

Highlighted

Depth (ft)	= 3.17
Q (cfs)	= 118.70
Area (sqft)	= 234.65
Velocity (ft/s)	= 0.51
Wetted Perim (ft)	= 226.37
Crit Depth, Yc (ft)	= 1.52
Top Width (ft)	= 226.06
EGL (ft)	= 3.17

(Sta, El, n)-(Sta, El, n)...

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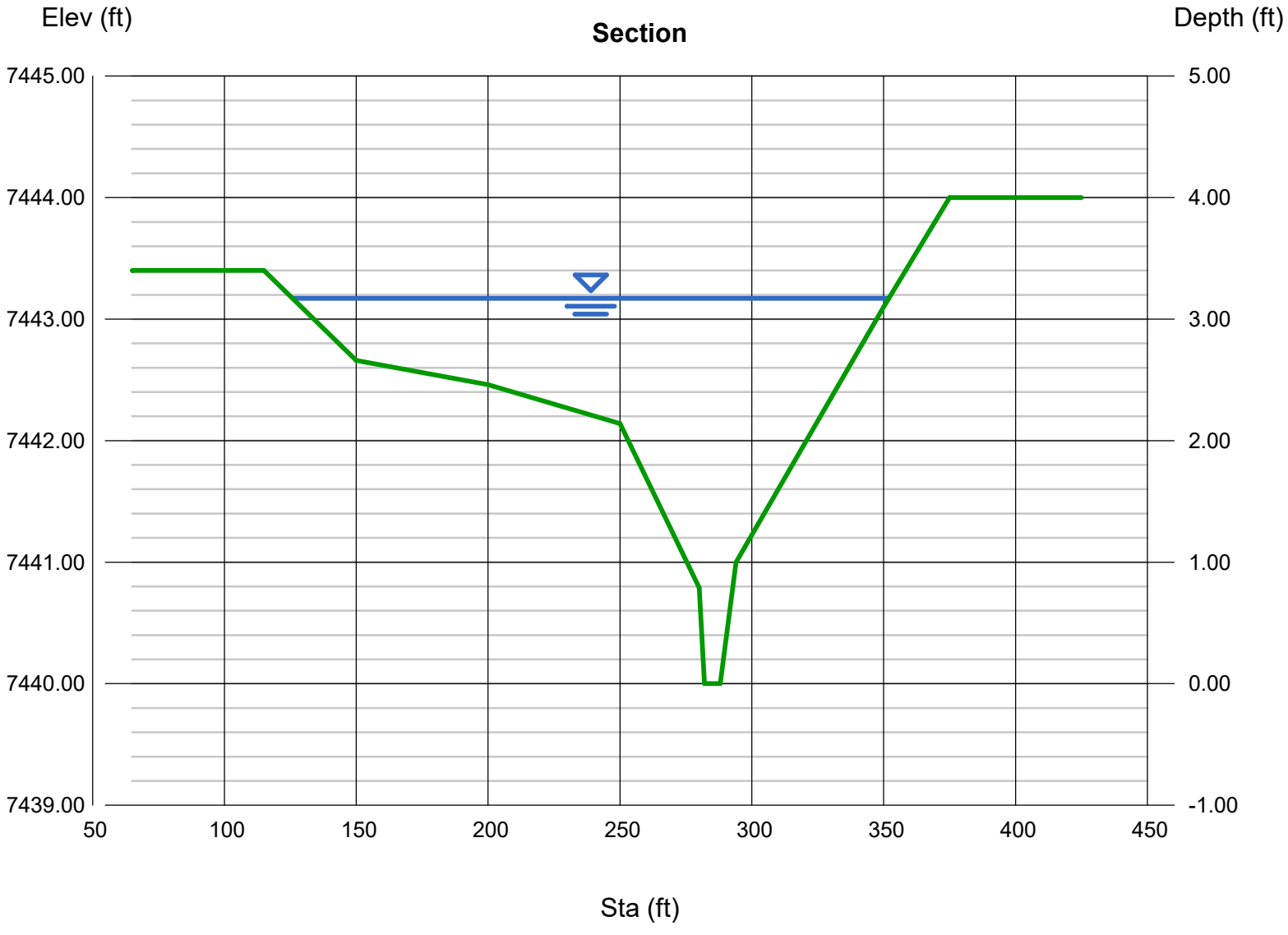

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Nov 26 2024

Black Squirrel Road (DP7) Overtop Weir (Q100 = 133 cfs)

User-defined

Invert Elev (ft)	= 7415.90
Slope (%)	= 0.01
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 133.00

Highlighted

Depth (ft)	= 1.47
Q (cfs)	= 133.00
Area (sqft)	= 248.31
Velocity (ft/s)	= 0.54
Wetted Perim (ft)	= 221.10
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 221.05
EGL (ft)	= 1.47

(Sta, El, n)-(Sta, El, n)...

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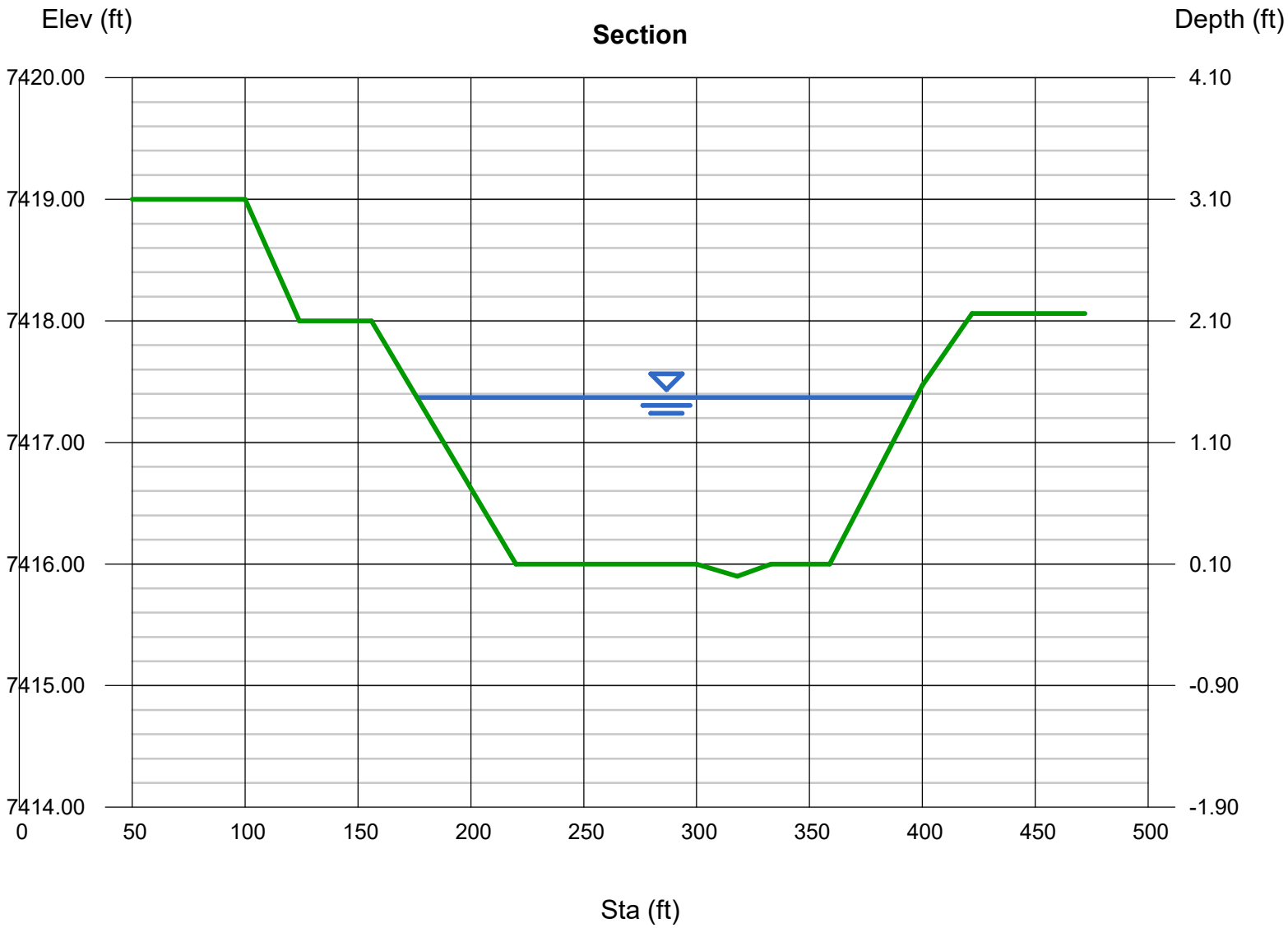


APPENDIX D – WATER QUALITY & DETENTION

Post Construction Stormwater Management Applicability Evaluation Form

This form is to be used by the Engineer of Record to evaluate applicable construction activities to determine if the activities are eligible for an exclusion to permanent stormwater quality management requirements. Additionally Part III of the form is used to identify and document which allowable control measure design standard is used for the structure.

