IRON RIDGE SUBDIVISION FILING NO. 1 & 2

FINAL DRAINAGE REPORT

PCD FILE NO: SF2612 & SF2613
ALL TERRAIN ENGINEERING PROJECT NO: 25009
NOVEMBER 2026

PREPARED FOR:
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ENGINEER'S STATEMENT

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



10/28/2026

Ryan E. Burns, 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.

2026-10-29

Jake DeCoto, Manager Date

Atticus Land, LLC

PO Box 88010, Colorado Springs, CO 80908

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, P.E. Date

County Engineer/ECM Administrator

Conditions:

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I. General Purpose, Location & Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for IRON RIDGE SUBDIVISION FILING NO. 1 & 2 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. Iron

b. Location

IRON RIDGE SUBDIVISION FILING NO. 1 & 2, referred to as 'the site' herein, is in a portion of southeast quarter of Section 13, Township 11 South, Range 66 West of the 6th P.m., County of El Paso, State of Colorado. The site is bound by Walker Road to the north, Equine Meadows Subdivision to the east and undeveloped parcels to the west and south. A vicinity map is presented in Appendix A.

c. Description of Property

The site is comprised of (3) existing Parcels. Parcel 1 is 43.47 acres, Parcel 2 is 42.52 acres and Parcel 3 is 35.14 acres for a total of approximately 121.14 acres of undeveloped land. The development of Iron Ridge Subdivision will occur on Parcel 1 and 2. Parcel 3 will remain undeveloped. Existing vegetation consists of prairie grasses based upon aerial imagery. The approximate disturbed area is 9.2 acres. The development will plat (28) 2.5 acre+ "Large Lot single family residential lots" & public R.O.W. for an extension of Colt Court and proposed Brown Road, both Rural Local EPC cross sections with a 60' R.O.W.

Proposed improvements include Rural Local Roadways, associated road-side swales, culverts, (2) full spectrum extended detention basins, and grading. The residential lots will be served by private wells and OWTS.

In general, Parcel 1 slopes southeasterly towards an unnamed tributary of East Cherry Creek. East Cherry Creek is the ultimate receiving water for the site. The confluence of the unnamed tributary and East Cherry Creek is approximately 3.2 miles northeast of the site. Parcel 2 drains northwesterly towards the same tributary. Onsite elevations range from 7,450' – 7,560' with slopes ranging 1 – 80%. Per a NRCS soil survey, the site is made up of Type B Peyton sandy loam, Type B Peyton-Pring complex, Type B Tomah-Crowfoot loamy sands. The NRCS soil survey is presented in Appendix A.

An unnamed tributary of East Cherry Creek bisects the site and flows northeasterly. This tributary will be referred to as Tributary #1 from herein. There are no existing utilities located on site. An existing drainage map is presented in Appendix F.

d. Floodplain Statement

Based on FEMA Firm map 08041C0305Gdated 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 East Cherry Creek Drainage Basin. There is not a Drainage Basin Planning Study available for the East Cherry Creek Drainage Basin.

b. Existing Subbasin Description

The existing site's drainage patterns are relatively uniform. Tributary #1 bisects the site and conveys stormwater northeasterly towards Walker Road. An existing impoundment structure, The "Franktown Parker Reservoir FPE-5" is located approximately 850' upstream of Walker Road. The proposed development will

not have impacts on the impoundment structure. A portion of the site in the southeast area drains easterly to a separate tributary. An existing drainage map is presented in Appendix F.

Basin OS1 is 723.2 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS1 hydrologic parameters. Existing stormwater from this basin (Q_5 = 33.9 cfs Q_{100} = 199 cfs) is collected offsite in Tributary #1 and flows onsite at DPOS1 (Q_5 = 34.6 cfs Q_{100} = 202.5 cfs) where it combines with flows from DPOS2. Flows from DPOS1 continue through the site via Tributary 1 to DP5 (Q_5 = 48.7 cfs Q_{100} = 291.5 cfs)at Walker Road.

Basin OS2 is 38.4 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS2 hydrologic parameters. Existing stormwater from this basin (Q_5 = 3.5 cfs Q_{100} = 16.4 cfs) is collected offsite in Tributary #2 and flows onsite at DPOS2 (Q_5 = 3.5 cfs Q_{100} = 16.4 cfs) and continues across Basin EX1 and off-site again, where it joins Tributary 1 at DPOS1 (Q_5 = 34.6 cfs Q_{100} = 202.5 cfs).

Basin OS3 is 53.9 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS3 hydrologic parameters. Existing stormwater from this basin (Q_5 = 4.3 cfs Q_{100} = 20.4 cfs) is collected offsite in Tributary #3 and flows onsite at DPOS3 (Q_5 = 4.3 cfs Q_{100} = 20.4 cfs). Flows continue through the SE corner of basin EX9 and flow off-site in Tributary 3 to DP7 (Q_5 = 7.7 cfs Q_{100} = 42.0 cfs).

Basin EX1 is 14.90 acres of undeveloped land and Walker Road. Existing stormwater from this basin (Q_5 = 3.5 cfs Q_{100} = 21.3 cfs) is collected in Tributary#1 at DP1 (Q_5 = 3.5 cfs Q_{100} = 21.3 cfs) and continue in Tributary 1, see Basin OS1 description above.

Basin EX2 is 6.91 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 1.9 cfs Q_{100} = 12.6 cfs) is collected in Tributary#1 at DP2 (Q_5 = 3.9 cfs Q_{100} = 24.4 cfs). Flows continue NE in Tributary 1 to DP3. See Basin EX4 description below.

Basin EX3 is 17.98 acres of undeveloped land and Walker Road. Existing stormwater from this basin (Q_5 = 4.5 cfs Q_{100} = 27.4 cfs) is collected in Tributary#1 at DP3 (Q_5 = 11.6 cfs Q_{100} = 74.4 cfs). Flows at DP3 continue in Tributary 1 to DP4, see basin EX4 description below.

Basin EX4 is 6.94 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 2.0 cfs Q_{100} = 13.1 cfs) is collected in Tributary#1 at DP4 (Q_5 = 12.5 cfs Q_{100} = 80.8 cfs) where it combines with flows from DP3 and basin EX5. Flows at DP4, pass through the “Franktown Parker Reservoir FPE-5” via a concrete outlet structure and outfall pipe and continue in Tributary 1 to DP5. See basin EX7 description below. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing.

Basin EX5 is 39.65 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 9.1 cfs Q_{100} = 61.2 cfs) is collected in Tributary#1 at DP4 (Q_5 = 12.5 cfs Q_{100} = 80.8 cfs) where they combine with flows from DP3 and Basin EX4. Flows at DP4, pass through the “Franktown Parker Reservoir FPE-5” via a concrete outlet structure and outfall pipe and continue in Tributary 1 to DP5. See basin EX6, EX7, & EX8 descriptions below. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing.

Basin EX6 is 1.43 acres of undeveloped land and Walker Road. Existing stormwater from this basin (Q_5 = 1.2 cfs Q_{100} = 4.3 cfs) is collected in a swale along Walker Road before discharging into Tributary#1 at DP5 (Q_5 = 14.0 cfs Q_{100} = 89.0 cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX7 & EX8, see description below.

Basin EX7 is 3.54 acres of undeveloped land adjacent to Walker Road. Existing stormwater from this basin (Q_5 = 0.9 cfs Q_{100} = 6.3 cfs) is collected in Tributary#1 at DP5 (Q_5 = 14.0 cfs Q_{100} = 89.0 cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX6 & EX8, see description below.

Basin EX8 is 26.55 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 5.5 cfs Q_{100} = 34.7 cfs) is collected in Tributary#1 at DP5 (Q_5 = 14.0 cfs Q_{100} = 89.0 cfs, excludes off-site flows for comparison purposes) where they combine with flows from DP4 and basins EX6 & EX7.

The total flow at DP5 including the off-site flow from basin's OS1 and OS2 is (Q_5 = 48.7 cfs Q_{100} = 291.5 cfs).

Basin EX9 is 12.23 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 2.7 cfs Q_{100} = 18.4 cfs) flows offsite and is collected in Tributary#3 at DP6 (Q_5 = 2.7 cfs Q_{100} = 18.4 cfs). Flows at DP6 continue in Tributary 3 to DP7 where they combine with flows from basins EX10 and EX11, see description below.

Basin EX10 is 2.15 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 0.7 cfs Q_{100} = 4.5 cfs) flows offsite and is collected in Tributary#3 at DP7 (Q_5 = 3.5 cfs Q_{100} = 20.3 cfs, excludes off-site flows for comparison purposed) where they combine with flows from DP6 and basin EX11.

Basin EX11 is 2.85 acres of undeveloped land and Colt Court. Existing stormwater from this basin (Q_5 = 1.9 cfs Q_{100} = 7.9 cfs) flows offsite and is collected in Tributary#3 at DP7 (Q_5 = 3.6 cfs Q_{100} = 20.5 cfs, excludes off-site flows for comparison purposed) where they combine with flows from DP6 and basin EX10.

The total flow at DP7 including the off-site flow from basin OS3 is (Q_5 = 7.9cfs Q_{100} = 40.9 cfs).

c. Proposed Subbasin Description

The proposed site has been divided into 30 subbasins for analysis. Areas designated 'no-build' have been analyzed as 'Pasture/Meadow/Lawns' in the proposed condition. Basin OS1 – OS3 are excluded from the design point flows presented in Basin A – Basin V descriptions. However, Basin OS1 - OS3 flows will be included in the stability analysis of Tributary #1 - #3. The offsite flows are analyzed separately to accurately quantify the change in onsite flow from the existing to proposed condition.

In general, the site was designed to preserve existing drainage patterns to the extent possible and minimize the disturbance area to allow for the lots to remain in a natural condition. Developed stormwater from the proposed roadways will be captured in road-side swales and conveyed to full-spectrum detention pond 1 or 2. The proposed lots are considered "large lot single family" sites which do not require water quality per Appendix I.6.1.B.5. Lot areas that are tributary to the proposed roads or ponds, will be treated and detained, however, lots that are not tributary to the roadways or ponds will flow off-site undetained per the existing drainage patterns.

Basin OS1 is 723.2 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS1 hydrologic parameters. Existing stormwater from this basin (Q_5 = 33.9 cfs Q_{100} = 199 cfs) is collected offsite in Tributary #1 and flows onsite at DPOS1 (Q_5 = 34.6 cfs Q_{100} = 202.5 cfs) where it combines with flows from DPOS2. Flows from DPOS1 continue through the site via Tributary 1 to DP15 (Q_5 = 46.3 cfs Q_{100} = 287.7 cfs) a 72" CMP public culvert at Walker Road.

Basin OS2 is 38.4 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS2 hydrologic parameters. Existing stormwater from this basin (Q_5 = 3.5 cfs Q_{100} = 16.4 cfs) is collected offsite in Tributary #2 and flows onsite at DPOS2 (Q_5 = 3.5 cfs Q_{100} = 16.4 cfs) and continues across Basin A and off-site again at DP1.1 (Q5 = 5.8 cfs, Q100 = 29.1 cfs, includes Basin A1/A2 flows for stability analysis of on-site Tributary 2), where it joins Tributary 1 at DPOS1 (Q_5 = 34.6 cfs Q_{100} = 202.5 cfs). Flows from DPOS1 continue through the site via Tributary 1 to DP15 (Q_5 = 46.3 cfs Q_{100} = 287.7 cfs) a 72" CMP culvert at Walker Road.

Basin OS3 is 53.9 acres of offsite land. Due to the size and proximity to the site, Streamstats was used for Basin OS3 hydrologic parameters. Existing stormwater from this basin (Q_5 = 4.3 cfs Q_{100} = 20.4 cfs) is collected offsite in Tributary #3 and flows onsite at DPOS3 (Q_5 = 4.3 cfs Q_{100} = 20.4 cfs). Flows continue through the SE corner of basin L1 and flow off-site @ DP7 (Q5 = 5.4 cfs, Q100 = 26.6 cfs, includes Basin L1 flows for stability analysis of on-site Tributary 3), and continues in Tributary 3 to DP11 (Q_5 = 8.4 cfs Q_{100} = 40.8 cfs).

Basin A1 is 8.74 acres of proposed 2.5+ acre lots and a portion of existing Walker Road. Basin A1 stormwater (Q_5 = 2.6 cfs Q_{100} = 14.9 cfs) follows historic drainage patterns south to DP1 (Q_5 = 2.6 cfs Q_{100} = 14.9 cfs) where it enters Basin A2 via proposed swale DP1 and continues per Basin A2 drainage patterns. Basin A1 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin A2 is 5.68 acres of proposed 2.5+ acre lots and a portion of existing Walker Road. Basin A stormwater (Q_5 = 2.2 cfs Q_{100} = 11.9 cfs) follows historic drainage patterns and is collected in Tributary #2 and directed to DP1.1 (Q_5 = 5.8 cfs Q_{100} = 29.1 cfs, includes Basin OS2 flows for stability analysis of on-site Tributary 2)) where it combines with flows from DP1 and continues offsite. Flow at DP1.1 continues via Tributary 2 to DPOS1, where flows continue back onsite via Tributary 1 and continue to DP5, see Basins B-G descriptions below. Basin A2 will not be detained in Pond 1. Basin A2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin B1 is 6.83 acres of proposed 2.5+ acres lots, a small portion of proposed Brown Road & associated roadside swale B and a portion of existing Walker Road. Basin B1 stormwater (Q_5 = 3.0 cfs Q_{100} = 14.2 cfs) is captured in Roadside Swale B @ DP2 (Q_5 = 5.9 cfs Q_{100} = 23.7 cfs) where it combines with flows from Basin B2 & C and enter a 30" RCP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin B1 will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin B2 is 1.13 acres of a small portion of proposed 2.5+ acres lots, proposed Brown Road & associated roadside swale B. Basin B2 stormwater (Q_5 = 1.3 cfs Q_{100} = 3.6 cfs) is captured in Roadside Swale B and is conveyed to DP2 (Q_5 = 5.9 cfs Q_{100} = 23.7 cfs) where it combines with flows from Basin B1 & C and enter a 30" RCP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin B2 will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin C is 2.84 acres of proposed 2.5+ acres lots, a portion of proposed Brown Road and associated roadside swale C and Walker Road. Basin C stormwater (Q_5 = 1.9 cfs Q_{100} = 7.2 cfs) is captured in Roadside Swale C and conveyed to DP2 (Q_5 = 5.9 cfs Q_{100} = 23.7 cfs) where it combines with flows from Basin B1 & B2 and enter a 30" RCP culvert (public) and is piped under Brown Road to DP3, see Basin description below. Basin C will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin D is 0.86 acres of proposed Brown Road and associated roadside swale D. Basin D stormwater (Q_5 = 1.3 cfs Q_{100} = 3.1 cfs) is captured in Roadside Swale D and conveyed to DP3.1 (Q_5 = 7.4 cfs Q_{100} = 27.2 cfs) via an 18" RCP culvert (private) underneath the proposed Pond 1 maintenance access road where it combines with flows from DP3 in proposed "DP3.1 - DP4" Swale. Basin D will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin E is 0.47 acres of proposed Brown Road and associated roadside swale E. Basin E stormwater (Q_5 = 0.8 cfs Q_{100} = 2.0 cfs) is captured in Roadside Swale E and conveyed to DP3 (Q_5 = 6.4 cfs Q_{100} = 25.1 cfs) where it combines with flows from DP2 in swale "DP3 - DP3.1) and continues in the swale to DP3.1 ((Q_5 = 7.4 cfs Q_{100} = 27.2 cfs). DP3 is conveyed to Pond 1 in swale "DP3.1 – DP4". Basin E will be captured and detained in Pond 1 for full spectrum water quality and detention.

Basin F is 2.87 acres of proposed 2.5+ acres lots and Pond 1. Basin F stormwater (Q_5 = 1.3 cfs Q_{100} = 6.0 cfs) overland flows to Pond 1 at DP4 (Q_5 = 8.4 cfs Q_{100} = 32.2 cfs) and combines in the pond with flows from DP3.1. Basin F will be captured and detained in Pond 1 for full spectrum water quality and detention. Detained flows at DP4 are released via a full-spectrum outlet structure and 24" RCP pipe (private) and low tail-water basin at DP4.1 (Q_5 = 0.1 cfs Q_{100} =23.9 cfs). Released flows are conveyed to Tributary 1 via "DP4.1 outfall swale" at DP5 (Q_5 = 8.4 cfs Q_{100} =64.5 cfs) where they combine with flows from Basins A, G, and K and continue to DP6, see basin descriptions below.

Basin G is 8.16 acres of proposed 2.5+ acres lots and undevelopable land within Tributary #1. Basin G stormwater (Q_5 = 2.2 cfs Q_{100} = 12.5 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 (Q_5 = 8.4 cfs Q_{100} =64.5 cfs) where it combines with flows from Basins A1, A2, K, U1-3, and DP4.1. Flows continue in Tributary 1 to DP5.1, see basin descriptions below. Basin G will not be detained in Pond 1. Basin G is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin H is 9.25 acres of 2.5+ acre lots and undevelopable land within Tributary #1. Basin H stormwater (Q_5 = 3.0 cfs Q_{100} = 17.7cfs) follows historic drainage patterns and is collected in Tributary #1 at DP6 (Q_5 = 9.5 cfs Q_{100} = 76.3 cfs) where it combines with flows from DP5.1, DP14.1, and basins U5. Flows at DP6, pass through the "Franktown Parker Reservoir FPE-5" via an existing, concrete outlet structure and outfall pipe and continue to DP15, a 72" CMP public culvert at Walker Road. It is assumed flows pass through the reservoir unrestricted for the purposes of hydrologic routing. Basin H will not be detained in Pond 1. Basin H is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin I is 3.54 acres of undevelopable land within Tributary #1. Basin I stormwater (Q_5 = 0.9 cfs Q_{100} = 6.3 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 (Q_5 = 11.6 cfs Q_{100} = 85.3 cfs), a 72" CMP public culvert at Walker Road where it combines with flows from DP6, basin J and basin V. Basin I will remain undeveloped and will not be detained in Pond 1.

Basin J is 1.35 acres of existing Walker Road and undevelopable land within Tributary #1. Basin J stormwater (Q_5 = 1.4 cfs Q_{100} = 4.1 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 (Q_5 = 11.6 cfs Q_{100} = 85.3 cfs), a 72" CMP public culvert at Walker Road where it combines with flows from DP6, basin H and basin V. Basin I will remain undeveloped and will not be detained in Pond 1.

Basin K is 0.89 acres of proposed 2.5+ acres lots. Basin K stormwater (Q_5 = 0.4 cfs Q_{100} = 2.4 cfs) flows offsite and is captured in Tributary #1 and conveyed to DP5 (Q_5 = 8.4 cfs Q_{100} = 64.5 cfs) where it combines with flows from DP4.1, DP1.1, & Basins G, U1-3. Flows continue in Tributary 1 to DP5.1, see basin descriptions below. Basin K will not be detained in Pond 1. Basin K is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin L1 is 4.82 acres of proposed 2.5+ acres lots. Basin L stormwater (Q_5 = 1.4 cfs Q_{100} = 7.8 cfs) follows historic drainage patterns and is collected in Tributary #3 at DP7 (Q_5 = 5.4 cfs Q_{100} = 26.6 cfs, includes offsite flow from OS3 for stability analysis of on-site Tributary 3) where flows combine with flows from DP OS3. Flows continue offsite in Tributary 3 to DP11, see basin descriptions below. Basin L1 will not be detained in Pond 2. Basin L is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin L2 is 7.18 acres of proposed 2.5+ acres lots. Basin L2 stormwater (Q_5 = 2.2 cfs Q_{100} = 12.6 cfs) follows historic drainage patterns and flows offsite at DP7.1 (Q_5 = 2.2 cfs Q_{100} = 12.6 cfs). Flows continue into off-site Tributary 3 and are carried to DP11, see basin descriptions below. Basin L2 will not be detained in Pond 2. Basin L2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin M is 2.06 acres of proposed 2.5+ acres lots. Basin M stormwater (Q_5 = 0.9 cfs Q_{100} = 5.0 cfs) follows historic drainage patterns to the east and offsite at DP8 (Q_5 = 0.9 cfs Q_{100} = 5.0 cfs) and continues into Tributary 3 where it is carried to DP11, see basin descriptions below. Basin M will not be detained in Pond 2. Basin M is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

N1

Basin N1 is 1.06 acres of existing residential area and Colt Court. Basin ~~N~~ stormwater (Q_5 = 0.9 cfs Q_{100} = 3.2 cfs) is collected in roadside swale N1 and is transported to DP9 (Q_5 = 1.9 cfs Q_{100} = 7.0 cfs) where it combines with flows from Basin N2 and enters an 18" RCP culvert (public). Flows are piped under Colt Court and continue to DP10 per Basin O1 drainage patterns described below. There is no proposed development within Basin N1, however; Colt Court will be extended to Iron Ridge from its current terminus. Per EPC ECM Section I.7.1.3.A.1, the developed area within Basin N1 will be excluded from permanent water quality management. The total excluded area is 0.12 acres encompassing the paved portion of Colt Court. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2. Water quality for the remaining 0.94 acres is excluded under EPC ECM Section 1.6.1.B.5. Coordination is ongoing with the property owners along Colt Court to facilitate the improvements required within the basin.

Basin N2

Basin N2 is 1.25 acres of existing residential area and Colt Court. Basin N2 stormwater (Q_5 = 1.1 cfs Q_{100} = 3.8 cfs) is collected in roadside swale N2 and is transported to DP9 (Q_5 = 1.9 cfs Q_{100} = 7.0 cfs) where it combines with flows from Basin N1 and enters an 18" RCP culvert (public). Flows are piped under Colt Court and continue to DP10 per Basin O1 drainage patterns described below. There is no proposed development within Basin N2, however; Colt Court will be extended to Iron Ridge from its current terminus. Per EPC ECM Section I.6.1.3.A.1, the developed area within Basin N will be excluded from permanent water quality management. The total excluded area is 0.14 acres encompassing the paved portion of Colt Court. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2. Water quality for the remaining 1.11 acres is excluded under EPC ECM Section 1.6.1.B.5. Coordination is ongoing with the property owners along Colt Court to facilitate the improvements required within the basin.

Basin O1 is 0.56 acres of existing Colt Court. Basin O1 stormwater (Q_5 = 0.5 cfs Q_{100} =1.7 cfs) follows historic drainage patterns to DP10 (Q_5 = 2.3 cfs Q_{100} = 8.1 cfs) where flows combine in the DP10 EX/Basin EX11 Swale with piped flows from DP9. Piped flows will outfall to a riprap pad and proposed DP9 swale. The DP9 swale extends from the culvert outlet to the edge of the existing 20' drainage and utility easement that was platted with the Equine Meadows Subdivision. This swale was designed and is stable when conveying the 100-yr design flows. All proposed improvements will be within this existing easement or the existing public ROW. It should be noted that the proposed flows tributary to the Basin EX11/DP10 Ex Swale are consistent in quantity and location with existing drainage patterns as well as the approved Equine Meadows report. The Equine Meadows plat and drainage report specifically states that lot owners "will accept adjacent property, lot, and/or road stormwater runoff and will maintain their lots to accept said stormwater". Any required maintenance or improvements outside of the existing easement will be the responsibility of the lot owner, as required by the recorded plat. Please see appendix E for applicable references.

There is no proposed development within Basin O1, however; Colt Court will be extended through Basin O1 to Iron Ridge. Stormwater continues per existing drainage patterns to the historic outfall within Tributary #3 at DP11 (Q_5 = 4.1 cfs Q_{100} = 20.4 cfs) where flows combine with flow from DP7 (basin L1), DP7.1 (basin L2) and

Please refer to comment provided on Proposed Drainage Map for Filing 2 at the end of this report.

DP8 (basin M). Per EPC ECM Section I.6.1.3.A.1, the developed area within Basin O1 will be excluded from permanent water quality management. The total excluded area is 0.08 acres encompassing the paved portion of Colt Court. Water quality for the remaining .48 acres is excluded under EPC ECM Section 1.6.1.B.5. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2.

Basin O2 is 0.15 acres of existing public ROW of Colt Court and a small portion of proposed ROW within the Iron Ridge parcel. Improvements will consist of extending Colt Court from its current terminus to the Iron Ridge Development. Runoff (Q_5 = 0.5 cfs Q_{100} = 1.0 cfs) follows existing drainage patterns to the southeast and to DP11 (Q_5 = 4.1 cfs Q_{100} = 20.4 cfs) where flows combine with flow from DP7 (basin L1), DP7.1 (basin L2) DP10, and DP8 (basin M). Per EPC ECM Section I.6.1.3.A.1, the developed area within Basin O2 will be excluded from permanent water quality management. The total excluded area is 0.09 acres encompassing the paved portion of Colt Court. Water quality for the remaining 0.06 acres is excluded under EPC ECM Section 1.6.1.B.5. Colt Court is within the Equine Meadows subdivision and the existing topography directs stormwater away from Iron Ridge Pond 2.

Basin P is 5.00 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale P. Basin P stormwater (Q_5 = 2.8 cfs Q_{100} = 11.7 cfs) is captured in Roadside Swale P and conveyed to DP12 (Q_5 = 2.9 cfs Q_{100} = 14.8 cfs) where it combines with flows from basin Q and enters a 24" RCP culvert (public) which transports flows under Colt Court to DP13, see basin descriptions below. Basin P will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin Q is 1.21 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale Q. Basin Q stormwater (Q_5 = 1.1 cfs Q_{100} = 3.8 cfs) is captured in Roadside Swale Q and conveyed to DP12 (Q_5 = 2.9 cfs Q_{100} = 14.8 cfs). where it combines with flows from basin P and enters a 24" RCP culvert (public) which transports flows under Colt Court to DP13, see basin descriptions below. Basin Q will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin R is 1.82 acres of proposed 2.5+ acres lots, Colt Court and associated roadside swale R. Basin R stormwater (Q_5 = 1.8 cfs Q_{100} = 5.5 cfs) is captured in Roadside Swale R and conveyed to DP13 (Q_5 = 4.7 cfs Q_{100} = 21.5 cfs) where flows combine with piped flows from DP12 and basin S flows. DP13 flow is conveyed to Pond 2 at DP14 in "swale DP13 – DP14". Basin R will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin S is 0.57 acres of proposed 2.5+ acres lots, Colt Court and roadside swale S. Basin R stormwater (Q_5 = 0.9 cfs Q_{100} = 2.2 cfs) is captured in Roadside Swale S and conveyed to DP13 (Q_5 = 4.7 cfs Q_{100} = 21.5 cfs) where flows combine with piped flows from DP12 and basin R flows. DP13 flow is conveyed to Pond 2 at DP14 in "swale DP13 – DP14". Basin S will be captured and detained in Pond 2 for full spectrum water quality and detention.

Basin T is 0.97 acres of proposed 2.5+ acres lots, "Swale DP13-14" and Pond 2. Basin F stormwater (Q_5 = 0.5 cfs Q_{100} = 2.6 cfs) overland flows to Pond 2 at DP14 (Q_5 = 4.8 cfs Q_{100} = 22.7 cfs) where it combines with flows transported in the swale from DP13. Basin T will be captured and detained in Pond 2 for full spectrum water quality and detention. Pond 2 will release flows through a full-spectrum outlet structure via a 24" RCP storm sewer (private) into a low-tailwater basin and connected "DP14.1 outfall swale" @ DP14.1 (Q_5 = 0.1 cfs Q_{100} = 14.4 cfs). "DP14.1 outfall swale" transports flows through basin U to Tributary 1 @ DP5.1 (Q_5 = 8.5 cfs Q_{100} = 72.3 cfs), where flows combine with flows from basin H, basin U4, and DP5.

Basin U1 is 6.63 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U1 stormwater (Q_5 = 1.5 cfs Q_{100} = 9.9 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 (Q_5 = 8.4 cfs Q_{100} = 64.5 cfs), where flows combine with flows Basin U2, U3, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U1 will not be detained in Pond 1. Basin U1 is

excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U2 is 7.43 acres of proposed 2.5+ acres lots. Basin U2 stormwater (Q_5 = 2.6 cfs Q_{100} = 14.1 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 (Q_5 = 8.4 cfs Q_{100} = 64.5 cfs), where flows combine with flows Basin U1, U3, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U2 will not be detained in Pond 1. Basin U2 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U3 is 8.41 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U3 stormwater (Q_5 = 2.2 cfs Q_{100} = 12.6 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP5 (Q_5 = 8.4 cfs Q_{100} = 64.5 cfs), where flows combine with flows Basin U1, U2, basin G, K, and DP4.1. Flows continue in Tributary 1 to DP5.1. Basin U3 will not be detained in Pond 1. Basin U3 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U4 is 4.00 acres of proposed 2.5+ acres lots, offsite area, and undevelopable land within Tributary #1. Basin U4 stormwater (Q_5 = 1.7 cfs Q_{100} = 7.8 cfs) flows towards proposed DP14.1 outfall swale and is directed in the swale to DP5.1 (Q_5 = 8.5 cfs Q_{100} = 72.3 cfs) in Tributary #1 where flows combine with flows from DP5, DP14.1 (Pond 2 controlled release). Flows continue in Tributary 1 to DP6. Basin U4 will not be detained in Pond 1. Basin U4 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. Proposed DP14.1 Outfall Swale disturbance area is excluded per EPC ECM Section 1.6.1.B.7. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin U5 is 5.31 acres of a potion of lot 16 within the pond 2 drainage easement, offsite area, and undevelopable land within Tributary #1. Basin U5 stormwater (Q_5 = 1.5 cfs Q_{100} = 9.7 cfs) flows overland towards proposed DP6 (Q_5 = 9.5 cfs Q_{100} = 76.3 cfs) within Tributary 1 where flows combine with flows from DP5.1 & Basin H. Flows continue in Tributary 1 to DP15. Basin U5 will not be detained in Pond 1. Basin U5 is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM.See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

Basin V is 24.97 acres of proposed 2.5+ acres lots, offsite 2.5+ acre lots and undevelopable land within Tributary #1. Basin V stormwater (Q_5 = 6.1 cfs Q_{100} = 37.7 cfs) follows historic drainage patterns and is collected in Tributary #1 at DP15 (Q_5 = 11.6 cfs Q_{100} = 85.33 cfs), a 72” CMP public culvert at Walker Road where it combines with flows from DP6, basin I, & J. Basin V will not be detained in Pond 1. Basin V is excluded from permanent water quality treatment per the Large Lot Single Family Sites exclusion in Appendix I of the EPC DCM. See end of *Proposed Basin Description* section for a comparison of existing and proposed 100-year discharge rates.

The total flow @ DP15, including offsite flows from Tributarys 1 & 2 is (Q_5 = 46.3 cfs Q_{100} = 287.7 cfs).

The total flow @ DP11, including offsite flows from Tributary 3 is (Q_5 = 8.4 cfs Q_{100} = 40.8 cfs)

EXISTING V. PROPOSED DESIGN POINT COMPARISON						
Ex/Pr DP	Ex Q_5 (cfs)	Ex Q_{100} (cfs)	Pr Q_5 (cfs)	Pr Q_{100} (cfs)	Q_5 Change	Q_{100} Change
5/15	14.0	89.0	11.6	85.3	-17.1%	-4.2%
7/11	3.6	20.5	4.1	20.4	13.9%	-0.4%

Existing Design Point 5 and Proposed Design Point 15 represent the site's outfall within Tributary #1. Existing Design Point 7 and Proposed Design Point 11 represent the site's outfall within Tributary #3. See below for flow change descriptions. It should be noted while some onsite basins demonstrate a peak flow increase in the proposed condition, the site's overall peak discharge is less than historic at DP15 & DP11 for the 100-year event.

- The decrease in 5-year flow at DP5/15 can be attributed to the decrease in 5-year discharge occurring at Pond 1 and Pond 2 as well as an increase in the time of concentration for the developed condition. The 5-year discharge is 0.1 cfs, which is less than historic. The decrease in the 5-yr storm was necessary to achieve the required pond drain times.
- The decrease in 100-year flow at DP5/15 can be attributed to the increased time of concentration for the site in the developed condition. The flow after development is reduced at the existing 72" CMP public culvert at DP5/15 and it conveys the 100-yr flows within El Paso County criteria. Culvert analysis is included in Appendix C. Additionally, the total flow within the existing Tributary's 1 and 2, has remained unchanged or decreased as a result of this project.
- The increase in 5-year flow at DP7/11 can be attributed to the extension of Colt Court. The flow increase is less than a cfs and is negligible. A stability analysis of the DP10 outfall and Tributary #3 is provided within appendix C.
- The decrease in 100-yr flows at DP7/11 is negligible, but can be attributed to a small increase in time of concentration due to revised drainage patterns caused by the extension of Colt Court.

III. Drainage Design Criteria

a. Development Criteria Reference

The drainage analysis follows the criteria from the "Drainage Criteria Manual County of El Paso, Colorado" Volumes 1 and 2," as amended.

b. Hydrologic Criteria

Hydrologic criteria and runoff calculations are per the "Drainage Criteria Manual County of El Paso, Colorado Volume 1 Update" – Chapter 6 Hydrology. Onsite drainage improvements are designed for the 5-year storm (minor event) and 100-year storm (major event). 1-hr duration rainfall depths from NOAA Atlas 14 are utilized for pond sizing. Private, full spectrum pond design was completed using the latest version of Mile High Flood District's (MHFD) UD-Detention. The detention pond allowable release rates will be limited to historic rates.

d. Hydraulic Criteria

Hydraulic criteria for storm sewer and open channel sizing were obtained from the "Drainage Criteria Manual County of El Paso, Colorado" Chapter 9 Culvert Design and Chapter 10 Open Channels and Structures. Culvert and swale calculations were performed using Hydraflow Express AutoCAD extension.

IV. Drainage Facility Design

a. General Concept

Proposed roadway stormwater will be captured and conveyed with roadside swales to onsite, full spectrum water quality and detention ponds (Pond and Pond 2). In areas where existing topography makes it feasible,

2.5+ acre lots are captured and detained in Pond 1 and Pond 2. Pond 1 and Pond 2 will discharge at less than historic rates to Tributary #1.

Swales:
Roadside swales will convey stormwater to proposed culverts and ponds. Roadside swales match the County typical section for a rural local roadway, consisting of a 2.5' deep v shaped swale with 4:1 and 3:1 side slopes with the exception of roadside swales N1 and N2. These swales have a reduced depth in order to fit within the existing R.O.W. and associated drainage and utility easements. Swale N1 and N2 remain stable while conveying the 100-yr design flow with adequate freeboard. Swales will remain stable while conveying the 100-yr design flow. Swales with velocities of 5fps or less & Froude #'s of 0.9 or less for the 100 design storm will be grass lined, while swales exceeding 5 fps or 0.9 Froude # will be armored/mitigated with Rock Check Dams to slow flow to non-erosive velocities. Please note that where rock check dams are installed, flows will be impounded by the downstream check dam. Flows will either slowly filter through the rock, or in larger storm events over-top the check dams. The effective slope of the swale is reduced to 0 by these check dams, as the downstream peak/top is equal to the toe of the upstream dam in elevation. This results in weir control for an overtopping dam. Please see the weir calculation included in appendix C which shows that for the check dam with the most flow (Basin P), the velocity is reduced to 2.55 fps. A "stable slope" calculation was also included for Roadside Swales requiring Check Dam stabilization, which shows the maximum slope that those swales are stable for while conveying the 100-yr flow which in all cases is greater than the effective slope of swales armored with check dams and therefore all swales will remain stable if lined/armored per the finding of this report and associated construction documents.

Swales will also convey stormwater from the roadside swales to Ponds 1 and 2 and from ponds 1 and 2 to Tributary 1. Swales outside of the ROW that exceed 5-fps or 0.9 Froude # for the 100-yr design storm will be armored with Turf Reinforcement Mat. See appendix C for hydraulic calcs.

Culverts:
Culverts will convey stormwater underneath roadways and future driveways. All future driveways shall use an 18" culvert with the exception of Lots 12 & 13 Filing No. 2 that shall use a 24" culvert. All culverts have been sized to convey the 100-yr flow without over-topping and with a HW-D ration of less than 1.5. Culvert inlets and outlets are stabilized with riprap pads where necessary. All culverts include FES's or headwalls at each end.

b. Water Quality & Detention

Pond 1
Water quality and detention for Basins B-F is provided in Pond 1: a private, full spectrum detention pond south of Brown Road along Tributary #1. A total of 14.99 acres at 15.7% imperviousness will be detained in Pond 1. The WQCV is 0.121 ac-ft, the EURV is 0.229 ac-ft, and the 100-year volume is 0.677 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 59 and 62 hours, respectively. A concrete bottom forebay will be located at the swale outfall into Pond 1. A 2.0' concrete trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance of the pond facilities. The pond and its components are located in a permanent easement. A 16' riprap lined, emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0'+ of freeboard towards Tributary #1.

Pond 2
Water quality and detention for Basins P-T is provided in Pond 2: a private, full spectrum detention pond north of Colt Court. A total of 9.57 acres at 17.0% imperviousness will be detained in Pond 2. The WQCV is 0.082 ac-ft, the EURV is 0.078 ac-ft, and the 100-year volume is 0.291 ac-ft. The WQCV, EURV and 100-year storms are released in 40, 60 and 61 hours, respectively. A concrete bottom forebay will be located at the swale outfall into Pond 2. A 2.0' concrete trickle channel conveys flow towards the outlet structure. A 10' access and maintenance road is provided to the bottom of the pond to facilitate future maintenance of the

pond facilities. The pond and its components are located in a permanent easement. A 10' riprap lined, emergency overflow spillway is provided that conveys the developed, peak 100-yr flow rate with 1.0' of freeboard towards Tributary #1.

See below Water Quality Summary table.

WATER QUALITY SUMMARY TABLE

Sub-basin	Area (acres)	WQ Source				
		Pond	Exclusion I.6.			Undeveloped
A1	8.74		1.B.5			
A2	5.68		1.B.5			
B1	6.83	Pond 1				
B2	1.13	Pond 1				
C	2.84	Pond 1				
D	0.86	Pond 1				
E	0.47	Pond 1				
F	2.87	Pond 1				
G	8.15		1.B.5			
H	9.25		1.B.5			
I	3.54					X
J	1.35					X
K	0.89		1.B.5			
L1	4.82		1.B.5			
L2	7.18		1.B.5			
M	2.06		1.B.5			
N1	1.06		1.B.5		3.A.1	
N2	1.25		1.B.5		3.A.1	
O1	0.56		1.B.5		3.A.1	
O2	0.15		1.B.5		3.A.1	
P	5.00	Pond 2				
Q	1.21	Pond 2				
R	1.82	Pond 2				
S	0.57	Pond 2				
T	0.97	Pond 2				
U1	6.63		1.B.5			X
U2	7.43		1.B.5			
U3	8.41		1.B.5			
U4	4.00		1.B.5	1.B.7		
U5	5.31		1.B.5			X
V	24.97		1.B.5			X
TOTAL	**136.01**	**24.56**	**75.37**	**0.46**	**0.49**	**35.12**

c. Major Drainageways

Tributary #1, an unnamed tributary to East Cherry Creek, bisects the site and conveys stormwater. Tributary # 2 is located in the southwest corner of the site and conveys stormwater to Tributary # 1. Tributary 3 crosses the southeast corner of the site and is the outfall for basin L-O. A stability analysis of Tributary #1-3 is included in appendix C.

d. Operations & Maintenance

An Operations and Maintenance Manual for Pond 1 and Pond 2 is provided with the this project. All drainage facilities including ponds, swales, and culverts will be located within Public R.O.W. or permanent easements. See the drainage map and final plat for easement and R.O.W. locations. Facilities within the Public R.O.W. will be maintained by El Paso County and facilities outside of the R.O.W. will be maintained by the HOA.

e. Grading & Erosion Control Plan

Due to the project disturbance area, a separate Grading and Erosion Control plan is included with this project.

f. Four Step Method

Step 1 – Reducing Runoff Volumes: Roof drains will route across landscape areas whenever possible to promote infiltration. In addition, grass lined drainage swales are used as the primary stormwater conveyance. The site disturbance was minimized to the extent possible to preserve vegetation which helps to slow runoff and promotes infiltration.

Step 2 – Treat and slowly release the WQCV: Onsite, private full spectrum detention ponds provide water quality treatment for the site. The WQCV is released over a period of 40 hours.

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. Drainage channels will be lined with non-erosive soils and permanently seeded to provide stabilization. Where required due to erosive velocities, turf reinforcement mat will provide stabilization. Stormwater discharge points will be adequately stabilized with riprap pads and low-tailwater basins.

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 located within the East Cherry Creek Drainage Basin. There is not an established basin and bridge fee for East Cherry Creek.

h. Engineer's Opinion of Probable Cost

An engineer's opinion of probable costs is provided within appendix E.

V. Summary

IRON RIDGE SUBDIVISION FILING NO. 1 & 2 remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements. The proposed development will not adversely affect downstream stormwater infrastructure or surrounding developments. This report meets the latest EL Paso County criteria.

VI. References

I. El Paso County – Drainage Criteria Manual, 2018 as amended.

II. Urban Storm Drainage Criteria Manual, Mile High Flood District, March 2024.

III. USGS - Colorado StreamStats, https://www.usgs.gov/streamstats/colorado-streamstats.

IV. TopoZone – Topo Map of Stream in El Paso County, Colorado, https://www.topozone.com/colorado/el-paso-co/stream.

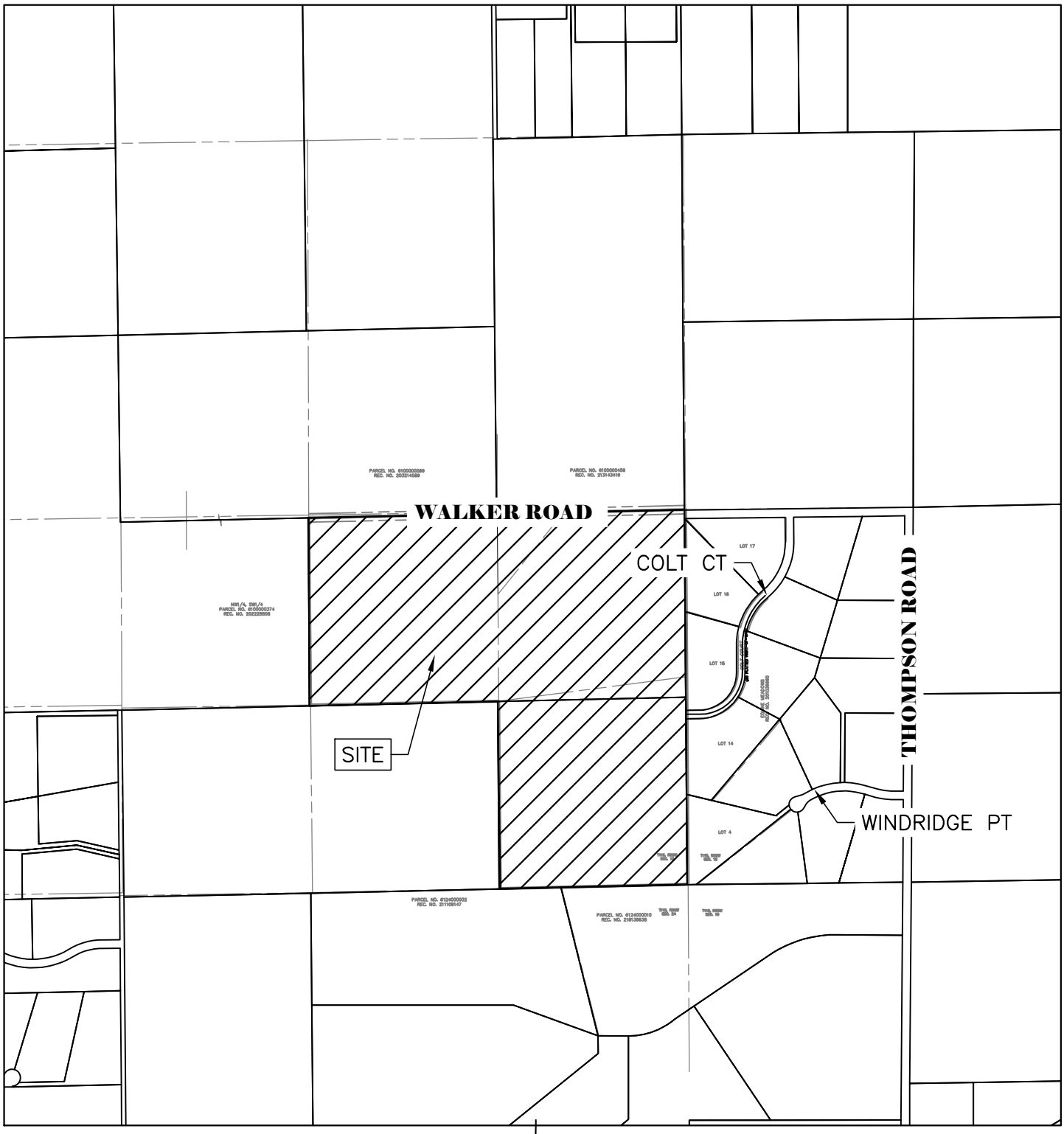
V. Federal Emergency Management Agency, Flood Map Service Center - https://msc.fema.gov/portal/home, September 2024.