Part I. Project Information	
1. Project Name: 18412-18440 Black Squirrel Road	
2. El Paso County Project #:	**3. ESQCP #:** N/A
4. Project Location: EL PASO COUNTY	**Project Location in MS4 Permit Area (Y or N):** N
5. Project Description: A 19 ACRE LOT WILL BE SUBDIVIDED INTO THREE 5+ ACRE LOTS. THERE WILL BE NO LAND DISTURBING ACTIVITIES ASSOCIATED WITH THIS PROJECT.	
If project is located within the El Paso County MS4 Permit Area, please provide copy of this completed form to the Stormwater Quality Coordinator for reporting purposes; and save completed form with project file.	

Part II. Exclusion Evaluation: Determine if Post-Construction Stormwater Management exclusion criteria are met. Note: Questions A thru K directly correlate to the MS4 permit Part I.E.4.a.i (A) thru (K). If Yes, to any of the following questions, then mark Not Applicable in Part III, Question 2.

Questions	Yes	No	Not Applicable	Notes:
A. Is this project a "Pavement Management Site" as defined in Permit Part I E.4.a.i.(A)?		X		This exclusion applies to "roadways" only. Areas used primarily for parking or access to parking are not included.
B. Is the project "Excluded Roadway Development"?				
• Does the site add less than 1 acre of paved area per mile?		X		
• Does the site add 8.25 feet or less of paved width at any location to the existing roadway?		X		
C. Does the project increase the width of the existing roadway by less than 2 times the existing width?		X		For redevelopment of existing roadways, only the area of the existing roadway is excluded from post-construction requirements when the site does not increase the width by two times or more. ***This exclusion only excludes the original roadway area it does NOT apply to entire project.***
D. Is the project considered an aboveground and Underground Utilities activity?		X		Activity can NOT permanently alter the terrain, ground cover or drainage patterns from those present prior to the activity
E. Is the project considered a "Large Lot Single-Family Site"?	X			Must be a single-residential lot or agricultural zoned land, ≥ 2.5 acres per dwelling and total lot impervious area < 10 percent.

Questions (cont'd)	Yes	No	Not Applicable	Notes
F. Do Non-Residential or Non-Commercial Infiltration Conditions exist? Post-development surface conditions do not result in concentrated stormwater flow or surface water discharge during an 80th percentile stormwater runoff event.		X		Exclusion does not apply to residential or commercial sites for buildings. A site specific study is required and must show: rainfall and soil conditions; allowable slopes; surface conditions; and ratios of imperviousness area to pervious area.
G. Is the project land disturbance to Undeveloped Land where undeveloped land remains undeveloped following the activity?		X		Project must be on land with no human made structures such as buildings or pavement.
H. Is the project a Stream Stabilization Site?		X		Standalone stream stabilization projects are excluded.
I. Is the project a bike or pedestrian trail?		X		Bike lanes for roadways are not included in this exclusion, but may qualify if part of larger roadway activity is excluded in A, B or C above.
J. Is the project Oil and Gas Exploration?		X		Activities and facilities associated with oil and gas exploration are excluded.
K. Is the project in a County Growth Area?				Note, El Paso County does not apply this exclusion. All Applicable Construction Activity in El Paso County must comply the Post-Construction Stormwater Management criteria.

Part III. Post Construction (Permanent) Stormwater Control Determination		
Questions	**Yes**	**No**
1. Is project an Applicable Construction Activity?		X
2. Do any of the Exclusions (A-K in Part II) apply?	X	
If the project is an Applicable Construction Activity and no Exclusions apply then Post-Construction (Permanent) Stormwater Management is required. Complete the applicable sections of Part IV below and then coordinate signatures for form and place in project file. If the project is not an Applicable Construction Activity, or Exclusion(s) apply then Post-Construction (Permanent) Stormwater Management is NOT required. Coordinate signatures for form and place in project file.		

Part IV: Onsite PWQ Requirements, Documentation and Considerations	Yes	No
1. Check which Design Standard(s) the project will utilize. Standards align with Control Measure Requirements identified in permit Part I.E.4.a.iv.		
A. Water Quality Capture Volume (WQCV) Standard		
B. Pollutant Removal/80% Total Suspended Solids Removal (TSS)		
C. Runoff Reduction Standard	X	
D. Applicable Development Site Draining to a Regional WQCV Control Measure		
E. Applicable Development Site Draining to a Regional WQCV Facility		
F. Constrained Redevelopment Sites Standard		
G. Previous Permit Term Standard		
2. Will any of the project permanent stormwater control measure(s) be maintained by another MS4? If Yes, you must obtain a structure specific maintenance agreement with the other MS4 prior to advertisement.		
3. Will any of the project permanent stormwater control measures be maintained by a private entity or quasi-governmental agency (e.g. HOA or Special District, respectively)? If Yes, a Private Detention Basin/Stormwater Quality Best Management Practice Maintenance Agreement and Easement must be recorded with the El Paso County Clerk and Recorder.		

Part V Notes (attach an additional sheet if you need more space)

Project design is complete to include the project design, construction plans, drainage report, specifications, and maintenance and access agreements as required. The engineering, drainage considerations and information used to complete these documents is complete, true, and accurate to the best of my belief and knowledge.

COLORADO LICENSED NICHOLAS QUINN JOKERST PE0059273 PROFESSIONAL ENGINEER

Signature and Stamp of Engineer of Record

08/29/2024
Date

Post-Construction Stormwater Management Applicability Form has been reviewed and the project design, construction plans, drainage report, specifications, and maintenance and access agreements as required, have been reviewed for compliance with the Post Construction Stormwater Management process and MS4 Permit requirements.

Signature of El Paso County Project Engineer

Date

APPENDIX E – REFERENCE MATERIAL

Figure 1: Looking SW from Black Squirrel Road to the site low point

Figure 2: Same location at Figure 1, looking NE across Black Squirrel Road

Figure 3: From Black Squirrel Road, looking towards low point

Figure 4: From dirt road along north PL, looking upstream of low point

Figure 5: From dirt road along west PL, looking down drainageway

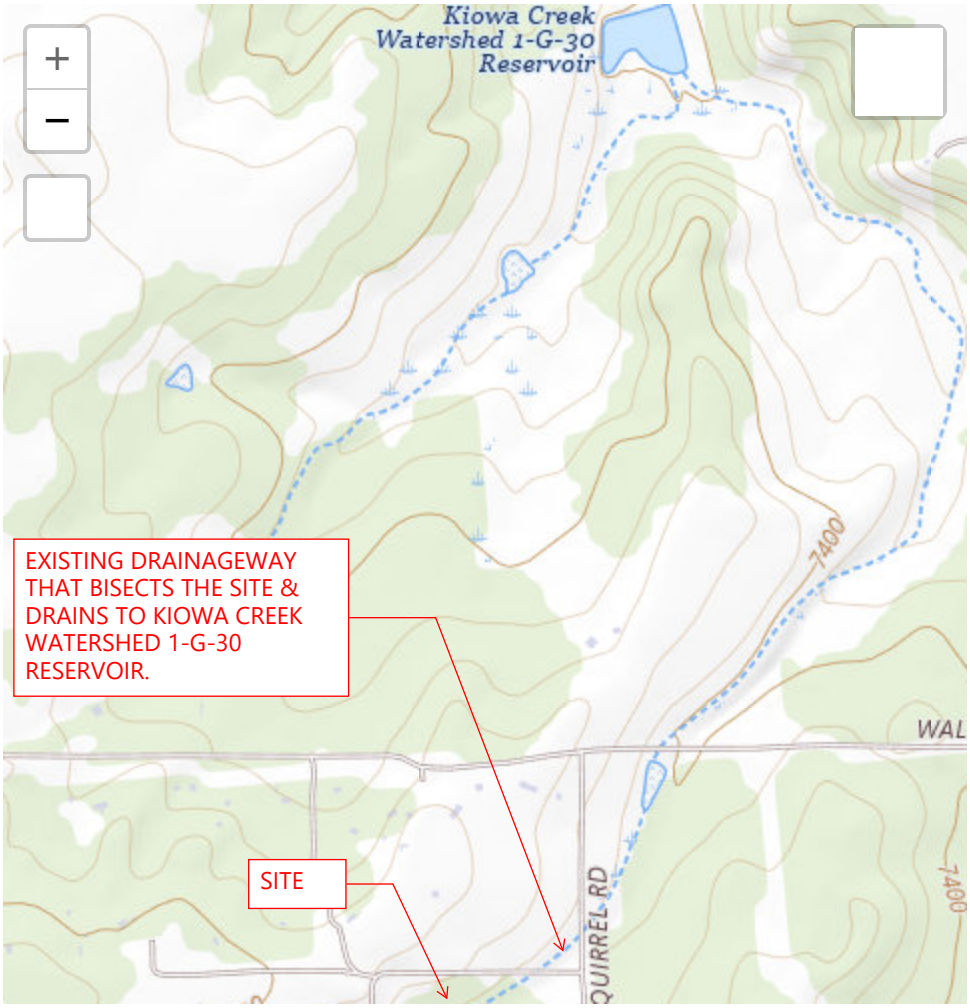
Figure 6: Same location as Figure 5, looking west to offsite/upstream portion of drainageway

Figure 7: Double 12" PVC culverts, tailwater

Figure 8: Double 12" PVC culverts, headwater

Figure 9: Double 12" PVC culverts, tailwater channel

Topo Map of Streams in El Paso County, Colorado



Search for Topo Maps of Streams in Colorado

Place Name (e.g. pikes peak)

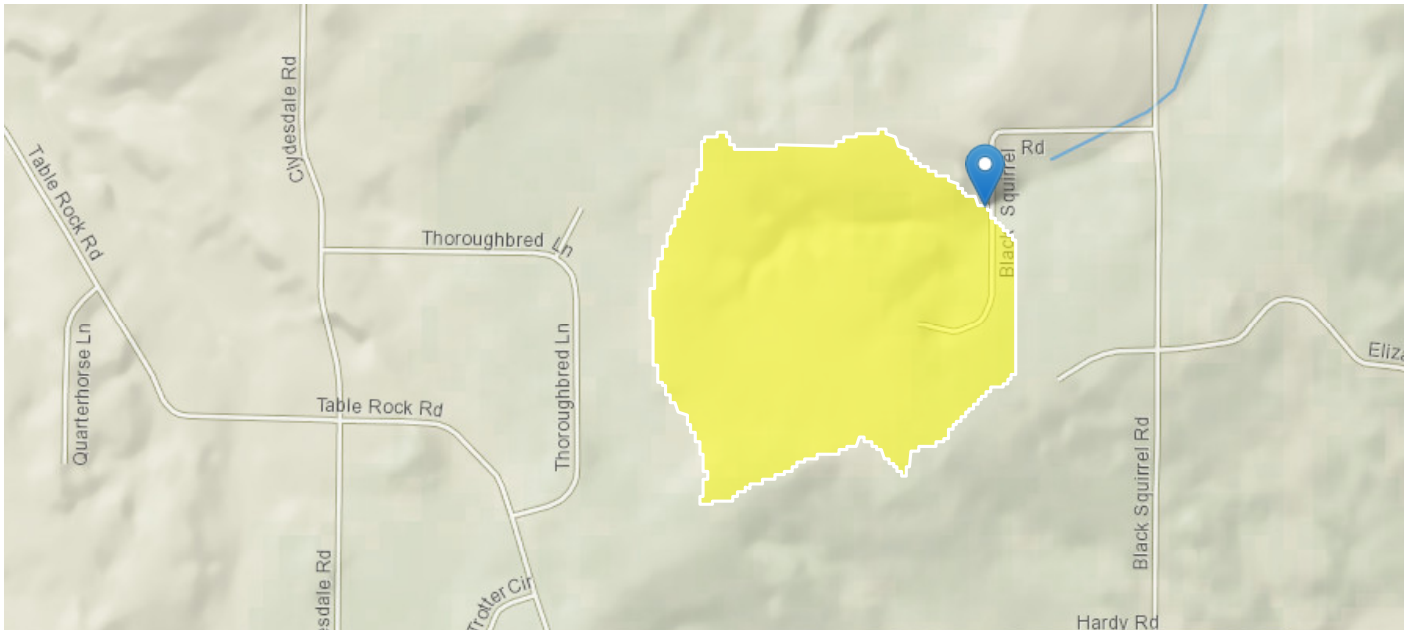
State Colorado

Feature Type Stream

SEARCH

StreamStats Report

Region ID: CO
Workspace ID: CO20241125153541092000
Clicked Point (Latitude, Longitude): 39.09839, -104.63486
Time: 2024-11-25 08:36:02 -0700



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	4	percent
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	88.7	feet per mi
DRNAREA	Area that drains to a point on a stream	0.22	square miles
EL7500	Percent of area above 7500 ft	74	percent
ELEV	Mean Basin Elevation	7508	feet
ELEVMAX	Maximum basin elevation	7550	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.95	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.89	inches
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3	inches
I6H2Y	Maximum 6-hour precipitation that occurs on average once in 2 years	1.38	inches
LAT_OUT	Latitude of Basin Outlet	39.098448	degrees
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	0	percent

Parameter Code	Parameter Description	Value	Unit
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	40	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	30.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	27.5	percent
LC11SNOIC	Percent snow and ice from NLCD 2011 class 12	0	percent
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	2.5	percent
LFPLENGTH	Length of longest flow path	0.87	miles
LONG_OUT	Longitude of Basin Outlet	-104.634967	degrees
MINBELEV	Minimum basin elevation	7450	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7451	feet
PRECIP	Mean Annual Precipitation	20.73	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	66.75	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.35	dimensionless
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	44.4	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	55.6	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent
STATSCLAY	Percentage of clay soils from STATSGO	16.3	percent
STORNHD	Percent storage (wetlands and waterbodies) determined from 1:24K NHD	0.5	percent
TOC	Time of concentration in hours	1.3	hours

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Foothills Region Peak Flow 2016 5099]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.22	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3	inches	2.38	4.89
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5
OUTLETELEV	Elevation of Gage	7451	feet	4290	8270

Peak-Flow Statistics Disclaimers [Foothills Region Peak Flow 2016 5099]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Foothills Region Peak Flow 2016 5099]

Statistic	Value	Unit
50-percent AEP flood	3.02	ft^3/s
20-percent AEP flood	7.84	ft^3/s
10-percent AEP flood	12.5	ft^3/s
4-percent AEP flood	20.2	ft^3/s
2-percent AEP flood	27.3	ft^3/s
1-percent AEP flood	36.1	ft^3/s
0.5-percent AEP flood	45.9	ft^3/s
0.2-percent AEP flood	61	ft^3/s

Peak-Flow Statistics Citations

Kohn, M.S., Stevens, M.R., Harden, T.M., Godaire, J.E., Klinger, R.E., and Mommandi, A.,2016, Paleoflood investigations to improve peak-streamflow regional-regression equations for natural streamflow in eastern Colorado, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5099, 58 p. (http://dx.doi.org/10.3133/sir20165099)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.24.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

LAND SURVEY PLAT

BEING A PART OF THE NORTHEAST QUARTER OF SECTION 14, TOWNSHIP 11 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, COUNTY OF EL PASO, STATE OF COLORADO.

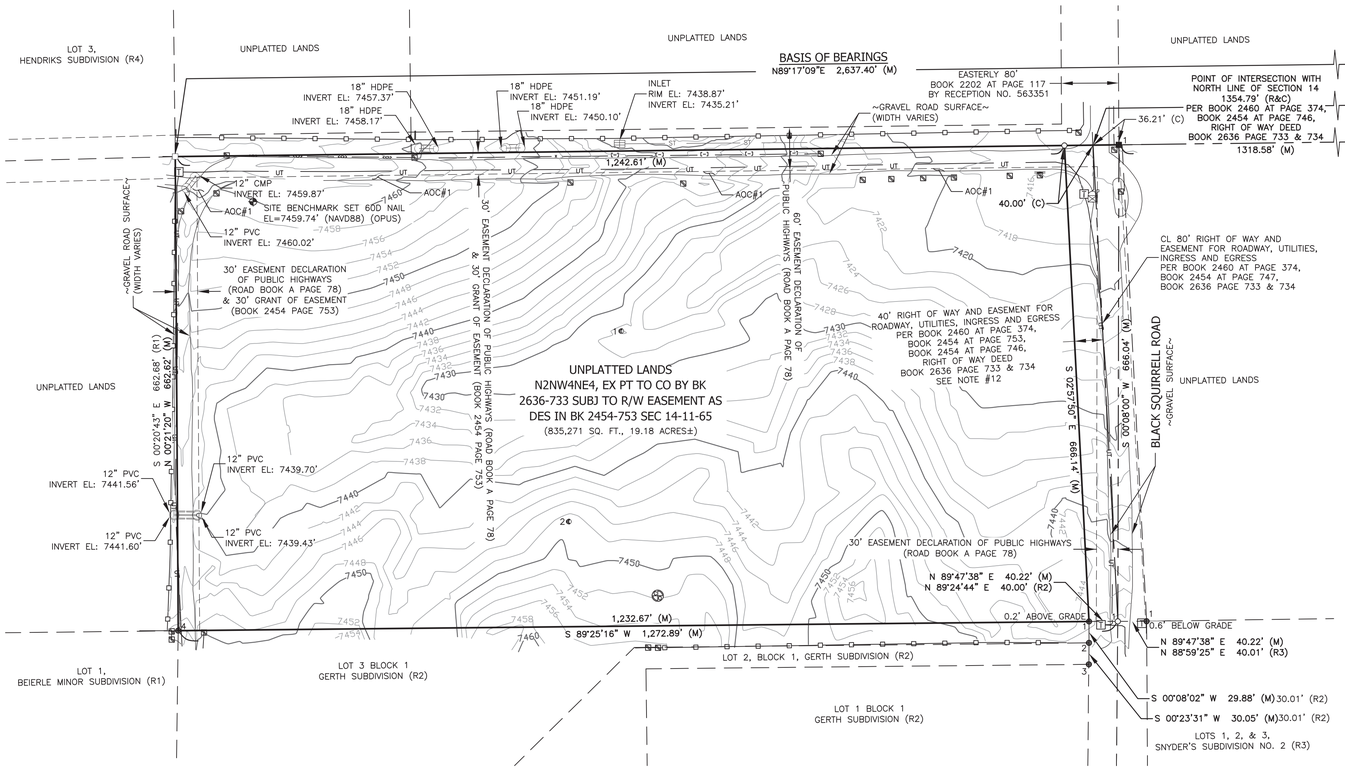
N

W E

S

1" = 100'