VI. Web Soil Survey, Natural Resources Conservation Service - https://websoilsurvey.nrcs.usda.gov/app/, September 2024.

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

IRON RIDGE SUBDIVISION

VICINITY MAP



N

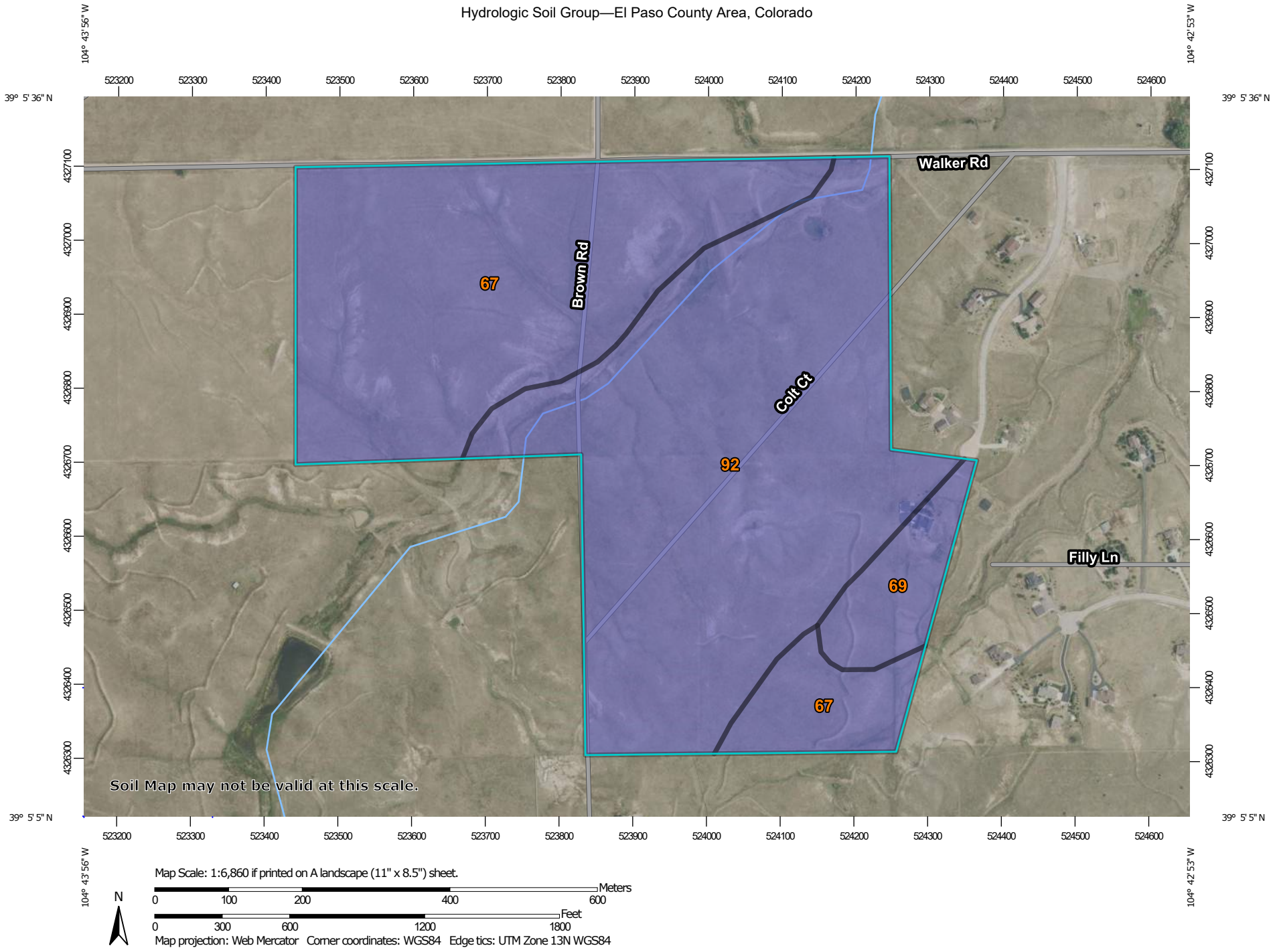
1000 500 0 1000 2000

ORIGINAL SCALE: 1" = 1000'

VICINITY MAP	
IRON RIDGE SUB.	
JOB NO. 25009	
LOCATION: EPC	SHEET
09/17/2025	
SHEET: 1	

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

Hydrologic Soil Group—El Paso County Area, Colorado



Map Scale: 1:6,860 if printed on A landscape (11" x 8.5") sheet.

N

0 100 200 400 600 Meters

0 300 600 1200 1800 Feet

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- 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: Jul 23, 2024—Aug 4, 2024

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
67	Peyton sandy loam, 5 to 9 percent slopes	B	54.2	42.4%
69	Peyton-Pring complex, 8 to 15 percent slopes	B	6.8	5.3%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	67.0	52.3%
Totals for Area of Interest			**127.9**	**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.

NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.0884°, Longitude: -104.7191°
Elevation: 7510 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	**0.237** (0.195-0.291)	**0.286** (0.235-0.351)	**0.372** (0.304-0.457)	**0.448** (0.364-0.553)	**0.560** (0.442-0.722)	**0.653** (0.502-0.849)	**0.750** (0.556-0.999)	**0.855** (0.606-1.17)	**1.00** (0.680-1.40)	**1.12** (0.737-1.58)
10-min	**0.347** (0.285-0.425)	**0.419** (0.344-0.514)	**0.544** (0.445-0.669)	**0.656** (0.533-0.809)	**0.820** (0.648-1.06)	**0.956** (0.735-1.24)	**1.10** (0.814-1.46)	**1.25** (0.887-1.71)	**1.47** (0.996-2.05)	**1.64** (1.08-2.31)
15-min	**0.423** (0.348-0.519)	**0.511** (0.420-0.627)	**0.664** (0.543-0.816)	**0.800** (0.650-0.987)	**1.00** (0.790-1.29)	**1.16** (0.896-1.52)	**1.34** (0.993-1.78)	**1.53** (1.08-2.08)	**1.79** (1.22-2.50)	**2.00** (1.32-2.82)
30-min	**0.609** (0.501-0.746)	**0.734** (0.603-0.900)	**0.952** (0.779-1.17)	**1.15** (0.932-1.41)	**1.43** (1.13-1.85)	**1.67** (1.28-2.17)	**1.92** (1.42-2.55)	**2.19** (1.55-2.98)	**2.56** (1.74-3.58)	**2.86** (1.88-4.04)
60-min	**0.772** (0.635-0.946)	**0.923** (0.758-1.13)	**1.20** (0.978-1.47)	**1.44** (1.17-1.78)	**1.82** (1.44-2.35)	**2.13** (1.64-2.79)	**2.47** (1.84-3.30)	**2.84** (2.02-3.89)	**3.36** (2.29-4.72)	**3.78** (2.50-5.34)
2-hr	**0.935** (0.773-1.14)	**1.11** (0.919-1.36)	**1.44** (1.18-1.76)	**1.74** (1.42-2.13)	**2.20** (1.76-2.84)	**2.60** (2.02-3.38)	**3.03** (2.26-4.02)	**3.49** (2.50-4.76)	**4.16** (2.86-5.81)	**4.71** (3.13-6.61)
3-hr	**1.02** (0.844-1.24)	**1.20** (0.996-1.46)	**1.55** (1.28-1.88)	**1.88** (1.54-2.29)	**2.39** (1.92-3.09)	**2.84** (2.21-3.69)	**3.33** (2.50-4.42)	**3.86** (2.78-5.26)	**4.64** (3.20-6.47)	**5.28** (3.52-7.38)
6-hr	**1.18** (0.985-1.42)	**1.38** (1.15-1.66)	**1.76** (1.46-2.12)	**2.13** (1.75-2.58)	**2.72** (2.21-3.50)	**3.24** (2.55-4.20)	**3.82** (2.89-5.06)	**4.47** (3.24-6.06)	**5.42** (3.76-7.51)	**6.20** (4.16-8.61)
12-hr	**1.39** (1.16-1.66)	**1.61** (1.34-1.92)	**2.02** (1.69-2.43)	**2.44** (2.02-2.94)	**3.10** (2.52-3.96)	**3.68** (2.91-4.73)	**4.33** (3.30-5.68)	**5.05** (3.68-6.79)	**6.11** (4.27-8.41)	**6.98** (4.72-9.63)
24-hr	**1.63** (1.37-1.94)	**1.90** (1.60-2.26)	**2.40** (2.01-2.86)	**2.86** (2.39-3.43)	**3.60** (2.94-4.54)	**4.23** (3.35-5.37)	**4.92** (3.76-6.39)	**5.67** (4.15-7.55)	**6.77** (4.76-9.23)	**7.66** (5.21-10.5)
2-day	**1.90** (1.60-2.24)	**2.25** (1.90-2.66)	**2.87** (2.42-3.40)	**3.42** (2.86-4.06)	**4.24** (3.45-5.26)	**4.91** (3.90-6.16)	**5.63** (4.31-7.22)	**6.39** (4.69-8.41)	**7.47** (5.27-10.1)	**8.33** (5.70-11.3)
3-day	**2.09** (1.77-2.45)	**2.47** (2.09-2.90)	**3.14** (2.65-3.70)	**3.73** (3.13-4.41)	**4.59** (3.75-5.66)	**5.30** (4.22-6.60)	**6.04** (4.64-7.71)	**6.84** (5.03-8.94)	**7.94** (5.62-10.7)	**8.82** (6.06-12.0)
4-day	**2.24** (1.91-2.63)	**2.64** (2.24-3.10)	**3.33** (2.82-3.92)	**3.94** (3.32-4.65)	**4.83** (3.96-5.94)	**5.57** (4.44-6.92)	**6.34** (4.88-8.06)	**7.16** (5.28-9.34)	**8.30** (5.89-11.1)	**9.21** (6.35-12.5)
7-day	**2.64** (2.26-3.08)	**3.06** (2.61-3.57)	**3.79** (3.22-4.43)	**4.44** (3.75-5.21)	**5.39** (4.43-6.58)	**6.17** (4.94-7.62)	**6.99** (5.41-8.83)	**7.86** (5.84-10.2)	**9.08** (6.48-12.1)	**10.0** (6.97-13.5)
10-day	**2.98** (2.55-3.46)	**3.43** (2.94-3.99)	**4.21** (3.59-4.90)	**4.90** (4.15-5.72)	**5.90** (4.86-7.17)	**6.72** (5.40-8.26)	**7.58** (5.88-9.54)	**8.49** (6.32-11.0)	**9.76** (6.99-12.9)	**10.8** (7.50-14.4)
20-day	**3.94** (3.39-4.54)	**4.52** (3.88-5.21)	**5.48** (4.69-6.34)	**6.30** (5.37-7.32)	**7.48** (6.18-8.99)	**8.42** (6.80-10.2)	**9.39** (7.32-11.7)	**10.4** (7.78-13.3)	**11.8** (8.48-15.5)	**12.9** (9.01-17.1)
30-day	**4.74** (4.09-5.44)	**5.43** (4.68-6.23)	**6.56** (5.64-7.56)	**7.52** (6.42-8.69)	**8.84** (7.31-10.5)	**9.87** (7.98-11.9)	**10.9** (8.53-13.5)	**12.0** (8.99-15.2)	**13.4** (9.68-17.5)	**14.5** (10.2-19.2)
45-day	**5.74** (4.97-6.56)	**6.59** (5.70-7.54)	**7.95** (6.85-9.11)	**9.06** (7.77-10.4)	**10.6** (8.73-12.5)	**11.7** (9.46-14.0)	**12.8** (10.0-15.7)	**13.9** (10.5-17.6)	**15.4** (11.1-19.9)	**16.4** (11.6-21.7)
60-day	**6.61** (5.73-7.53)	**7.58** (6.57-8.65)	**9.13** (7.89-10.4)	**10.4** (8.91-11.9)	**12.0** (9.94-14.1)	**13.2** (10.7-15.8)	**14.4** (11.3-17.6)	**15.5** (11.7-19.5)	**16.9** (12.3-21.8)	**18.0** (12.7-23.6)

[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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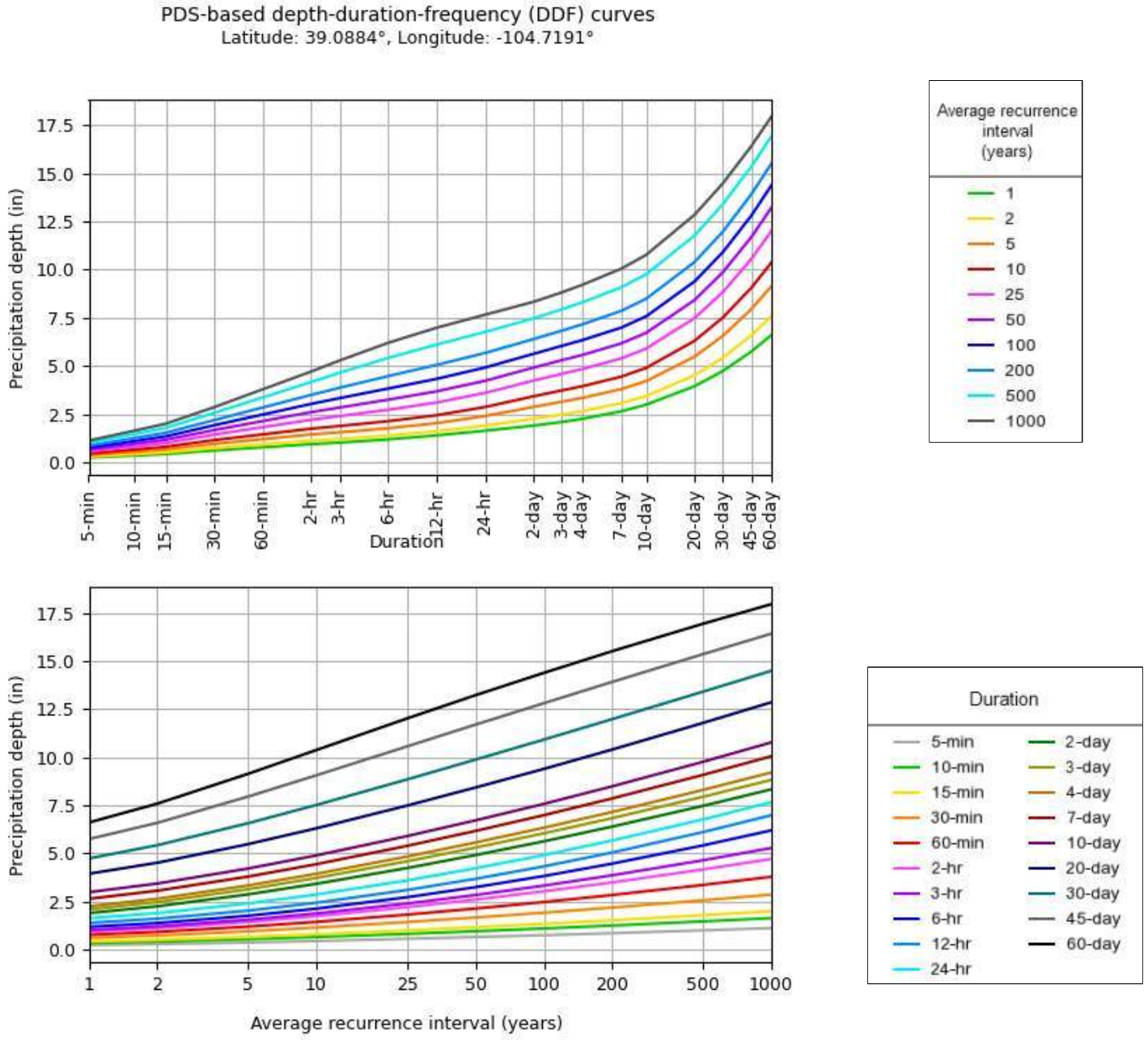
PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Thu Jun 19 01:06:57 2025

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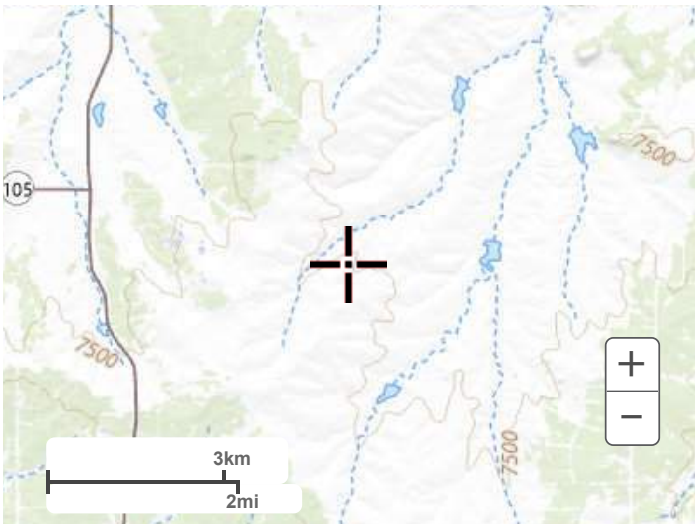
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

NOTES TO USERS

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

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

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

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

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the **same vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

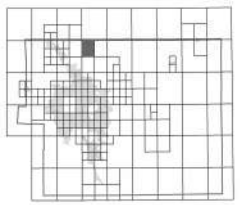
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/businessnfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

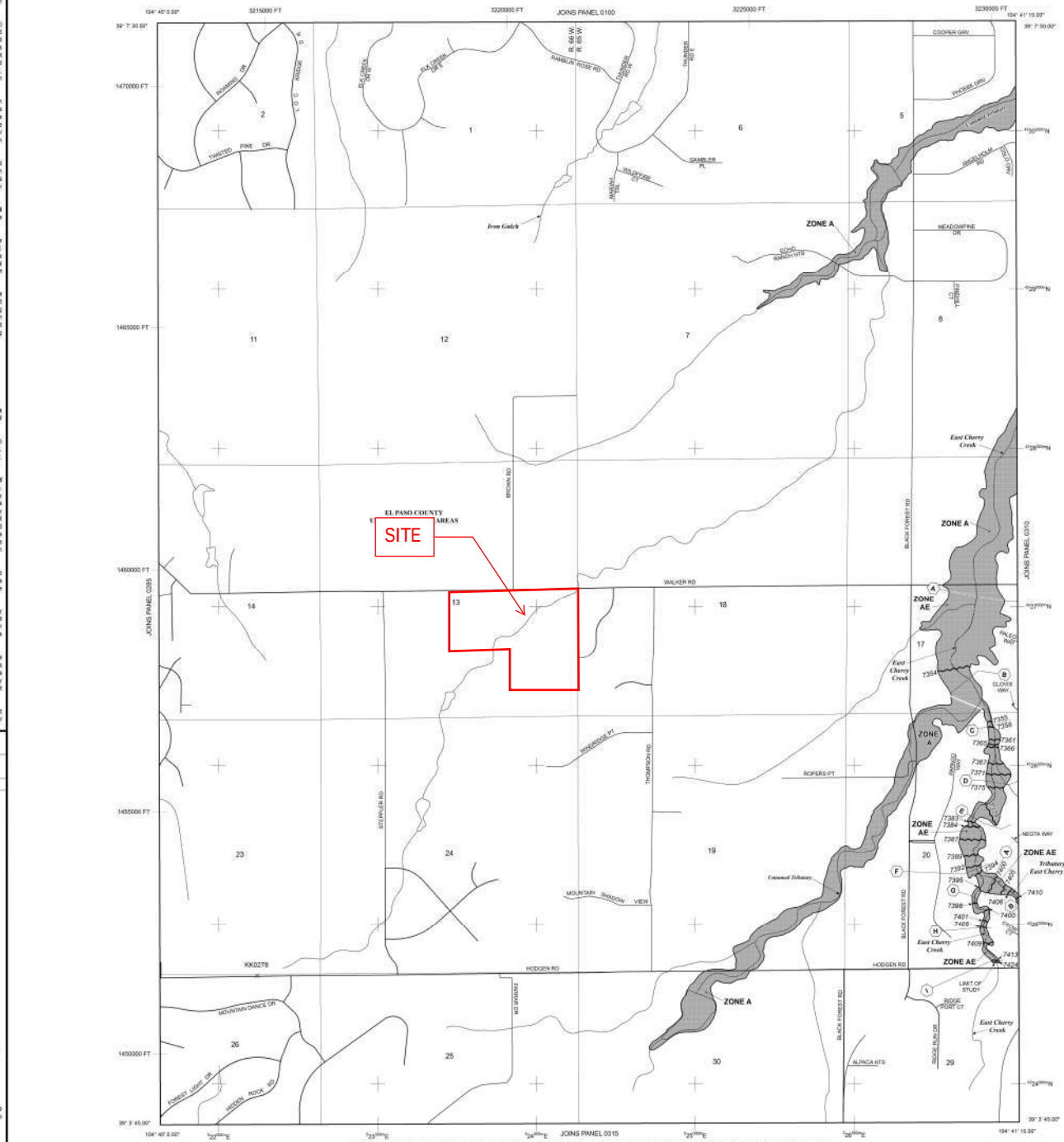
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



LEGEND

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

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

Floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
A — A — Cross section line
23 — 23 — Transect line
97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0305G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 305 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0305	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0305G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

APPENDIX B – HYDROLOGIC CALCULATIONS

Subdivision:	Iron Ridge Subdivision
Location:	El Paso County
Project Name:	Iron Ridge Subdivision
Project Number:	25009
Calculated By:	NQJ
Checked By:	REB
Date:	10/26/2026

EXISTING CONDITIONS - BASIN SUMMARY TABLE

Sub-basin	Area (ac)	Impervious	C_5	C_{100}	t_c (min)	$Q_{5\text{-YR}}$ (cfs)	$Q_{100\text{-YR}}$ (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	14.6%	0.18	0.43	12.2	1.9	7.9
EX12	0.89	16.7%	0.20	0.44	11.0	0.7	2.6

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	3.5	21.3
2	3.9	24.4
3	11.6	74.4
4	12.5	80.8
5 (ONSITE)	14.0	89.0
5 (TOTAL)	48.7	291.5
6	2.7	18.4
7 (ONSITE)	3.6	20.5
7 (TOTAL)	7.9	40.9

COMPOSITE % IMPERVIOUS CALCULATIONS - EXISTING CONDITIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

		Gravel Drives				Paved				2.5+ Acre Lots				Historic				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}	Area (ac)	% Imp.	C_5	C_{100}	
OS1	723.20	See Basin OS1 Streamstats data in Appendix B																		-
OS2	38.40	See Basin OS2 Streamstats data in Appendix B																		-
OS3	53.90	See Basin OS3 Streamstats data in Appendix B																		-
EX1	14.90	0.59	0.70	0.00	80.0%	0.90	0.96	0.22	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	14.68	2.0%	0.10	0.37	3.4%
EX2	6.91	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	6.91	2.0%	0.09	0.36	2.0%
EX3	17.98	0.59	0.70	0.00	80.0%	0.90	0.96	0.25	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	17.73	2.0%	0.10	0.37	3.4%
EX4	6.94	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	6.94	2.0%	0.09	0.36	2.0%
EX5	39.65	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	39.65	2.0%	0.09	0.36	2.0%
EX6	1.43	0.59	0.70	0.37	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	1.06	2.0%	0.22	0.45	22.2%
EX7	3.54	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	3.54	2.0%	0.09	0.36	2.0%
EX8	26.55	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	7.18	7.0%	0.09	0.36	19.36	2.0%	0.10	0.37	3.4%
EX9	12.23	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	12.23	2.0%	0.09	0.36	2.0%
EX10	2.15	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	2.15	2.0%	0.09	0.36	2.0%
EX11	2.85	0.59	0.70	0.18	80.0%	0.90	0.96	0.10	100.0%	0.12	0.39	2.58	7.0%	0.09	0.36	0.00	2.0%	0.18	0.43	14.6%
EX12	0.89	0.59	0.70	0.08	80.0%	0.90	0.96	0.07	100.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.74	2.0%	0.20	0.44	16.7%
EX1-EX9	**136.01**																			**3.1%**

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (NON-URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C_5	Weighted C_{100}	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)
OS1	723.20	See Basin OS1 Streamstats data in Appendix B															129.0
OS2	38.40	See Basin OS2 Streamstats data in Appendix B															62.4
OS3	53.90	See Basin OS3 Streamstats data in Appendix B															41.4
EX1	14.90	B	0.10	0.37	3.4%	300	6.6%	16.7	1490	4.4%	7.0	1.5	16.9	33.7	1790.0	37.9	33.7
EX2	6.91	B	0.09	0.36	2.0%	300	10.0%	14.8	1142	4.0%	15.0	3.0	6.3	21.1	1442.0	35.9	21.1
EX3	17.98	B	0.10	0.37	3.4%	300	8.3%	15.5	1390	5.0%	7.0	1.6	14.8	30.3	1690.0	36.4	30.3
EX4	6.94	B	0.09	0.36	2.0%	300	10.0%	14.8	520	6.9%	7.0	1.8	4.7	19.5	820.0	29.2	19.5
EX5	39.65	B	0.09	0.36	2.0%	300	5.0%	18.6	2064	5.3%	15.0	3.5	10.0	28.5	2364.0	41.8	28.5
EX6	1.43	B	0.22	0.45	22.2%	20	2.0%	5.7	1388	7.9%	15.0	4.2	5.5	11.1	1408.0	29.0	11.1
EX7	3.54	B	0.09	0.36	2.0%	200	10.0%	12.1	870	1.0%	15.0	1.5	9.7	21.7	1070.0	41.3	21.7
EX8	26.55	B	0.10	0.37	3.4%	300	2.7%	22.6	1600	4.8%	7.0	1.5	17.4	40.0	1900.0	38.3	38.3
EX9	12.23	B	0.09	0.36	2.0%	300	3.4%	21.0	890	5.6%	7.0	1.7	8.9	30.0	1190.0	32.4	30.0
EX10	2.15	B	0.09	0.36	2.0%	155	4.9%	13.4	254	5.9%	7.0	1.7	2.5	15.9	409.0	27.5	15.9
EX11	2.85	B	0.18	0.43	14.6%	175	7.0%	11.6	155	8.0%	15.0	4.2	0.6	12.2	330.0	24.3	12.2
EX12	0.89	B	0.20	0.44	16.7%	102	9.0%	8.0	220	3.0%	7.0	1.2	3.0	11.0	322.0	25.0	11.0

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).

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

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 6-3

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

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

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).

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

Where:

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).

Equation 6-5

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: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS1	OS1	723.20	-	129.0	115.59	0.29	33.9															BASIN OS1 @ DPOS1
	OS2	OS2	38.40	-	62.4	2.53	1.38	3.5					3.5	2.53	3					661	1.2	9.1	BASIN OS1 @ DPOS2
	OS1								129.0	118.12	0.29	34.6	34.6	118.12	0.8					2300	0.6	61.2	COMBINED 0S1 AND 0S2 FLOW @ DP0S1, CONTINUES TO DP5
	1	EX1	14.90	0.10	33.7	1.52	2.31	3.5	33.7	1.52	2.31	3.5	3.5	1.52	2.8					905	1.2	12.9	BASIN EX1 @ DP1, DRAINAGEWAY FLOW TO DP2
		EX2	6.91	0.09	21.1	0.62	3.01	1.9															BASIN EX2 @ DP2
	2								46.5	2.14	1.82	3.9	3.9	2.14	2.2					610	1.0	9.8	DP1 & BASIN EX2 COMBINED @ DP2, DRAINAGEWAY TO DP3
		EX3	17.98	0.10	30.3	1.82	2.46	4.5															BASIN EX3 @ DP3
		EX5	39.65	0.09	28.5	3.57	2.56	9.1															BASIN EX5 @ DP3
	3								56.3	7.53	1.54	11.6	11.6	7.53	0.9					476	0.7	11.9	DP2, BASIN EX3 & EX5 COMBINED @ DP3, DRAINAGEWAY FLOW TO DP4
		EX4	6.94	0.09	19.5	0.62	3.13	2.0															BASIN EX4 @ DP4
	4								56.3	8.15	1.54	12.5	12.5	8.15	2					750	1.0	12.6	DP3 & BASIN EX4 COMBINED @ DP4, DRAINAGEWAY FLOW TO DP5
		EX6	1.43	0.22	11.1	0.31	3.97	1.2															BASIN EX6 @ DP5
		EX7	3.54	0.09	21.7	0.32	2.97	0.9															BASIN EX7 @ DP5
		EX8	26.55	0.10	38.3	2.60	2.12	5.5															BASIN EX8 @ DP5
	5								69.0	11.39	1.23	14.0											TOTAL SITE FLOW @ DP5 (EXLUDES BASIN OS1 & OS2)
	5											48.7											TOTAL SITE & OFFSITE FLOW @ DP5 (INCLUDES BASIN OS1 & OS2)

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

DESCRIPTION	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	OS3	OS3	53.90	-	41.4	2.15	2.00	4.3															BASIN OS3 FLOW @ DPOS3
	6	EX9	12.23	0.09	30.0	1.10	2.48	2.7					2.7	1.10	4.4					931	1.5	10.6	BASIN EX9 FLOW @ DP6, DRAINAGEWAY FLOW TO DP5
		EX10	2.15	0.09	15.9	0.19	3.43	0.7															BASIN EX10 @ DP7
		EX11	2.85	0.18	12.2	0.50	3.83	1.9															BASIN EX11 @ DP7
		EX12	0.89	0.20	11.0	0.18	3.99	0.7															BASIN EX12 (Flows off-site)
	7								40.5	1.79	2.03	3.6											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (EXCLUDES BASIN OS3)
	7											7.9											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (INCLUDES BASIN OS3)

Notes:
Street, Pipe, & OS Basin 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: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	OS1	OS1	723.20	-	129.0	407.6	0.49	199.0															BASIN OS1 @ DPOS1
	OS2	OS2	38.40	-	62.4	7.07	2.32	16.4					3.5	7.07	3					661	1.2	9.1	BASIN OS1 @ DPOS2
	OS1								129.0	414.63	0.49	202.5											COMBINED 0S1 AND 0S2 FLOW @ DP0S1, CONTINUES TO DP5
	1	EX1	14.90	0.37	33.7	5.50	3.87	21.3	33.7	5.50	3.87	21.3	21.3	5.50	2.8					905	1.2	12.9	BASIN EX1 @ DP1, DRAINAGEWAY FLOW TO DP2
		EX2	6.91	0.36	21.1	2.49	5.05	12.6															BASIN EX2 @ DP2
	2								46.5	7.98	3.06	24.4	24.4	7.98	2.2					610	1.0	9.8	DP1 & BASIN EX2 COMBINED @ DP2, DRAINAGEWAY TO DP3
		EX3	17.98	0.37	30.3	6.62	4.14	27.4															BASIN EX3 @ DP3
		EX5	39.65	0.36	28.5	14.27	4.29	61.2															BASIN EX5 @ DP3
	3								56.3	28.88	2.58	74.4	74.4	28.88	0.9					476	0.7	11.9	DP2, BASIN EX3 & EX5 COMBINED @ DP3, DRAINAGEWAY FLOW TO DP4
		EX4	6.94	0.36	19.5	2.50	5.25	13.1															BASIN EX4 @ DP4
	4								56.3	31.38	2.58	80.8	80.8	31.38	2					750	1.0	12.6	DP3 & BASIN EX4 COMBINED @ DP4, DRAINAGEWAY FLOW TO DP5
		EX6	1.43	0.45	11.1	0.64	6.66	4.3															BASIN EX6 @ DP5
		EX7	3.54	0.36	21.7	1.27	4.98	6.3															BASIN EX7 @ DP5
		EX8	26.55	0.37	38.3	9.77	3.55	34.7															BASIN EX8 @ DP5
	5								69.0	43.06	2.07	89.0											TOTAL SITE FLOW @ DP5 (EXLUDES BASIN OS1 & OS2)
	5											291.5											TOTAL SITE & OFFSITE FLOW @ DP5 (INCLUDES BASIN OS1 & OS2)

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge Subdivision
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 10/26/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	OS3	OS3	53.90	-	41.4	6.09	3.35	20.4															BASIN OS3 FLOW @ DPOS3
	6	EX9	12.23	0.36	30.0	4.40	4.17	18.4					18.4	4.40	2.5					931	1.1	14.0	BASIN EX9 FLOW @ DP6, DRAINAGEWAY FLOW TO DP5
		EX10	2.15	0.36	15.9	0.77	5.76	4.5															BASIN EX10 @ DP7
		EX11	2.85	0.43	12.2	1.22	6.42	7.9															BASIN EX11 @ DP7
		EX12	0.89	0.44	11.0	0.39	6.70	2.6															BASIN EX12 (Flows off-site)
	7								44.0	6.40	3.20	20.5											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (EXCLUDES BASIN OS3)
	7											40.9											DP6, BASIN EX10 & EX11 @ DP7, HISTORIC DRAINAGE EAST IN DRAINAGEWAY (INCLUDES BASIN OS3)

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

Subdivision: Iron Ridge
Location: El Paso County
Project Name: Iron Ridge
Project Number: 25009
Calculated By: NQJ
Checked By: REB
Date: 9/10/2026

PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.06	18.6%	0.22	0.46	11.4	0.9	3.2
N2	1.25	18.1%	0.21	0.46	10.7	1.1	3.8
O1	0.56	25.0%	0.26	0.49	13.8	0.5	1.7
O2	0.15	66.2%	0.60	0.74	5.0	0.5	1.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

WATER QUALITY SUMMARY TABLE

Sub-basin	Area (acres)	WQ Source: Pond	Exclusion I.6.			Undeveloped
A1	8.74		1.B.5			
A2	5.68		1.B.5			
B1	6.83	Pond 1				
B2	1.13	Pond 1				
C	2.84	Pond 1				
D	0.86	Pond 1				
E	0.47	Pond 1				
F	2.87	Pond 1				
G	8.15		1.B.5			
H	9.25		1.B.5			
I	3.54					X
J	1.35					X
K	0.89		1.B.5			
L1	4.82		1.B.5			
L2	7.18		1.B.5			
M	2.06		1.B.5			
N1	1.06		1.B.5		3.A.1	
N2	1.25		1.B.5		3.A.1	
O1	0.56		1.B.5		3.A.1	
O2	0.15		1.B.5		3.A.1	
P	5.00	Pond 2				
Q	1.21	Pond 2				
R	1.82	Pond 2				
S	0.57	Pond 2				
T	0.97	Pond 2				
U1	6.63		1.B.5			X
U2	7.43		1.B.5			
U3	8.41		1.B.5			
U4	4.00		1.B.5	1.B.7		
U5	5.31		1.B.5			X
V	24.97		1.B.5			X
TOTAL	**136.01**	**24.56**	**75.37**	**0.46**	**0.49**	**35.12**

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	2.6	14.9
1.1	5.8	29.1
2	5.9	23.7
3	6.4	25.1
3.1	7.4	27.2
4	8.4	32.2
4.1	0.1	23.9
5	8.4	64.5
5.1	8.5	0.0
6	9.5	76.3
7	5.4	26.6
7.1	2.2	12.6
8	0.9	5.0
9	1.9	7.0
10	2.3	8.2
11 (ONSITE)	4.1	20.4
11 (TOTAL)	8.4	40.8
12	2.9	14.8
13	4.7	21.5
14	4.8	22.7
14.1	0.1	14.4
15 (ONSITE)	11.6	85.3
15 (TOTAL)	46.3	287.7

EXISTING V. PROPOSED DESIGN POINT COMPARISON

Ex/Pr DP	Ex Q_5 (cfs)	Ex Q_{100} (cfs)	Pr Q_5 (cfs)	Pr Q_{100} (cfs)	Q_5 Change	Q_{100} Change
5/15	14.0	89.0	11.6	85.3	-17.1%	-4.2%
7/11	3.6	20.5	4.1	20.4	13.9%	-0.4%

COMPOSITE % IMPERVIOUS CALCULATIONS - PROPOSED CONDITIONS

Subdivision: Iron Ridge
Location: El Paso County

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: NQJ
Date: 9/10/26

		Gravel				Paved				Pasture/Meadow/Lawns				2.5+ Large Lots				Historic				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}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	
OS1	723.20	See Basin OS1 Streamstats data in Appendix B																						-
OS2	38.40	See Basin OS2 Streamstats data in Appendix B																						-
OS3	53.90	See Basin OS3 Streamstats data in Appendix B																						-
A1	8.74	0.59	0.70	0.00	80.0%	0.90	0.96	0.06	100.0%	0.09	0.35	4.85	0.0%	0.12	0.39	3.83	7.0%	0.09	0.36	0.00	2.0%	0.11	0.37	3.8%
A2	5.68	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	5.68	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
B1	6.83	0.59	0.70	0.04	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	6.60	7.0%	0.09	0.36	0.00	2.0%	0.14	0.41	9.9%
B2	1.13	0.59	0.70	0.00	80.0%	0.90	0.96	0.33	100.0%	0.09	0.35	0.37	0.0%	0.12	0.39	0.42	7.0%	0.09	0.36	0.00	2.0%	0.34	0.55	32.3%
C	2.84	0.59	0.70	0.02	80.0%	0.90	0.96	0.28	100.0%	0.09	0.35	0.22	0.0%	0.12	0.39	2.31	7.0%	0.09	0.36	0.00	2.0%	0.20	0.45	16.2%
D	0.86	0.59	0.70	0.04	80.0%	0.90	0.96	0.32	100.0%	0.09	0.35	0.33	0.0%	0.12	0.39	0.17	7.0%	0.09	0.36	0.00	2.0%	0.42	0.60	41.9%
E	0.47	0.59	0.70	0.03	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.24	0.0%	0.12	0.39	0.02	7.0%	0.09	0.36	0.00	2.0%	0.43	0.60	42.7%
F	2.87	0.59	0.70	0.09	80.0%	0.90	0.96	0.03	100.0%	0.09	0.35	0.03	0.0%	0.12	0.39	2.71	7.0%	0.09	0.36	0.00	2.0%	0.14	0.41	10.3%
G	8.15	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	1.71	0.0%	0.12	0.39	6.44	7.0%	0.09	0.36	0.00	2.0%	0.11	0.38	5.5%
H	9.25	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	5.18	0.0%	0.12	0.39	4.07	7.0%	0.09	0.36	0.00	2.0%	0.10	0.37	3.1%
I	3.54	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	3.54	2.0%	0.09	0.36	2.0%
J	1.35	0.59	0.70	0.00	80.0%	0.90	0.96	0.34	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.10	7.0%	0.09	0.36	0.91	2.0%	0.30	0.51	27.1%
K	0.89	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.89	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
L1	4.82	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.43	0.0%	0.12	0.39	4.39	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	6.4%
L2	7.18	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.94	0.0%	0.12	0.39	4.24	7.0%	0.09	0.36	0.00	2.0%	0.11	0.37	4.1%
M	2.06	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.04	0.0%	0.12	0.39	2.02	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	6.9%
N1	1.06	0.59	0.70	0.02	80.0%	0.90	0.96	0.12	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.92	7.0%	0.09	0.36	0.00	2.0%	0.22	0.46	18.6%
N2	1.25	0.59	0.70	0.01	80.0%	0.90	0.96	0.14	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	1.10	7.0%	0.09	0.36	0.00	2.0%	0.21	0.46	18.1%
O1	0.56	0.59	0.70	0.04	80.0%	0.90	0.96	0.08	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.45	7.0%	0.09	0.36	0.00	2.0%	0.26	0.49	25.0%
O2	0.15	0.59	0.70	0.01	80.0%	0.90	0.96	0.09	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	0.05	7.0%	0.09	0.36	0.00	2.0%	0.60	0.74	66.2%
P	5.00	0.59	0.70	0.04	80.0%	0.90	0.96	0.34	100.0%	0.09	0.35	0.55	0.0%	0.12	0.39	4.07	7.0%	0.09	0.36	0.00	2.0%	0.17	0.43	13.2%
Q	1.21	0.59	0.70	0.03	80.0%	0.90	0.96	0.18	100.0%	0.09	0.35	0.26	0.0%	0.12	0.39	0.75	7.0%	0.09	0.36	0.00	2.0%	0.24	0.47	21.1%
R	1.82	0.59	0.70	0.04	80.0%	0.90	0.96	0.35	100.0%	0.09	0.35	0.39	0.0%	0.12	0.39	1.04	7.0%	0.09	0.36	0.00	2.0%	0.27	0.50	24.8%
S	0.57	0.59	0.70	0.03	80.0%	0.90	0.96	0.17	100.0%	0.09	0.35	0.24	0.0%	0.12	0.39	0.12	7.0%	0.09	0.36	0.00	2.0%	0.37	0.57	36.8%
T	0.97	0.59	0.70	0.05	80.0%	0.90	0.96	0.01	100.0%	0.09	0.35	0.91	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.00	2.0%	0.12	0.37	5.2%
U1	6.63	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	6.63	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.00	2.0%	0.09	0.35	0.0%
U2	7.43	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	7.43	7.0%	0.09	0.36	0.00	2.0%	0.12	0.39	7.0%
U3	8.41	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.15	0.0%	0.12	0.39	6.26	7.0%	0.09	0.36	0.00	2.0%	0.11	0.38	5.2%
U4	4.00	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	2.39	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	1.60	2.0%	0.09	0.35	0.8%
U5	5.31	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	5.26	0.0%	0.12	0.39	0.00	7.0%	0.09	0.36	0.06	2.0%	0.09	0.35	0.0%
V	24.97	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.09	0.35	0.00	0.0%	0.12	0.39	9.58	7.0%	0.09	0.36	15.39	2.0%	0.10	0.37	3.9%
A-V TOTAL	**136.01**																							**6.9%**
Pond 1 (B-F)	**14.99**																							**15.7%**
Pond 2 (P-T)	**9.57**																							**17.0%**

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Iron Ridge
Location: El Paso County

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: NQJ
Date: 9/10/26

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)
OS1	723.20	B	See Basin OS1 Streamstats data in Appendix B													129.0
OS2	38.40	B	See Basin OS2 Streamstats data in Appendix B													62.4
OS3	53.90	B	See Basin OS3 Streamstats data in Appendix B													41.4
A1	8.74	B	0.11	3.8%	300	8.6%	15.2	903	4.5%	7.0	1.5	10.1	25.4	1203.0	32.8	25.4
A2	5.68	B	0.12	7.0%	175	6.3%	12.8	530	4.8%	7.0	1.5	5.8	18.5	705.0	28.8	18.5
B1	6.83	B	0.14	9.9%	300	5.7%	16.8	832	5.6%	15.0	3.5	3.9	20.7	1132.0	30.0	20.7
B2	1.13	B	0.34	32.3%	134	2.0%	12.6	693	5.6%	15.0	3.5	3.3	15.9	827.0	24.1	15.9
C	2.84	B	0.20	16.2%	250	5.6%	14.6	413	6.0%	15.0	3.7	1.9	16.4	663.0	25.7	16.4
D	0.86	B	0.42	41.9%	127	1.7%	11.6	631	5.8%	15.0	3.6	2.9	14.6	758.0	21.8	14.6
E	0.47	B	0.43	42.7%	65	3.8%	6.3	530	3.4%	15.0	2.8	3.2	9.5	595.0	21.9	9.5
F	2.87	B	0.14	4.3%	240	4.1%	16.8	507	11.0%	7.0	2.3	3.6	20.4	747.0	27.9	20.4
G	8.15	B	0.11	5.5%	300	7.3%	16.0	1396	4.5%	7.0	1.5	15.7	31.7	1696.0	36.3	31.7
H	9.25	B	0.10	3.1%	205	7.1%	13.5	658	5.9%	7.0	1.7	6.4	19.9	863.0	30.3	19.9
I	3.54	B	0.09	2.0%	300	10.8%	14.4	665	1.0%	15.0	1.5	7.4	21.8	965.0	37.6	21.8
J	1.35	B	0.30	27.1%	99	6.0%	8.0	1257	4.1%	15.0	3.0	6.9	14.9	1356.0	29.5	14.9
K	0.89	B	0.12	7.0%	60	8.3%	6.8	270	5.5%	7.0	1.6	2.7	9.6	330.0	26.7	9.6
L1	4.82	B	0.12	6.4%	300	3.4%	20.5	895	5.6%	7.0	1.7	9.0	29.5	1195.0	31.3	29.5
L2	7.18	B	0.11	4.1%	300	3.7%	20.2	415	5.8%	7.0	1.7	4.1	24.3	715.0	28.3	24.3
M	2.06	B	0.12	6.9%	125	8.0%	10.0	272	3.7%	7.0	1.3	3.4	13.3	397.0	27.2	13.3
N1	1.06	B	0.22	18.6%	170	7.9%	10.5	152	4.0%	15.0	3.0	0.8	11.4	322.0	23.9	11.4
N2	1.25	B	0.21	18.1%	125	8.7%	8.8	210	1.5%	15.0	1.8	1.9	10.7	335.0	25.4	10.7
O1	0.56	B	0.26	25.1%	140	2.4%	13.4	110	11.0%	15.0	5.0	0.4	13.8	250.0	22.2	13.8
O2	0.15	B	0.62	68.1%	75	7.0%	3.9	58	4.0%	7.0	1.4	0.7	4.6	133.0	14.7	5.0
P	5.00	B	0.17	13.2%	300	6.6%	15.5	448	4.7%	15.0	3.3	2.3	17.8	748.0	26.9	17.8
Q	1.21	B	0.24	21.1%	132	8.3%	8.9	375	2.2%	15.0	2.2	2.8	11.7	507.0	25.9	11.7
R	1.82	B	0.27	24.8%	112	3.5%	10.5	794	5.3%	15.0	3.5	3.8	14.3	906.0	26.4	14.3
S	0.57	B	0.37	36.8%	30	2.0%	5.7	543	2.2%	15.0	2.2	4.1	9.8	573.0	24.1	9.8
T	0.97	B	0.12	5.2%	50	5.0%	7.3	244	6.9%	7.0	1.8	2.2	9.5	294.0	26.7	9.5

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Iron Ridge
Location: El Paso County