100' 0' 100' 200'



LEGEND

1 ●	FOUND NO. 5 REBAR AS NOTED
2 ●	FOUND NO. 4 REBAR WITH 1" YELLOW PLASTIC CAP, PLS 15686, FLUSH WITH GRADE
3 ●	FOUND NO. 4 REBAR WITH 1" YELLOW PLASTIC CAP REMNANTS, 0.2' ABOVE GRADE
4 ●	FOUND NO. 5 REBAR WITH 1-1/4" ORANGE PLASTIC CAP, PLS 38141, 0.6' BELOW GRADE
1 ■	N 1/16 SEC 14 T11S R65W FOUND NO. 6 REBAR WITH 2-1/2" ALUM CAP MARKED E1/16 S11&S14 1997 PLS 4842, FLUSH WITH GRADE
2 ■	NE 1/4 SEC 14 T11S R65W FOUND NO. 6 REBAR WITH 2-1/2" ALUM CAP MARKED 1/4 S11&S14 1997 PLS 4842, FLUSH WITH GRADE
□	N 1/4 SEC. 14 T11S R65W. FOUND NO. 6 REBAR, REHABILITATED WITH 2-1/2" ALUM CAP, T11S R65W 1/4 S13|S14 2024 PLS 38759, FLUSH WITH GRADE
○	SET NO. 5 REBAR WITH 1-1/4" PURPLE PLASTIC CAP, PLS 38759, FLUSH WITH GRADE
1 ○	SET NO. 5 REBAR WITH 1-1/2" ALUMINUM CAP, PLS 38759, 0.5' BELOW GRADE
	SITE BENCHMARK SET 60D NAIL EL=7459.74' (NAVD88) (OPUS)
(R)	RECORD VALUE
(R1)	RECORD VALUE (BEIERLE MINOR SUBDIVISION) RECEPTION NO. 216713868
(R2)	RECORD VALUE (GERTH SUBDIVISION) PLAT BOOK X-3 AT PAGE 178
(R3)	RECORD VALUE (SNYDER'S SUBDIVISION NO.2) RECEPTION NO. 1490259
(R4)	RECORD VALUE (HENDRICKS SUBDIVISION) RECEPTION NO. 1178523
(M)	MEASURED VALUE
(C)	CALCULATED VALUE
(AOC#_)	AREA OF CONCERRN
	BREAK SYMBOL
1 ⊕	HEADSTONE
2 ⊕	BRICK GRILL
	STORM CULVERT INLET
	STORM DRAIN INLET
	SANITARY SEWER CLEANOUT
	TELEPHONE PEDESTAL
	SIGN-"PRIVATE PROPERTY" "PRIVATE DRIVE"
	FENCE POST
	MAILBOX CLUSTER
UT	UNDERGROUND TELEPHONE LINE
«»	WROUGHT-IRON FENCE
(-)	BARABED WIRE FENCE REMNANTS
	WIRE MESH FENCE
X	BARBED-WIRE FENCE

LEGAL DESCRIPTION

The North 1/2 of the Northwest 1/4 of the Northeast 1/4 of Section 14 in Township 11 South, Range 65 West of the 6th P.M., together with 80 foot right-of-way described in Exhibit B in Warranty Deed recorded in Book 2460 at page 374 of the records of El Paso County, Colorado,

(Per Title Commitment Order Number RND55116760)

LEGAL DESCRIPTION - VESTING DEED

N2NW4NE4, EX PT TO CO BY BK 2636-733 SUBJ TO R/W EASEMENT AS DES IN BK 2454-753 SEC 14-11-65

(Per Warranty Deed by Reception No. 218044100)

PARCEL DETAILS

Address: 18412-18440 BLACK SQUIRREL ROAD, COLORADO SPRINGS, CO 80908

El Paso County Schedule No.: 5114000019

AREA(S) OF CONCERN

(AOC#1): Portions of gravel road lies southerly and easterly of said easement, as graphically depicted on this Land Survey Plat, causing an area of concern.

SURVEYOR'S NOTES

1. NOTICE: According to Colorado law you must commence any legal action based upon any defect in this survey within three years after you first discover such defect. In no event may any action based upon any defect in this survey be commenced more than ten years from the date of the certification shown hereon.

2. Any person who knowingly removes, alters or defaces any public land survey monument or land boundary monument or accessory commits a class 2 misdemeanor pursuant to the Colorado Revised Statute 18-4-508.

3. The lineal units used in this drawing are U.S. Survey Feet.

4. The fieldwork for this survey was completed on May 28, 2024.

5. The overall subject parcel contains a net calculated area of 835,271 square feet (19.18 acres) of land, more or less.

6. This survey does not constitute a title search by Apex Land Surveying and Mapping, LLC. to determine ownership or easements of record. For information regarding easements, rights-of-way and title of record, Apex Land Surveying and Mapping, LLC. relied upon Title Commitment order number RND55116760, with an effective date of 05/24/2024 @ 5:00 P.M. as provided by Land Title Guaranty Company & Old Republic National Title Insurance Company..

7. Bearings are based on a portion of the North line of Section 14, T11S, R65W of the Ute P.M., monumented on the west end with a found No. 6 rebar, rehabilitated with 2-1/2" aluminum cap, T11S R65W 1/4 S13|S14 2024 PLS 38759, flush with grade, and on the east end with a found No. 6 rebar with 2-1/2" aluminum cap marked 1/4 S11|S14 1997 PLS 4842, flush with grade and is assumed to bear N89°17'09"E a measured distance of 2,637.40 feet.

8. Any underground or above ground utilities shown hereon have been located from field survey information. Apex Land Surveying and Mapping, LLC. does not guarantee said underground utilities to be shown in their exact location and that said underground utilities are shown in their entirety. Apex Land Surveying and Mapping, LLC. did not physically enter any manholes or inlets to verify size and material. Where additional or more detailed information is required, the client is advised that excavation may be necessary.

9. Site Benchmark: Set 60D nail (Elevation=7459.74' NAVD88).

10. The purpose of this survey is to determine boundary lines of subject parcel for future minor subdivision.

11. Exeption No 13 in title commitment stipulates terms, conditions, provisions, burdens and obligations as set forth in right of way recorded July 09, 1967 under Reception No. 563351 under Book 2202 at Page 117. Said right of way and easement for roadway, utilities, ingress and egress purposes over and across the East 80 feet of that part of the west half of the Southeast quarter of Section 11 in Township 11 South, Range 65 West of the 6th P.M., as graphically depicted on thie Land Survey Plat.

12. Right Of Way Deed per Book 2636 at Page 733 by Reception No. 30371 grants, bargain, sell, and convey the said 80' Strip (40' on either side of centerline) to El Paso County as graphically depicted on this Land Survey Plat. POINT OF INTERSECTION WITH NORTH LINE OF SECTION 14, a distance of 1354.79' (R&C) lands within field measured evidence of intersection of Black Squirrel Road (Gravel road) and private road (gravel road). This document is listed as an "EX" in the vesting deed (Warranty Deed by Reception No. 218044100).

13. Abbreviated Legal Description in vesting Warranty Deed by Reception No. 218044100 Has an address listed as 6275 Montabor Dr, Colorado Springs CO 80918. The address listed in this document is the address for Chris team Living trust, not the physical address of subject parcel.

14. Exception No. 19-Grant of right of way to mountain view electric association, inc. over a portion of subject property as recorded June 5, 2001 under reception No. 201075608. The evidence in this description in this document does not touch the subject parcel.

15. Exception No. 20-Grant of right of way to mountain view electric association, inc. over a portion of subject property as recorded October 2, 2012 under Reception No. 212115628. The evidence in this description does not touch the subject parcel.

16. Exception No. 22-Easement granted to public service company of Colorado, for utility, and incidental purposes, by instrument recorded april 21, 1964, in book 2007 at page 850. The evidence in this description does not touch the subject parcel.

SURVEYOR'S STATEMENT

The undersigned Colorado Registered Professional Land Surveyor does hereby state and declare to Team Chris Living Trust Dated April 11, 2018 C/O Christine Tschamler, that this plat is signed and/or sealed by a professional land surveyor representing that the surveying services addressed therein have been performed by the professional land surveyor or under the professional land surveyor in responsible charge. Is in accordance with applicable standards of practice. Is not a guaranty or warranty, either expressed or implied, and have been met to the best of his professional knowledge, information, and belief.

COLORADO LICENSED DANNY RODIC 38759 06-17-2024 PROFESSIONAL LAND SURVEYOR

Danny Rodic
State of Colorado Professional Land Surveyor No. 38759
For and on behalf of Apex Land Surveying and Mapping LLC.

DEPOSITING CERTIFICATION

Deposited this _____ day of _____, A.D.