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: NQJ
Date: 9/10/26

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)
U1	6.63	B	0.09	0.0%	250	8.1%	14.5	1252	6.0%	6.0	1.5	14.2	28.7	1502.0	35.5	28.7
U2	7.43	B	0.12	7.0%	300	5.8%	17.2	524	5.0%	7.0	1.6	5.6	22.7	824.0	28.7	22.7
U3	8.41	B	0.11	5.2%	300	4.3%	19.1	1428	6.2%	7.0	1.7	13.7	32.7	1728.0	34.9	32.7
U4	4.00	B	0.09	0.8%	220	7.3%	14.0	829	6.4%	15.0	3.8	3.6	17.7	1049.0	31.9	17.7
U5	5.31	B	0.09	0.0%	300	10.0%	14.8	450	6.2%	6.0	1.5	5.0	19.8	750.0	29.3	19.8
V	24.97	B	0.10	3.9%	300	10.0%	14.6	1379	3.9%	7.0	1.4	16.6	31.2	1679.0	37.5	31.2

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: Iron Ridge
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	OS1	OS1	723.20	-	129.0	115.59	0.29	33.9															BASIN OS1 FLOW @ DPOS1,CONTINUES TO DP15
	OS2	OS2	38.40	-	62.4	2.53	1.38	3.5					3.5	2.53	3					661	1.2	9.1	BASIN OS2 FLOW @ DPOS2, CONTINUES TO DPOS1
	OS1								129.0	118.12	0.29	34.6	#####	118.12	0.8					2300	0.6	61.2	COMBINED 0S1 AND 0S2 FLOW @ DP0S1, CONTINUES TO DP15
	1	A1	8.74	0.11	25.4	0.95	2.73	2.6	25.4	0.95	2.73	2.6	2.6	0.95	4.9					260	1.5	2.8	BASIN A FLOW @ DP1, Continues through Basin A2 to DP1.1 where it combines with Basin A2 flows.
	1.1	A2	5.68	0.12	18.5	0.68	3.21	2.2	28.2	1.63	2.58	4.2	4.2	1.63	1.8					1369	0.9	24.3	BASIN A2 flows to DP1.1, combines with Basin A1 & OS2 flows and continues into Trbiutary 1 to DP5
	1.1								62.4	4.16	1.38	5.8	5.8	4.16	1.8					1369	0.9	24.3	TOTAL FLOW @ DP1.1 (includes off-site flow from OS2)
		B1	6.83	0.14	20.7	0.98	3.03	3.0															BASIN B1 FLOW @ DP2
		B2	1.13	0.34	15.9	0.39	3.44	1.3															BASIN B2 FLOW @ DP2
		C	2.84	0.20	16.4	0.56	3.38	1.9															BASIN C FLOW @ DP2
	2								20.7	1.93	3.03	5.9				5.9	1.93	1.0	30 / 18	65	6.1	0.2	BASIN B1, B2, & C COMBINED FLOW @ DP2, ENTERS 30" RCP CULVERT, PIPED TO DP3
		D	0.86	0.42	14.6	0.36	3.57	1.3								1.3	0.36	1.0	18	40	3.9	0.2	BASIN D FLOW IN ROADSIDE SWALE D, ENTERS 18" RCP CULVERT, PIPED TO DP3.1
		E	0.47	0.43	9.5	0.20	4.20	0.8															BASIN E FLOW, COMBINES IN SWALE @ DP3 WITH PIPED FLOWS FROM DP2, CONTINUES IN SWALE TO DP 3.1
	3								20.9	2.13	3.02	6.4	6.4	2.13	1.25					80	1.7	0.8	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
	3.1								21.7	2.49	2.97	7.4	7.4	2.49	6.4					240	3.8	1.1	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
		F	2.87	0.14	20.4	0.41	3.06	1.3															BASIN F FLOW ENTERS POND @ DP4
	4								22.8	2.90	2.89	8.4											COMBINED DP3.1 & BASIN F FLOWS @ DP4 (POND 1)
	4.1								27.8	0.04	2.60	0.1											CONTROLLED RELASE FROM POND 1, TRAVELS OVERLAND TO DP5

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		G	8.15	0.11	31.7	0.93	2.40	2.2															BASIN G FLOW @ DP5
		H	9.25	0.10	19.9	0.95	3.09	3.0															BASIN H FLOW @ DP6
		I	3.54	0.09	21.8	0.32	2.96	0.9															BASIN I FLOW @ DP15
		J	1.35	0.30	14.9	0.40	3.53	1.4															BASIN J FLOW @ DP15
		K	0.89	0.12	9.6	0.11	4.20	0.4					0.4	0.11	5.7					1902	1.7	19.0	BASIN K @ DP5
	5	U1	6.63	0.09	28.7	0.60	2.55	1.5															BASIN U1 FLOW, ENTERS TRIBUTARY 1, CONTINUES TO DP5
	5	U2	7.43	0.12	22.7	0.89	2.90	2.6															BASIN U2 FLOW ENTERS TRIBUTARY 1 WITHIN BASIN U1, CONTINUES IN TRIBUTARY 1 TO DP5
	5	U3	8.41	0.11	32.7	0.94	2.35	2.2															BASIN U3 FLOW ENTERS TRIBUTARY 1 @ DP5
	5								52.5	5.14	1.64	8.4	8.4	5.14	1.0					176	0.7	4.2	DP1, BASIN G, BASIN K, Basin U1-U3, & POND 1 CONTROLLED RELEASE (DP4.1) FLOWS @ DP5, DRAINAGEWAY FLOW TO DP6
	5.1	U4	4.00	0.09	17.7	0.36	3.27	1.2															BASIN U4 FLOW ENTERS DP14.1 OUTFALL SWALE, COMBINES W. POND 2 CONTROLLED RELEASE AND CONTINUES IN SWALE TO TRIBUTARY 1 @ DP5.1
	5.1								56.7	5.54	1.53	8.5	8.5	5.54	2.0					400	1.0	6.7	DP5, BASIN H, BASIN U1-4 & POND 2 DISCHARGE @ DP5.1, DRAINAGEWAY FLOW TO DP6
	6	U5	5.31	0.09	19.8	0.48	3.10	1.5															BASIN U5 FLOW ENTERS TRIBUTARY 1 @ DP6
	6								63.4	6.98	1.36	9.5	9.5	6.98	2					600	1.0	10.1	DP5, BASIN H, BASIN U & POND 2 DISCHARGE @ DP6, DRAINAGEWAY FLOW TO DP15
	OS3	OS3	53.90	-	41.4	2.15	2.00	4.3															BASIN OS3 @ DPOS3, DRAINAGEWAY TO DP11
	7	L1	4.82	0.12	29.5	0.57	2.51	1.4					1.4	0.57	2.5					1196	1.1	18.0	BASIN L1 @ DP7, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	7								41.4	2.72	2.00	5.4	5.4	2.72	2.5					1196	1.1	18.0	DP5, BASIN H, BASIN U & POND 2 DISCHARGE @ DP6, DRAINAGEWAY FLOW TO DP15
	7.1	L2	7.18	0.11	24.3	0.77	2.80	2.2					2.2	0.77	2.5					650	1.1	9.8	BASIN L2 @ DP7.1, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	8	M	2.06	0.12	13.3	0.25	3.70	0.9					0.9	0.25	2.5					525	1.1	7.9	BASIN M @ DP8, OFFSITE FLOW EAST TO DP11
		N1	1.06	0.22	11.4	0.23	3.94	0.9															BASIN N1 FLOW IN SWALE @ DP9
		N2	1.25	0.21	10.7	0.26	4.03	1.1															BASIN N2 FLOW IN SWALE @ DP9
	9								11.4	0.49	3.94	1.9	1.9	0.49	10					110	4.7	0.4	COMBINED FLOW IN SWALE @ DP9, ENTERS 18" RCP CULVERT, PIPED TO BASIN O1, CONTINUES OVERLAND TO DP10
		O1	0.56	0.26	13.8	0.15	3.65	0.5															BASIN O1 @ DP10

STANDARD FORM SF-3 - PROPOSED CONDITIONS

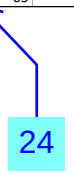
STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	10								13.8	0.15	3.65	0.5	0.5	0.15	10.0					350	2.2	2.6	DP9 & BASIN O1 @ DP10, OVERLAND FLOW TO DP11
		O2	0.15	0.62	5.0	0.09	5.17	0.5					0.5	0.09	11.0					400	2.3	2.9	BASIN O2 RUNOFF, SHEET FLOWS PER EXISTING DRAINAGE PATTERNS TO DP11
	11								47.5	1.82	1.79	3.3											DP7, DP8 & DP10 COMBINED @ DP11 (EXCLUDES BASIN OS3)
	11											7.6											DP7, DP8, DP10 & DPOS3 COMBINED @ DP11 (INCLUDES BASIN OS3)
		P	5.00	0.17	17.8	0.87	3.26	2.8															BASIN P FLOW @ DP12
		Q	1.21	0.24	11.7	0.29	3.90	1.1															BASIN Q FLOW @ DP12
	12								29.5	1.16	2.51	2.9				2.9	1.16	1.0	18	65	5.1	0.2	COMBINED BASIN P & Q FLOW @ DP12, ENTERS 24" RCP CULVERT, PIPED TO DP 13



STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 5-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		R	1.82	0.27	14.3	0.50	3.59	1.8															BASIN R FLOW @ DP13
		S	0.57	0.37	9.8	0.21	4.16	0.9															BASIN S FLOW @ DP13
	13								29.7	1.87	2.50	4.7	4.7	1.87	10.0					185	2.2	1.4	DP12, BASIN R & S COMBINED FLOW @ DP13 IN SWALE T, CONTINUE IN SWALE TO DP14 (POND 2)
		T	0.97	0.12	9.5	0.12	4.20	0.5															BASIN T FLOW @ DP14
	14								31.1	1.99	2.43	4.8											COMBINED DP13 & BASIN T FLOW @ DP14 (POND 2)
	14.1								36.1	0.05	2.20	0.1											CONTROLLED RELASE FROM POND 1 @ DP14.1, TRAVELS OVERLAND TO DP5
		V	24.97	0.10	31.2	2.54	2.42	6.1															BASIN V @ DP15
	15								73.5	10.23	1.14	11.6											TOTAL SITE FLOW @ DP15 (EXCLUDES BASIN OS1 & OS2)
	15											46.3											TOTAL SITE & OFFSITE FLOW @ DP15 (INCLUDES BASIN OS1 & OS2)

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

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	OS1	OS1	723.20	-	129.0	407.6	0.49	199.0															BASIN OS1 FLOW @ DPOS1,CONTINUES TO DP15
	OS2	OS2	38.40	-	62.4	7.07	2.32	16.4					3.5	7.07	3					661	1.2	9.1	BASIN OS2 FLOW @ DPOS2, CONTINUES TO DP15
	OS1								129.0	414.63	0.49	202.5											COMBINED 0S1 AND 0S2 FLOW @ DP0S1, CONTINUES TO DP15
	1	A1	8.74	0.37	25.4	3.25	4.59	14.9	25.4	3.25	4.59	14.9	14.9	3.25	4.9					260	1.5	2.8	BASIN A FLOW @ DP1, Continues through Basin A2 to DP1.1 where it combines with Basin A2 flows.
	1.1	A2	5.68	0.39	18.5	2.22	5.38	11.9	28.2	5.46	4.32	23.6	23.6	5.46	1.8					1369	0.9	24.3	BASIN A2 flows to DP1.1, combines with Basin A1 & OS2 flows and continues into Trbiutary 1 to DP5
	1.1								62.4	12.54	2.32	29.1	29.1	12.54	1.8					1369	0.9	24.3	TOTAL FLOW @ DP1.1 (includes off-site flow from OS2)
		B1	6.83	0.41	20.7	2.78	5.09	14.2															BASIN B1 FLOW @ DP2
		B2	1.13	0.55	15.9	0.62	5.77	3.6															BASIN B2 FLOW @ DP2
		C	2.84	0.45	16.4	1.26	5.68	7.2															BASIN C FLOW @ DP2
	2								20.7	4.66	5.09	23.7				23.7	4.66	1.0	30 18	65	13.4	0.1	BASIN B & C COMBINED FLOW @ DP2, ENTERS 30" RCP CULVERT, PIPED TO DP3
		D	0.86	0.60	14.6	0.51	5.99	3.1								3.1	0.51	1.0	18	40	5.1	0.1	BASIN D FLOW IN ROADSIDE SWALE D, ENTERS 18" RCP CULVERT, PIPED TO DP3.1
		E	0.47	0.60	9.5	0.28	7.05	2.0															BASIN E FLOW, COMBINES IN SWALE @ DP3 WITH PIPED FLOWS FROM DP2, CONTINUES IN SWALE TO DP 3.1
	3								20.8	4.94	5.08	25.1	25.1	4.94	1.25					80	1.7	0.8	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
	3.1								21.6	5.46	4.99	27.2	27.2	5.46	6.4					240	3.8	1.1	DP2, BASIN E & D @ DP3, SWALE FLOW TO DP4 (POND 1)
		F	2.87	0.41	20.4	1.16	5.13	6.0															BASIN F FLOW ENTERS POND @ DP4
	4								22.7	6.62	4.87	32.2											COMBINED DP3.1 & BASIN F FLOWS @ DP4 (POND 1)
	4.1								32.7	6.05	3.95	23.9											CONTROLLED RELASE FROM POND 1, TRAVELS OVERLAND TO DP5

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		G	8.15	0.38	31.7	3.11	4.03	12.5															BASIN G FLOW @ DP5
		H	9.25	0.37	19.9	3.40	5.19	17.7															BASIN H FLOW @ DP6
		I	3.54	0.36	21.8	1.27	4.97	6.3															BASIN I FLOW @ DP15
		J	1.35	0.51	14.9	0.69	5.93	4.1															BASIN J FLOW @ DP15
		K	0.89	0.39	9.6	0.35	7.05	2.4					2.4	0.35	5.7					1902	1.7	19.0	BASIN K @ DP5
	5	U1	6.63	0.35	28.7	2.32	4.28	9.9															BASIN U1 FLOW, ENTERS TRIBUTARY 1, CONTINUES TO DP5
	5	U2	7.43	0.39	22.7	2.90	4.86	14.1															BASIN U2 FLOW ENTERS TRIBUTARY 1 WITHIN BASIN U1, CONTINUES IN TRIBUTARY 1 TO DP5
	5	U3	8.41	0.38	32.7	3.19	3.94	12.6															BASIN U3 FLOW ENTERS TRIBUTARY 1 @ DP5
	5								52.5	23.39	2.76	64.5	64.5	23.39	1.0					176	0.7	4.2	DP1, BASIN G, BASIN K, Basin U1-U3, & POND 1 CONTROLLED RELEASE (DP4.1) FLOWS @ DP5, DRAINAGEWAY FLOW TO DP6
	5.1	U4	4.00	0.35	17.7	1.42	5.50	7.8															BASIN U4 FLOW ENTERS DP14.1 OUTFALL SWALE, COMBINES W. POND 2 CONTROLLED RELEASE AND CONTINUES IN SWALE TO TRIBUTARY 1 @ DP5.1
	5.1								56.7	28.22	2.56	72.3	72.3	28.22	2.0					400	1.0	6.7	DP5, BASIN H, BASIN U1-4 & POND 2 DISCHARGE @ DP5.1, DRAINAGEWAY FLOW TO DP6
	6	U5	5.31	0.35	19.8	1.86	5.21	9.7															BASIN U5 FLOW ENTERS TRIBUTARY 1 @ DP6
	6								63.4	33.48	2.28	76.3	76.3	33.48	2					600	1.0	10.1	DP5, BASIN H, BASIN U & POND 2 DISCHARGE @ DP6, DRAINAGEWAY FLOW TO DP15
	OS3	OS3	53.90	-	41.4	6.09	3.35	20.4															BASIN OS3 @ DPOS3, DRAINAGEWAY TO DP11
	7	L1	4.82	0.39	29.5	1.86	4.20	7.8					7.8	1.86	2.5					1196	1.1	18.0	BASIN L1 @ DP7, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	7								41.4	7.95	3.35	26.6	26.6	7.95	2.5					1196	1.1	18.0	TOTAL FLOW @ DP7 (includes off-site flow from OS3)
	7.1	L2	7.18	0.37	24.3	2.68	4.70	12.6					12.6	2.68	2.5					650	1.1	9.8	BASIN L2 @ DP7.1, OFFSITE FLOW EAST TO DP11 via TRIBUTARY 3
	8	M	2.06	0.39	13.3	0.80	6.21	5.0					5.0	0.80	2.5					525	1.1	7.9	BASIN M @ DP8, OFFSITE FLOW EAST TO DP11
		N1	1.06	0.46	11.4	0.49	6.61	3.2															BASIN N1 FLOW IN SWALE @ DP9
		N2	1.25	0.46	10.7	0.57	6.77	3.8															BASIN N2 FLOW IN SWALE @ DP9
													7.0	1.06	10					110	4.7	0.4	COMBINED FLOW IN SWALE @ DP9, ENTERS 18" RCP CULVERT, PIPED TO BASIN O1, CONTINUES OVERLAND TO

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

		DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	9								11.4	1.06	6.61	7.0											DP10
		O1	0.56	0.49	13.8	0.27	6.12	1.7															BASIN O1 @ DP10
	10								13.8	0.27	6.12	1.7	1.7	0.27	10					350	2.2	2.6	DP9 & BASIN O1 @ DP10, OVERLAND FLOW TO DP11
		O2	0.15	0.75	5.0	0.11	8.68	1.0					1.0	0.11	11.0					400	2.3	2.9	BASIN O2 RUNOFF, SHEET FLOWS PER EXISTING DRAINAGE PATTERNS TO DP11
	11								47.5	5.73	3.00	17.2											DP7, DP8 & DP10 COMBINED @ DP11 (EXCLUDES BASIN OS3)
	11											37.6											DP7, DP8, DP10 & DPOS3 COMBINED @ DP11 (INCLUDES BASIN OS3)
		P	5.00	0.43	17.8	2.14	5.47	11.7															BASIN P FLOW @ DP12

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Iron Ridge
Location: El Paso County
Design Storm: 100-Year

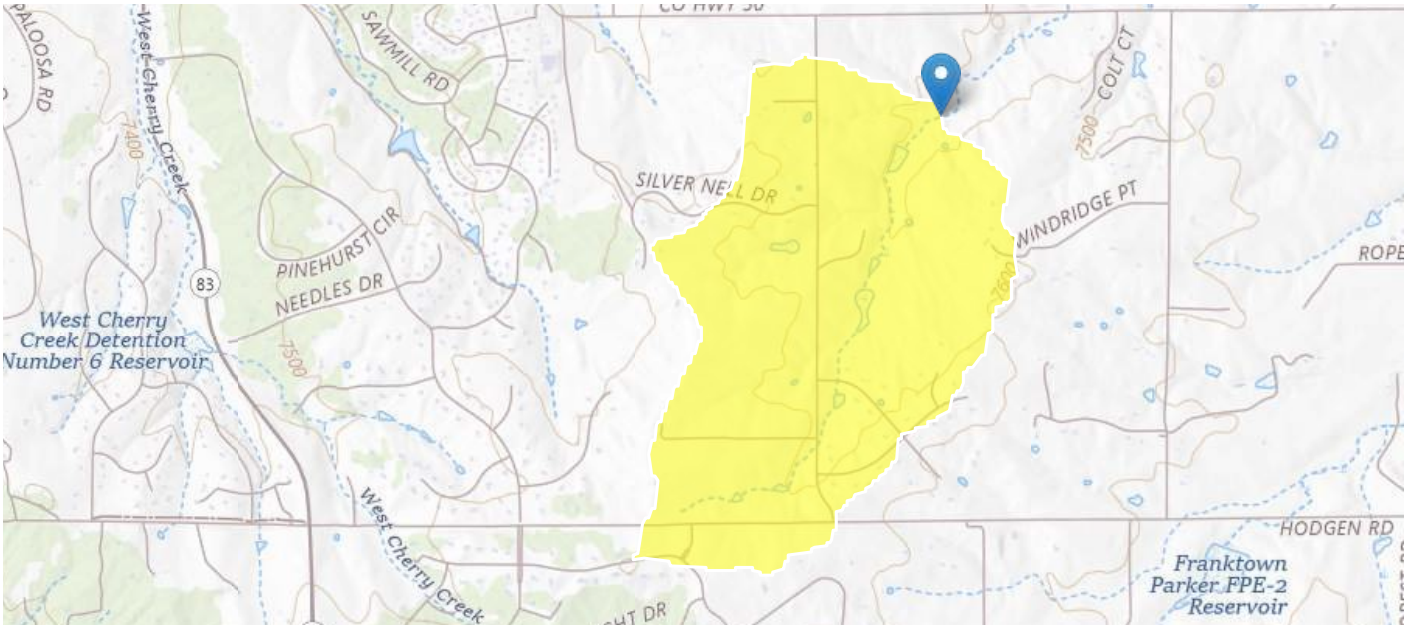
Project Name: Iron Ridge
Project No.: 25009.00
Calculated By: NQJ
Checked By: REB
Date: 9/10/26

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				OVERLAND			PIPE				TRAVEL TIME			REMARKS
		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_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
		Q	1.21	0.47	11.7	0.57	6.54	3.8															BASIN Q FLOW @ DP12
	12								17.8	2.71	5.47	14.8				14.8	2.71	1.0	18	65	8.4	0.1	COMBINED BASIN P & Q FLOW @ DP12, ENTERS 24" RCP CULVERT, PIPED TO DP 13
		R	1.82	0.50	14.3	0.91	6.03	5.5															BASIN R FLOW @ DP13
		S	0.57	0.57	9.8	0.32	6.99	2.2															BASIN S FLOW @ DP13
	13								18.0	3.94	5.46	21.5	21.5	3.94	10					185	2.2	1.4	DP12, BASIN R & S COMBINED FLOW @ DP13 IN SWALE T, CONTINUE IN SWALE TO DP14 (POND 2)
		T	0.97	0.37	9.5	0.36	7.05	2.6															BASIN T FLOW @ DP14
	14								19.4	4.30	5.27	22.7											COMBINED DP13 & BASIN T FLOW @ DP14 (POND 2)
	14.1								29.4	3.41	4.22	14.4											CONTROLLED RELASE FROM POND 1 @ DP14.1, TRAVELS OVERLAND TO DP5
		V	24.97	0.37	31.2	9.28	4.06	37.7															BASIN V @ DP15
	15								73.5	44.73	1.91	85.3											TOTAL SITE FLOW @ DP15 (EXCLUDES BASIN OS1 & OS2)
	15											287.7											TOTAL SITE & OFFSITE FLOW @ DP15 (INCLUDES BASIN OS1 & OS2)

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

Iron Ridge Subdivision - DPOS1 - Offsite Drainage Basin South

Region ID: CO
Workspace ID: CO20250911180450987000
Clicked Point (Latitude, Longitude): 39.08832, -104.72674
Time: 2025-09-11 12:05:15 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	7	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	99.4	feet per mi
DRNAREA	Area that drains to a point on a stream	1.13	square miles
EL7500	Percent of area above 7500 ft	97	percent
ELEV	Mean Basin Elevation	7588	feet
ELEVMAX	Maximum basin elevation	7700	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.96	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.92	inches
I6H100Y	6-hour precipitation that is expected to occur on average once in 100 years	3.83	inches
I6H2Y	Maximum 6-hour precipitation that occurs on average once in 2 years	1.38	inches
LAT_OUT	Latitude of Basin Outlet	39.088337	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	3.9	percent

Parameter Code	Parameter Description	Value	Unit
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0.6	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	69	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	4	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	26.5	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	0	percent
LFPLENGTH	Length of longest flow path	1.96	miles
LONG_OUT	Longitude of Basin Outlet	-104.726713	degrees
MINBELEV	Minimum basin elevation	7470	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7474	feet
PRECIP	Mean Annual Precipitation	21.75	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	61.76	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.25	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	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	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	1.1	percent
TOC	Time of concentration in hours	2.15	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	1.13	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3.83	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7474	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

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

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	11.8	ft^3/s	117
20-percent AEP flood	33.9	ft^3/s	87

Statistic	Value	Unit	ASEp
10-percent AEP flood	57.6	ft^3/s	80
4-percent AEP flood	100	ft^3/s	80
2-percent AEP flood	143	ft^3/s	83
1-percent AEP flood	199	ft^3/s	88
0.5-percent AEP flood	263	ft^3/s	94
0.2-percent AEP flood	368	ft^3/s	104

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)

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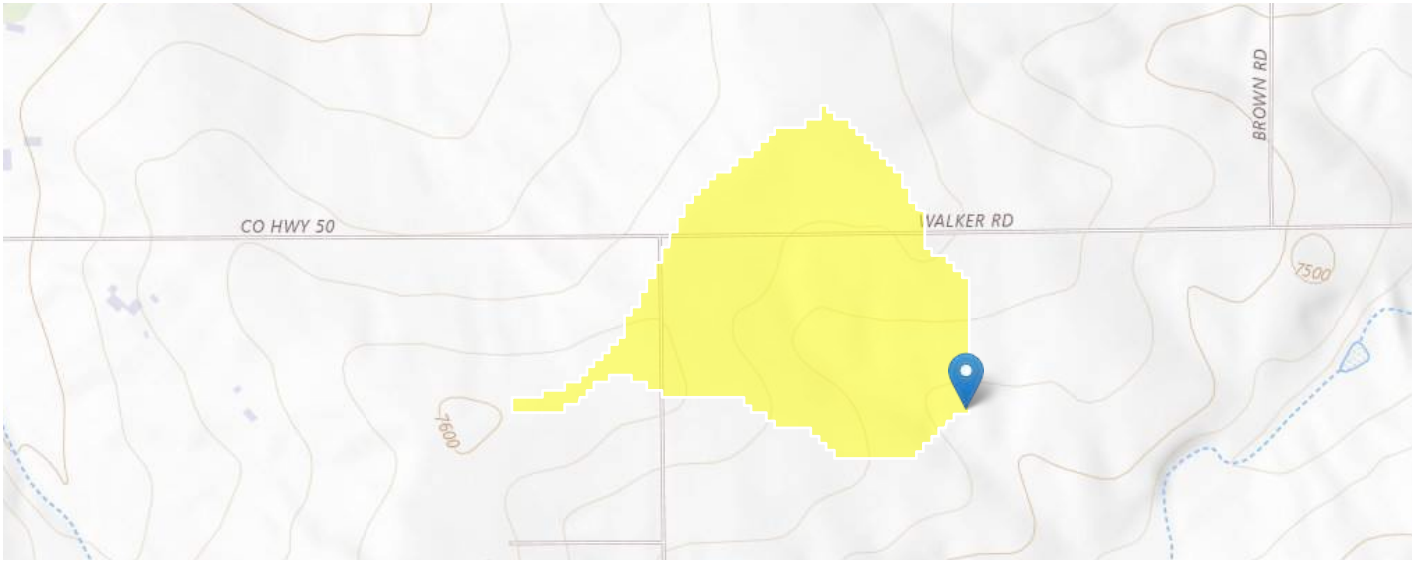
Application Version: 4.29.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Iron Ridge Subdivision - DPOS2 - Offsite Drainage Basin West

Region ID: CO
Workspace ID: CO20250911180928394000
Clicked Point (Latitude, Longitude): 39.09053, -104.72889
Time: 2025-09-11 12:09:51 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	5	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	146.3	feet per mi
DRNAREA	Area that drains to a point on a stream	0.0576	square miles
EL7500	Percent of area above 7500 ft	100	percent
ELEV	Mean Basin Elevation	7556	feet
ELEVMAX	Maximum basin elevation	7600	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.93	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.91	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	39.090594	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	10.2	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	78.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	10.3	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	11.7	percent
LC11SNOIC	Percent snow and ice from NLCD 2011 class 12	0	percent

Parameter Code	Parameter Description	Value	Unit
LC11WATER	Percent of open water, class 11, from NLCD 2011	0	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LFPLENGTH	Length of longest flow path	0.61	miles
LONG_OUT	Longitude of Basin Outlet	-104.728901	degrees
MINBELEV	Minimum basin elevation	7500	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7504	feet
PRECIP	Mean Annual Precipitation	21.86	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	60.17	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.25	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	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	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	percent
TOC	Time of concentration in hours	1.04	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	0.0576	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7504	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

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	1.28	ft^3/s
20-percent AEP flood	3.46	ft^3/s
10-percent AEP flood	5.6	ft^3/s
4-percent AEP flood	9.1	ft^3/s
2-percent AEP flood	12.3	ft^3/s
1-percent AEP flood	16.4	ft^3/s
0.5-percent AEP flood	20.8	ft^3/s
0.2-percent AEP flood	27.8	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)

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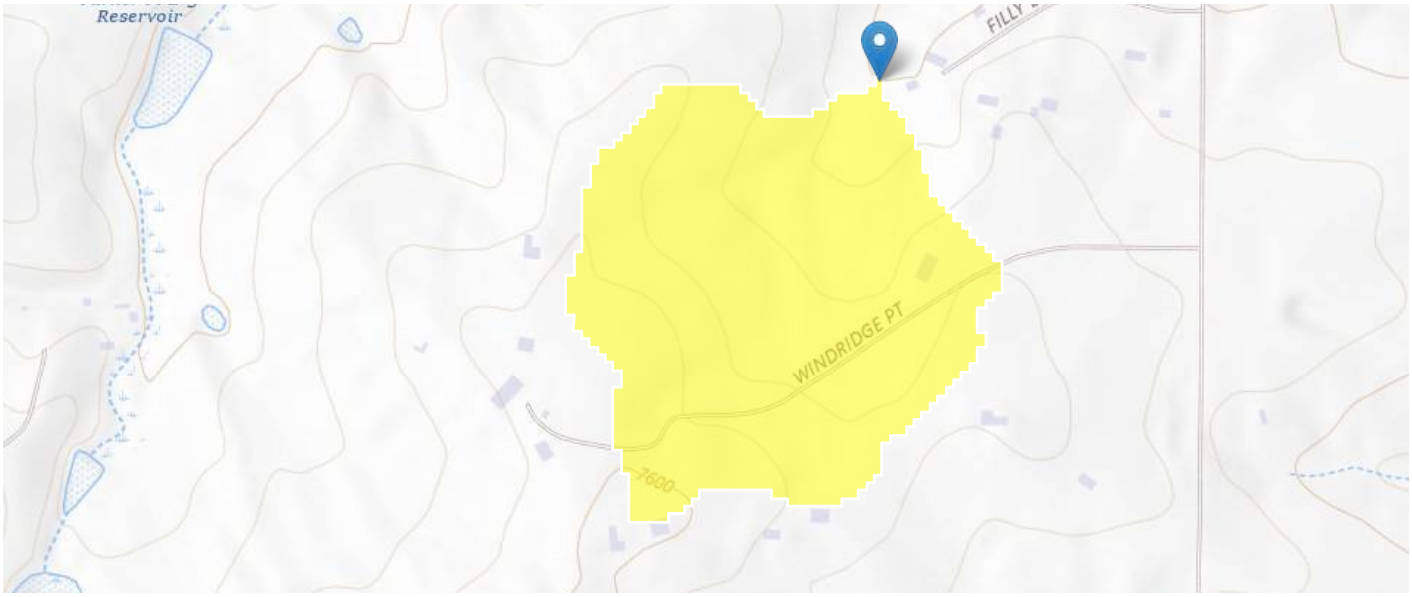
Application Version: 4.29.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Iron Ridge Subdivision - DPOS3 - Offsite Drainage Basin South

Region ID: CO
Workspace ID: CO20250916210122474000
Clicked Point (Latitude, Longitude): 39.08654, -104.71870
Time: 2025-09-16 15:01:34 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	6	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	268.2	feet per mi
DRNAREA	Area that drains to a point on a stream	0.0843	square miles
EL7500	Percent of area above 7500 ft	100	percent
ELEV	Mean Basin Elevation	7557	feet
ELEVMAX	Maximum basin elevation	7610	feet
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	4.93	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	1.9	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	39.086515	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
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	0	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	70	percent

Parameter Code	Parameter Description	Value	Unit
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	30	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	0	percent
LFPLENGTH	Length of longest flow path	0.43	miles
LONG_OUT	Longitude of Basin Outlet	-104.718741	degrees
MINBELEV	Minimum basin elevation	7500	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	7501	feet
PRECIP	Mean Annual Precipitation	21.46	inches
RCN	Runoff-curve number as defined by NRCS (http://policy.nrcs.usda.gov/OpenNonWebContent.aspx?content=17758.wba)	61.66	dimensionless
RUNCO_CO	Soil runoff coefficient as defined by Verdin and Gross (2017)	0.24	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	100	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	0	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	percent
TOC	Time of concentration in hours	0.69	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	0.0843	square miles	0.6	2850
I6H100Y	6 Hour 100 Year Precipitation	3	inches	2.38	4.89
OUTLETELEV	Elevation of Gage	7501	feet	4290	8270
STATSCLAY	STATSGO Percentage of Clay Soils	16.3	percent	9.87	37.5

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	1.63	ft^3/s
20-percent AEP flood	4.34	ft^3/s
10-percent AEP flood	7	ft^3/s
4-percent AEP flood	11.4	ft^3/s

Statistic	Value	Unit
2-percent AEP flood	15.4	ft^3/s
1-percent AEP flood	20.4	ft^3/s
0.5-percent AEP flood	25.9	ft^3/s
0.2-percent AEP flood	34.5	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)

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Application Version: 4.29.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

APPENDIX C – HYDRAULIC CALCULATIONS

Subdivision:	Iron Ridge
Location:	El Paso County
Project Name:	Iron Ridge
Project Number:	25009
Calculated By:	REB
Checked By:	NQJ
Date:	10/26/2026

Proposed Conditions - Drainageway/Swale Summary Table

Swale Section/DP/BASIN	Section Slope, ft/ft	100-year Depth, ft	100-year Velocity, ft/s	100-year Hydraulic Radius, ft	Froude, 100-yr	Shear Stress, 100-yr (lb/ft^2)	5-year Depth, ft	5-year Velocity, ft/s	5-year Hydraulic Radius, ft	Froude, 5-yr	Shear Stress, 5-yr (lb/ft^2)	COMMENT
DP1	0.0235	0.98	3.88	0.49	0.69	0.7	0.51	2.5	0.25	0.62	0.4	
DP1.1	0.0320	0.35	2.86	0.24	0.85	0.5	0.16	1.68	0.12	0.74	0.2	
B	0.0990	0.46	4.86	0.22	1.26	1.4	0.32	3.63	0.15	1.13	1.0	MAX SLOPE
B	0.0500	0.53	3.66	0.25	0.89	0.8						STABLE SLOPE
B1	0.0125	1.14	3.12	0.55	0.51	0.4	0.64	2.09	0.31	0.46	0.2	PROP. SWALE
C	0.0371	0.72	3.97	0.34	0.82	0.8	0.44	2.8	0.21	0.74	0.5	
D	0.0990	0.44	4.57	0.21	1.21	1.3	0.32	3.63	0.15	1.13	1.0	
E	0.0371	0.45	2.82	0.22	0.74	0.5	0.32	2.23	0.15	0.69	0.4	
N1	0.0655	0.52	4.12	0.25	1.01	1.0	0.34	3.21	0.16	0.97	0.7	MAX SLOPE
N1-1	0.0500	0.55	3.68	0.26	0.87	0.8					0.0	STABLE SLOPE
N2	0.0135	0.65	2.25	0.32	0.49	0.3	0.35	2.57	0.17	0.77	0.1	
P	0.0800	0.71	5.80	0.35	1.21	1.7	0.44	4.13	0.21	1.10	1.1	MAX SLOPE
P	0.0400	0.85	4.63	0.41	0.89	1.0					0.0	STABLE SLOPE
Q	0.0200	0.61	2.55	0.30	0.58	0.4	0.4	1.96	0.19	0.55	0.2	
R	0.0800	0.54	4.72	0.26	1.13	1.3	0.37	3.76	0.18	1.09	0.9	
R	0.0500	0.63	3.96	0.30	0.88	0.9						
S	0.0200	0.49	2.29	0.24	0.58	0.3	0.37	1.88	0.18	0.54	0.2	
3-3.1	0.0125	1.34	3.49	0.65	0.53	0.5	0.8	2.50	0.39	0.49	0.3	
3.1-4	0.0633	1.08	6.88	0.52	1.17	2.1	0.66	4.82	0.32	1.05	1.3	
4.1	0.0400	0.66	4.96	0.45	1.08	1.1	0.13	1.18	0.06	0.58	0.2	
DP7	0.0340	0.48	3.51	0.32	0.89	0.7	0.26	1.97	0.14	0.68	0.3	OS3 - DP7 (TOTAL FLOW)
Basin EX 11 Swale	0.1000	0.31	3.67	0.15	1.16	1.0	0.18	2.62	0.09	1.09	0.6	Ex Flows, Ex Sect.
DP9-10 (EXISTING SECT.)	0.1000	0.3	3.47	0.15	1.12	0.9	0.18	2.62	0.09	1.09	0.6	Proposed Flows, Ex Sect.
DP9 (PROPOSED)	0.0110	0.57	2.33	0.39	0.54	0.3	0.29	1.57	0.22	0.51	0.2	Proposed Flows, Proposed Sect.
13-14 (1)	0.1000	0.87	7.50	0.42	1.42	2.6	0.49	5.00	0.24	1.26	1.5	MAX SLOPE
13-14 (2)	0.0170	1.21	3.88	0.59	0.62	0.6	0.68	2.60	0.33	0.56	0.3	CAPACITY
14.1 S1	0.0590	0.43	4.98	0.34	1.34	1.2	0.03	0.65	0.03	0.66	0.1	
14.1 S2	0.0752	0.41	5.29	0.32	1.46	1.5	0.03	0.65	0.03	0.66	0.1	
14.1 S3	0.0411	0.48	4.34	0.37	1.10	1.0	0.03	0.65	0.03	0.66	0.1	

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

CHECK DAM - WEIR FLOW (ALL ROADSIDE DITCHES WHERE CDS ARE SHOWN)

Trapezoidal Weir

Crest	= Sharp
Bottom Length (ft)	= 0.01
Total Depth (ft)	= 1.50
Side Slope (z:1)	= 4.00

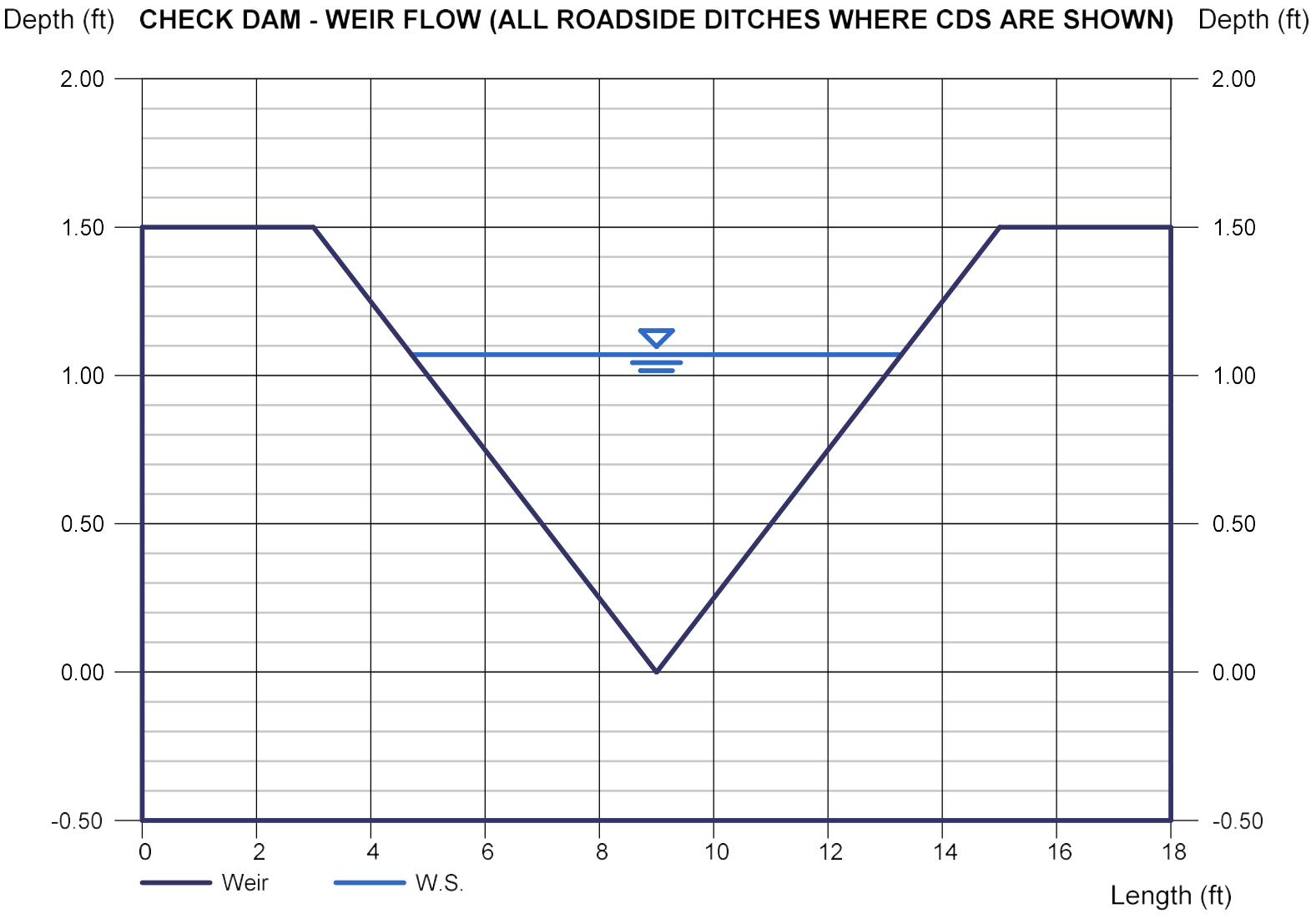
Highlighted

Depth (ft)	= 1.07
Q (cfs)	= 11.70
Area (sqft)	= 4.59
Velocity (ft/s)	= 2.55
Top Width (ft)	= 8.57

Calculations

Weir Coeff. Cw	= 3.10
Compute by:	Known Q
Known Q (cfs)	= 11.70

BASIN P FLOWS WERE USED AS THEY DEMONSTRATE THE WORST CASE/MOST CONSERVATIVE ANALYSIS



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE B - Q5

Triangular

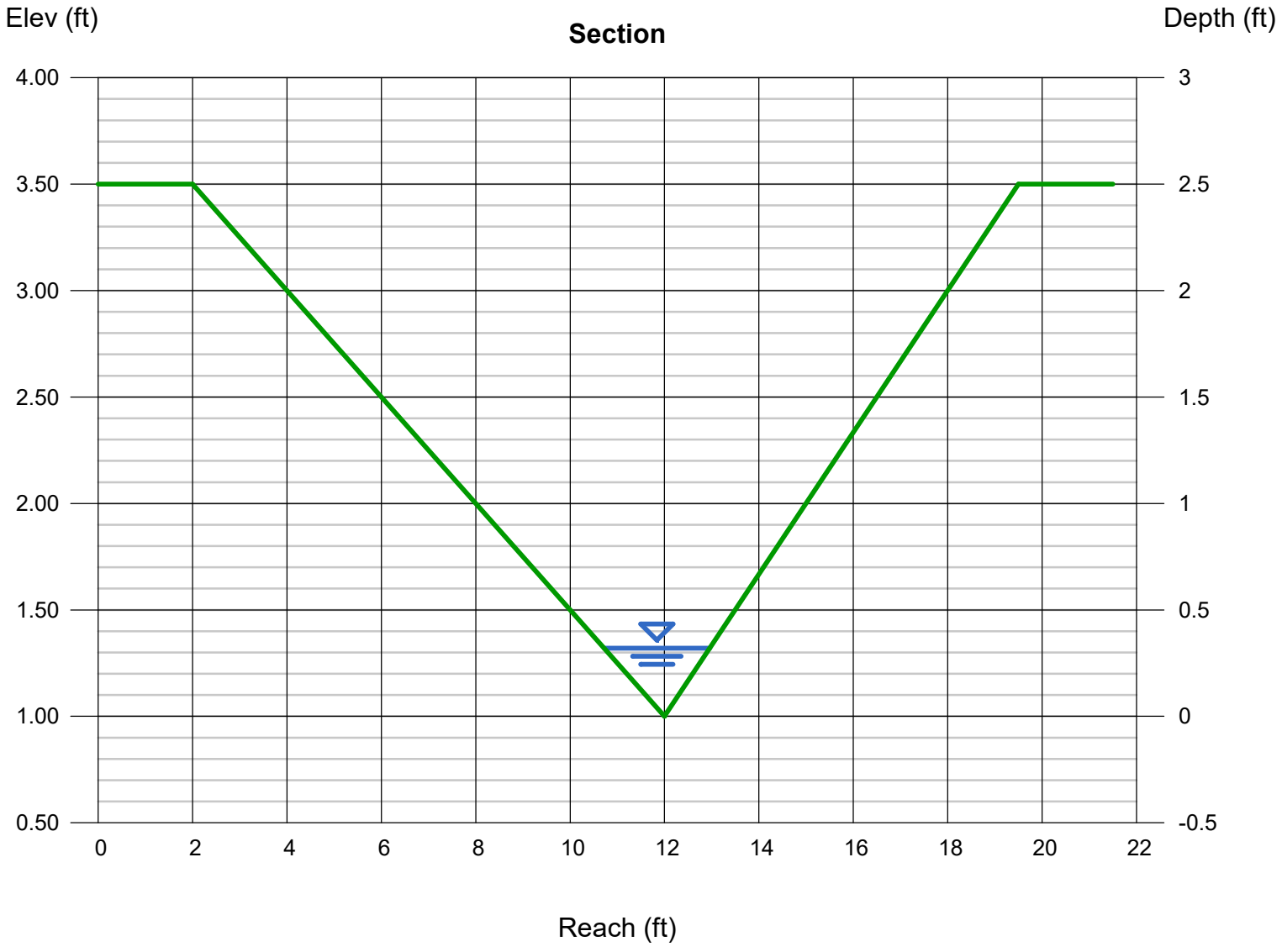
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 9.99
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.30