20___ at _____o'clock ____M. in Book _____ of Land Survey Plats, at Page(s) _____,

Deposit Number _____ of the records of the Clerk and Recorder's Office of El Paso County, Colorado.

_____ By: Deputy

DATE: June 17, 2024 REVISIONS

No.	Remarks	Date	By

Field: TJM/DDR Drawn: TJM/DDR Checked: DDR

APEX Land Surveying and Mapping LLC.

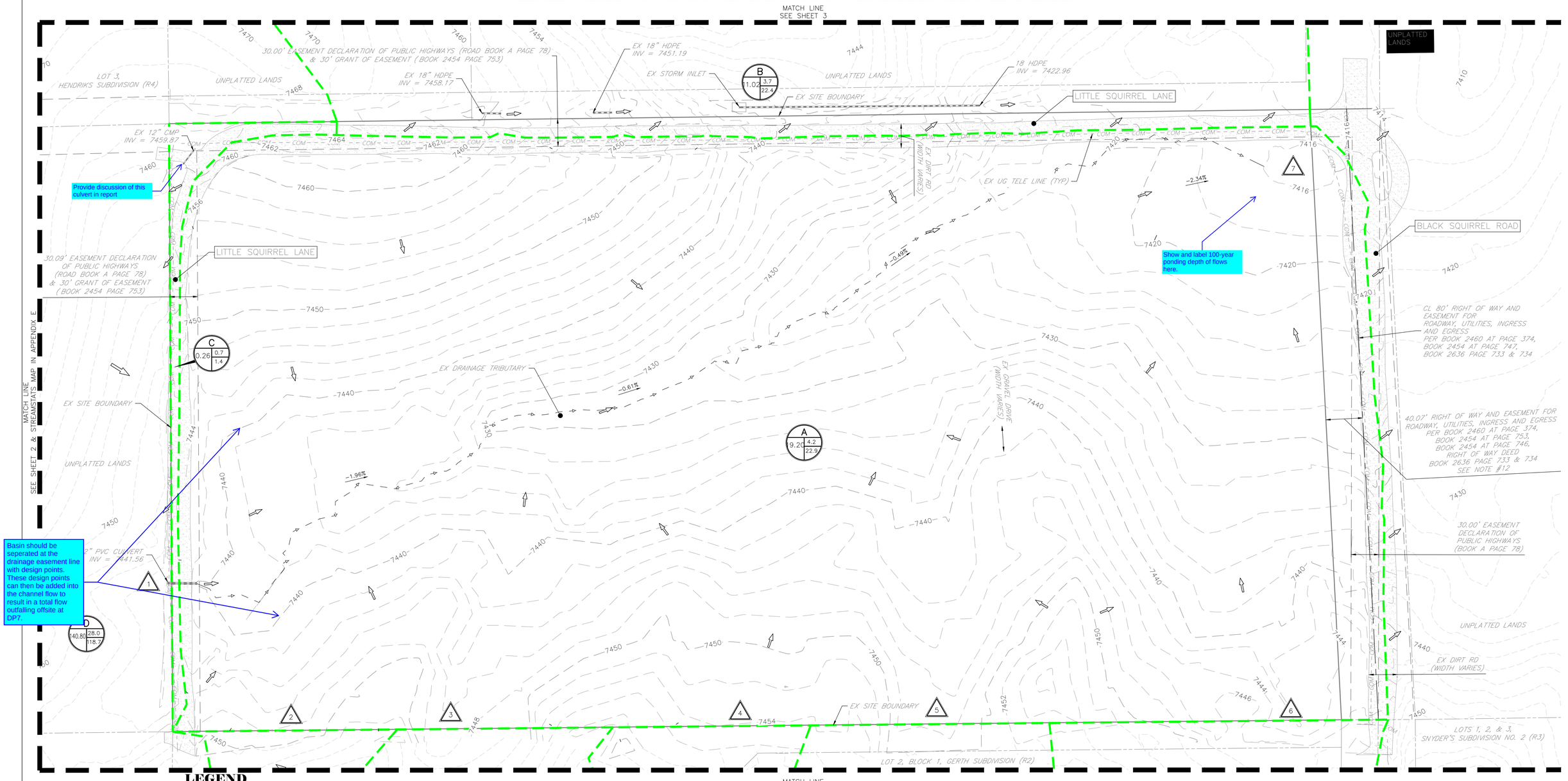
5855 Lehman Drive, Suite 102
Colorado Springs, CO 80918
Phone: 719-318-0377
E-mail: info@apexsurveyor.com
Website: www.apexsurveyor.com

PROJECT No.: 24032 SHEET 1 OF 1

APPENDIX F – DRAINAGE MAPS

CHRIS TEAM SUBDIVISION

EXISTING CONDITIONS DRAINAGE MAP



LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
FLOW DIRECTION		
BASIN ID	ID / AC / Q5 / Q100	
DESIGN POINT DESIGNATION	1	
DRAINAGE BASIN		

EXISTING CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	19.20	6%	0.11	0.38	44.5	4.2	22.9
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	2.2	9.6
5	0.5	2.3
6	3.7	16.0
7	35.5	126.9
8	3.7	22.4

50 25 0 50 100

ORIGINAL SCALE: 1" = 50'

EXISTING CONDITIONS DRAINAGE MAP

CHRIS TEAM SUBDIVISION

JOB NO. 24019 | SHEET 1

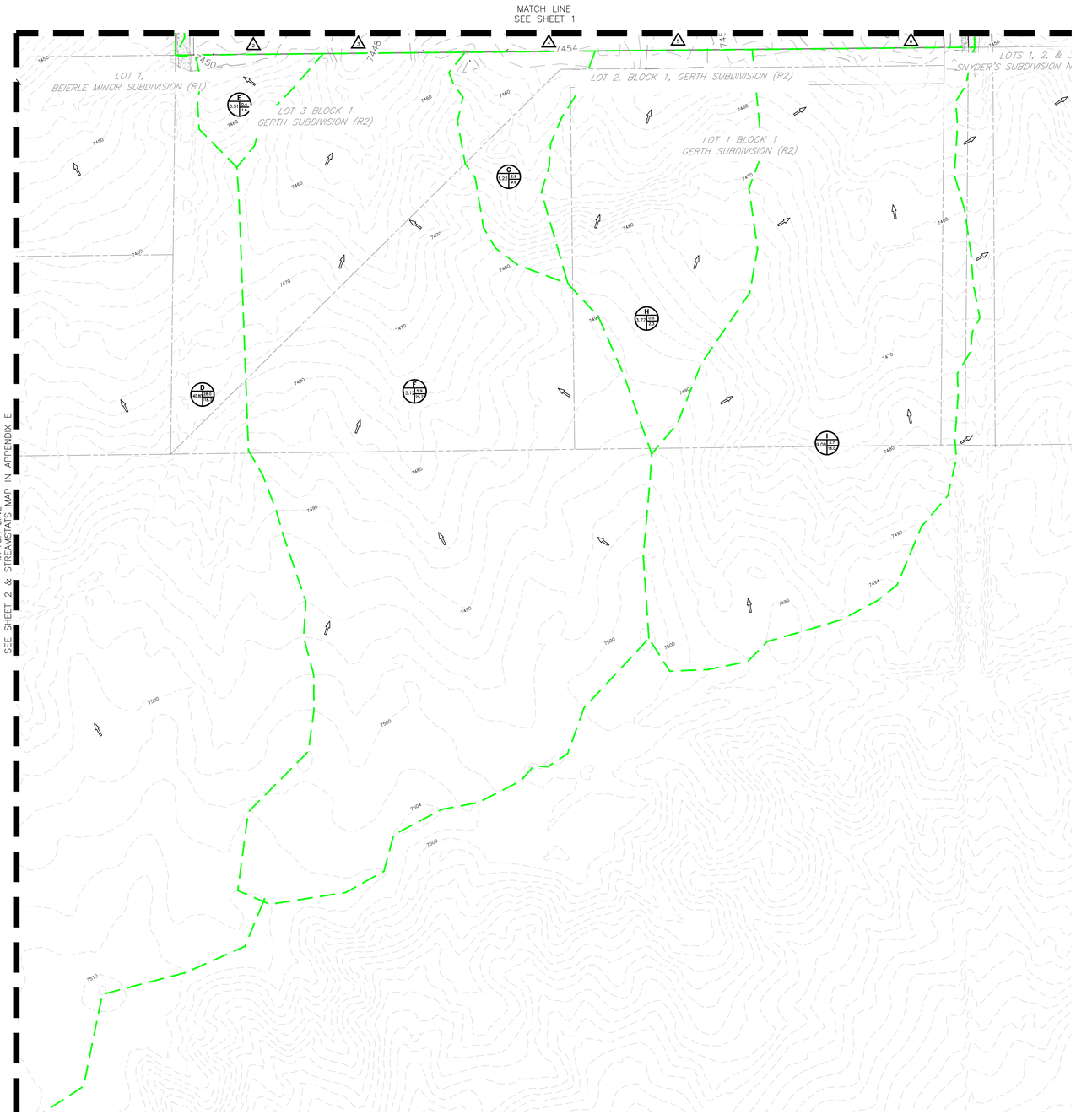
LOCATION: EPC

11/29/2024

ALL TERRAIN ENGINEERING

CHRIS TEAM SUBDIVISION

EXISTING CONDITIONS DRAINAGE MAP



LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
FLOW DIRECTION		
BASIN ID	ID / AC / Q5 / Q100	
DESIGN POINT DESIGNATION	1	
DRAINAGE BASIN		

EXISTING CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	19.20	6%	0.11	0.38	44.5	4.2	22.9
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-}YR}$	$Q_{100\text{-}YR}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	2.2	9.6
5	0.5	2.3
6	3.7	16.0
7	35.5	126.9
8	3.7	22.4

N

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

EXISTING CONDITIONS DRAINAGE MAP

CHRIS TEAM SUBDIVISION

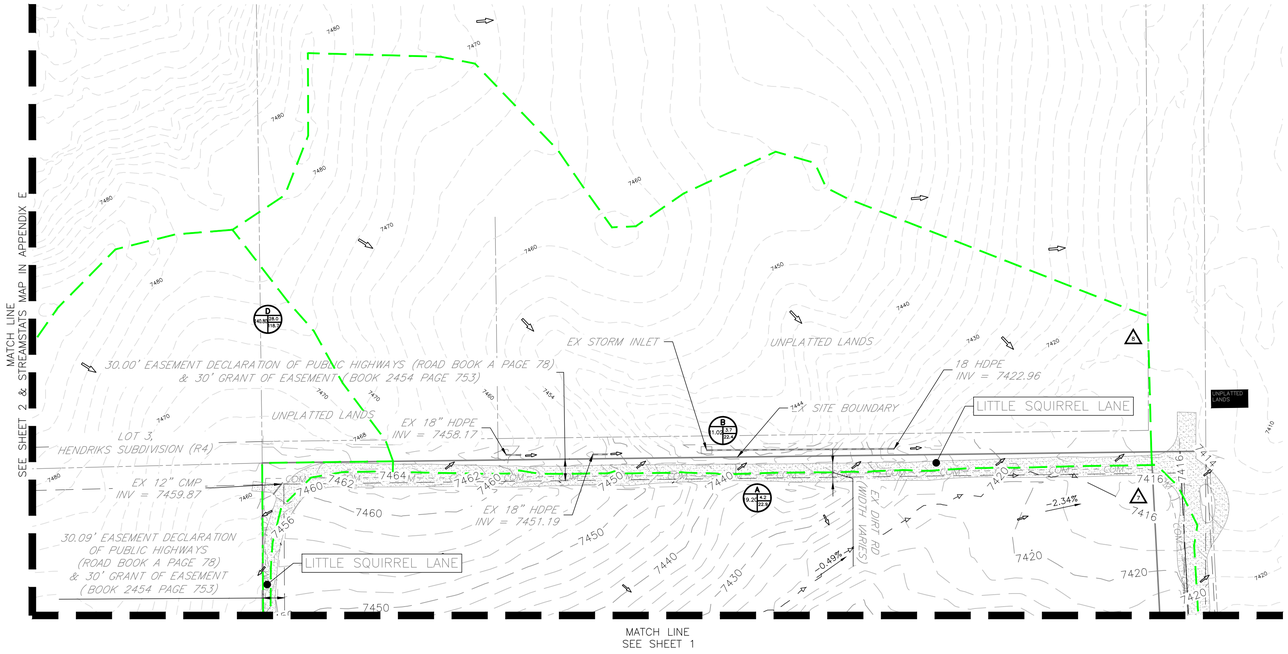
JOB NO. 24019
LOCATION: EPC
11/29/2024

SHEET 2

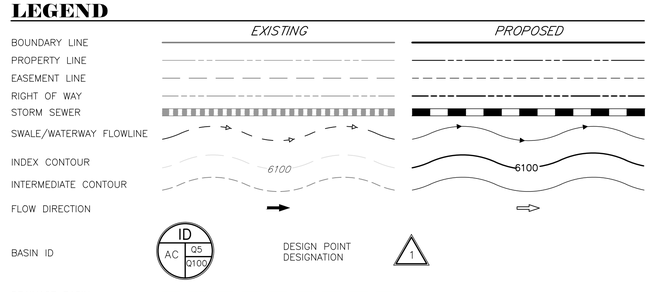
ALL TERRAIN ENGINEERING

CHRIS TEAM SUBDIVISION

EXISTING CONDITIONS DRAINAGE MAP



LEGEND



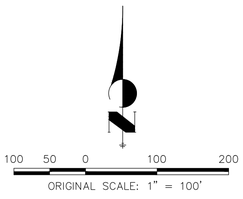
EXISTING CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	19.20	6%	0.11	0.38	44.5	4.2	22.9
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	2.2	9.6
5	0.5	2.3
6	3.7	16.0
7	35.5	126.9
8	3.7	22.4

Sheet 3 please, for clarity.



EXISTING CONDITIONS DRAINAGE MAP

CHRIS TEAM SUBDIVISION

JOB NO. Z4019 | SHEET 2

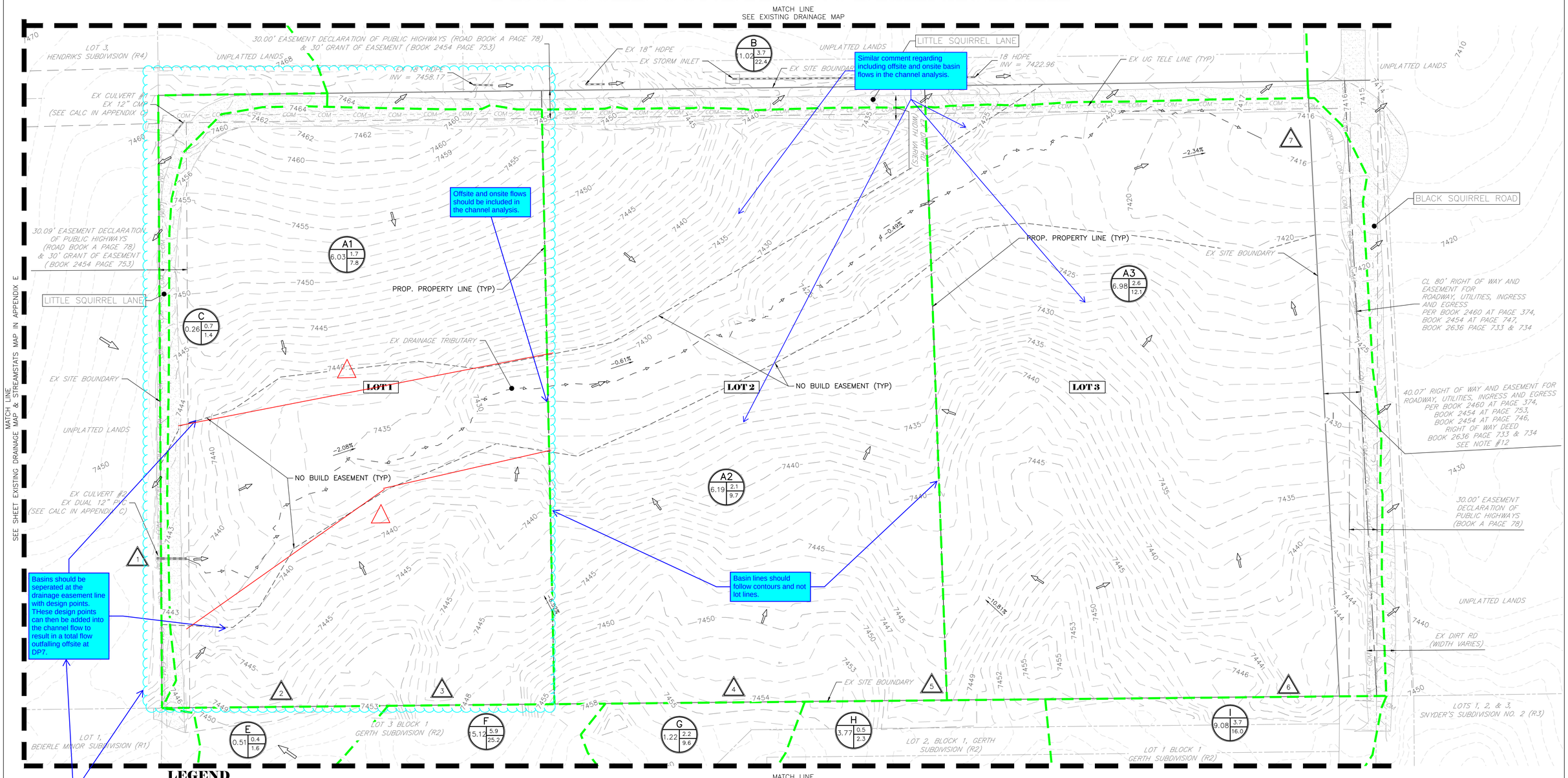
LOCATION: EPC

11/29/2024

ALL TERRAIN ENGINEERING

CHRIS TEAM SUBDIVISION

PROPOSED CONDITIONS DRAINAGE MAP



This is to show an example of what this note is asking for. These basin lines may be shown in different places based on other comments.

LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR		
INTERMEDIATE CONTOUR	6100	6100
FLOW DIRECTION		
BASIN ID	ID / AC / Q5 / Q100	
DESIGN POINT DESIGNATION		1
DRAINAGE BASIN		

PROPOSED CONDITIONS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	6.03	10%	0.14	0.40	42.9	1.7	7.8
A2	6.19	9%	0.14	0.40	36.1	2.1	9.7
A3	6.98	10%	0.14	0.40	33.6	2.6	12.1
B	11.02	4%	0.10	0.37	33.9	3.7	22.4
C	0.26	80%	0.63	0.74	15.2	0.7	1.4
D	140.80	10%	0.19	0.48	-	28.0	118.7
E	0.51	10%	0.16	0.41	25.1	0.4	1.6
F	15.12	10%	0.16	0.41	31.9	5.9	25.2
G	3.77	10%	0.16	0.41	26.3	2.2	9.6
H	1.22	10%	0.16	0.41	26.8	0.5	2.3
I	9.08	10%	0.16	0.41	32.6	3.7	16.0

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	28.2	118.7
2	0.4	1.6
3	5.9	25.2
4	**2.2**	**9.6**
5	**0.5**	**2.3**
6	**3.7**	**16**
7	40.4	160.8
8	3.7	22.4

Flow shown does not match hydrology spreadsheet in appendix

50 25 0 50 100

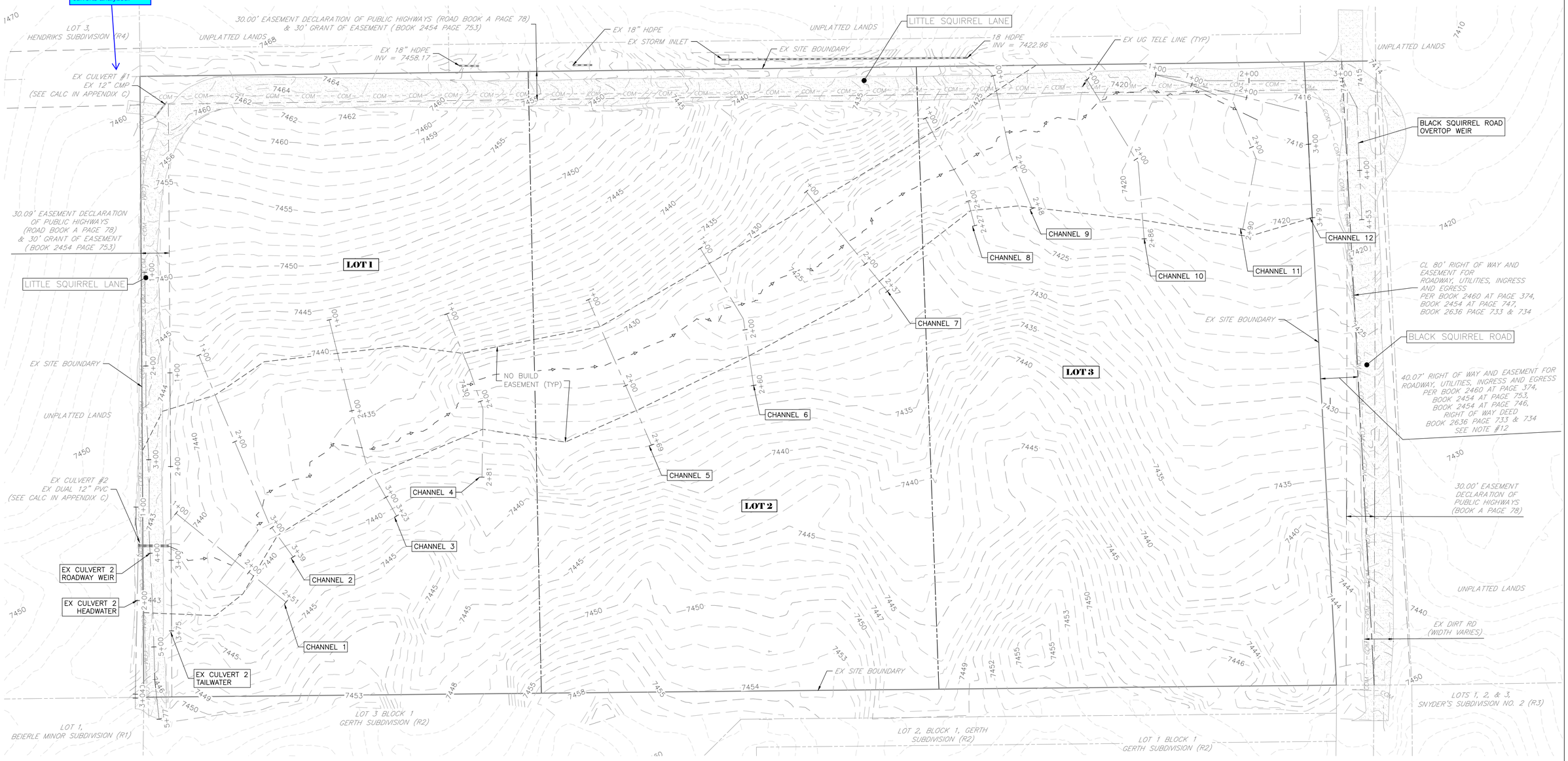
ORIGINAL SCALE: 1" = 50'

PROPOSED CONDITIONS DRAINAGE MAP
CHRIS TEAM SUBDIVISION
JOB NO. 24019
LOCATION: EPC
11/29/2024
SHEET 1

ALL TERRAIN ENGINEERING

CHRIS TEAM SUBDIVISION

CHANNEL CROSS SECTION MAP



N

50 25 0 50 100

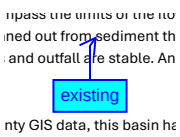
ORIGINAL SCALE: 1" = 50'

CHANNEL CROSS SECTION MAP	
CHRIS TEAM SUBDIVISION	
JOB NO. Z4019	SHEET
LOCATION: EPC	1
11/29/2024	

ALL TERRAIN ENGINEERING

v2_Drainage Report - Final.pdf Markup Summary

Callout (20)



Subject: Callout
Page Label: 5
Author: Joseph Sandstrom
Date: 12/17/2024 4:59:44 PM
Status:
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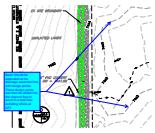
existing

Subject: Callout
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:07:06 PM
Status:
Color:
Layer:
Space:

Basins should be seperated at the drainage easement line with design points. THese design points can then be added into the channel flow to result in a total flow outfalling offsite at DP7.



Subject: Callout
Page Label: [1] 24019_Ex Drainage Map-Ex Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 2:57:22 PM
Status:
Color:
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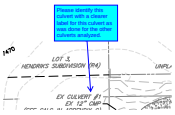
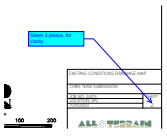
Basin should be seperated at the drainage easement line with design points. These design points can then be added into the channel flow to result in a total flow outfalling offsite at DP7.



Subject: Callout
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 7:44:54 AM
Status:
Color:
Layer:
Space:

Please identify this culvert with a clearer label for this culvert as was done for the other culverts analyzed.



Subject: Callout
Page Label: [3] 24019_Ex Drainage Map-Ex Drn Map (3)
Author: Joseph Sandstrom
Date: 12/18/2024 2:04:41 PM
Status:
Color:
Layer:
Space:

Sheet 3 please, for clarity.

Subject: Callout
Page Label: 5
Author: Joseph Sandstrom
Date: 12/18/2024 2:50:57 PM
Status:
Color:
Layer:
Space:

Please include the overtop depth in narrative.

Subject: Callout
Page Label: 36
Author: Joseph Sandstrom
Date: 12/18/2024 2:53:31 PM
Status:
Color:
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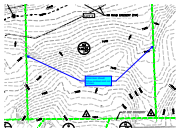
Erosion protection is needed for flows greater than 5 fps. Please include calcs and discuss in narrative.



Subject: Callout
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:00:19 PM
Status:
Color:
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Basin lines should follow contours and not lot lines.

Subject: Callout
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:06:27 PM
Status:
Color:
Layer:
Space:

Offsite and onsite flows should be included in the channel analysis.

Subject: Callout
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:05:30 PM
Status:
Color:
Layer:
Space:

This is to show an example of what this note is asking for. These basin lines may be shown in different places based on other comments.

Subject: Callout
Page Label: 6
Author: CDurham
Date: 12/23/2024 9:41:52 AM
Status:
Color:
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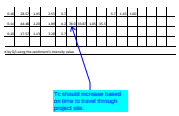
Please provide minimum driveway culvert sizing for driveways. You can do just one worse case scenario and then add caveat that sizes will be finalized with lot specific drainage reports.



Subject: Callout
Page Label: 15
Author: CDurham
Date: 12/23/2024 10:31:23 AM
Status:
Color:
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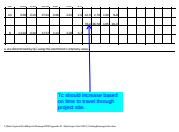
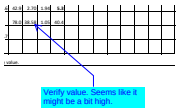
Tc should increase based on time to travel through project site.