Highlighted

Depth (ft)	= 0.32
Q (cfs)	= 1.300
Area (sqft)	= 0.36
Velocity (ft/s)	= 3.63
Wetted Perim (ft)	= 2.33
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 2.24
EGL (ft)	= 0.52



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE B - Q100

Triangular

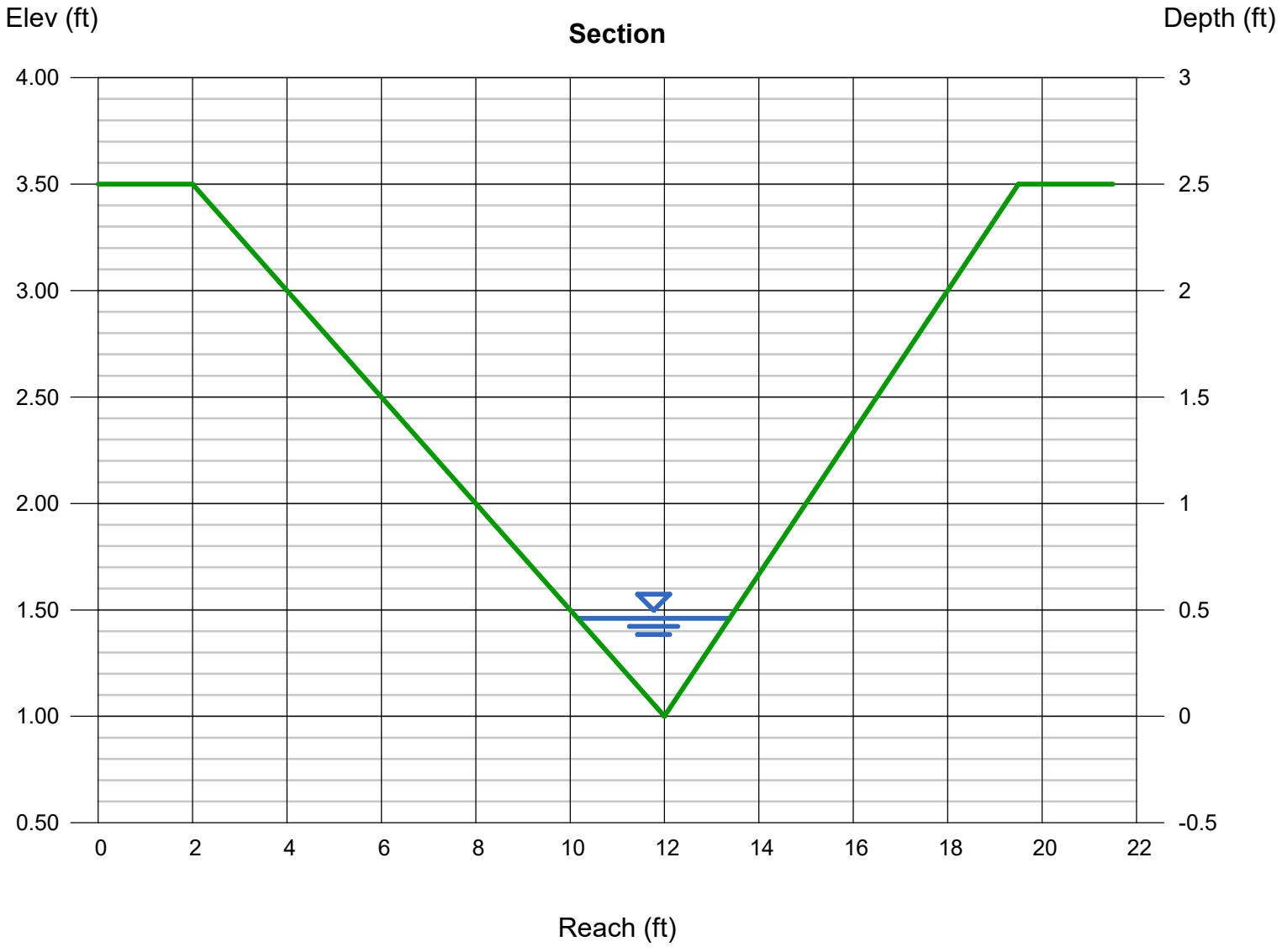
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 9.99
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.60

Highlighted

Depth (ft)	= 0.46
Q (cfs)	= 3.600
Area (sqft)	= 0.74
Velocity (ft/s)	= 4.86
Wetted Perim (ft)	= 3.35
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 3.22
EGL (ft)	= 0.83



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

ROADSIDE SWALE B - STABLE SLOPE

Triangular

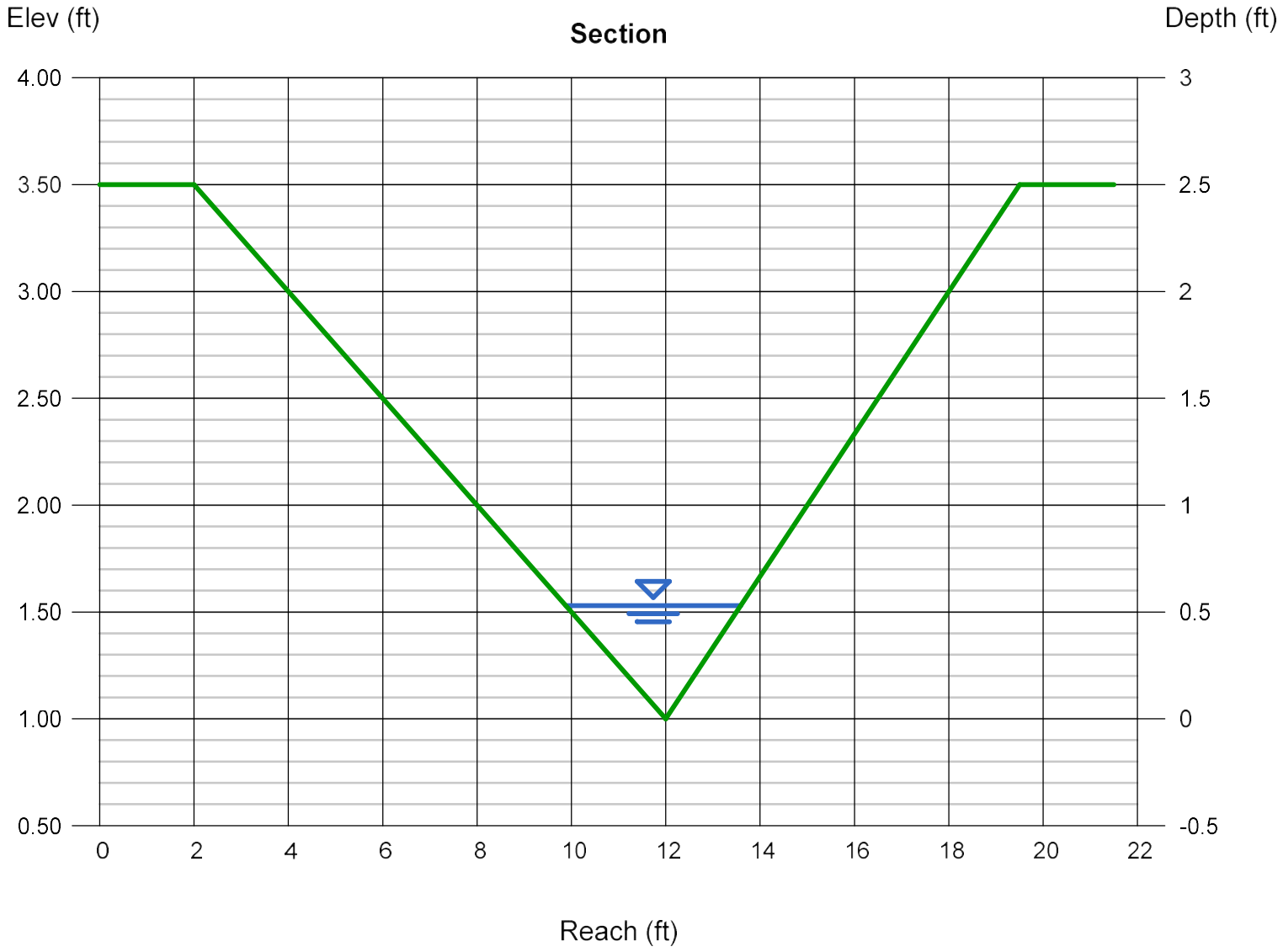
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 5.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.60

Highlighted

Depth (ft)	= 0.53
Q (cfs)	= 3.600
Area (sqft)	= 0.98
Velocity (ft/s)	= 3.66
Wetted Perim (ft)	= 3.86
Crit Depth, Yc (ft)	= 0.59
Top Width (ft)	= 3.71
EGL (ft)	= 0.74



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

SWALE BASIN B1 - Q5

Triangular

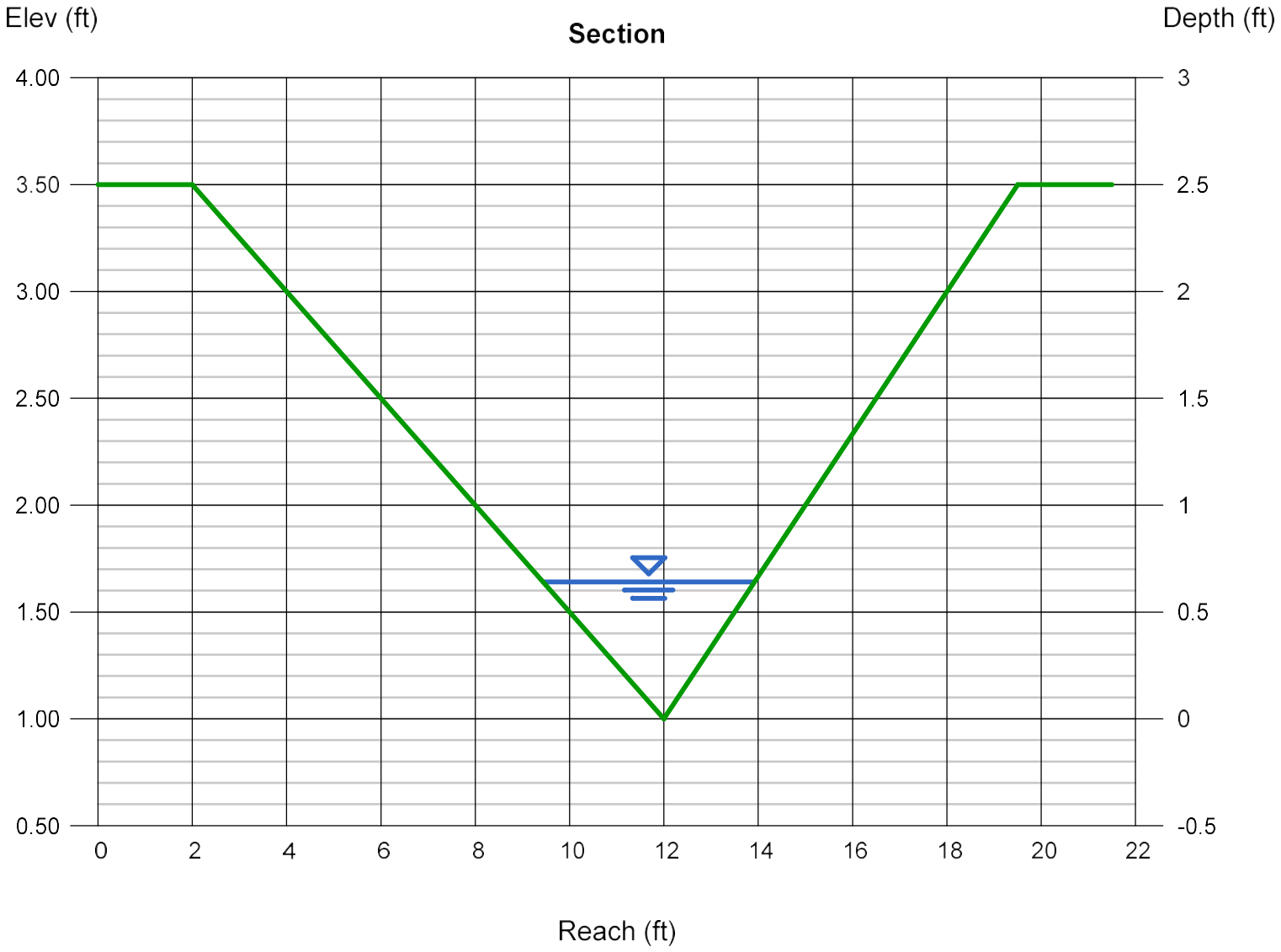
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.00

Highlighted

Depth (ft)	= 0.64
Q (cfs)	= 3.000
Area (sqft)	= 1.43
Velocity (ft/s)	= 2.09
Wetted Perim (ft)	= 4.66
Crit Depth, Yc (ft)	= 0.54
Top Width (ft)	= 4.48
EGL (ft)	= 0.71



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

SWALE BASIN B1 - Q100

Triangular

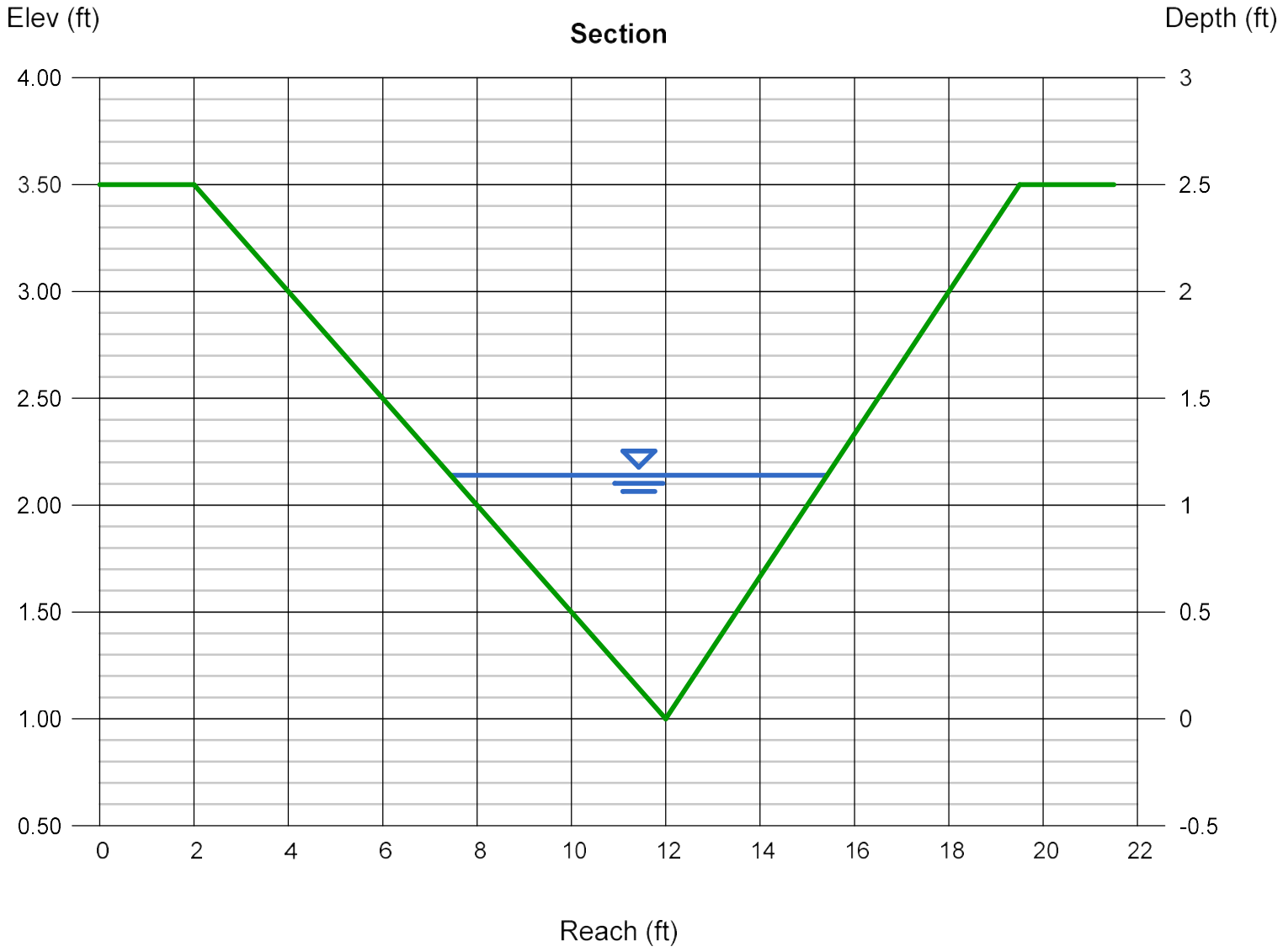
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.20

Highlighted

Depth (ft)	= 1.14
Q (cfs)	= 14.20
Area (sqft)	= 4.55
Velocity (ft/s)	= 3.12
Wetted Perim (ft)	= 8.31
Crit Depth, Yc (ft)	= 1.01
Top Width (ft)	= 7.98
EGL (ft)	= 1.29



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE C - Q5

Triangular

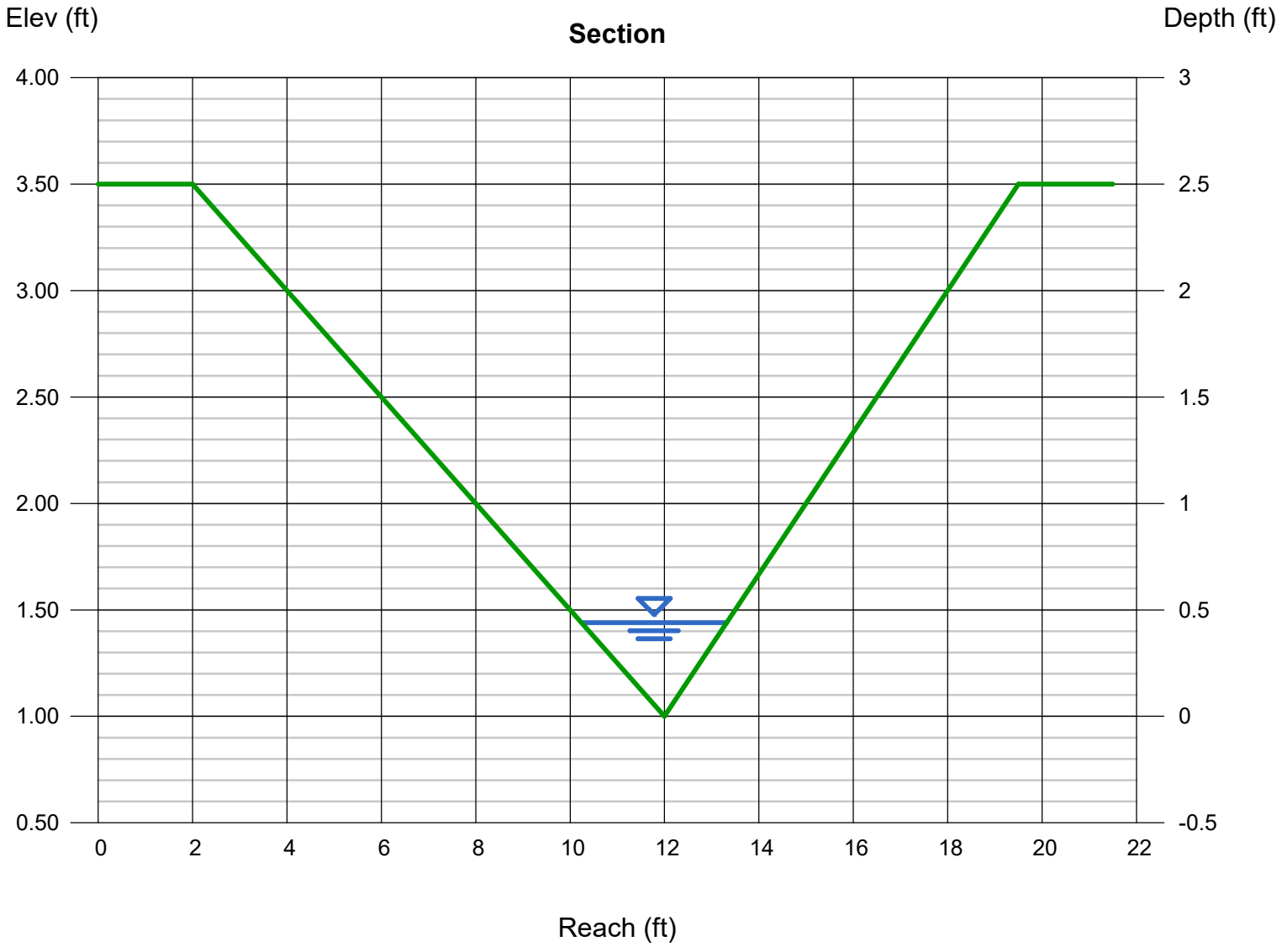
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 3.71
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.90

Highlighted

Depth (ft)	= 0.44
Q (cfs)	= 1.900
Area (sqft)	= 0.68
Velocity (ft/s)	= 2.80
Wetted Perim (ft)	= 3.21
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 3.08
EGL (ft)	= 0.56



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE C - Q100

Triangular

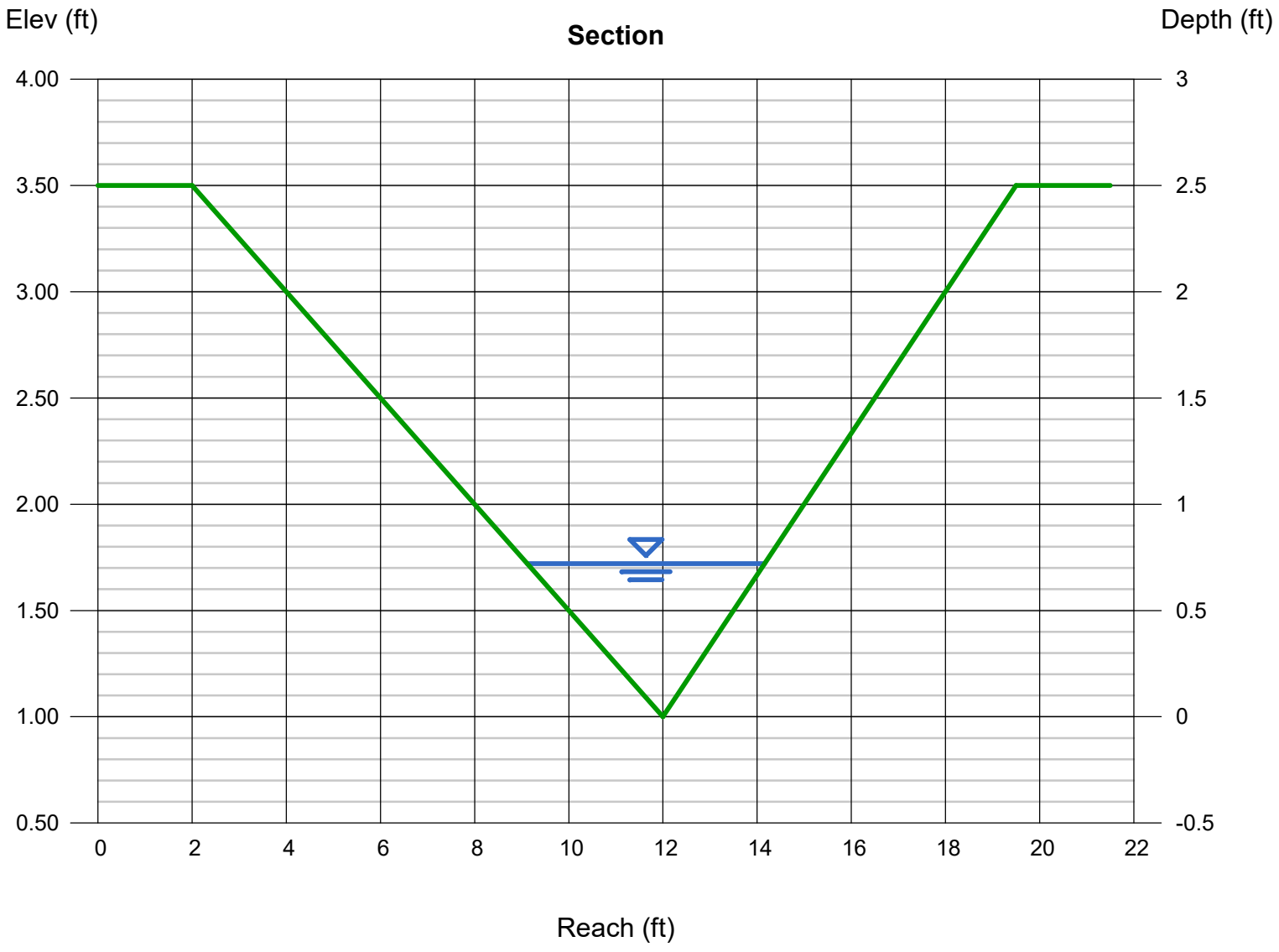
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 3.71
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.20

Highlighted

Depth (ft)	= 0.72
Q (cfs)	= 7.200
Area (sqft)	= 1.81
Velocity (ft/s)	= 3.97
Wetted Perim (ft)	= 5.25
Crit Depth, Yc (ft)	= 0.77
Top Width (ft)	= 5.04
EGL (ft)	= 0.96



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE D - Q5

Triangular

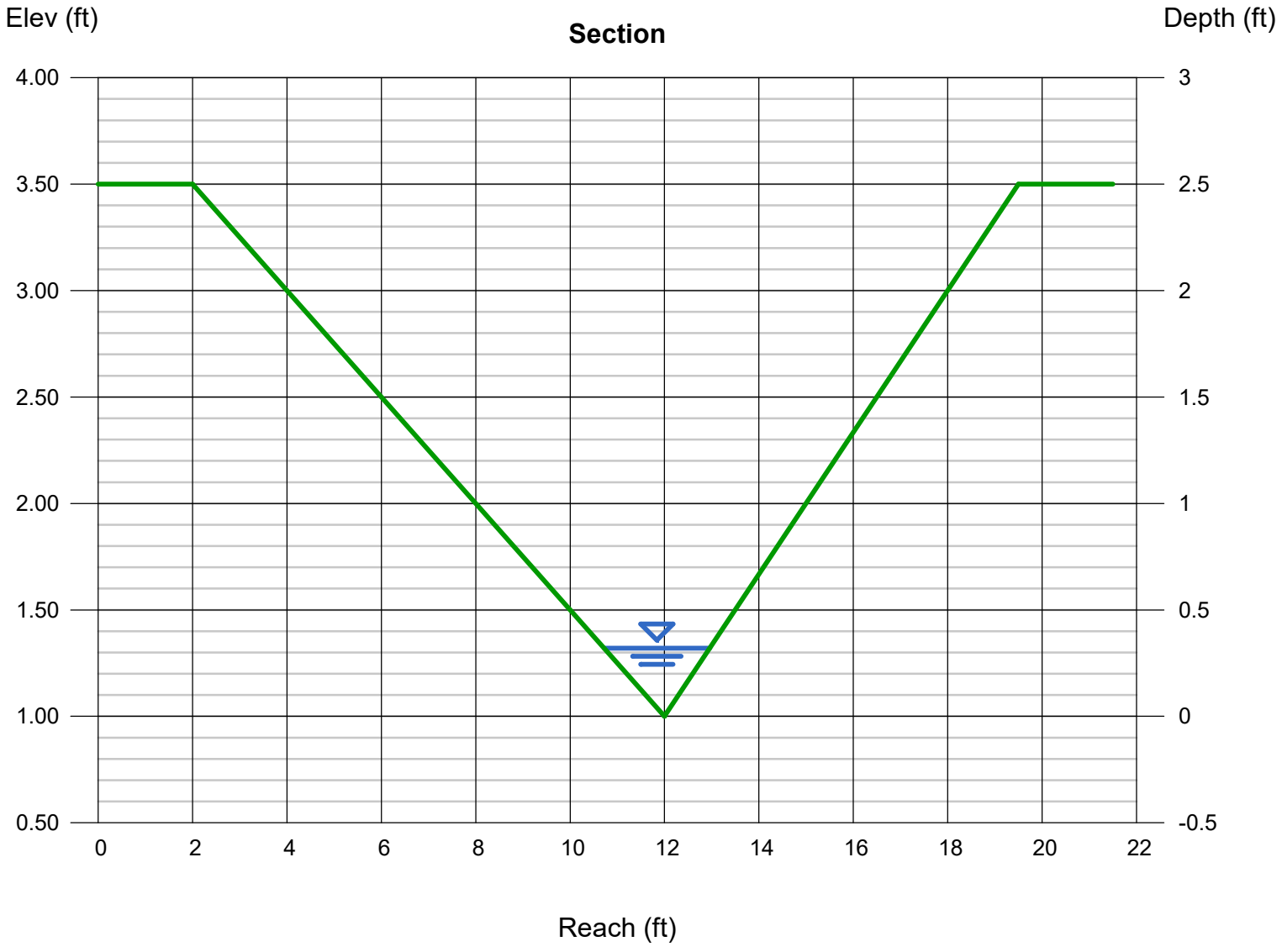
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 9.99
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.30

Highlighted

Depth (ft)	= 0.32
Q (cfs)	= 1.300
Area (sqft)	= 0.36
Velocity (ft/s)	= 3.63
Wetted Perim (ft)	= 2.33
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 2.24
EGL (ft)	= 0.52



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE D - MAX SLOPE (Q100)

Triangular

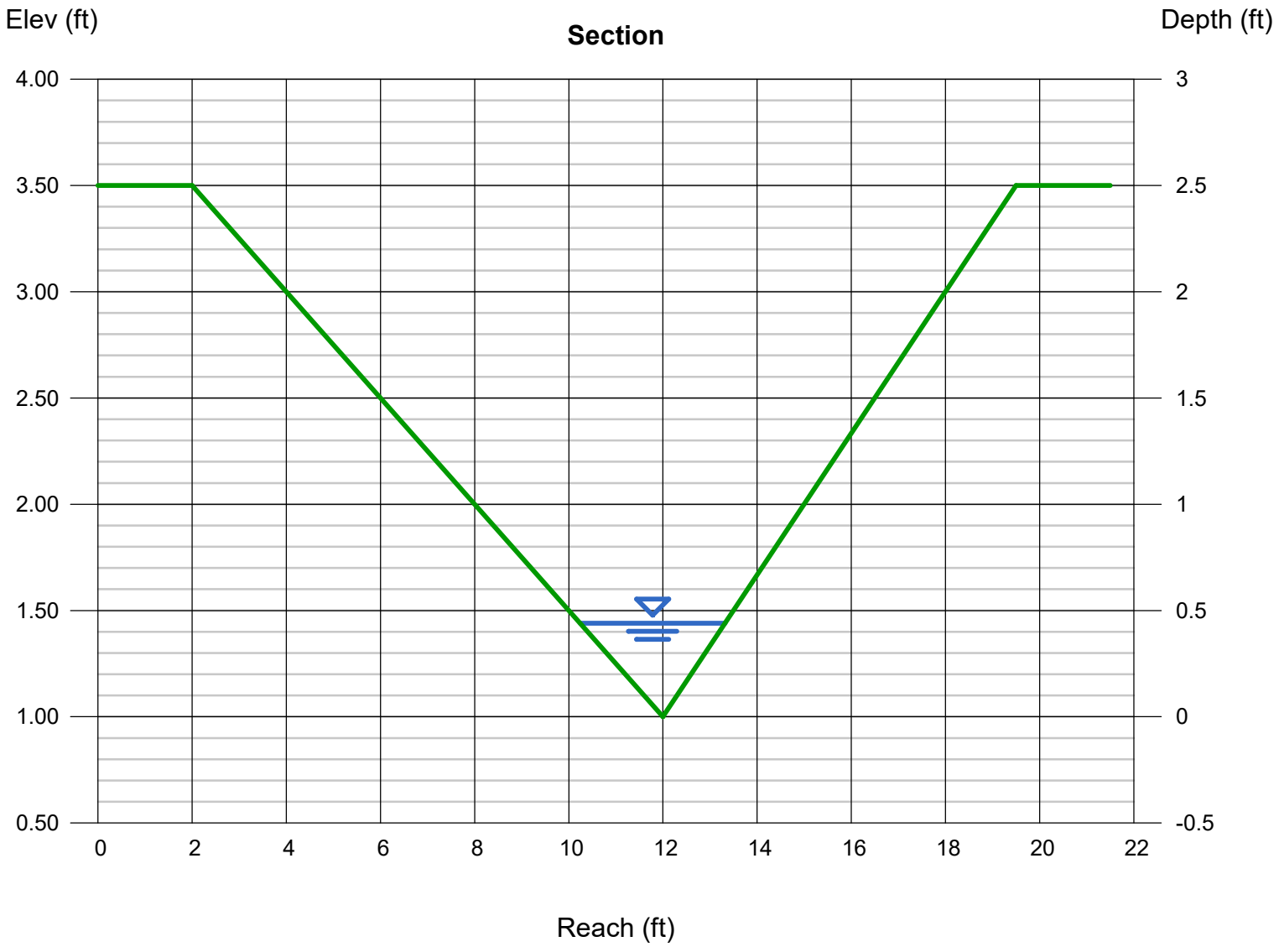
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 9.99
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.10

Highlighted

Depth (ft)	= 0.44
Q (cfs)	= 3.100
Area (sqft)	= 0.68
Velocity (ft/s)	= 4.57
Wetted Perim (ft)	= 3.21
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 3.08
EGL (ft)	= 0.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE E - Q5

Triangular

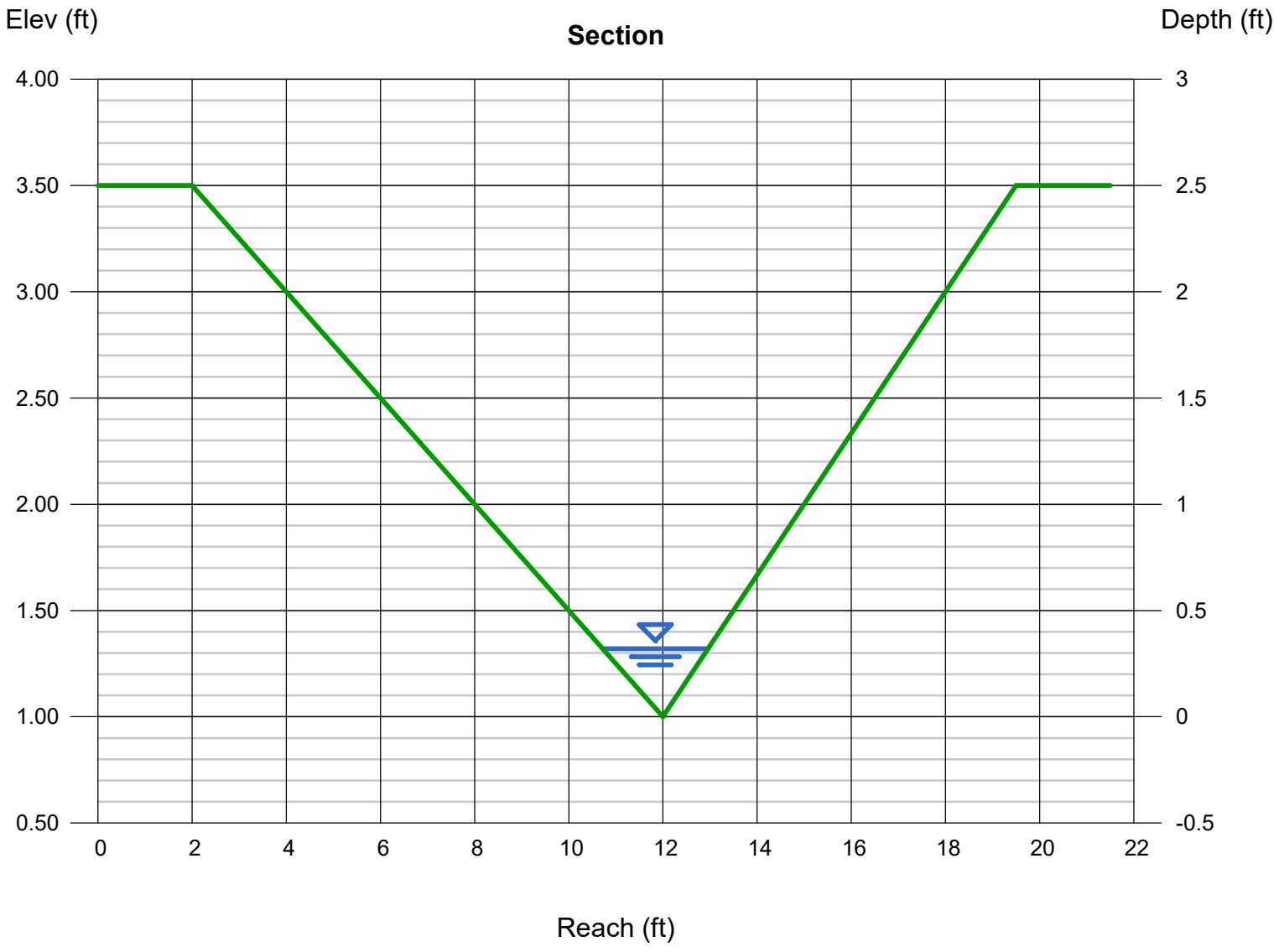
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 3.71
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.80

Highlighted

Depth (ft)	= 0.32
Q (cfs)	= 0.800
Area (sqft)	= 0.36
Velocity (ft/s)	= 2.23
Wetted Perim (ft)	= 2.33
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 2.24
EGL (ft)	= 0.40



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE E - MAX SLOPE (Q100)

Triangular

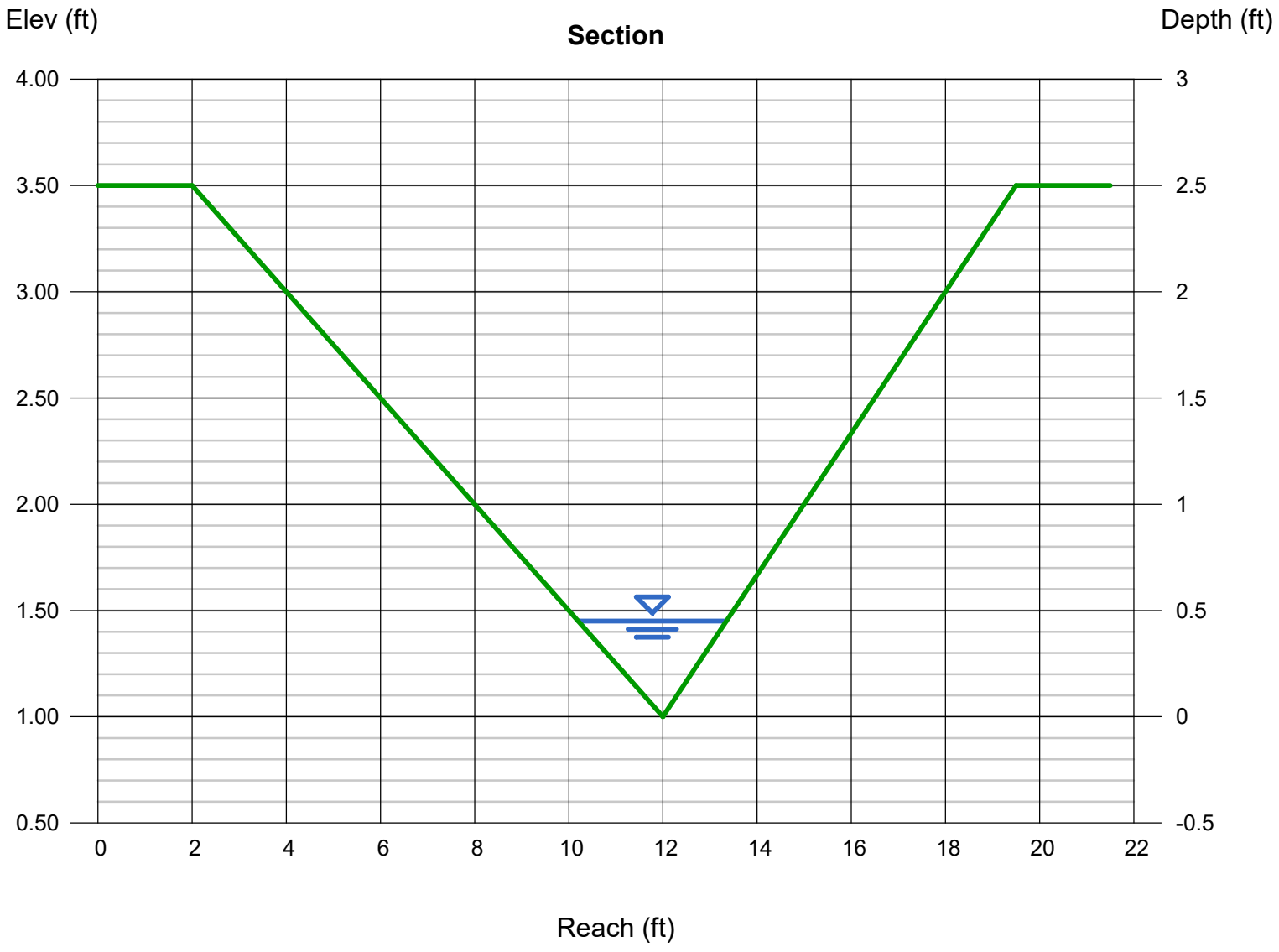
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 3.71
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.00

Highlighted

Depth (ft)	= 0.45
Q (cfs)	= 2.000
Area (sqft)	= 0.71
Velocity (ft/s)	= 2.82
Wetted Perim (ft)	= 3.28
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 3.15
EGL (ft)	= 0.57



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE N1 (Q5)

Triangular

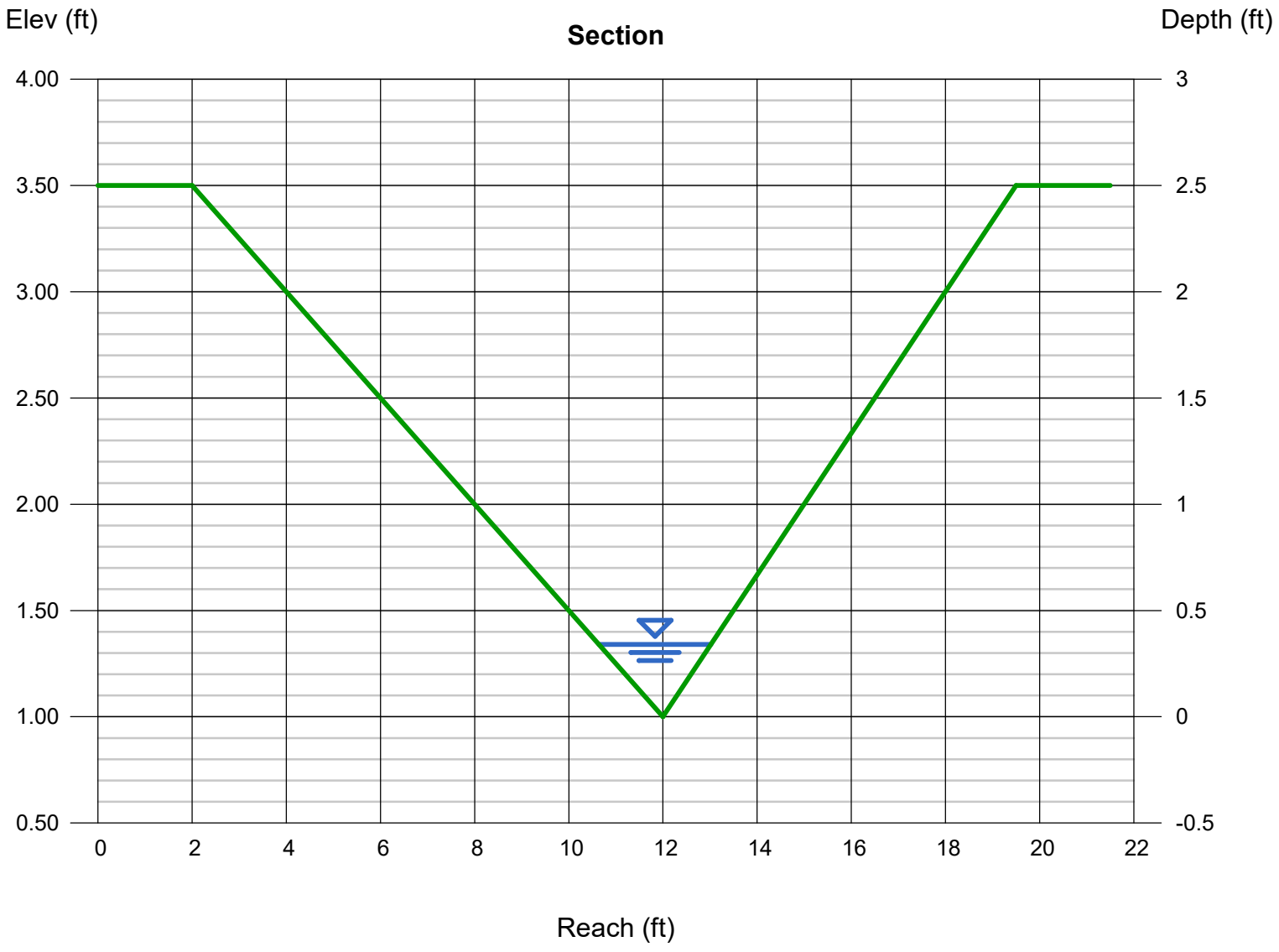
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 6.55
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.30

Highlighted

Depth (ft)	= 0.34
Q (cfs)	= 1.300
Area (sqft)	= 0.40
Velocity (ft/s)	= 3.21
Wetted Perim (ft)	= 2.48
Crit Depth, Yc (ft)	= 0.39
Top Width (ft)	= 2.38
EGL (ft)	= 0.50



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE N1 (Q100)

Triangular

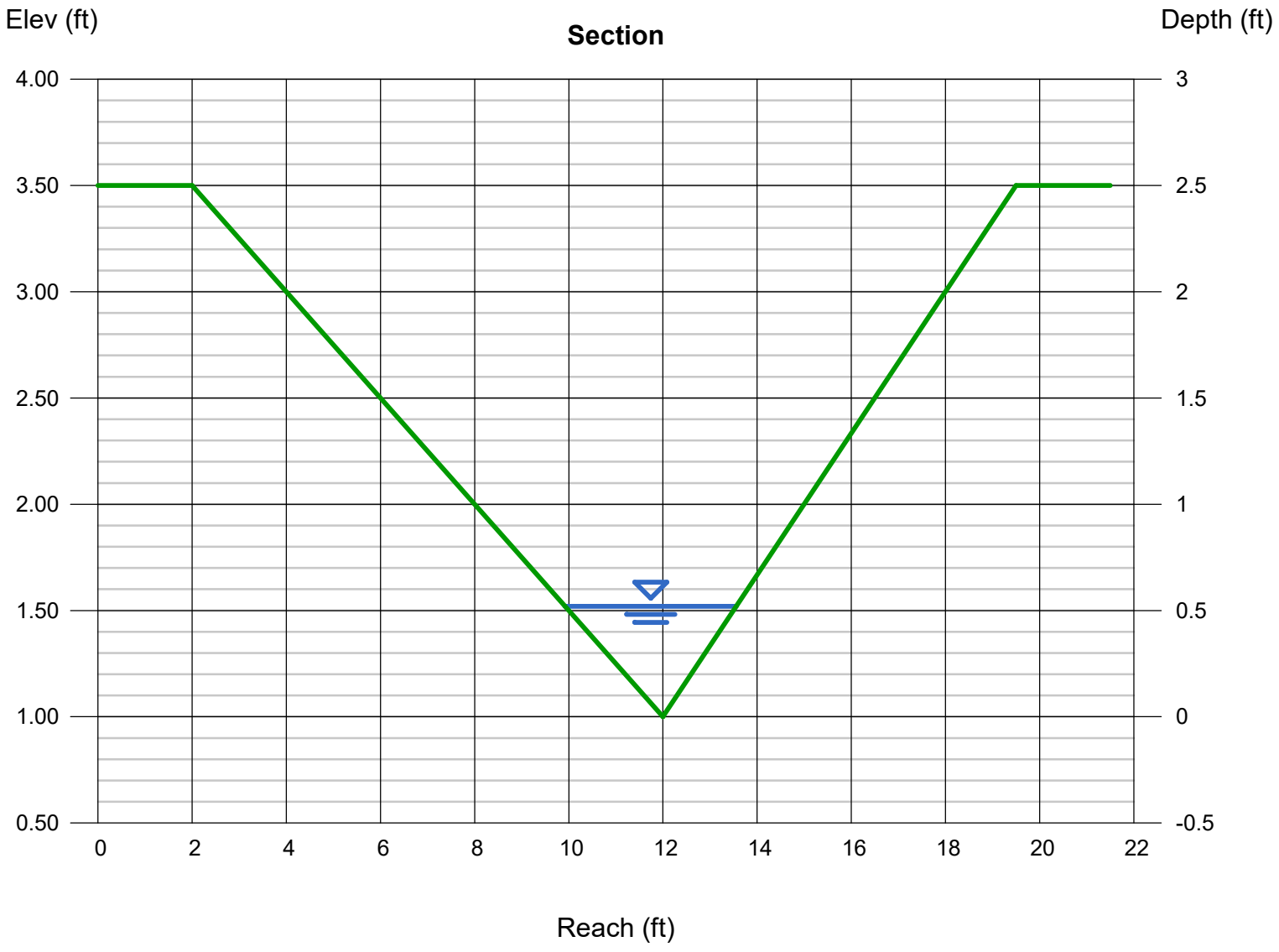
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 6.55
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.90

Highlighted

Depth (ft)	= 0.52
Q (cfs)	= 3.900
Area (sqft)	= 0.95
Velocity (ft/s)	= 4.12
Wetted Perim (ft)	= 3.79
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 3.64
EGL (ft)	= 0.78



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE N1-1 (Q100) STABLE SLOPE

Triangular

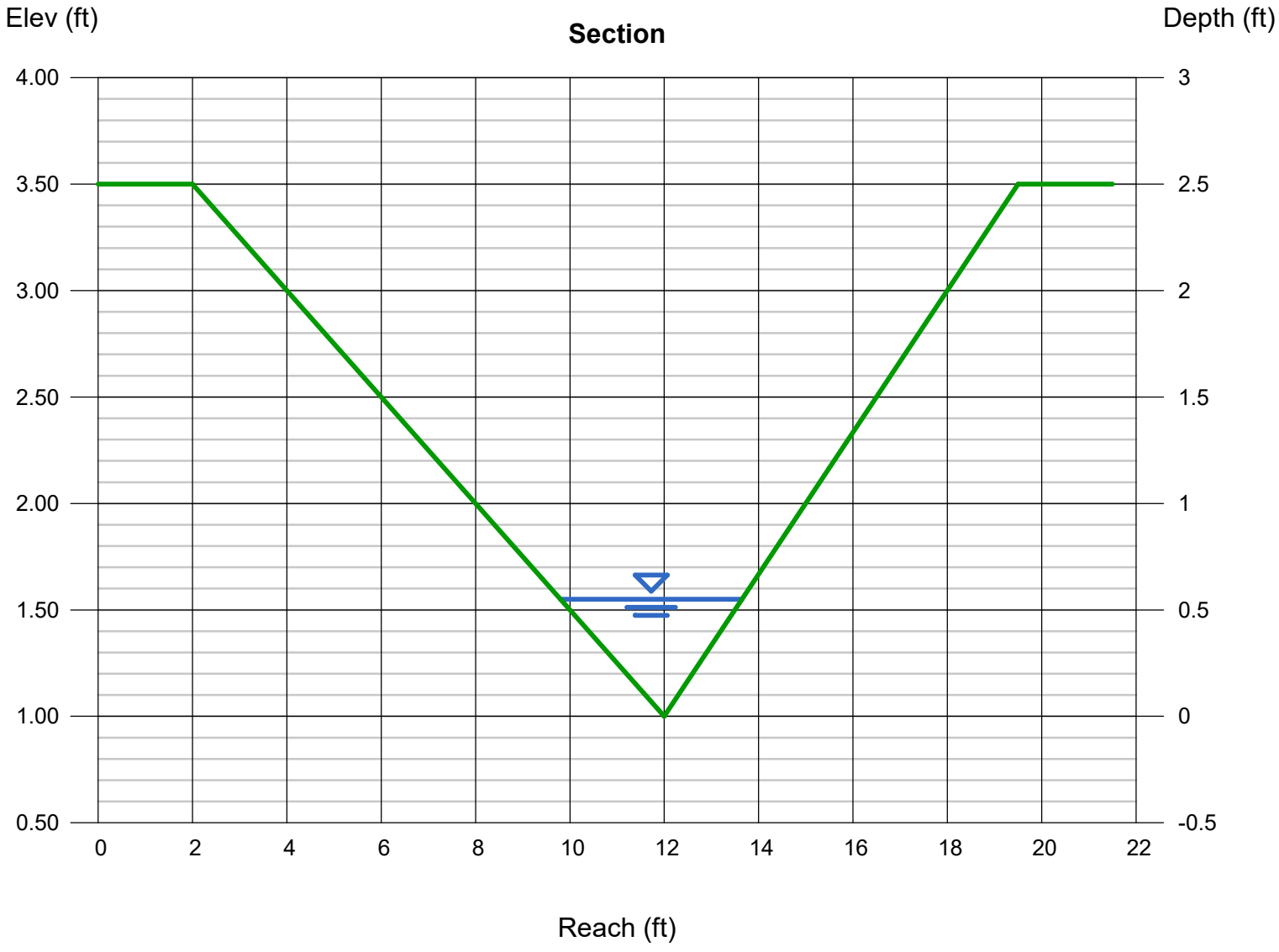
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.90

Highlighted

Depth (ft)	= 0.55
Q (cfs)	= 3.900
Area (sqft)	= 1.06
Velocity (ft/s)	= 3.68
Wetted Perim (ft)	= 4.01
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 3.85
EGL (ft)	= 0.76



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE N2 (Q5)

Triangular

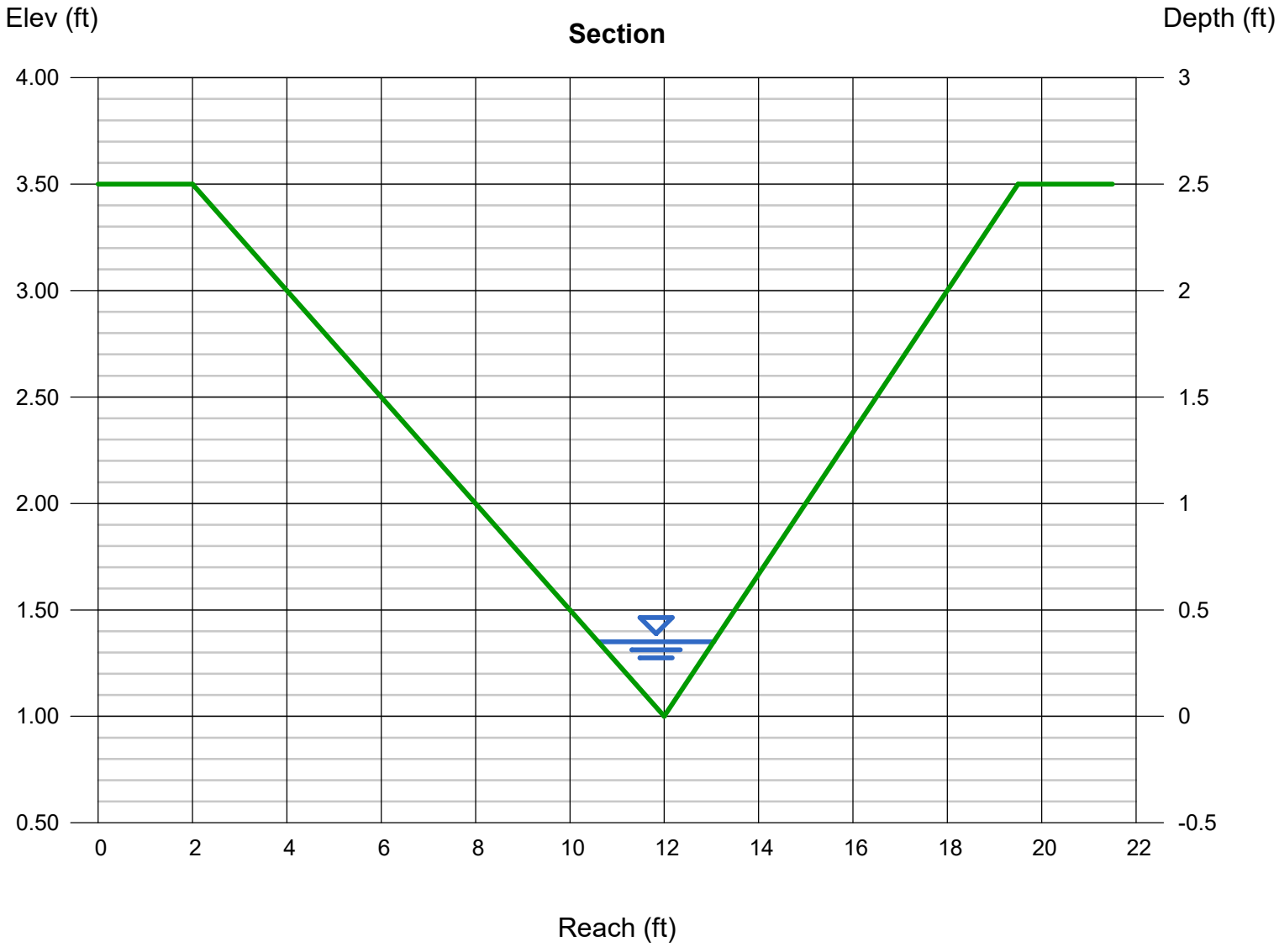
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.10

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 1.100
Area (sqft)	= 0.43
Velocity (ft/s)	= 2.57
Wetted Perim (ft)	= 2.55
Crit Depth, Yc (ft)	= 0.37
Top Width (ft)	= 2.45
EGL (ft)	= 0.45



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE N2 - MAX SLOPE (Q100)

Triangular

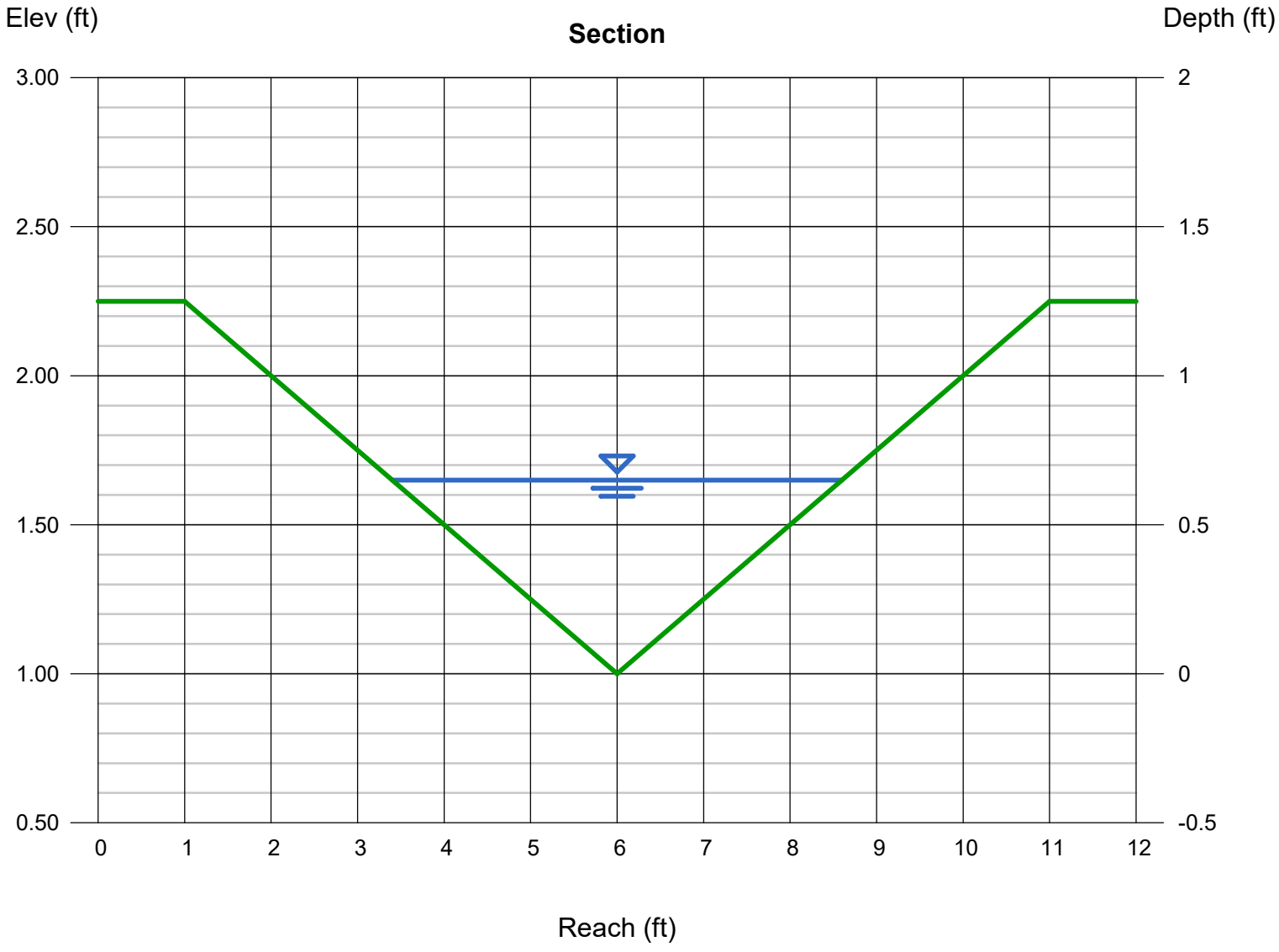
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 1.00
Slope (%)	= 1.35
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.80

Highlighted

Depth (ft)	= 0.65
Q (cfs)	= 3.800
Area (sqft)	= 1.69
Velocity (ft/s)	= 2.25
Wetted Perim (ft)	= 5.36
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 5.20
EGL (ft)	= 0.73



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE P (Q5)

Triangular

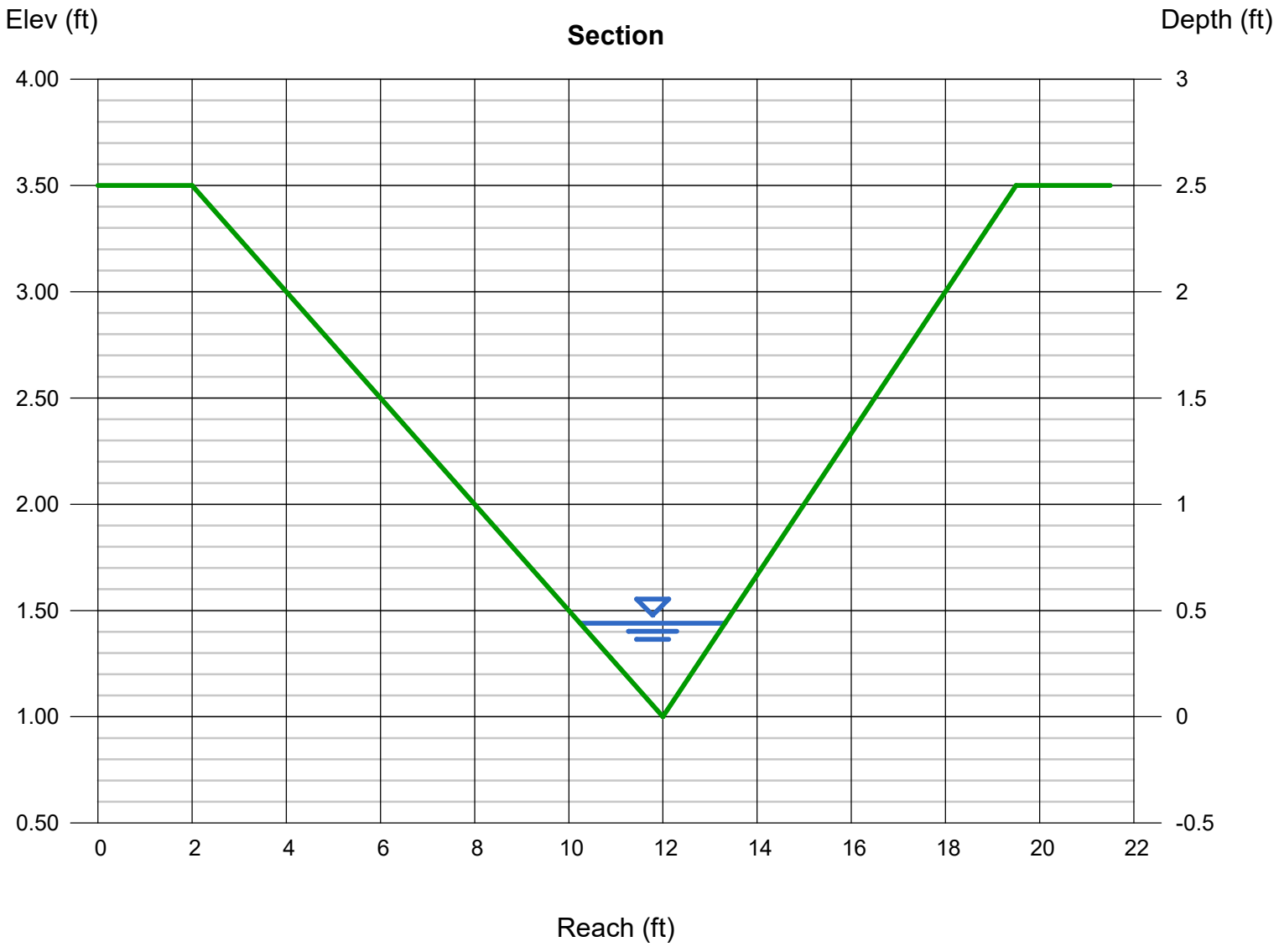
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 8.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.80

Highlighted

Depth (ft)	= 0.44
Q (cfs)	= 2.800
Area (sqft)	= 0.68
Velocity (ft/s)	= 4.13
Wetted Perim (ft)	= 3.21
Crit Depth, Yc (ft)	= 0.53
Top Width (ft)	= 3.08
EGL (ft)	= 0.71



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE P1 (Q100) - STABLE SLOPE

Triangular

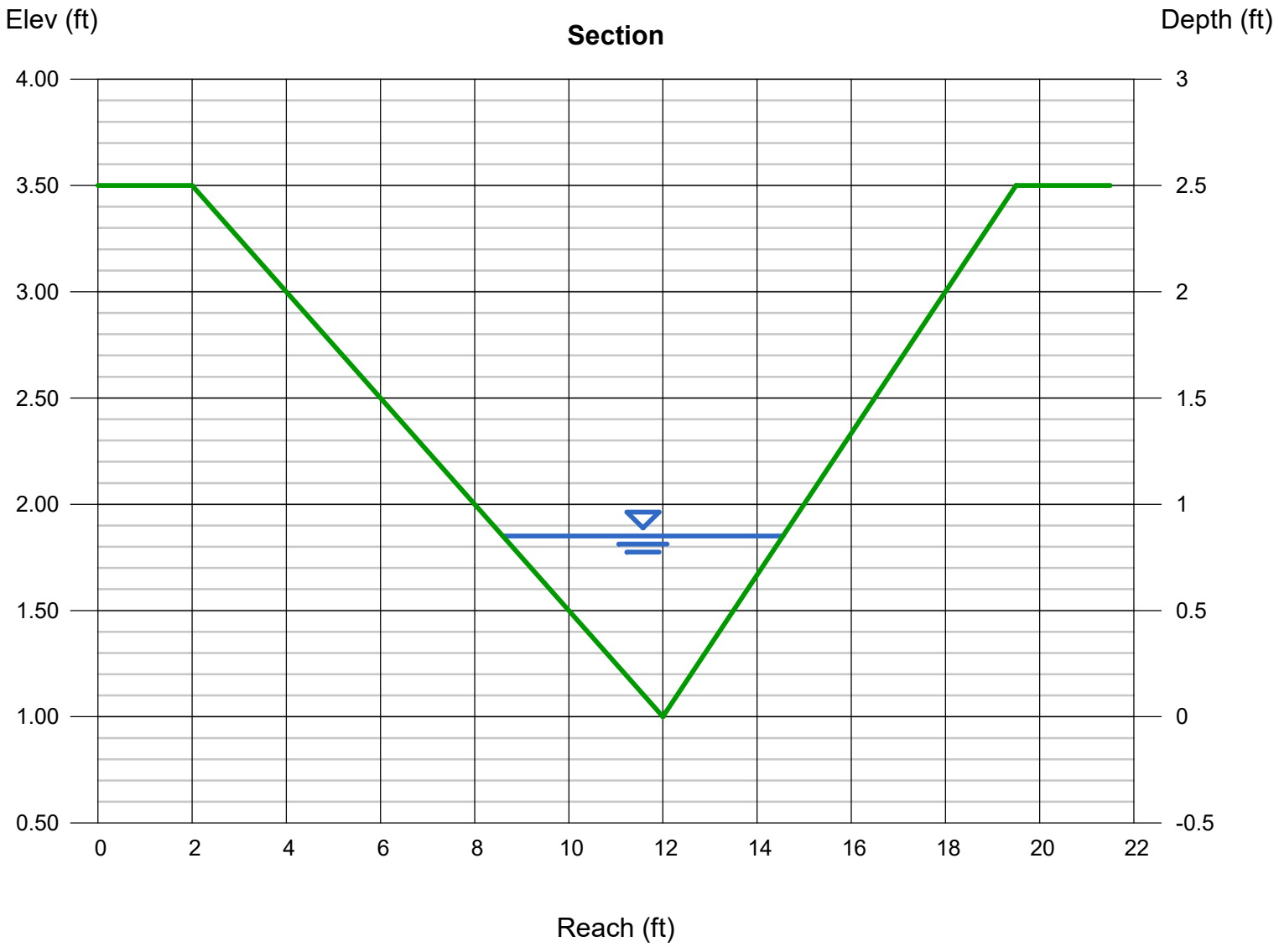
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.70

Highlighted

Depth (ft)	= 0.85
Q (cfs)	= 11.70
Area (sqft)	= 2.53
Velocity (ft/s)	= 4.63
Wetted Perim (ft)	= 6.19
Crit Depth, Yc (ft)	= 0.93
Top Width (ft)	= 5.95
EGL (ft)	= 1.18



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE P - MAX SLOPE (Q100)

Triangular

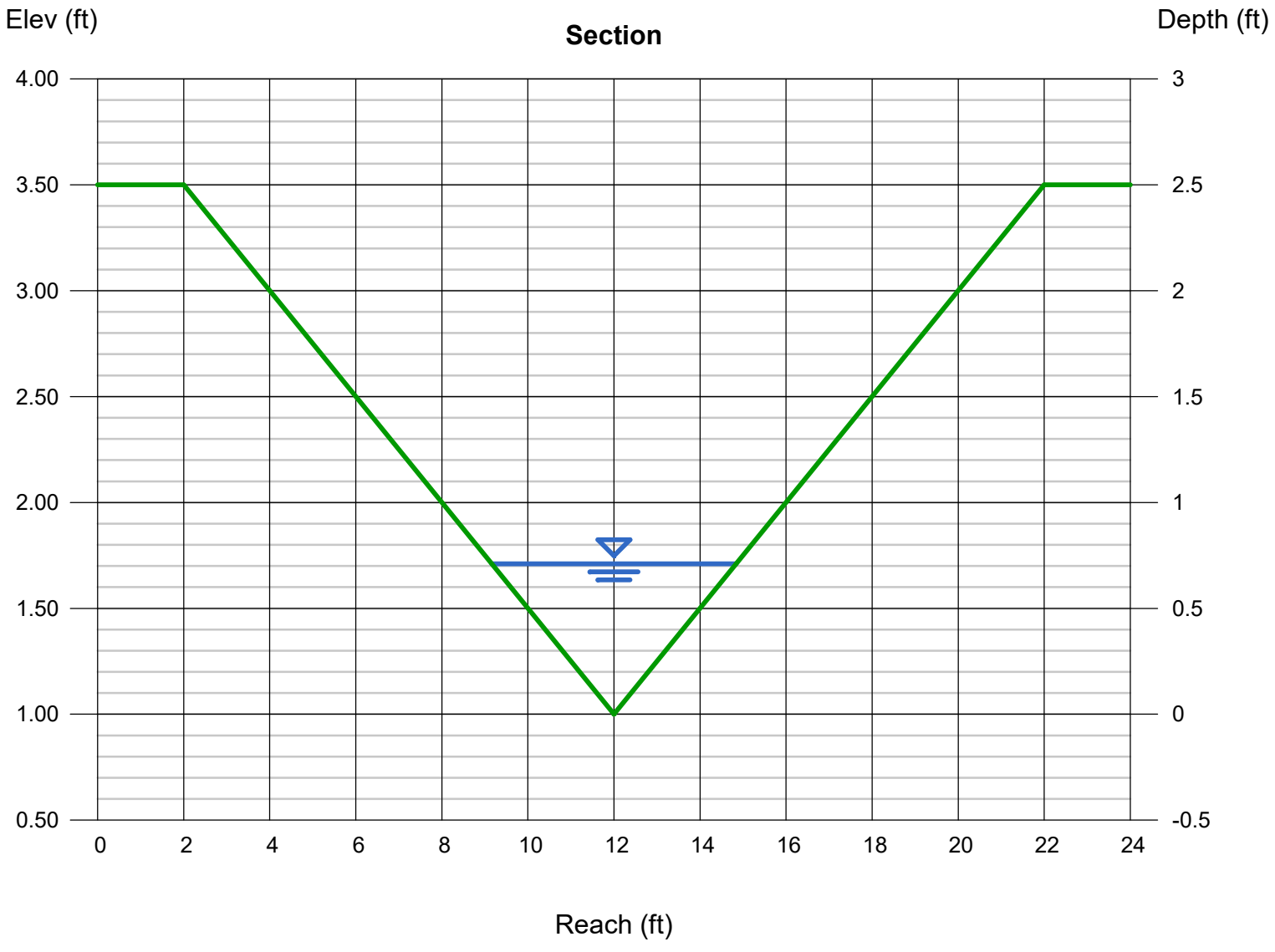
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 8.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.70

Highlighted

Depth (ft)	= 0.71
Q (cfs)	= 11.70
Area (sqft)	= 2.02
Velocity (ft/s)	= 5.80
Wetted Perim (ft)	= 5.85
Crit Depth, Yc (ft)	= 0.89
Top Width (ft)	= 5.68
EGL (ft)	= 1.23



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE Q (Q5)

Triangular

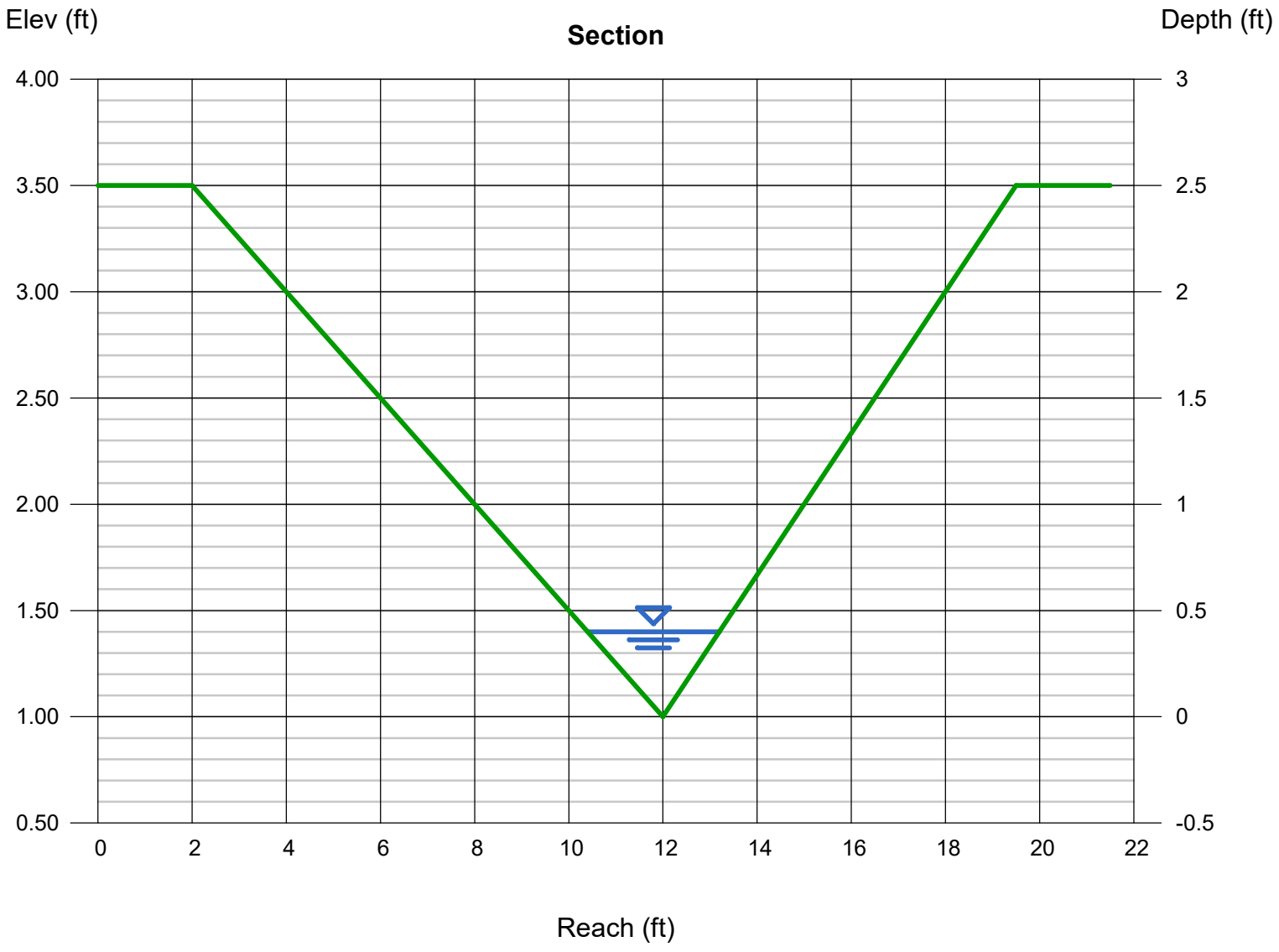
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.10

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 1.100
Area (sqft)	= 0.56
Velocity (ft/s)	= 1.96
Wetted Perim (ft)	= 2.91
Crit Depth, Yc (ft)	= 0.37
Top Width (ft)	= 2.80
EGL (ft)	= 0.46



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE Q - MAX SLOPE (Q100)

Triangular

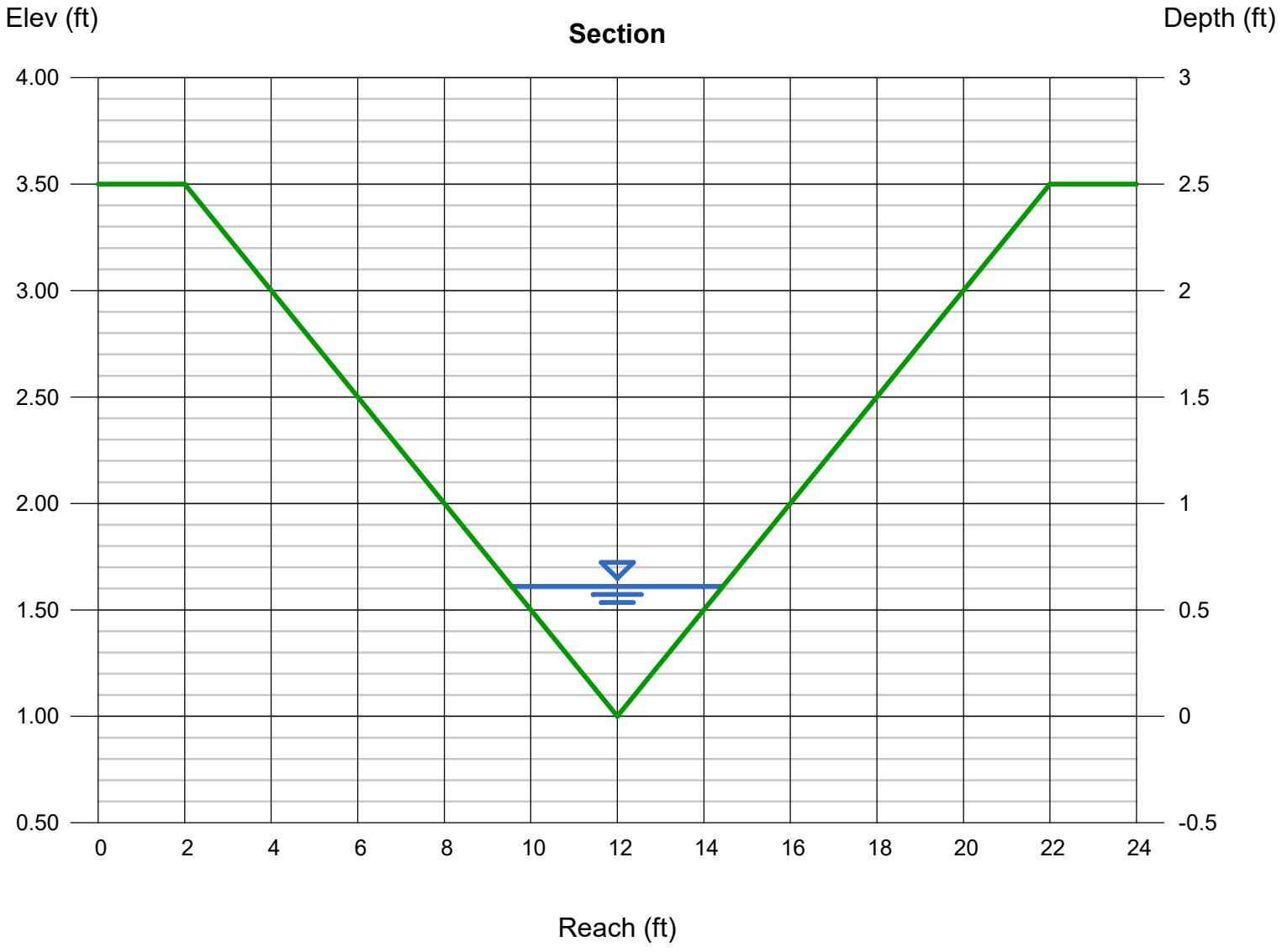
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.80

Highlighted

Depth (ft)	= 0.61
Q (cfs)	= 3.800
Area (sqft)	= 1.49
Velocity (ft/s)	= 2.55
Wetted Perim (ft)	= 5.03
Crit Depth, Yc (ft)	= 0.57
Top Width (ft)	= 4.88
EGL (ft)	= 0.71



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE R (Q5)

Triangular

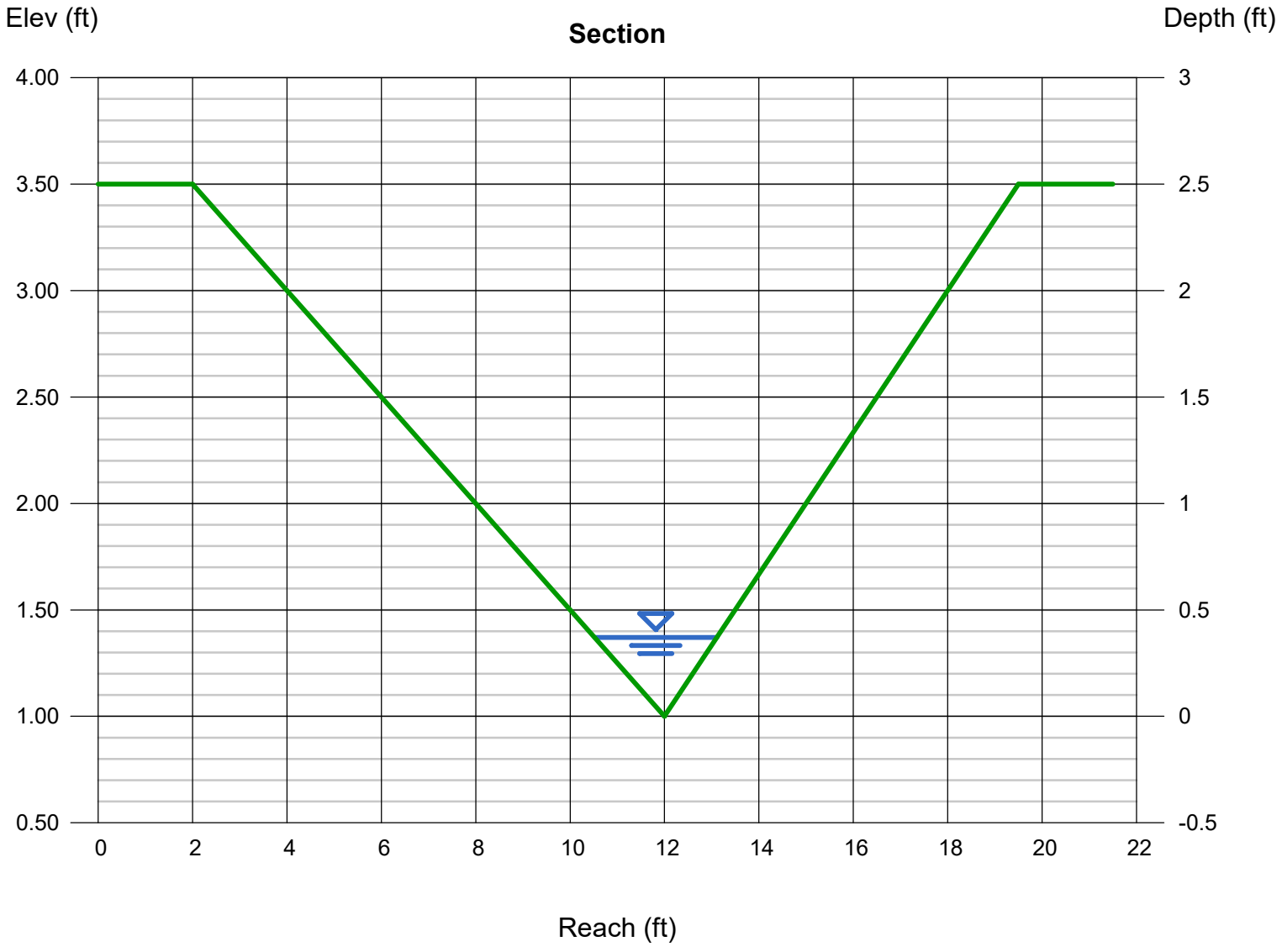
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 8.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.80

Highlighted

Depth (ft)	= 0.37
Q (cfs)	= 1.800
Area (sqft)	= 0.48
Velocity (ft/s)	= 3.76
Wetted Perim (ft)	= 2.70
Crit Depth, Yc (ft)	= 0.44
Top Width (ft)	= 2.59
EGL (ft)	= 0.59



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE R (Q100) - STABLE SLOPE

Triangular

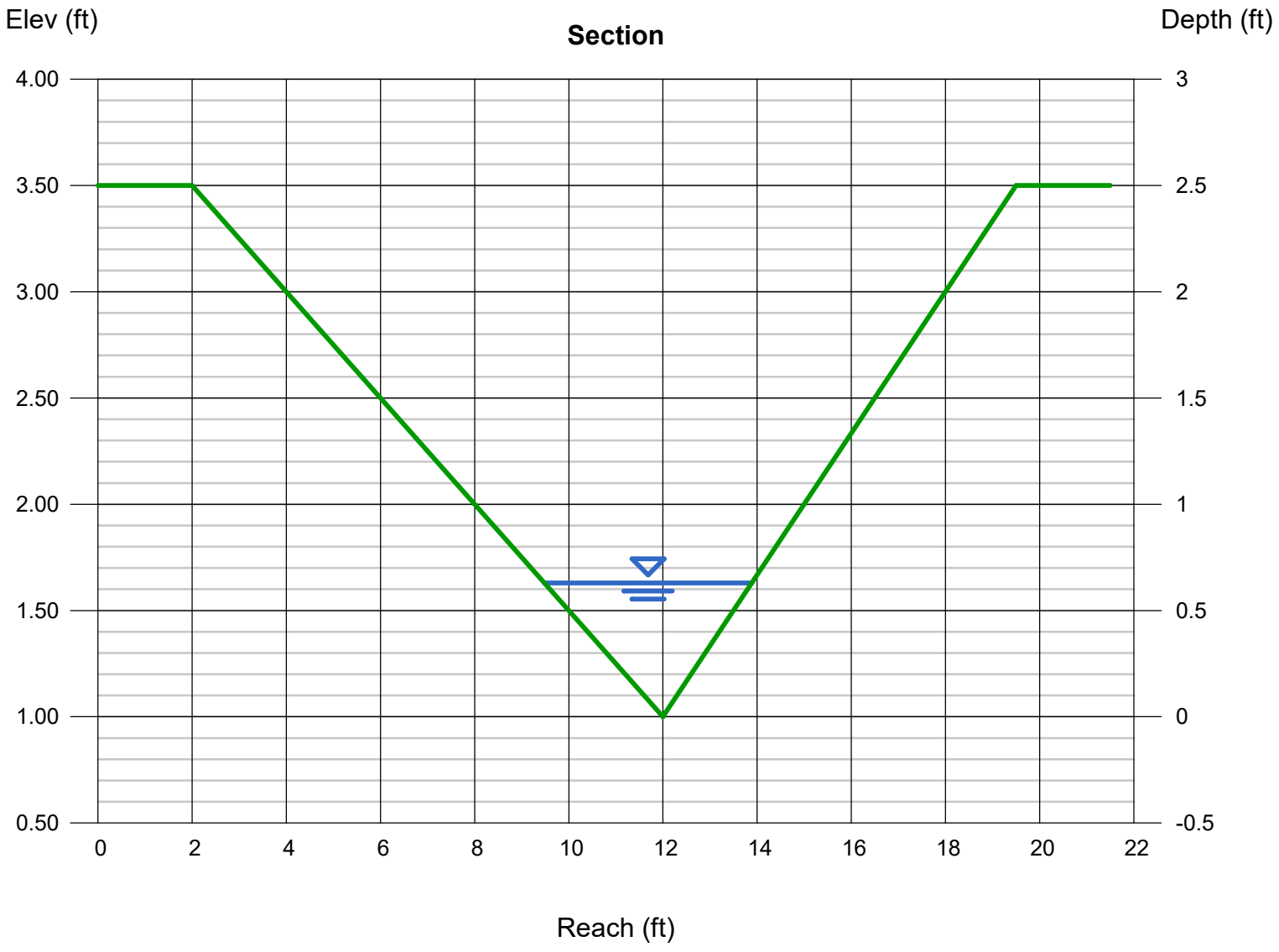
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.50
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.50

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 5.500
Area (sqft)	= 1.39
Velocity (ft/s)	= 3.96
Wetted Perim (ft)	= 4.59
Crit Depth, Yc (ft)	= 0.69
Top Width (ft)	= 4.41
EGL (ft)	= 0.87



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE R - MAX SLOPE (Q100)