Subject: Callout
Page Label: 20
Author: CDurham
Date: 12/23/2024 11:22:32 AM
Status:
Color:
Layer:
Space:

Tc should increase based on time to travel through project site.



Subject: Callout
Page Label: 20
Author: CDurham
Date: 12/23/2024 11:24:04 AM
Status:
Color:
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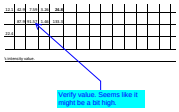
Verify value. Seems like it might be a bit high.



Subject: Callout
Page Label: 21
Author: CDurham
Date: 12/23/2024 11:26:31 AM
Status:
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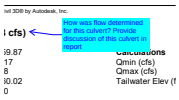
Verify value. Seems like it might be a bit high.



Subject: Callout
Page Label: 34
Author: CDurham
Date: 12/23/2024 11:35:19 AM
Status:
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How was flow determined for this culvert? Provide discussion of this culvert in report

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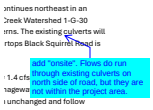

Subject: Callout
Page Label: 5
Author: CDurham
Date: 12/23/2024 11:43:03 AM
Status:
Color:
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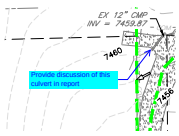
add "onsite". Flows do run through existing culverts on north side of road, but they are not within the project area.



Subject: Callout
Page Label: [1] 24019_Ex Drainage Map-Ex Drn Map
Author: CDurham
Date: 12/23/2024 11:46:18 AM
Status:
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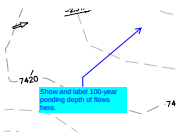
Provide discussion of this culvert in report



Subject: Callout
Page Label: [1] 24019_Ex Drainage Map-Ex Drn Map
Author: CDurham
Date: 12/23/2024 11:48:11 AM
Status:
Color:
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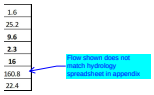
Show and label 100-year ponding depth of flows here.



Subject: Callout
Page Label: [1] Pr Drn Map
Author: CDurham
Date: 12/23/2024 11:50:36 AM
Status:
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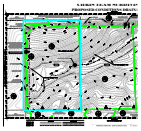
Flow shown does not match hydrology spreadsheet in appendix

Cloud (1)



Subject: Cloud
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:03:51 PM
Status:
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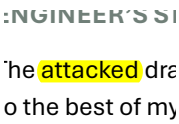
Highlight (6)



Subject: Highlight
Page Label: 2
Author: Joseph Sandstrom
Date: 12/17/2024 4:08:27 PM
Status:
Color:
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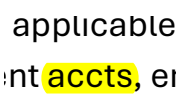

Subject: Highlight
Page Label: 2
Author: Joseph Sandstrom
Date: 12/17/2024 4:08:58 PM
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Subject: Highlight
Page Label: 4
Author: Joseph Sandstrom
Date: 12/17/2024 4:30:53 PM
Status:
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Stormwater from these roads sheet flows onsite and collects at DP2.

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Subject: Highlight
Page Label: 5
Author: Joseph Sandstrom
Date: 12/17/2024 4:36:53 PM
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Subject: Highlight
Page Label: 5
Author: CDurham
Date: 12/23/2024 9:34:50 AM
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Subject: Highlight
Page Label: 5
Author: CDurham
Date: 12/23/2024 9:34:51 AM
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Color:
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Line (5)

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Subject: Line
Page Label: 5
Author: Joseph Sandstrom
Date: 12/17/2024 4:59:56 PM
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Subject: Line
Page Label: 5
Author: Joseph Sandstrom
Date: 12/17/2024 5:00:02 PM
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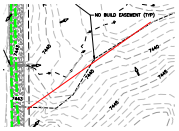
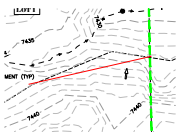
Color:
Layer:
Space:



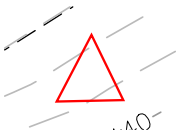
Subject: Line
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:02:18 PM
Status:
Color:
Layer:
Space:



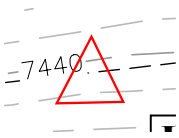
Subject: Line
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:02:22 PM
Status:
Color:
Layer:
Space:

Subject: Line
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:02:41 PM
Status:
Color:
Layer:
Space:

Polygon (2)



Subject: Polygon
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:02:04 PM
Status:
Color:
Layer:
Space:

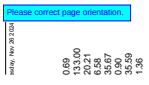


Subject: Polygon
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:02:46 PM
Status:
Color:
Layer:
Space:

Text Box (17)

Subject: Text Box
Page Label: 4
Author: Joseph Sandstrom
Date: 12/17/2024 4:36:48 PM
Status:
Color:
Layer:
Space:

Looks like this is DP7 now. Based on flow arrows, it looks like a portion of the roadways flow offsite and not onsite



Subject: Text Box
Page Label: 26
Author: Joseph Sandstrom
Date: 12/17/2024 4:40:37 PM
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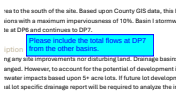
Color:
Layer:
Space:

Please correct page orientation.



Subject: Text Box
Page Label: 6
Author: Joseph Sandstrom
Date: 12/17/2024 5:11:33 PM
Status:
Color:
Layer:
Space:

Please include the total flows at DP7 from the other basins.

Subject: Text Box
Page Label: 5
Author: Joseph Sandstrom
Date: 12/18/2024 7:35:07 AM
Status:
Color:
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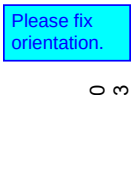
Space:

Review 1 unresolved comment: Include a discussion of the existing 12" culvert at the NW corner of the site, as shown on drainage map. There is a comment on the map to identify the culvert of interest.



Subject: Text Box
Page Label: 37
Author: Joseph Sandstrom
Date: 12/18/2024 7:50:11 AM
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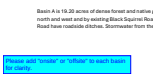
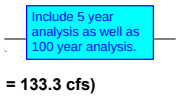
Color:
Layer:
Space:

Please fix orientation.



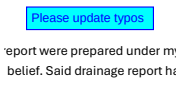
Subject: Text Box
Page Label: 4
Author: Joseph Sandstrom
Date: 12/18/2024 7:57:22 AM
Status:
Color:
Layer:
Space:

Please add "onsite" or "offsite" to each basin for clarity.



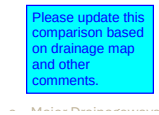
Subject: Text Box
Page Label: 23
Author: Joseph Sandstrom
Date: 12/18/2024 9:46:01 AM
Status:
Color:
Layer:
Space:

Include 5 year analysis as well as 100 year analysis.



Subject: Text Box
Page Label: 2
Author: Joseph Sandstrom
Date: 12/18/2024 1:51:25 PM
Status:
Color:
Layer:
Space:

Please update typos



Subject: Text Box
Page Label: 7
Author: Joseph Sandstrom
Date: 12/18/2024 1:57:06 PM
Status:
Color:
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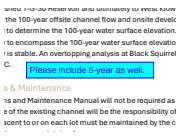
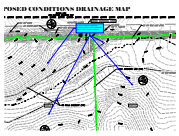
Please update this comparison based on drainage map and other comments.



Subject: Text Box
Page Label: 7
Author: Joseph Sandstrom
Date: 12/18/2024 1:58:52 PM
Status:
Color:
Layer:
Space:

Please include 5-year as well.



Subject: Text Box
Page Label: [1] Pr Drn Map
Author: Joseph Sandstrom
Date: 12/18/2024 3:08:31 PM
Status:
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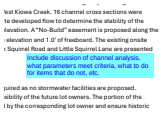
Similar comment regarding including offsite and onsite basin flows in the channel analysis.



Subject: Text Box
Page Label: 7
Author: CDurham
Date: 12/23/2024 11:44:27 AM
Status:
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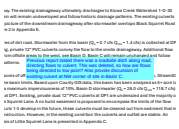
Include discussion of channel analysis, what parameters meet criteria, what to do for items that do not, etc.



Subject: Text Box
Page Label: 5
Author: CDurham
Date: 12/23/2024 9:49:29 AM
Status:
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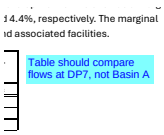
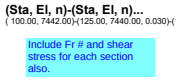
Previous report stated there was a roadside ditch along road, directing flows to culvert. This was deleted, so how are flows being directed to low point? Also provide discussion of existing culvert at NW corner of site in Basin C.



Subject: Text Box
Page Label: 7
Author: CDurham
Date: 12/23/2024 11:29:48 AM
Status:
Color:
Layer:
Space:

Table should compare flows at DP7, not Basin A



Subject: Text Box
Page Label: 23
Author: CDurham
Date: 12/23/2024 11:31:21 AM
Status:
Color:
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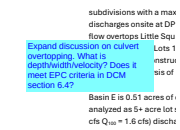
Space:

Include Fr # and shear stress for each section also.



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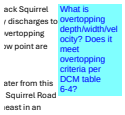
Expand discussion on culvert overtopping. What is depth/width/velocity? Does it meet EPC criteria in DCM section 6.4?



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What is overtopping depth/width/velocity? Does it meet overtopping criteria per DCM table 6-4?