Triangular

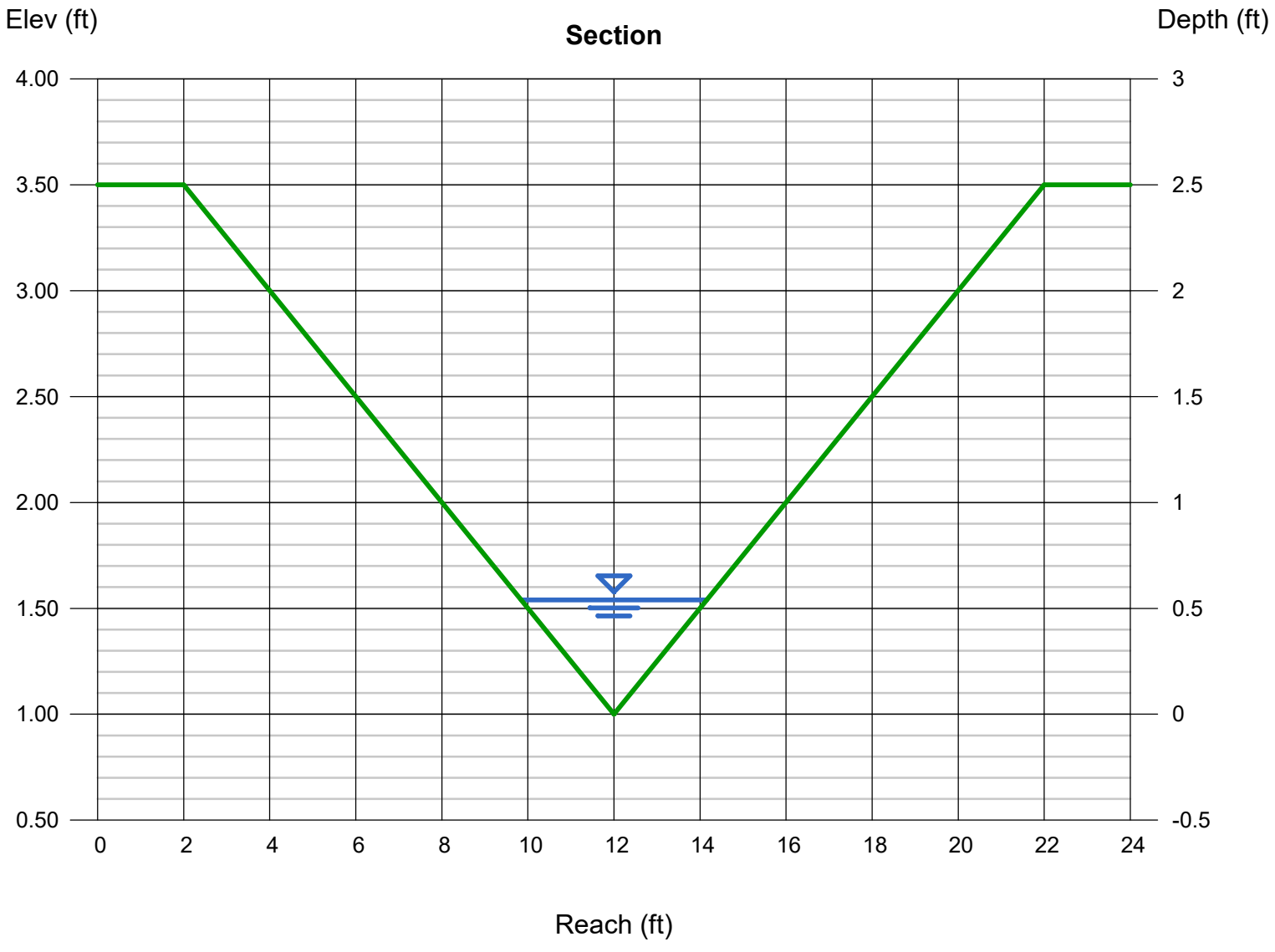
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 8.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.50

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 5.500
Area (sqft)	= 1.17
Velocity (ft/s)	= 4.72
Wetted Perim (ft)	= 4.45
Crit Depth, Yc (ft)	= 0.66
Top Width (ft)	= 4.32
EGL (ft)	= 0.89



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

ROAD-SIDE SWALE S (Q5)

Triangular

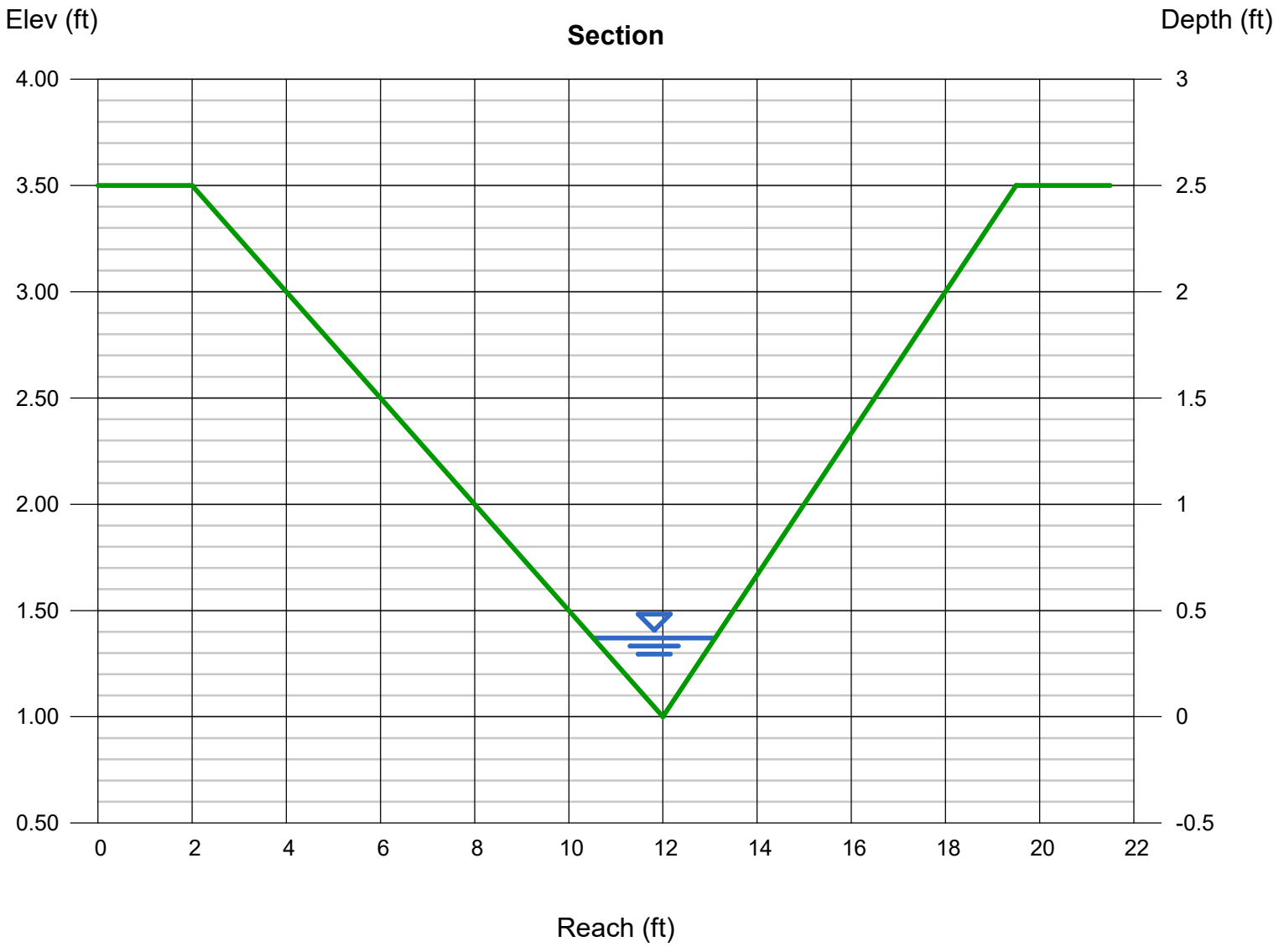
Side Slopes (z:1)	= 4.00, 3.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.90

Highlighted

Depth (ft)	= 0.37
Q (cfs)	= 0.900
Area (sqft)	= 0.48
Velocity (ft/s)	= 1.88
Wetted Perim (ft)	= 2.70
Crit Depth, Yc (ft)	= 0.34
Top Width (ft)	= 2.59
EGL (ft)	= 0.42



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, 00 17 2026

ROADSIDE SWALE S - MAX SLOPE (Q100)

Triangular

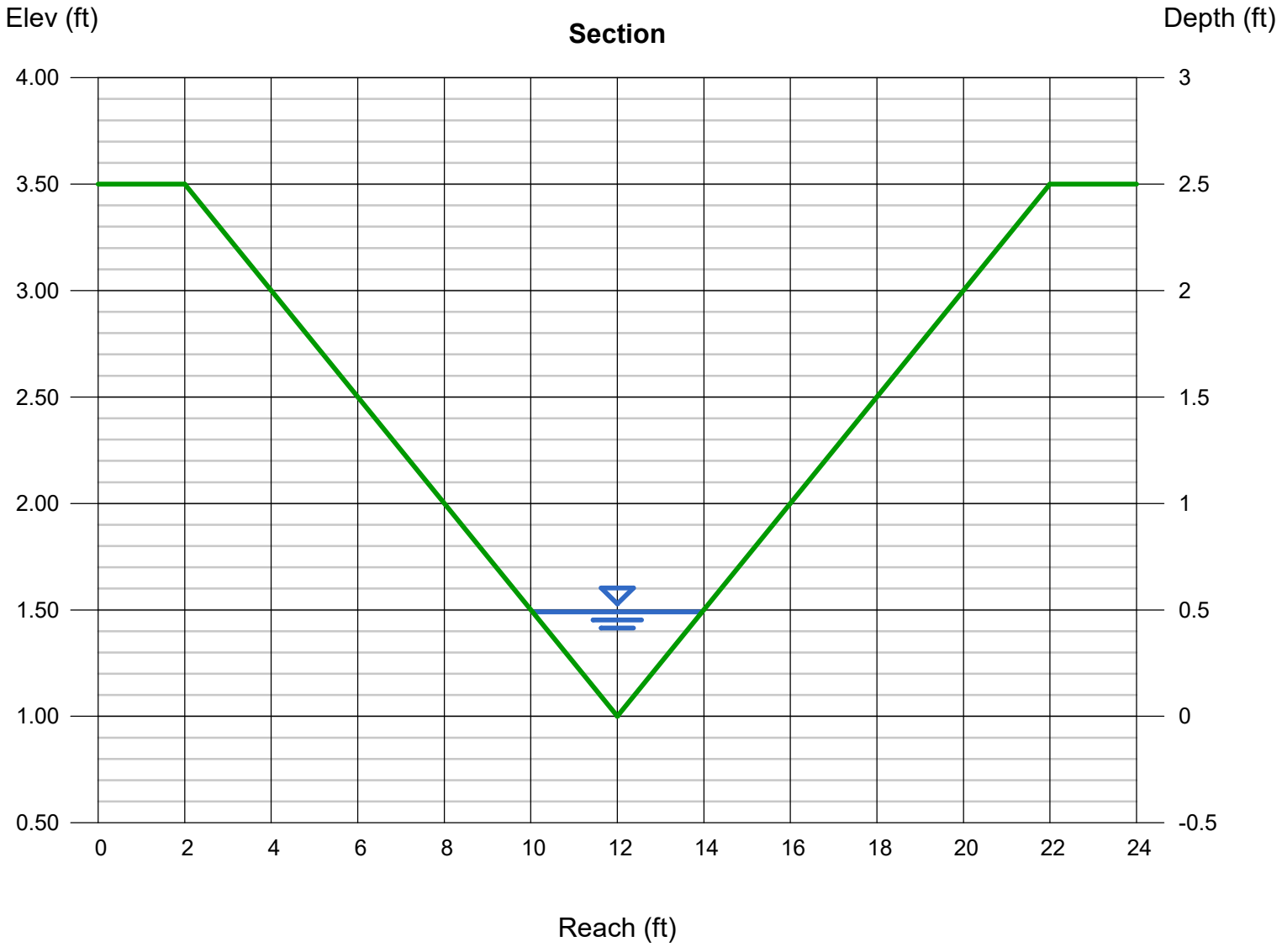
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.20

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 2.200
Area (sqft)	= 0.96
Velocity (ft/s)	= 2.29
Wetted Perim (ft)	= 4.04
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 3.92
EGL (ft)	= 0.57



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP1 SWALE Q5

Triangular

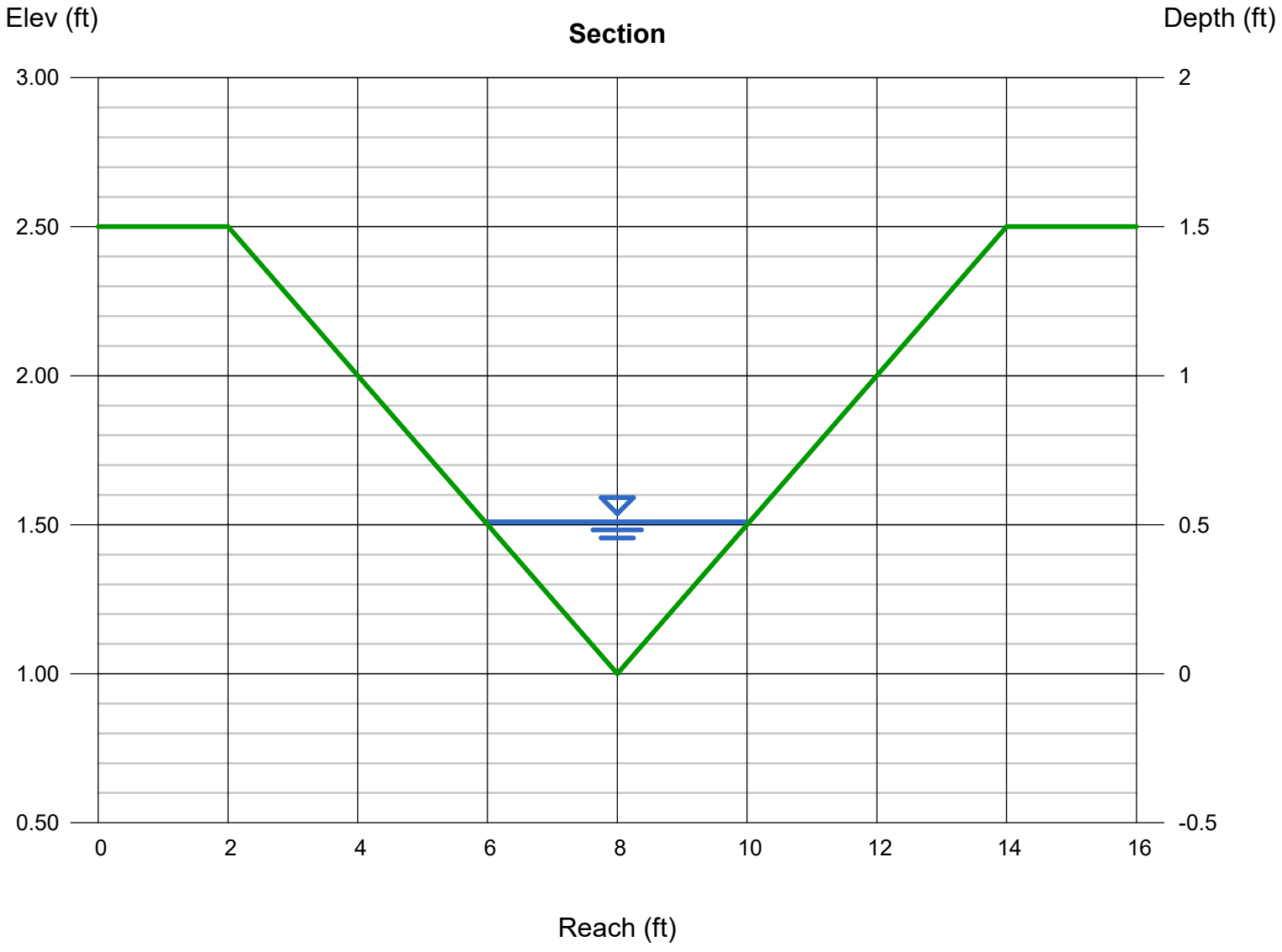
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.35
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.60

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 2.600
Area (sqft)	= 1.04
Velocity (ft/s)	= 2.50
Wetted Perim (ft)	= 4.21
Crit Depth, Yc (ft)	= 0.49
Top Width (ft)	= 4.08
EGL (ft)	= 0.61



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP1 SWALE Q100

Triangular

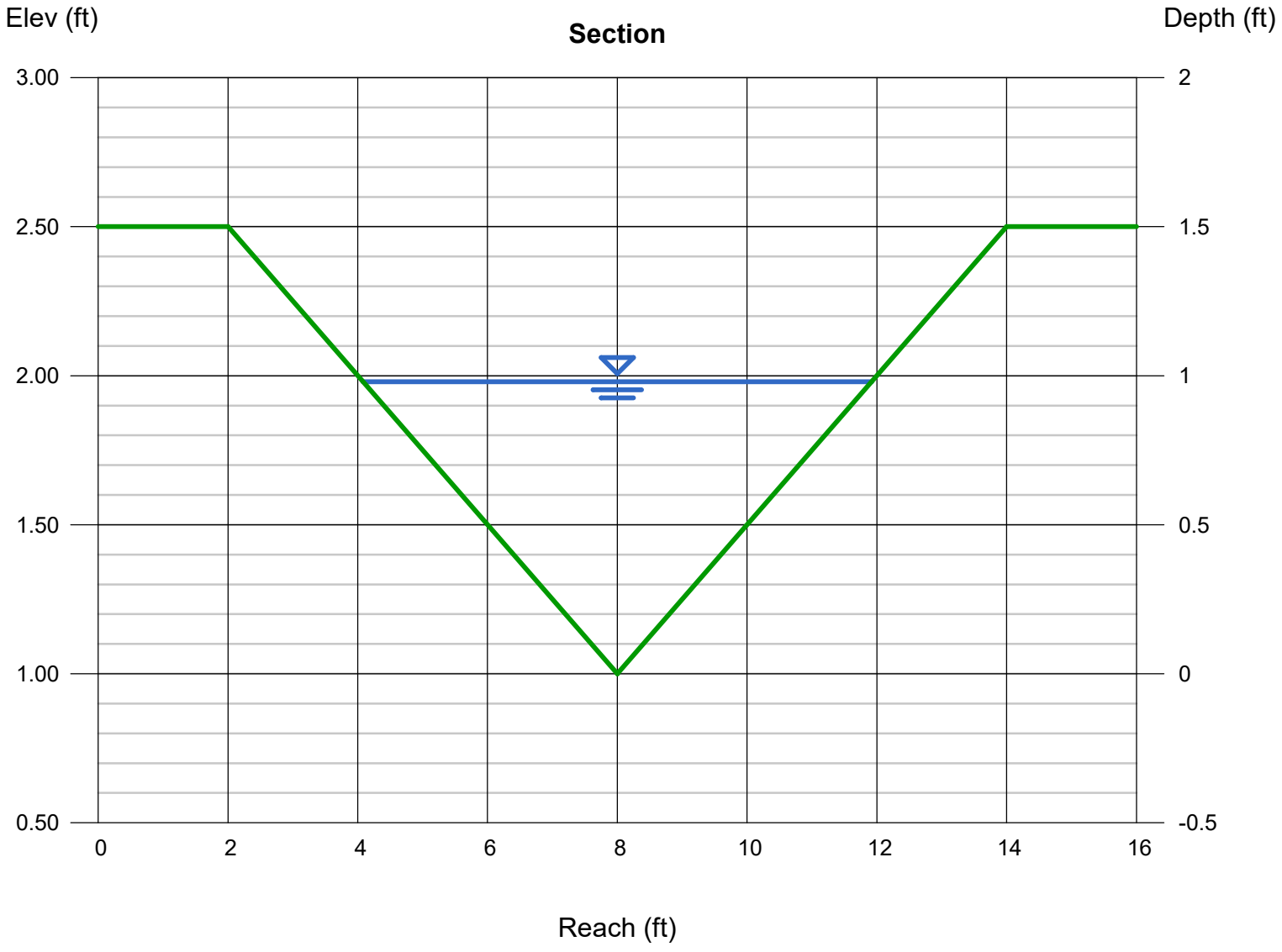
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 2.35
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.90

Highlighted

Depth (ft)	= 0.98
Q (cfs)	= 14.90
Area (sqft)	= 3.84
Velocity (ft/s)	= 3.88
Wetted Perim (ft)	= 8.08
Crit Depth, Yc (ft)	= 0.98
Top Width (ft)	= 7.84
EGL (ft)	= 1.21



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

Ex Swale Tributary 2 @ DP1.1 (total flow) Q5

User-defined

Invert Elev (ft)	= 91.98
Slope (%)	= 3.20
N-Value	= 0.035

Calculations

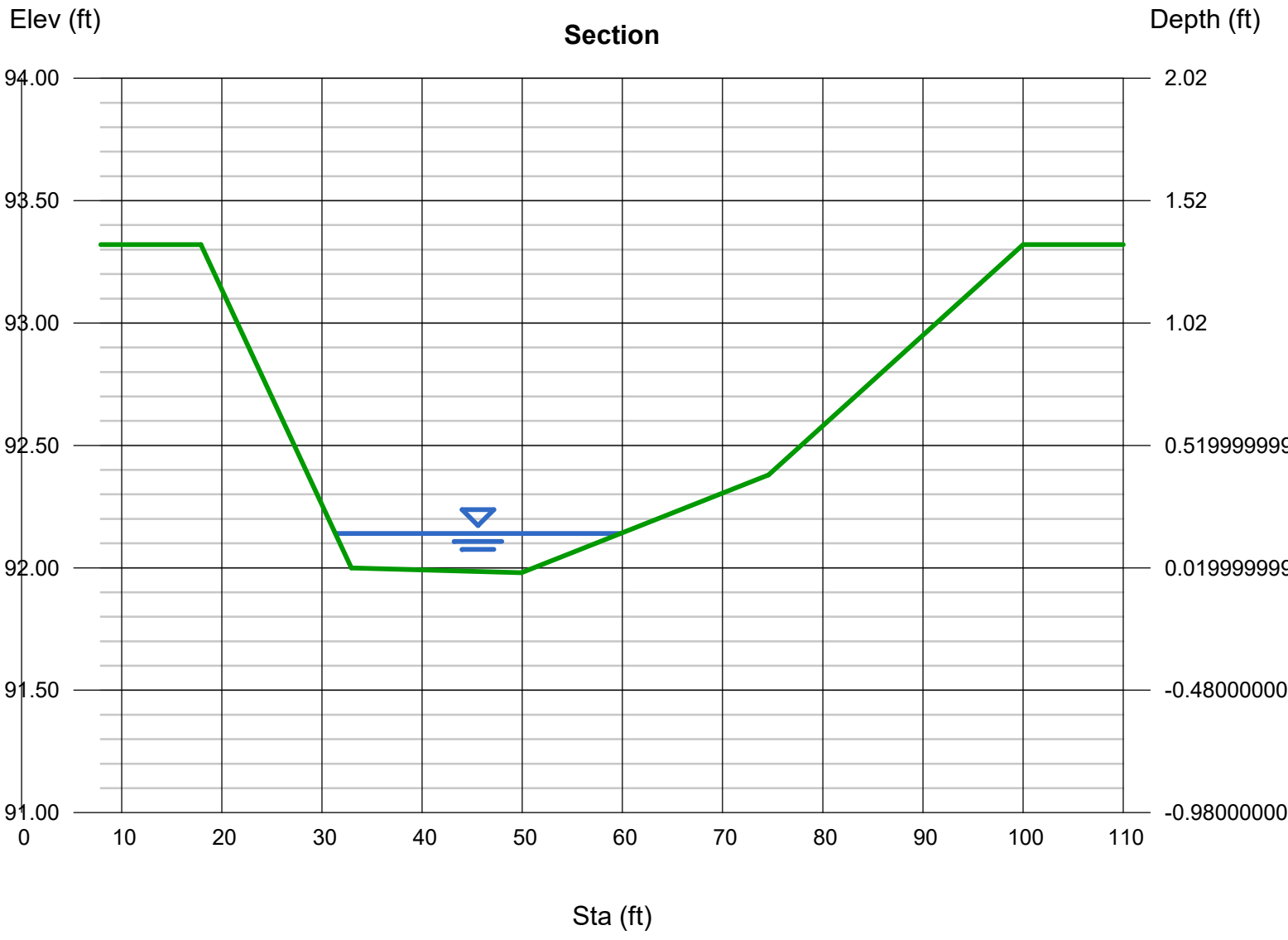
Compute by:	Known Q
Known Q (cfs)	= 5.80

Highlighted

Depth (ft)	= 0.16
Q (cfs)	= 5.800
Area (sqft)	= 3.45
Velocity (ft/s)	= 1.68
Wetted Perim (ft)	= 28.44
Crit Depth, Yc (ft)	= 0.15
Top Width (ft)	= 28.43
EGL (ft)	= 0.20

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

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

Ex Swale Tributary 2 @ DP1.1 (total flow) Q100

User-defined

Invert Elev (ft)	= 91.98
Slope (%)	= 3.20
N-Value	= 0.035

Calculations

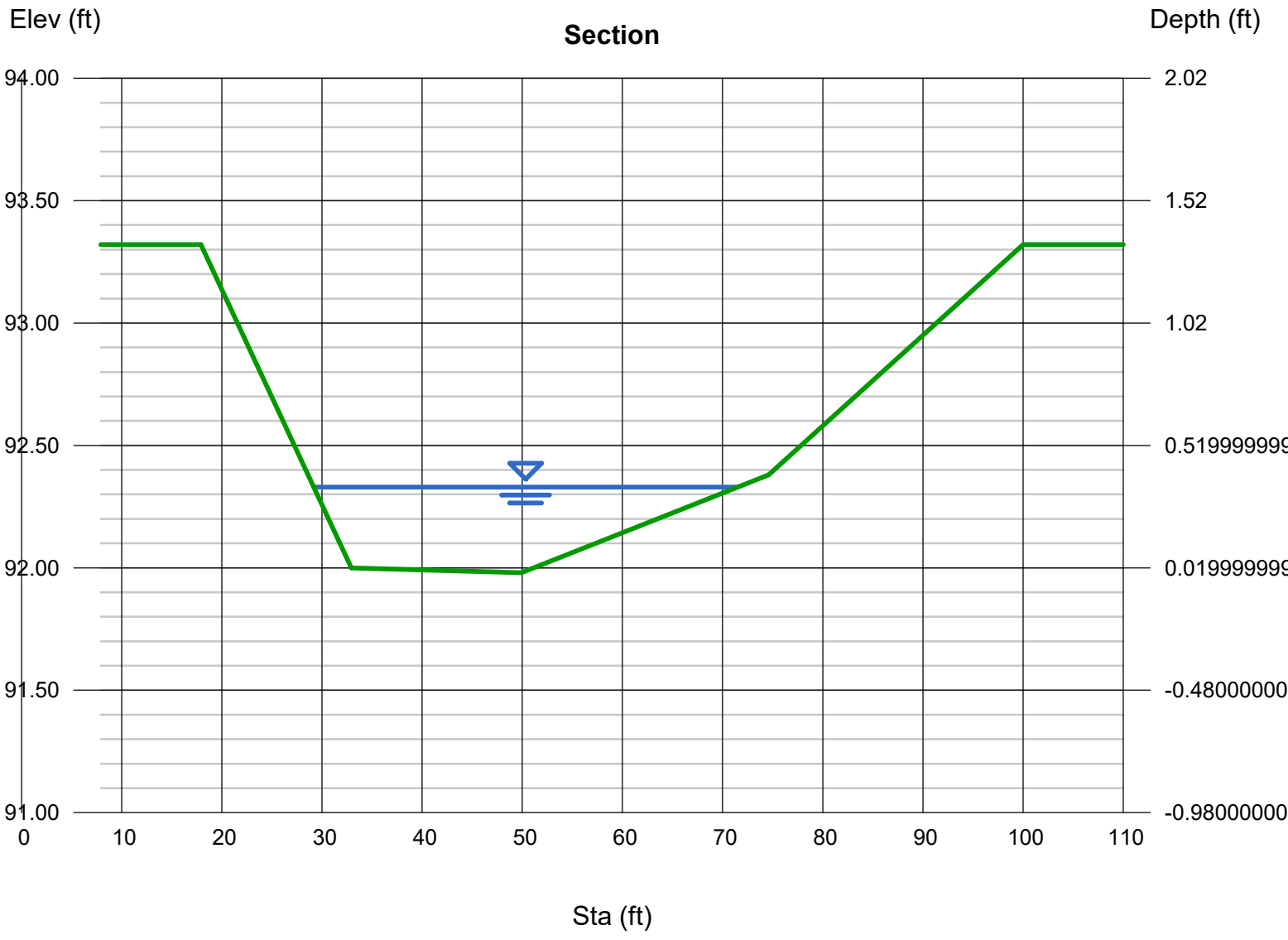
Compute by:	Known Q
Known Q (cfs)	= 29.10

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 29.10
Area (sqft)	= 10.17
Velocity (ft/s)	= 2.86
Wetted Perim (ft)	= 42.32
Crit Depth, Yc (ft)	= 0.36
Top Width (ft)	= 42.31
EGL (ft)	= 0.48

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

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP3.1 - DP4 SWALE (Q5)

Triangular

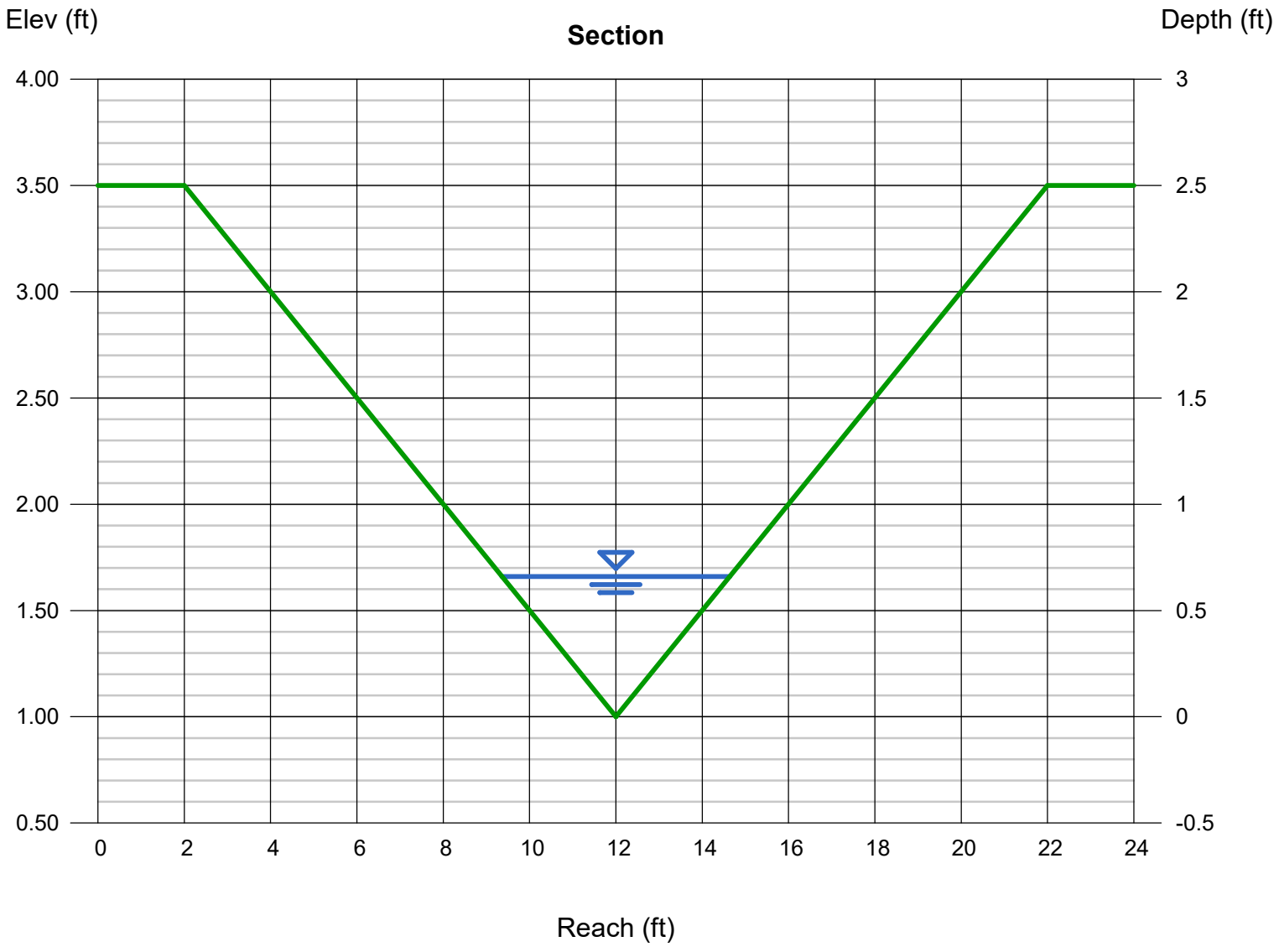
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 6.33
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.40

Highlighted

Depth (ft)	= 0.66
Q (cfs)	= 8.400
Area (sqft)	= 1.74
Velocity (ft/s)	= 4.82
Wetted Perim (ft)	= 5.44
Crit Depth, Yc (ft)	= 0.78
Top Width (ft)	= 5.28
EGL (ft)	= 1.02



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 2 2026

DP3.1 - DP4 MAX SLOPE (Q100)

Triangular

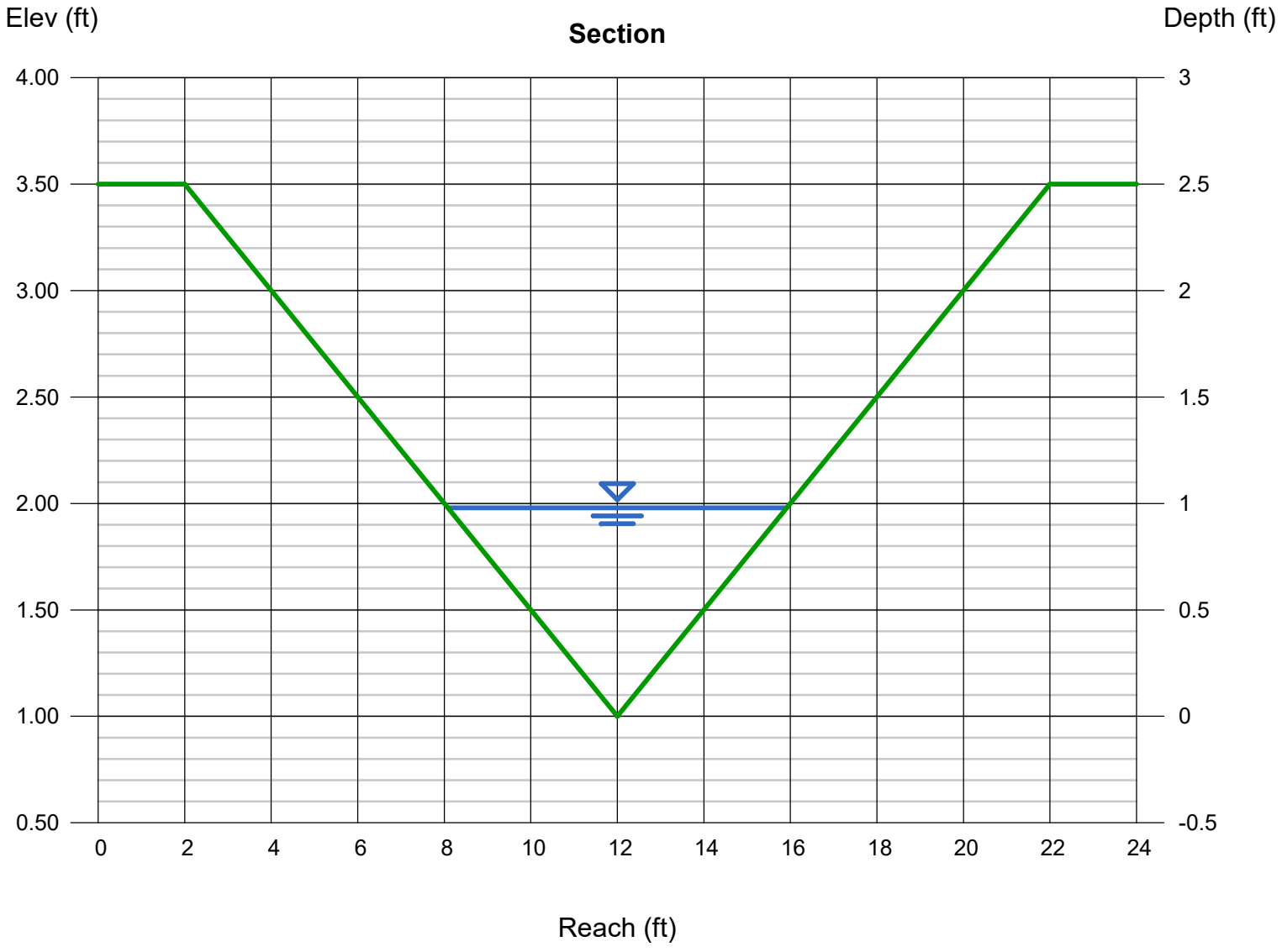
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 10.90
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.10

Highlighted

Depth (ft)	= 0.98
Q (cfs)	= 32.10
Area (sqft)	= 3.84
Velocity (ft/s)	= 8.36
Wetted Perim (ft)	= 8.08
Crit Depth, Yc (ft)	= 1.32
Top Width (ft)	= 7.84
EGL (ft)	= 2.07



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 2 2026

DP3.1 - DP4 (Q100)

Triangular

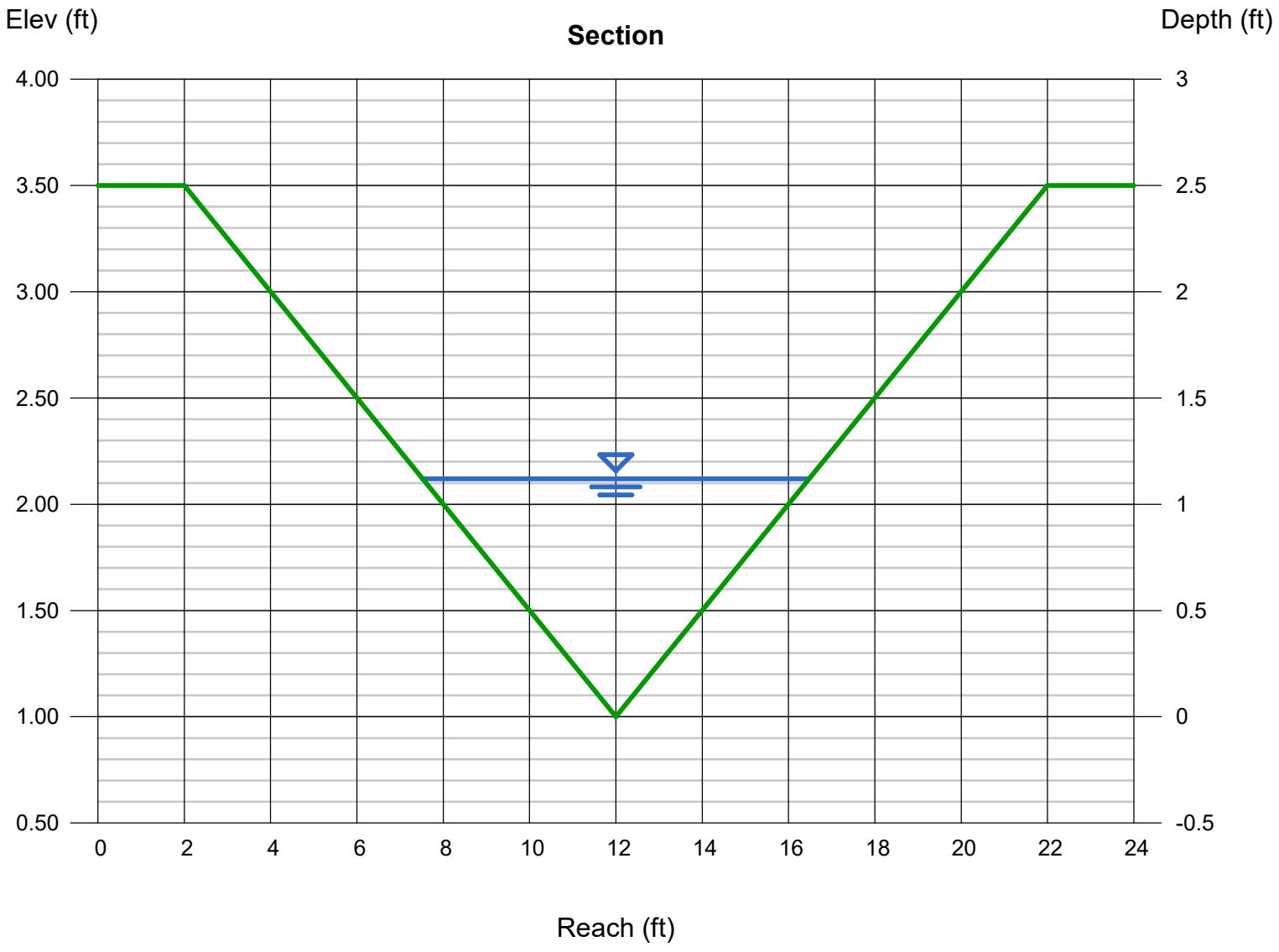
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 5.20
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 32.10

Highlighted

Depth (ft)	= 1.12
Q (cfs)	= 32.10
Area (sqft)	= 5.02
Velocity (ft/s)	= 6.40
Wetted Perim (ft)	= 9.24
Crit Depth, Yc (ft)	= 1.32
Top Width (ft)	= 8.96
EGL (ft)	= 1.76



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP3 - DP3.1 SWALE (Q5)

Triangular

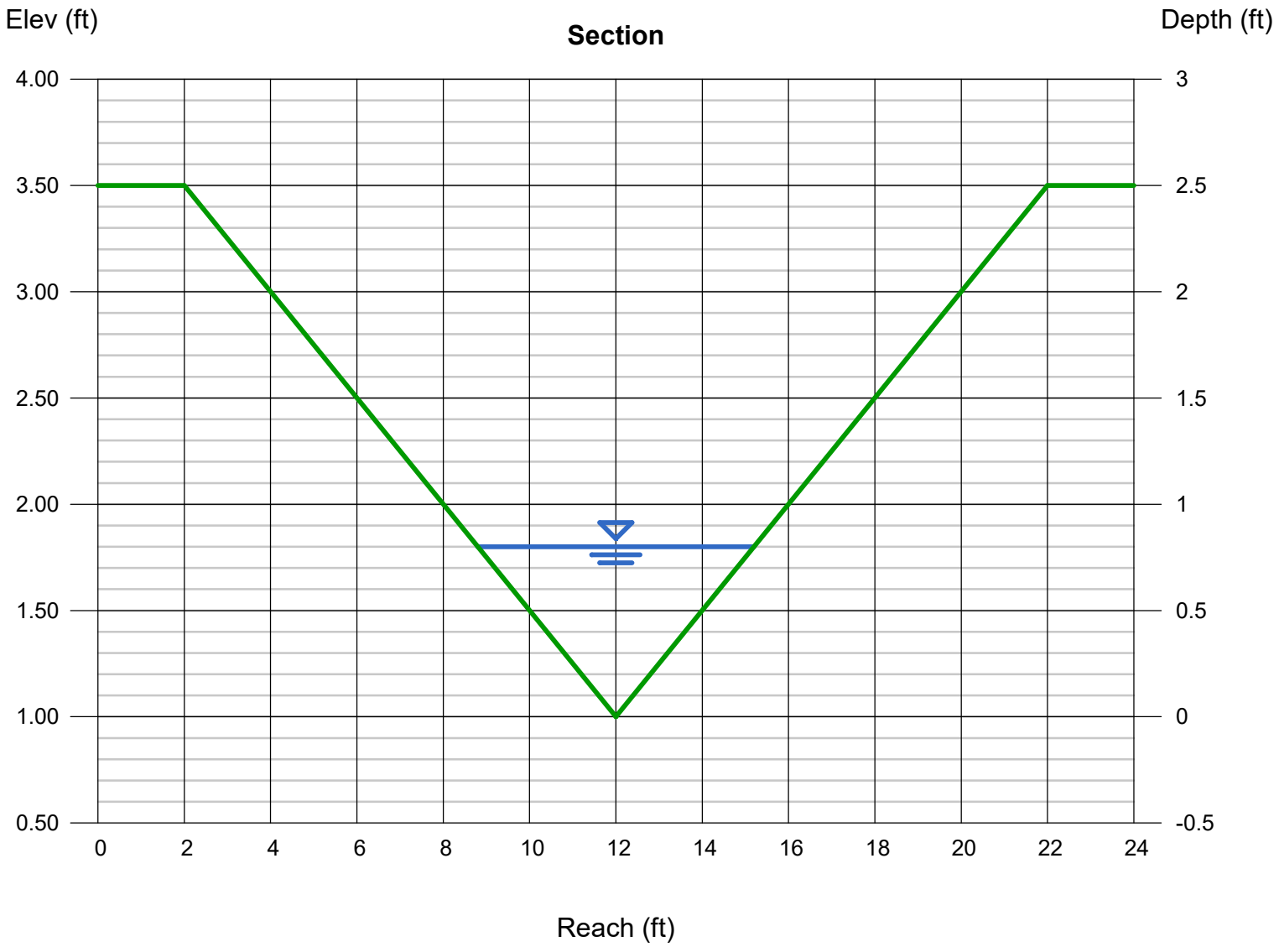
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.40

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 6.400
Area (sqft)	= 2.56
Velocity (ft/s)	= 2.50
Wetted Perim (ft)	= 6.60
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 6.40
EGL (ft)	= 0.90



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP3 - DP3.1 SWALE (Q100)

Triangular

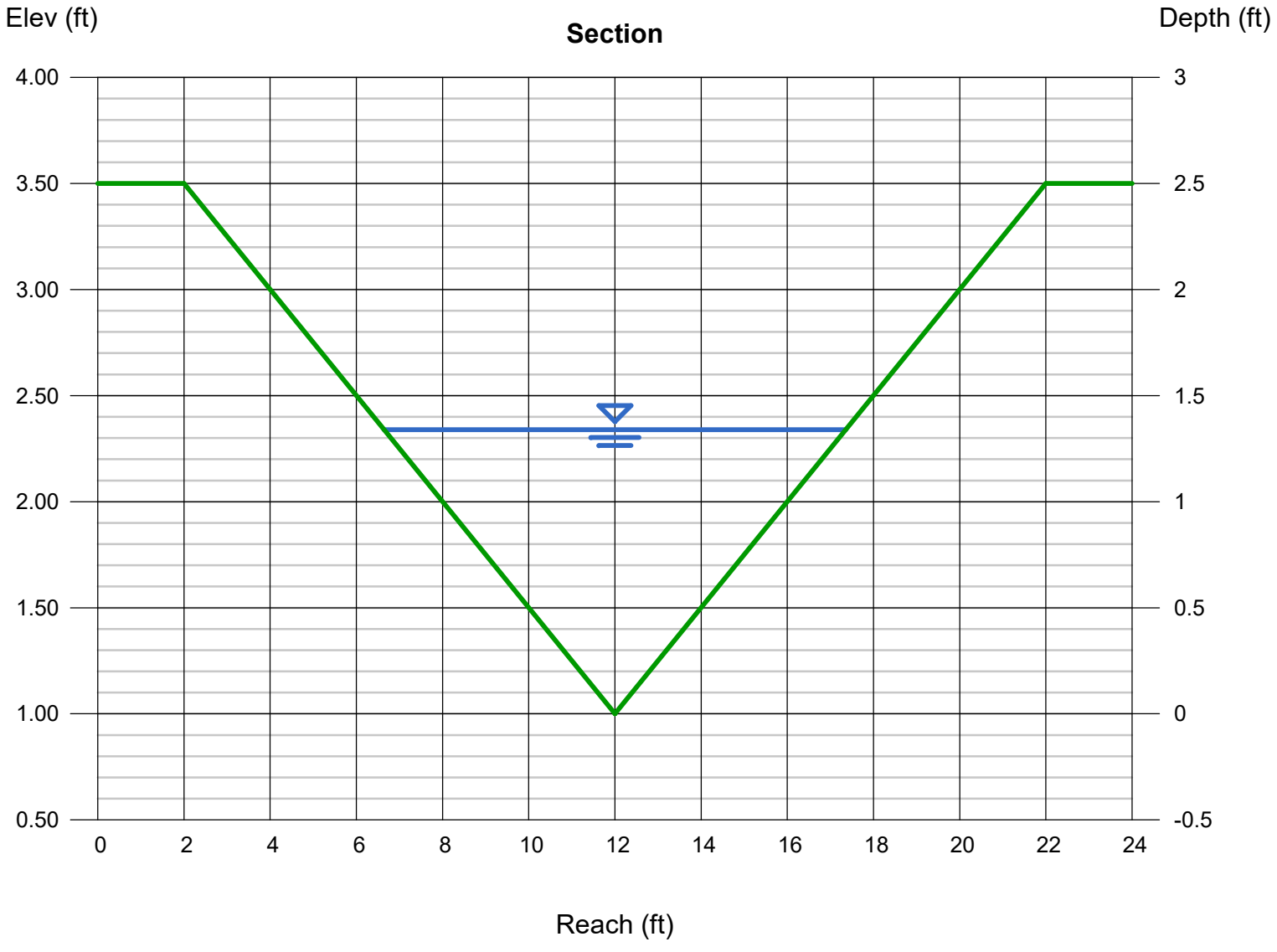
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.25
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 25.10

Highlighted

Depth (ft)	= 1.34
Q (cfs)	= 25.10
Area (sqft)	= 7.18
Velocity (ft/s)	= 3.49
Wetted Perim (ft)	= 11.05
Crit Depth, Yc (ft)	= 1.20
Top Width (ft)	= 10.72
EGL (ft)	= 1.53



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 2 2026

DP4.1 - POND 1 OUTFALL SWALE (Q5)

Trapezoidal

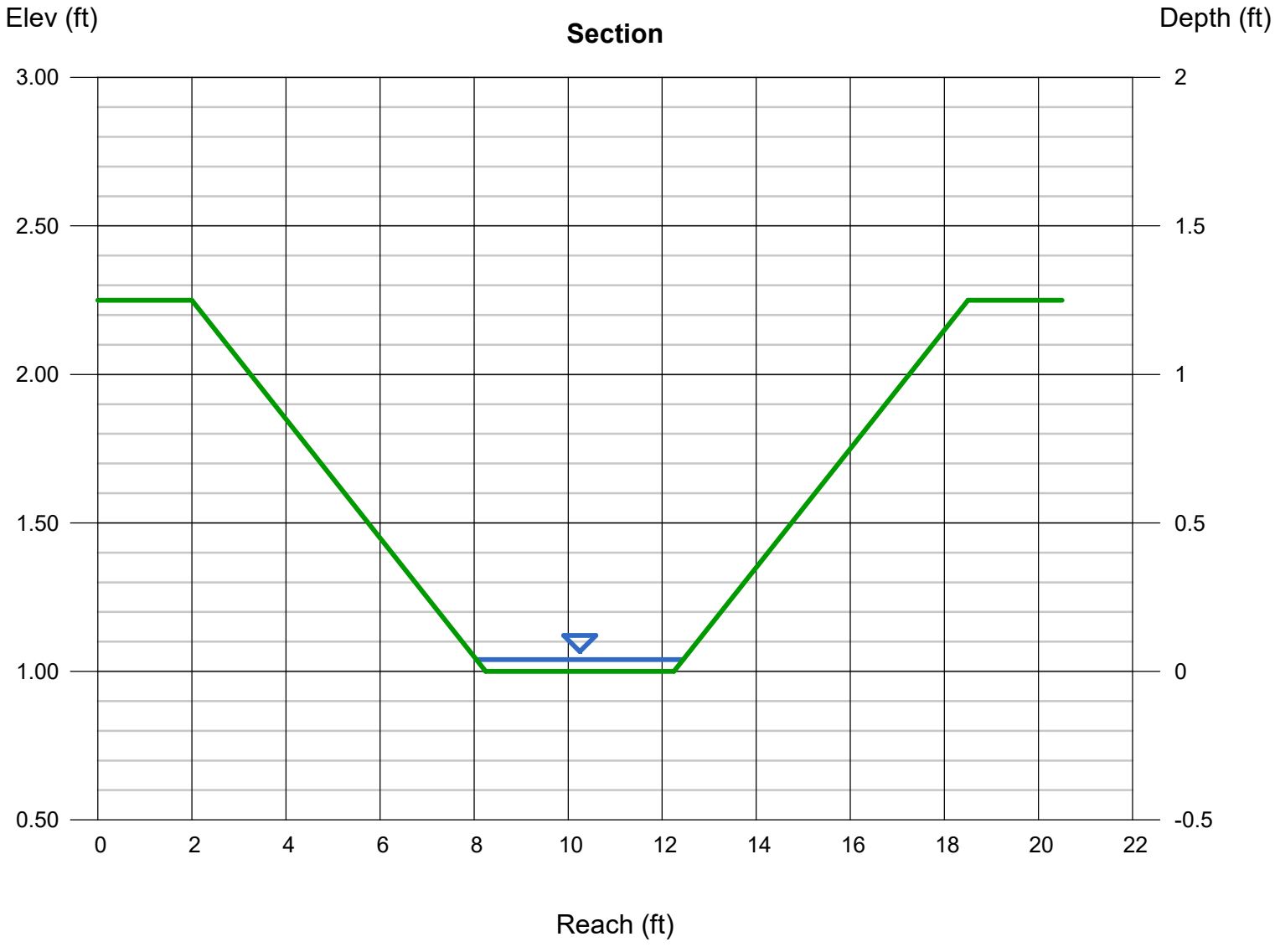
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 5.00, 5.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.04
Q (cfs)	= 0.100
Area (sqft)	= 0.17
Velocity (ft/s)	= 0.60
Wetted Perim (ft)	= 4.41
Crit Depth, Yc (ft)	= 0.03
Top Width (ft)	= 4.40
EGL (ft)	= 0.05



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, 00 31 2026

DP4.1 - POND 1 OUTFALL SWALE

Trapezoidal

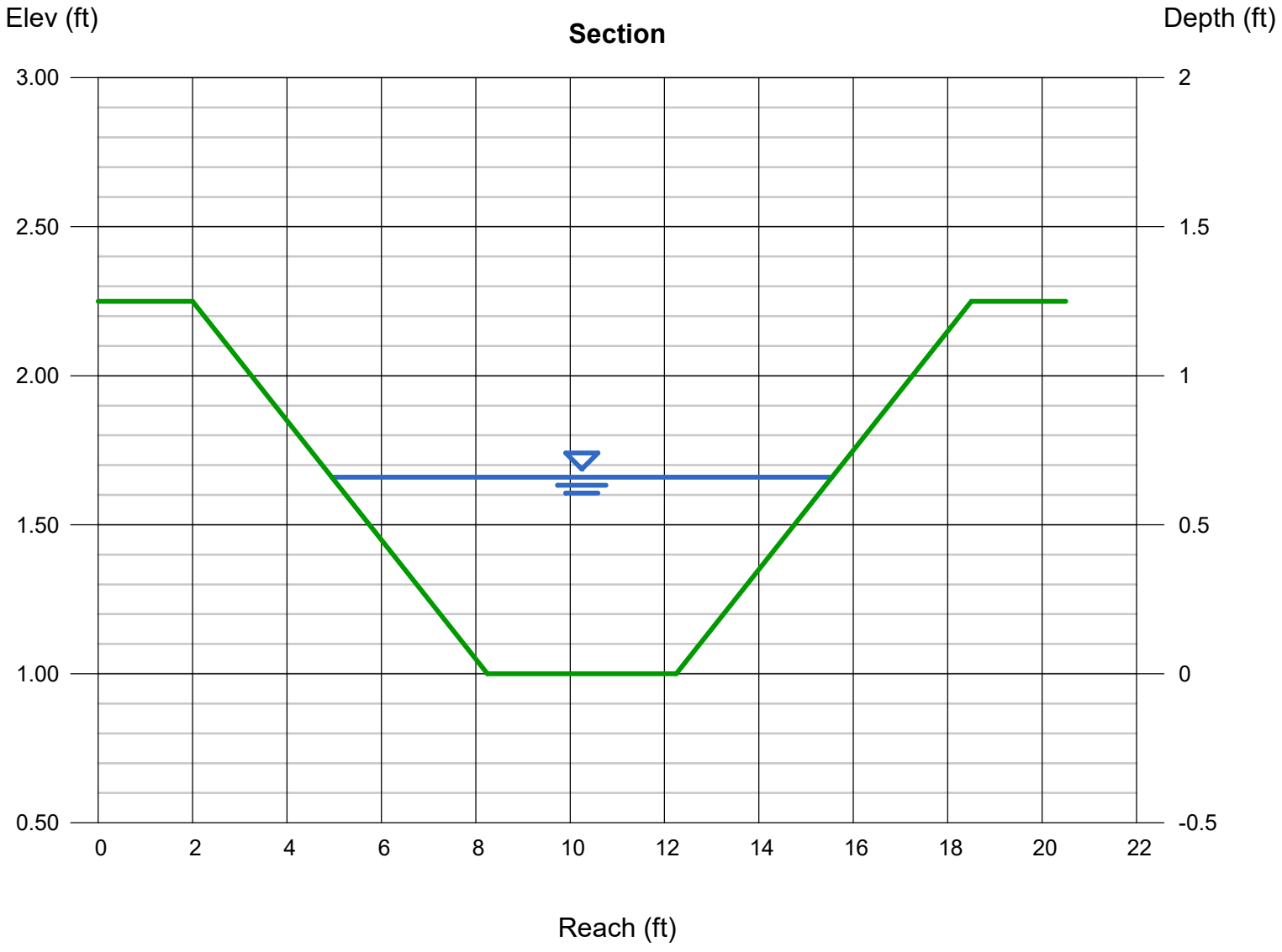
Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 5.00, 5.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 1.00
Slope (%)	= 4.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.90

Highlighted

Depth (ft)	= 0.66
Q (cfs)	= 23.90
Area (sqft)	= 4.82
Velocity (ft/s)	= 4.96
Wetted Perim (ft)	= 10.73
Crit Depth, Yc (ft)	= 0.76
Top Width (ft)	= 10.60
EGL (ft)	= 1.04



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

Ex Swale Tributary 3 @ DP7 (total flow) Q5

User-defined

Invert Elev (ft)	= 9.88
Slope (%)	= 3.40
N-Value	= 0.035

Calculations

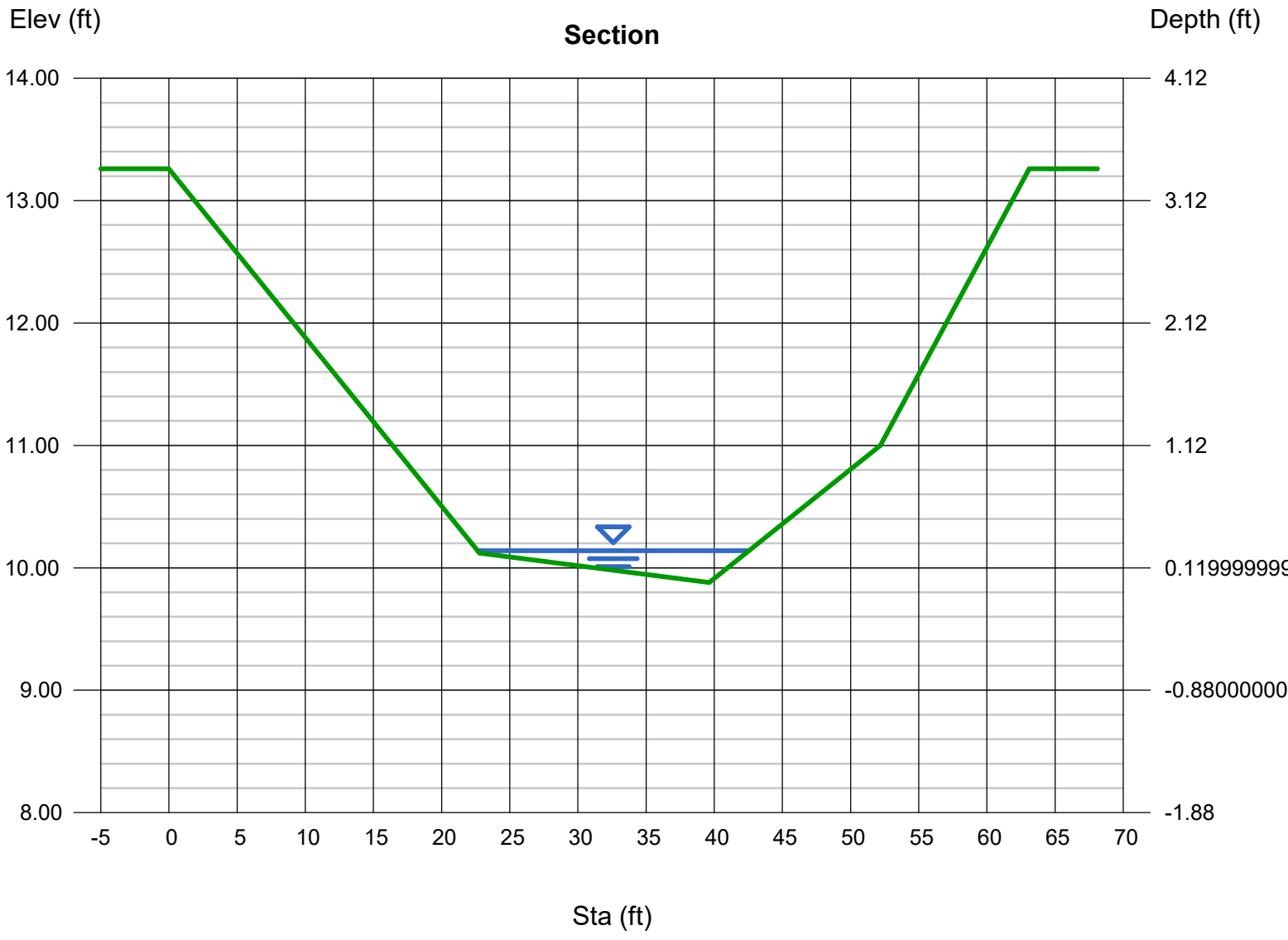
Compute by:	Known Q
Known Q (cfs)	= 5.40

Highlighted

Depth (ft)	= 0.26
Q (cfs)	= 5.400
Area (sqft)	= 2.74
Velocity (ft/s)	= 1.97
Wetted Perim (ft)	= 19.93
Crit Depth, Yc (ft)	= 0.26
Top Width (ft)	= 19.92
EGL (ft)	= 0.32

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

(0.00, 13.26)-(22.78, 10.12, 0.035)-(39.64, 9.88, 0.035)-(52.18, 11.00, 0.035)-(63.11, 13.26, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

Ex Swale Tributary 3 @ DP7 (total flow) Q100

User-defined

Invert Elev (ft)	= 9.88
Slope (%)	= 3.40
N-Value	= 0.035

Calculations

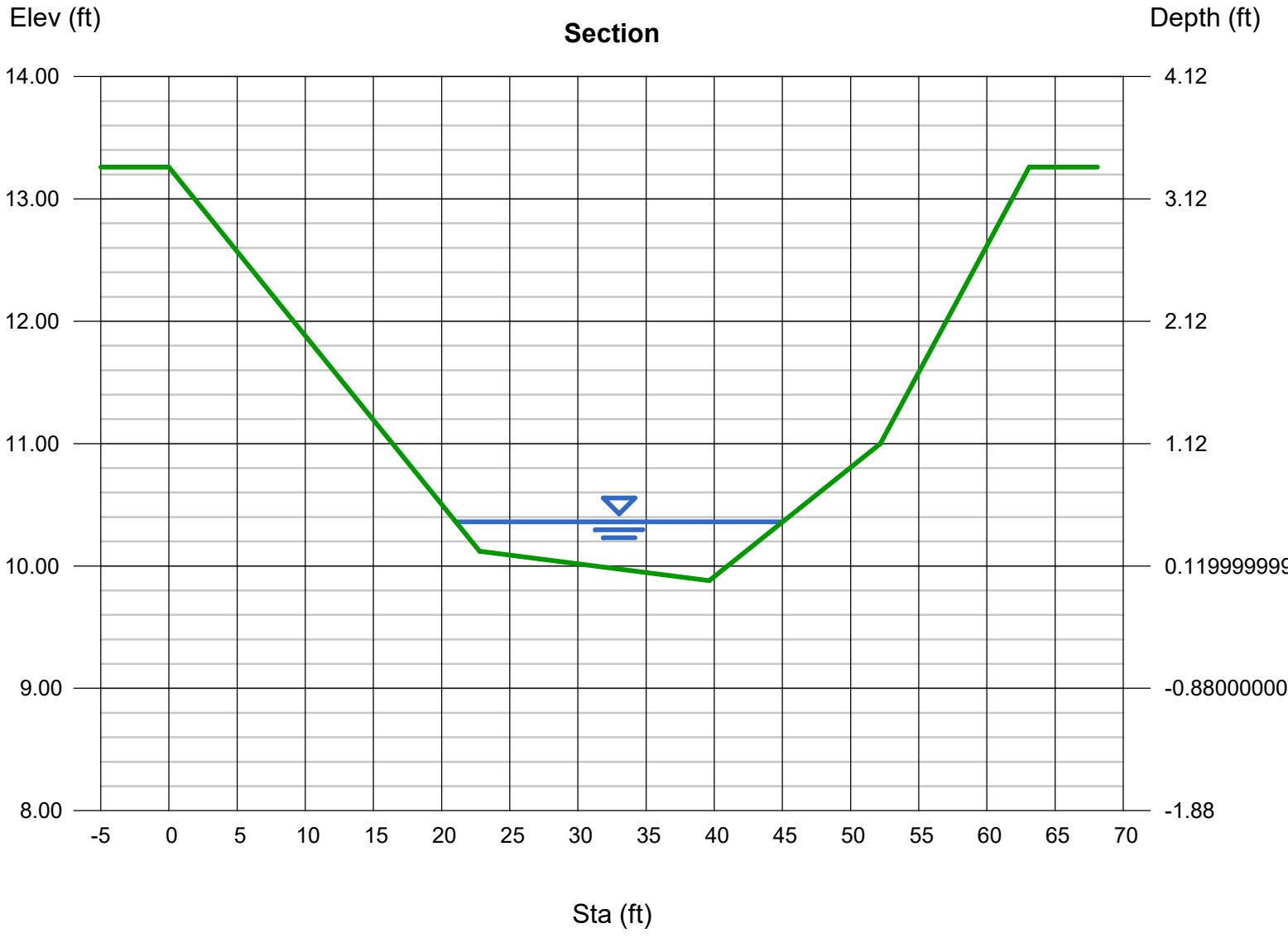
Compute by:	Known Q
Known Q (cfs)	= 26.60

Highlighted

Depth (ft)	= 0.48
Q (cfs)	= 26.60
Area (sqft)	= 7.57
Velocity (ft/s)	= 3.51
Wetted Perim (ft)	= 24.01
Crit Depth, Yc (ft)	= 0.51
Top Width (ft)	= 23.98
EGL (ft)	= 0.67

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

(0.00, 13.26)-(22.78, 10.12, 0.035)-(39.64, 9.88, 0.035)-(52.18, 11.00, 0.035)-(63.11, 13.26, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 27 2026

PROPOSED CONDITION DP9 SWALE (Q5)

Trapezoidal

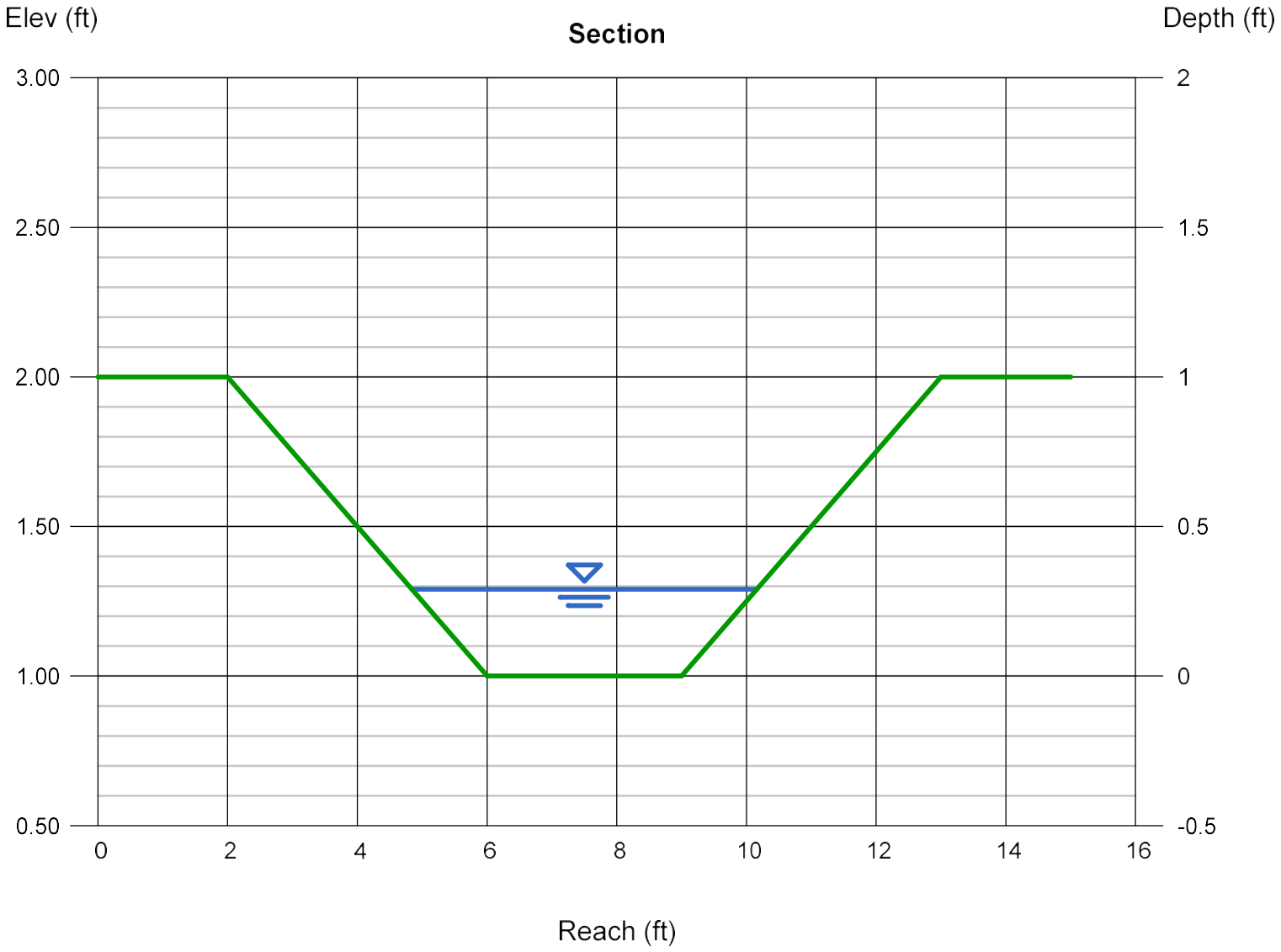
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.90

Highlighted

Depth (ft)	= 0.29
Q (cfs)	= 1.900
Area (sqft)	= 1.21
Velocity (ft/s)	= 1.57
Wetted Perim (ft)	= 5.39
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 5.32
EGL (ft)	= 0.33



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 27 2026

PROPOSED CONDITION DP9 SWALE (Q100)

Trapezoidal

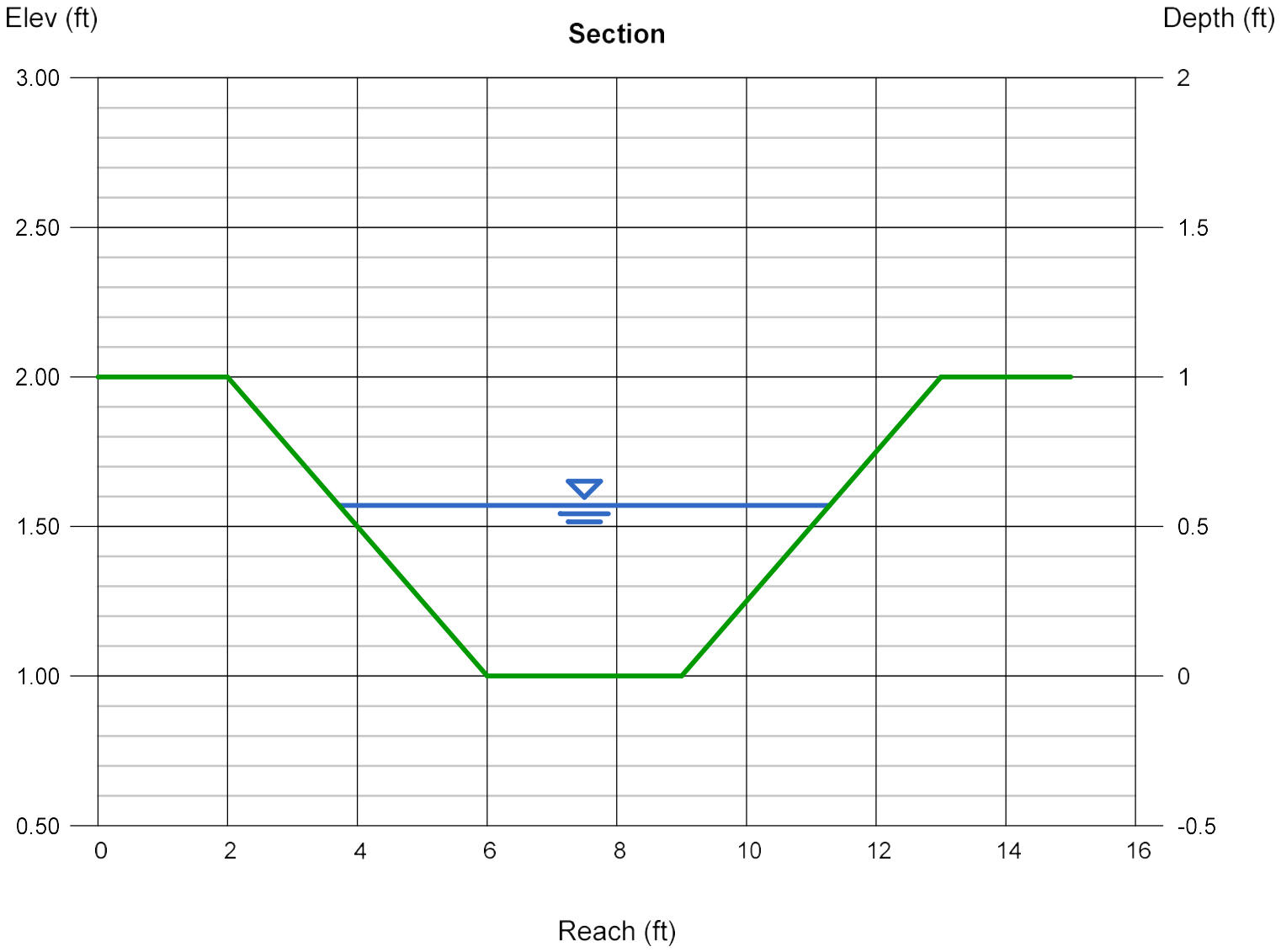
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.10
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.00

Highlighted

Depth (ft)	= 0.57
Q (cfs)	= 7.000
Area (sqft)	= 3.01
Velocity (ft/s)	= 2.33
Wetted Perim (ft)	= 7.70
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 7.56
EGL (ft)	= 0.65



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, 00 26 2026

EX11 EX SWALE (EXISTING Q5)

User-defined

Invert Elev (ft)	= 95.54
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

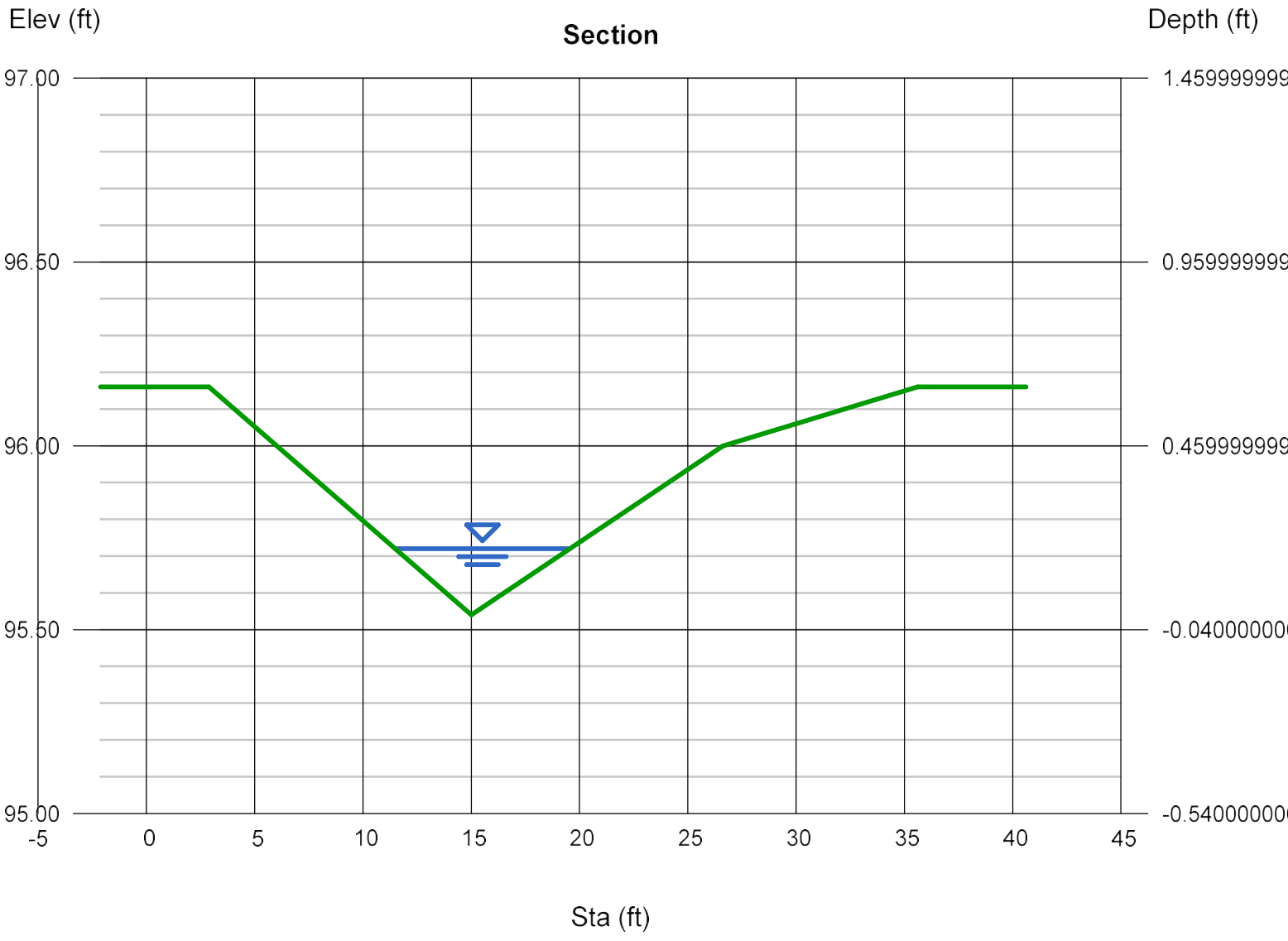
Compute by:	Known Q
Known Q (cfs)	= 1.90

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 1.900
Area (sqft)	= 0.73
Velocity (ft/s)	= 2.62
Wetted Perim (ft)	= 8.07
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 8.06
EGL (ft)	= 0.29

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

(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, 00 26 2026

EX11 EX SWALE (EXISTING Q100)

User-defined

Invert Elev (ft)	= 95.54
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

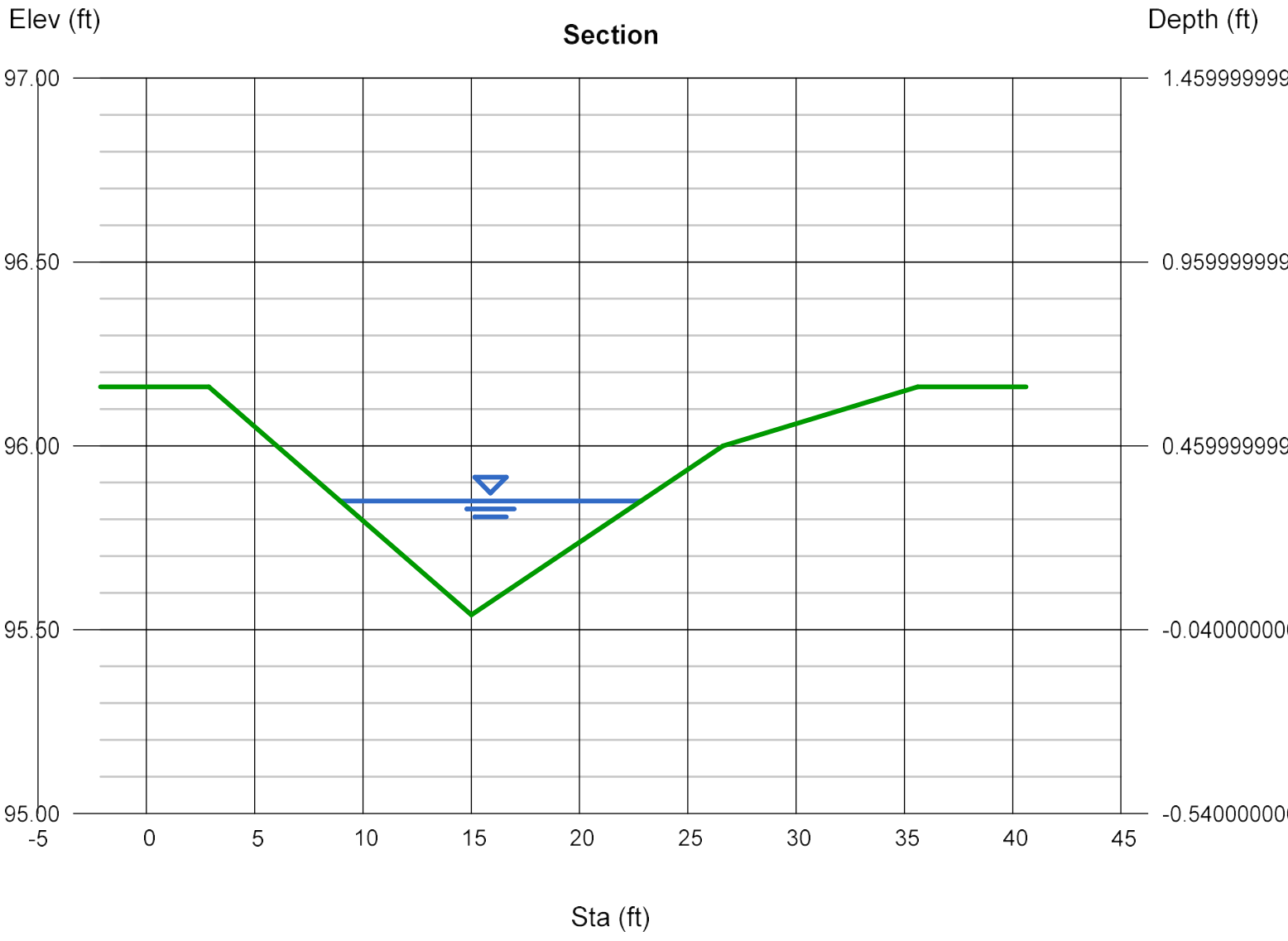
Compute by:	Known Q
Known Q (cfs)	= 7.90

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 7.900
Area (sqft)	= 2.15
Velocity (ft/s)	= 3.67
Wetted Perim (ft)	= 13.90
Crit Depth, Yc (ft)	= 0.38
Top Width (ft)	= 13.89
EGL (ft)	= 0.52

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

(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, 00 26 2026

DP9 - DP10 EX SWALE Q5

User-defined

Invert Elev (ft)	= 95.54
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

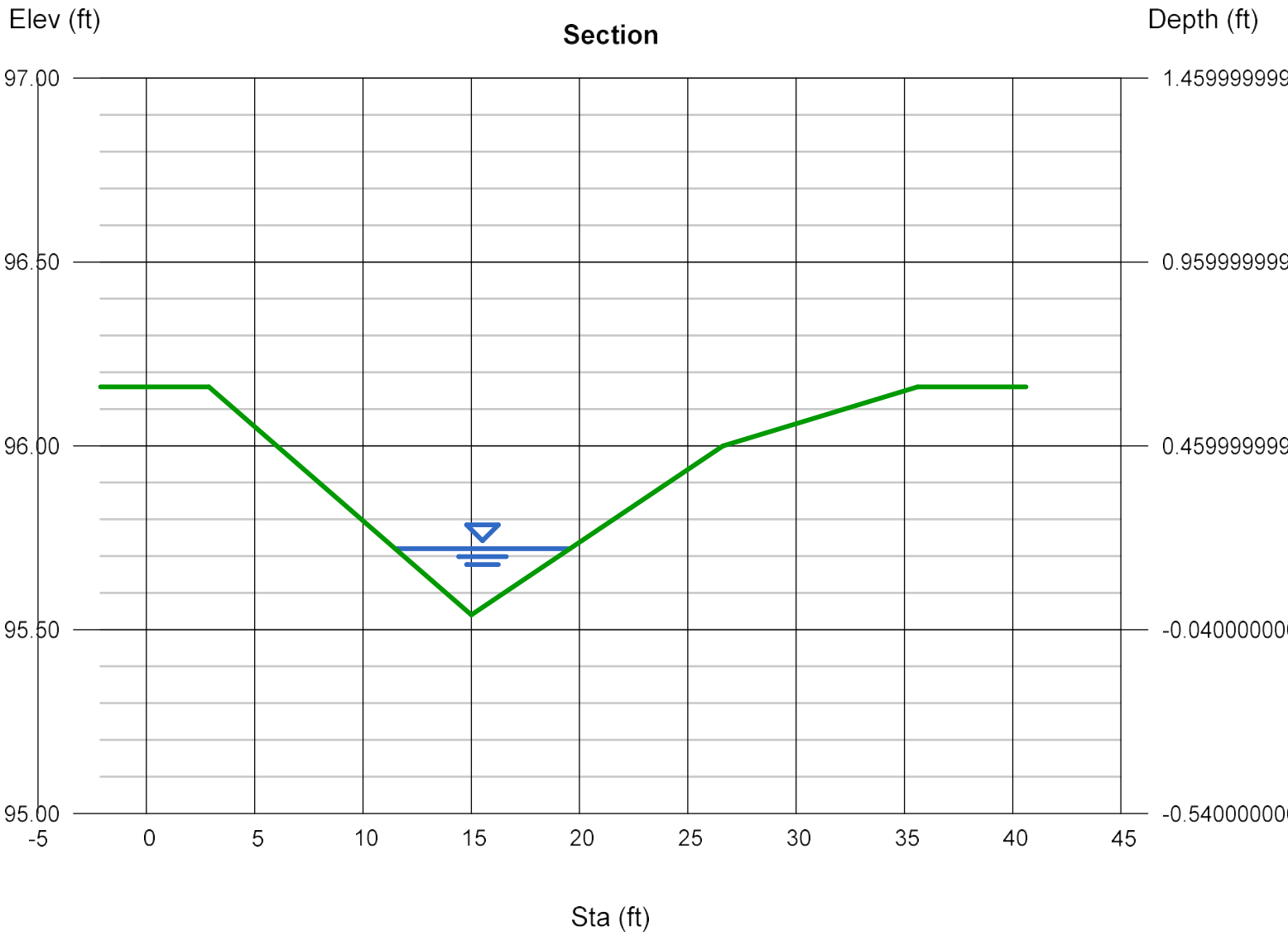
Compute by:	Known Q
Known Q (cfs)	= 1.90

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 1.900
Area (sqft)	= 0.73
Velocity (ft/s)	= 2.62
Wetted Perim (ft)	= 8.07
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 8.06
EGL (ft)	= 0.29

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

(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, 00 26 2026

PROPOSED CONDITION DP9 - DP10 EX SWALE Q100

User-defined

Invert Elev (ft)	= 95.54
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

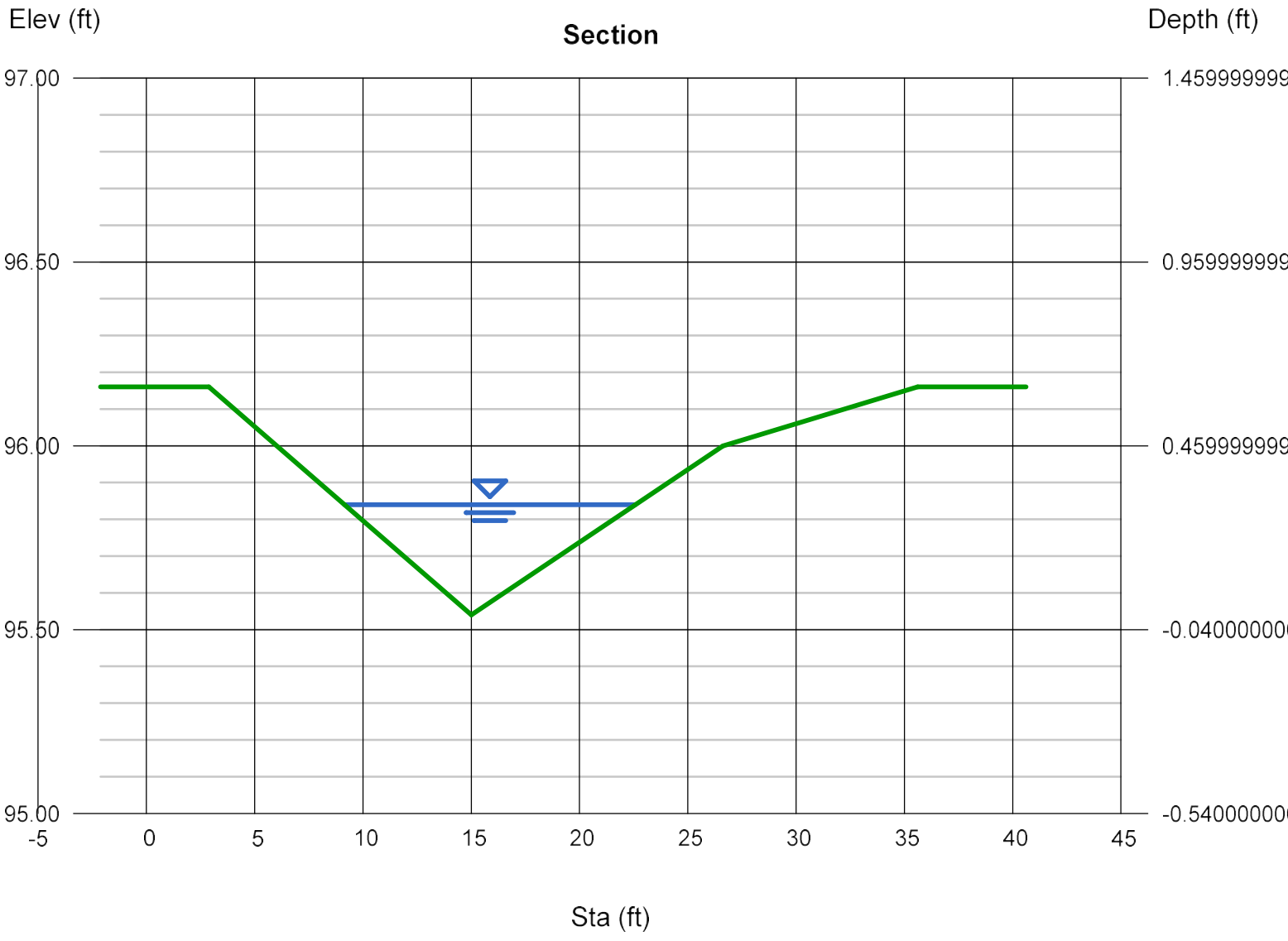
Compute by:	Known Q
Known Q (cfs)	= 7.00

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 7.000
Area (sqft)	= 2.02
Velocity (ft/s)	= 3.47
Wetted Perim (ft)	= 13.45
Crit Depth, Yc (ft)	= 0.37
Top Width (ft)	= 13.44
EGL (ft)	= 0.49

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

(2.88, 96.16)-(15.01, 95.54, 0.035)-(26.62, 96.00, 0.035)-(35.62, 96.16, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP13 - DP14 SWALE Q5 (CAPACITY)

Triangular

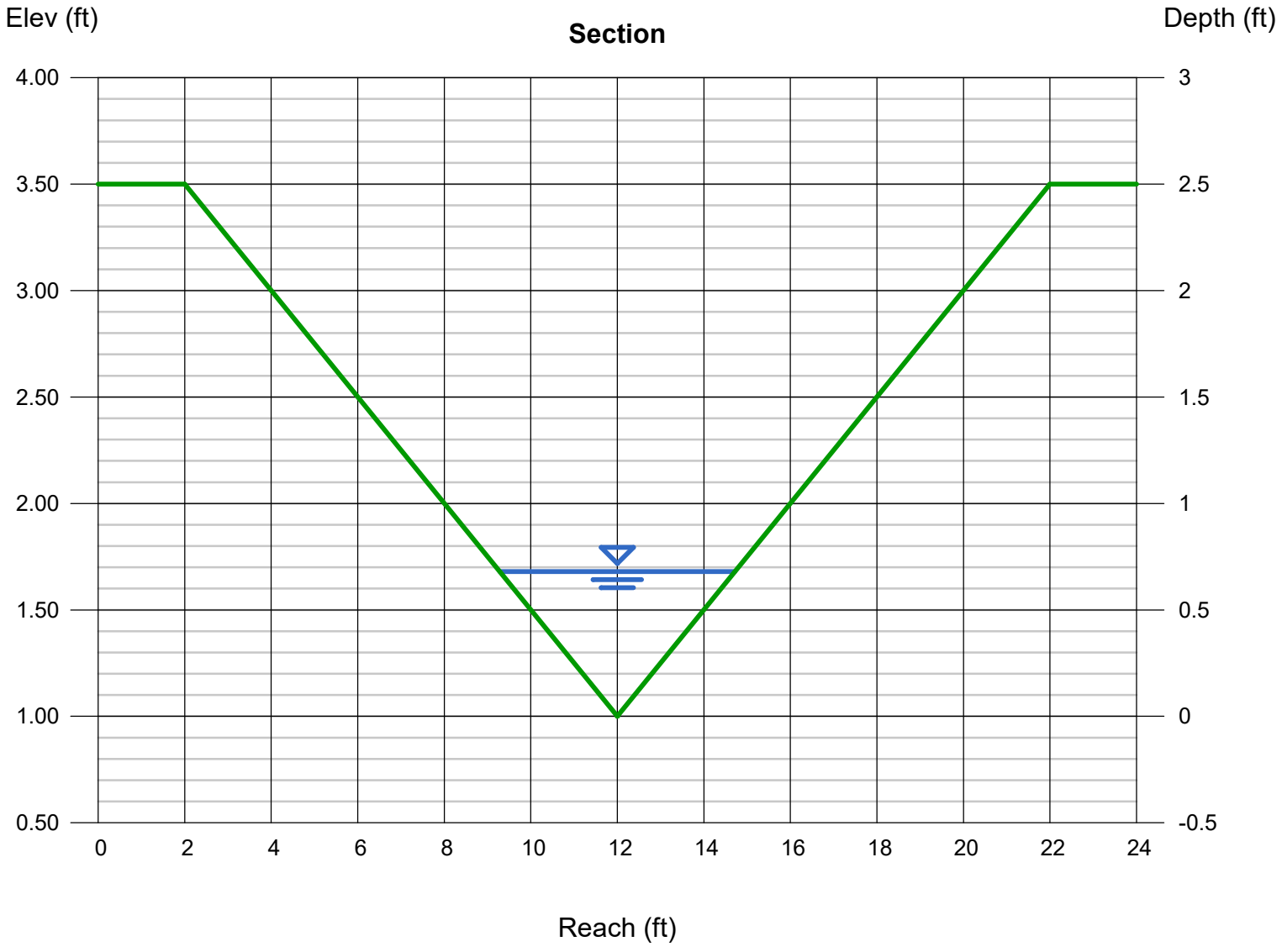
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.70
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.80

Highlighted

Depth (ft)	= 0.68
Q (cfs)	= 4.800
Area (sqft)	= 1.85
Velocity (ft/s)	= 2.60
Wetted Perim (ft)	= 5.61
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 5.44
EGL (ft)	= 0.78



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP13 - DP14 SWALE Q5

Triangular

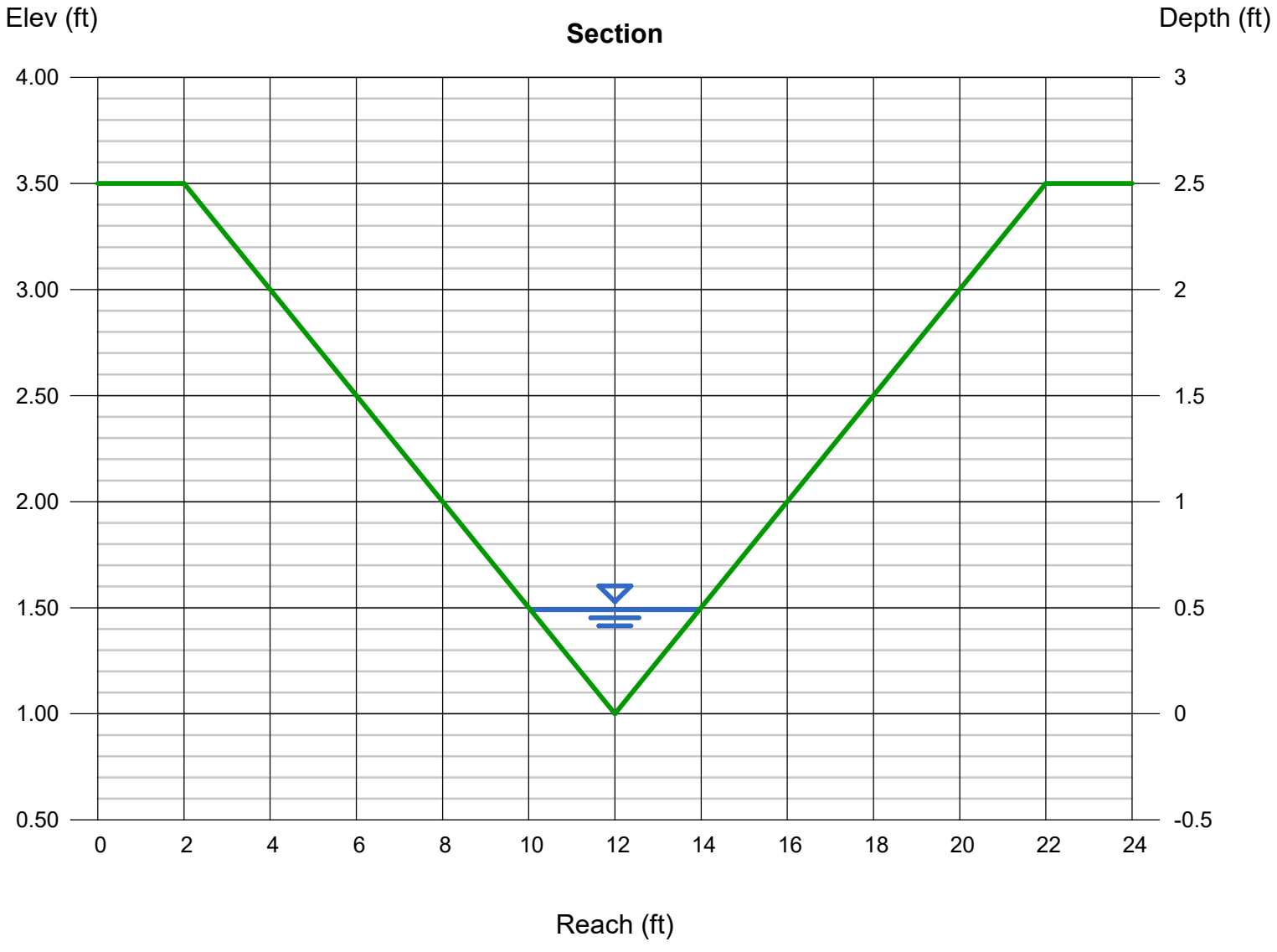
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 4.80

Highlighted

Depth (ft)	= 0.49
Q (cfs)	= 4.800
Area (sqft)	= 0.96
Velocity (ft/s)	= 5.00
Wetted Perim (ft)	= 4.04
Crit Depth, Yc (ft)	= 0.62
Top Width (ft)	= 3.92
EGL (ft)	= 0.88



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP13 - DP14 SWALE Q100 (CAPACITY)

Triangular

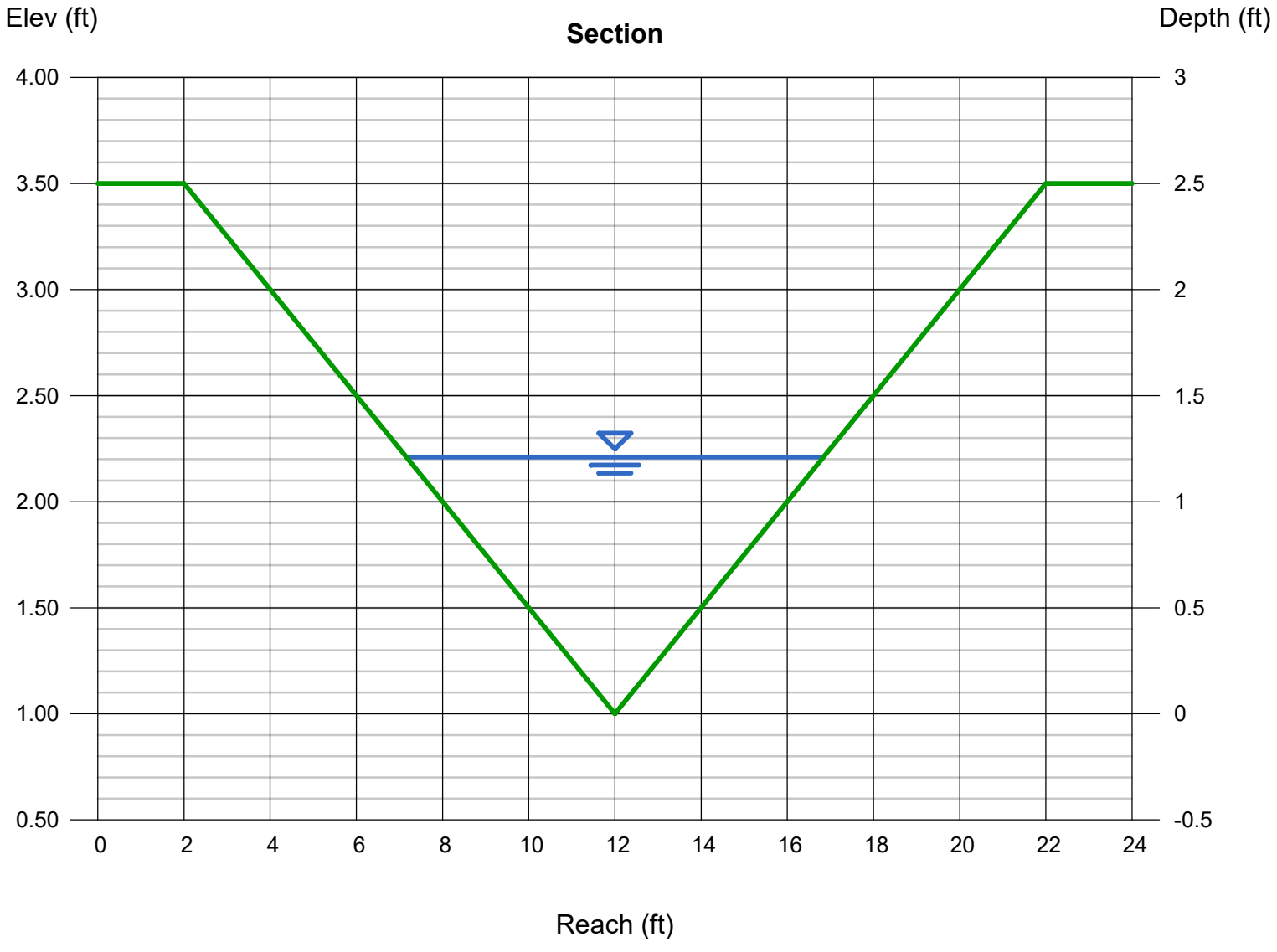
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 1.70
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.70

Highlighted

Depth (ft)	= 1.21
Q (cfs)	= 22.70
Area (sqft)	= 5.86
Velocity (ft/s)	= 3.88
Wetted Perim (ft)	= 9.98
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 9.68
EGL (ft)	= 1.44



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP13 - DP14 SWALE Q100

Triangular

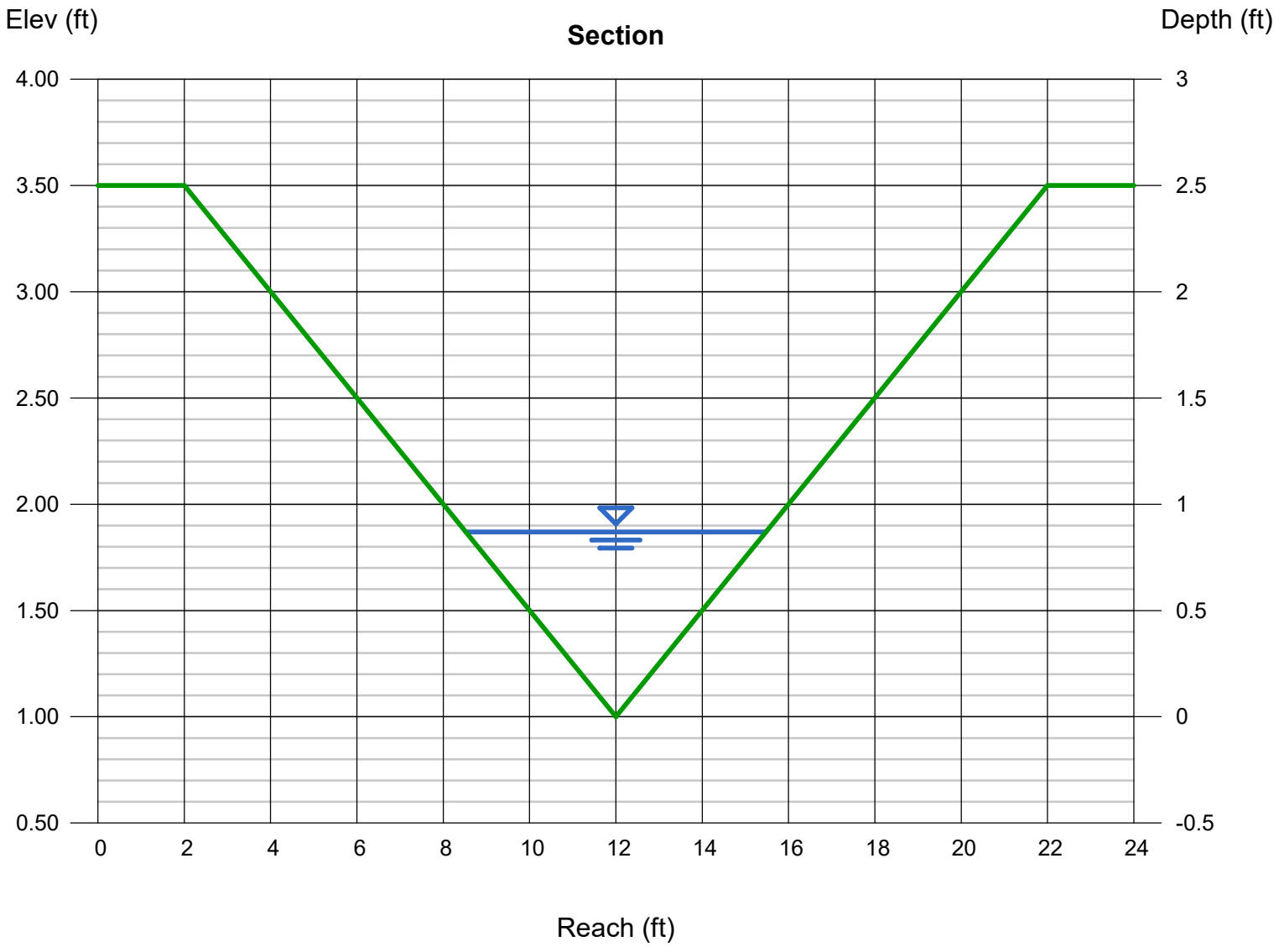
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 2.50
Invert Elev (ft)	= 1.00
Slope (%)	= 10.00
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.70

Highlighted

Depth (ft)	= 0.87
Q (cfs)	= 22.70
Area (sqft)	= 3.03
Velocity (ft/s)	= 7.50
Wetted Perim (ft)	= 7.17
Crit Depth, Yc (ft)	= 1.15
Top Width (ft)	= 6.96
EGL (ft)	= 1.74



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP14.1 OUTFALL SEC 1 (Q5)

Trapezoidal

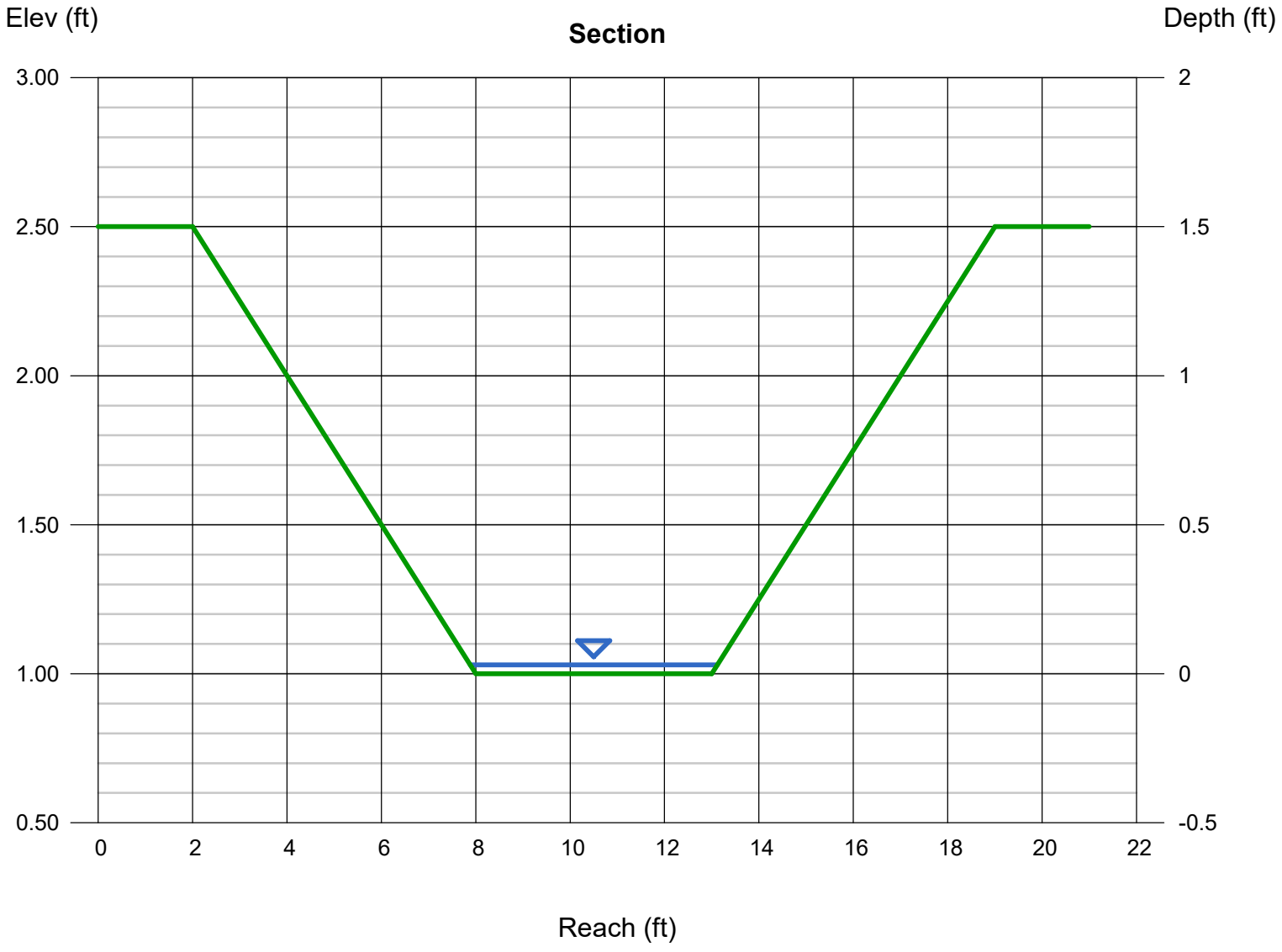
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 5.90
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.03
Q (cfs)	= 0.100
Area (sqft)	= 0.15
Velocity (ft/s)	= 0.65
Wetted Perim (ft)	= 5.25
Crit Depth, Yc (ft)	= 0.03
Top Width (ft)	= 5.24
EGL (ft)	= 0.04



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 28 2026

DP14.1 OUTFALL SEC. 1 (Q100)

Trapezoidal

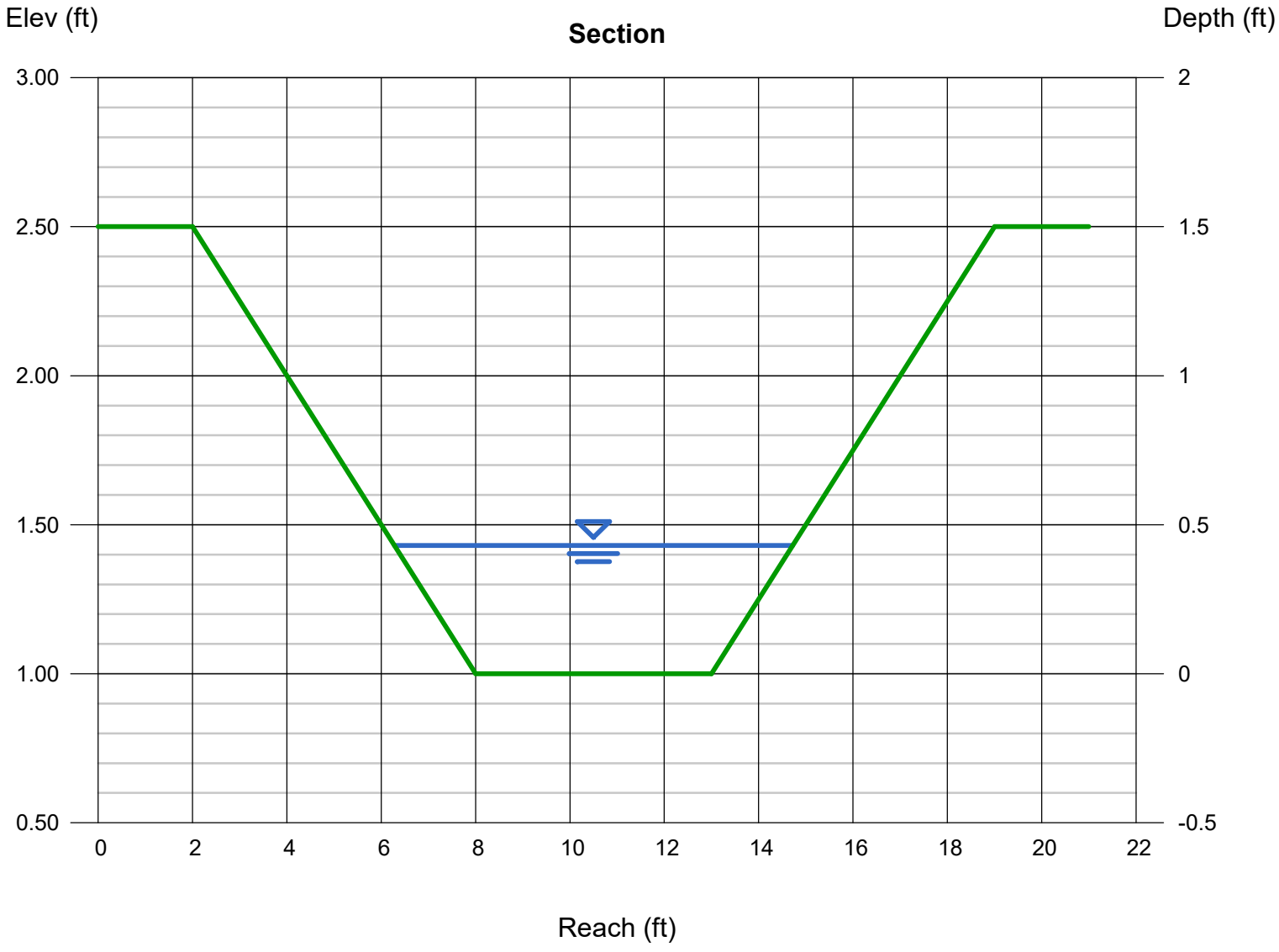
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 5.90
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.40

Highlighted

Depth (ft)	= 0.43
Q (cfs)	= 14.40
Area (sqft)	= 2.89
Velocity (ft/s)	= 4.98
Wetted Perim (ft)	= 8.55
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 8.44
EGL (ft)	= 0.82



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP14.1 OUTFALL SEC 2 (Q5)

Trapezoidal

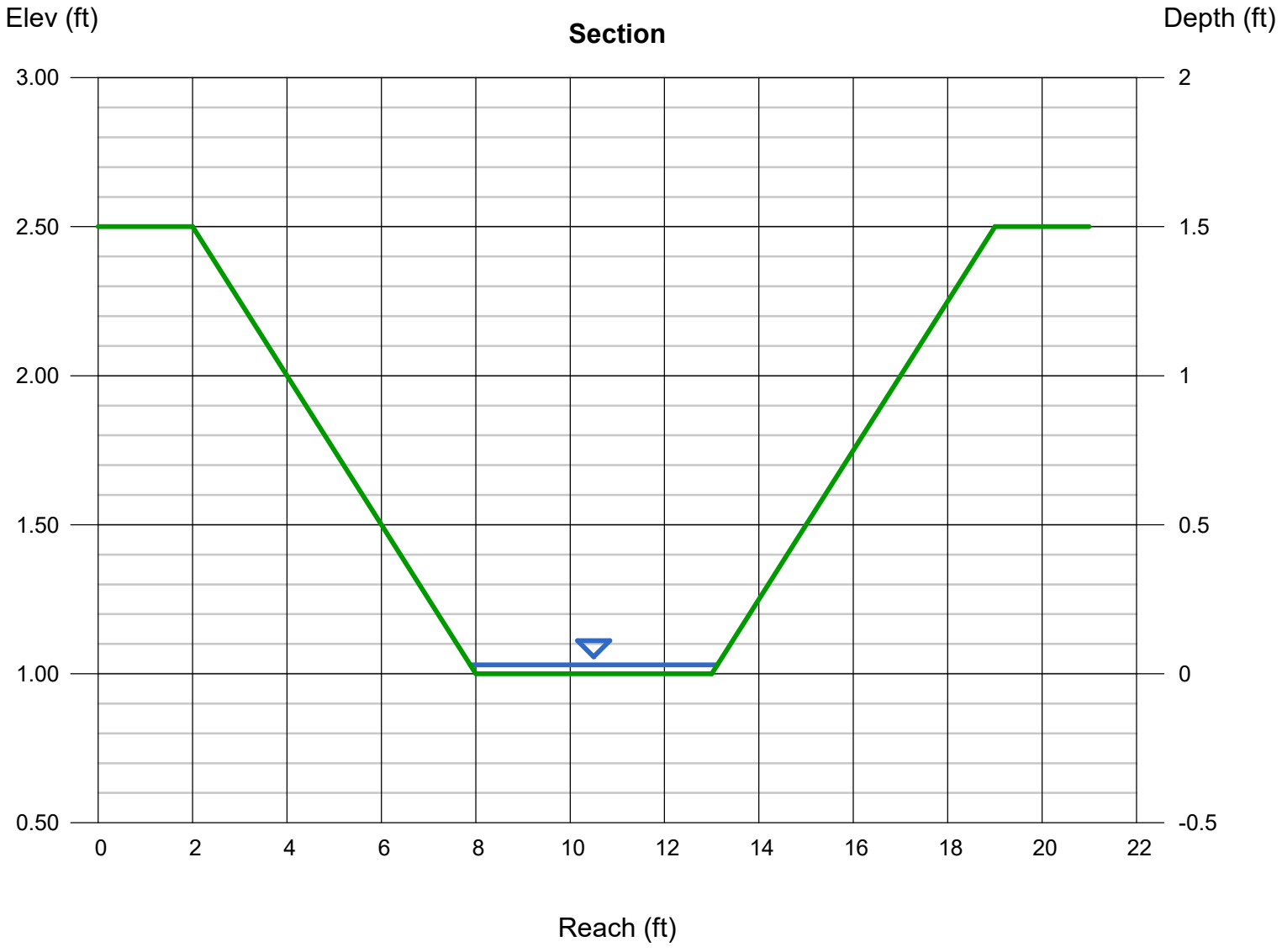
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 7.52
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.03
Q (cfs)	= 0.100
Area (sqft)	= 0.15
Velocity (ft/s)	= 0.65
Wetted Perim (ft)	= 5.25
Crit Depth, Yc (ft)	= 0.03
Top Width (ft)	= 5.24
EGL (ft)	= 0.04



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 28 2026

DP14.1 OUTFALL SEC. 2 (Q100)

Trapezoidal

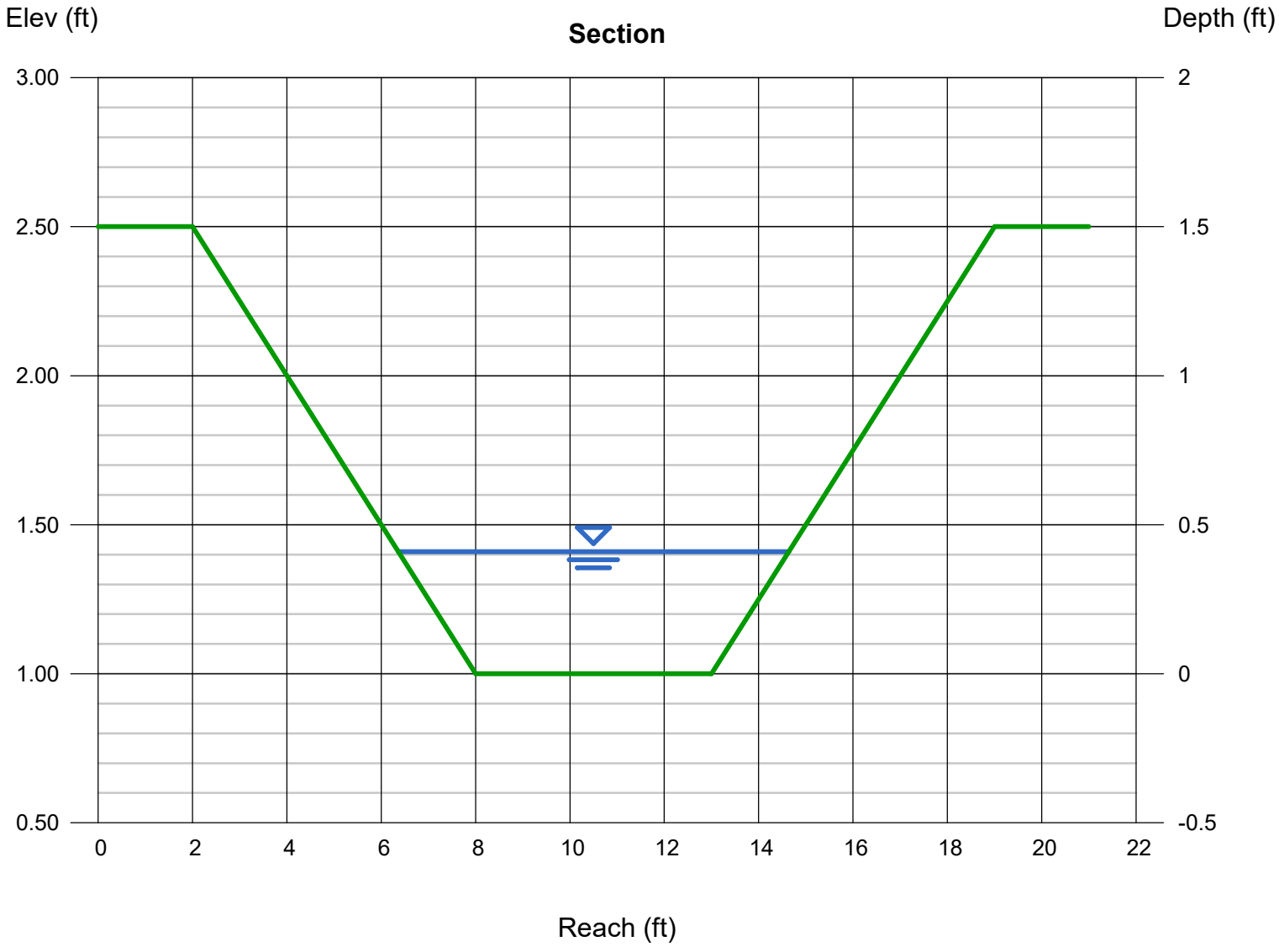
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 7.52
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.40

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 14.40
Area (sqft)	= 2.72
Velocity (ft/s)	= 5.29
Wetted Perim (ft)	= 8.38
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 8.28
EGL (ft)	= 0.84



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

DP14.1 OUTFALL SEC 3 (Q5)

Trapezoidal

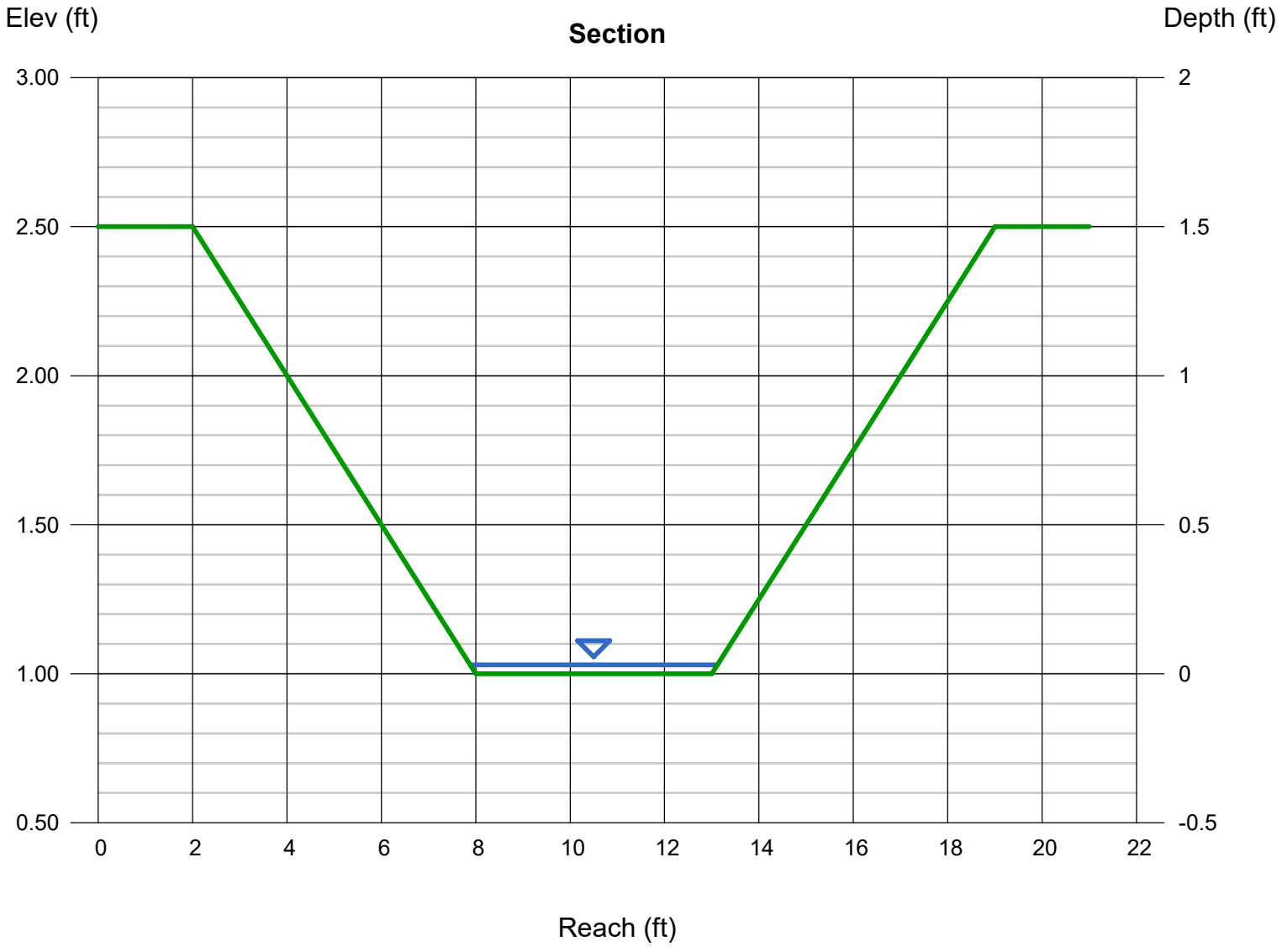
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.11
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.03
Q (cfs)	= 0.100
Area (sqft)	= 0.15
Velocity (ft/s)	= 0.65
Wetted Perim (ft)	= 5.25
Crit Depth, Yc (ft)	= 0.03
Top Width (ft)	= 5.24
EGL (ft)	= 0.04



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 28 2026

DP14.1 OUTFALL SEC. 3 (Q100)

Trapezoidal

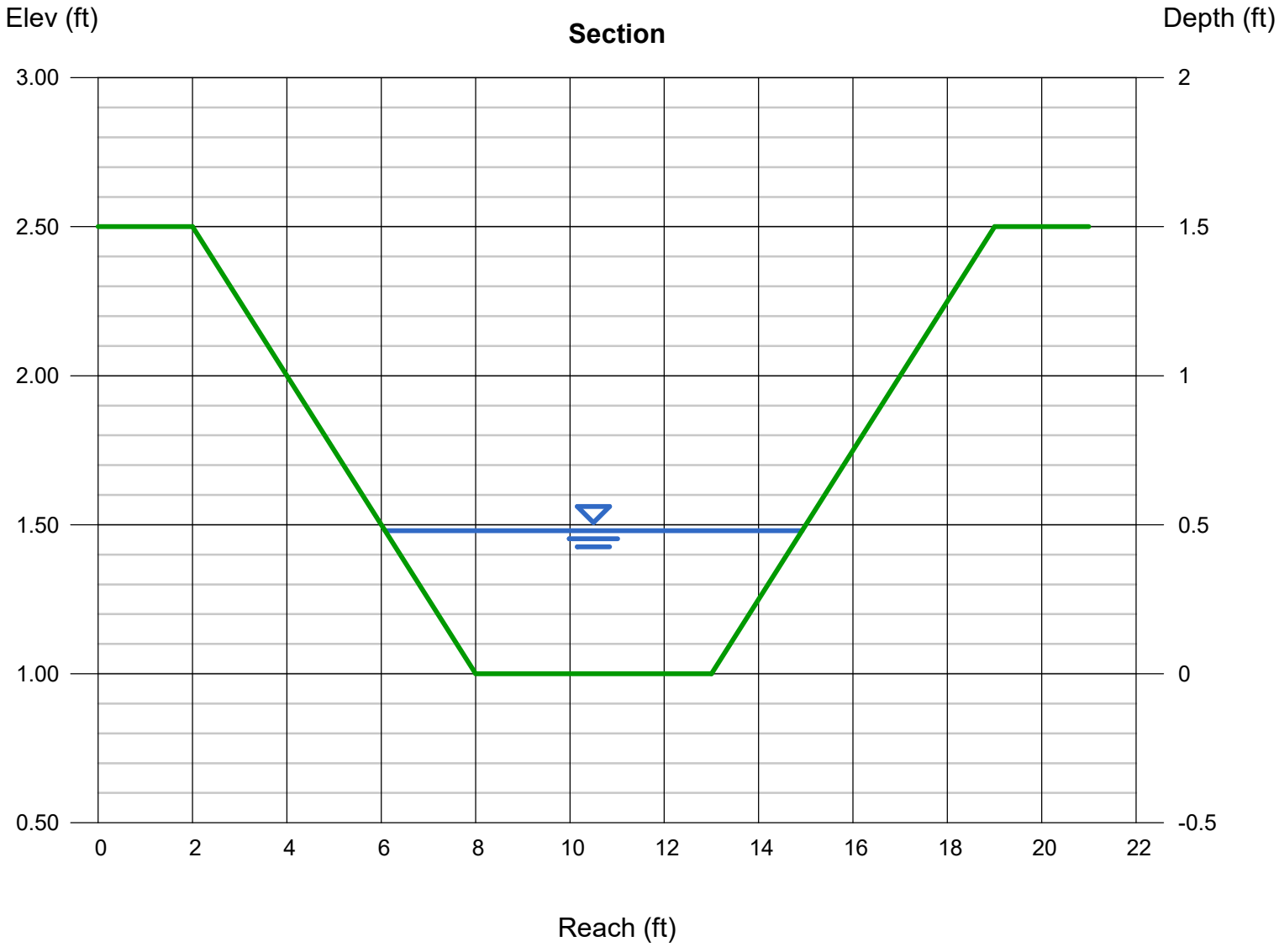
Bottom Width (ft)	= 5.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 1.00
Slope (%)	= 4.11
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.40

Highlighted

Depth (ft)	= 0.48
Q (cfs)	= 14.40
Area (sqft)	= 3.32
Velocity (ft/s)	= 4.34
Wetted Perim (ft)	= 8.96
Crit Depth, Yc (ft)	= 0.55
Top Width (ft)	= 8.84
EGL (ft)	= 0.77



MATERIAL PROPERTY DATA SHEET

VMax® SC250™

Permanent • Triple Net • Organic Fiber Matrix • Turf Reinforcement Mat

DESCRIPTION

SC250 Turf Reinforcement Mat (TRM) is composed of 70% straw and 30% coconut fibers mechanically (stitch) bound between a three-dimensional UV stabilized, synthetic net structure. Stitching is secured on two-inch centers using UV stabilized, synthetic thread. SC250 is a permanent, three-dimensional TRM that provides immediate erosion protection and long-term turf reinforcement and is intended for applications requiring erosion protection for greater than thirty-six months.



Each roll of SC250 is made in the USA and manufactured under Western Green's Quality Assurance Program to ensure a continuous distribution of fibers and consistent thickness.

Material Content	
Matrix	Straw/Coconut
Netting	Top Net: Mediumweight, UV stable Middle Net: Corrugated Ultra-Heavyweight, UV stable Bottom Net: Mediumweight, UV stable
Thread	Synthetic, UV Stable

Standard Roll Sizes				
Width	8 ft	(2.4 m)	6.5 ft	(2.0 m)
Length	90 ft	(27.4 m)	55.5 ft	(17.0 m)
Weight ± 10%	70 lb	(32.0 kg)	34 lb	(15.5 kg)
Area	80 sy	(66.9 m^2)	40 sy	(33.4 m^2)

Material available in custom roll sizes

Approvals & Classification	
Classification	FHWA: Type 5.C / ECTC: Type 5.C
TTI Approvals	Class 2 Type H
NTPEP Number	ECP-2019-03-014

Index Property	Test Method	Typical	
Thickness	ASTM D6525	0.58 in.	(15 mm)
Mass/Unit Area	ASTM D6566	15.0 oz/sy	(500 g/sm)
Tensile Strength – MD	ASTM D6818	700 lbs/ft	(10.2 kN/m)
Tensile Strength – TD	ASTM D6818	675 lbs/ft	(9.9 kN/m)
Elongation - MD	ASTM D6818	30%	
Elongation – TD	ASTM D6818	20%	
UV Stability	ASTM D4355	80% @1000 hr	
Light Penetration	ASTM D6567	5%	
Biomass Improvement	ASTM D7322	400%	
Specific Gravity	ASTM D792	57.4 lb/ft^3	(0.92 g/cm^3)
Porosity	ECTC	N/A	

Design Parameters		
Property	**Unvegetated**	**Vegetated[3]**
RUSLE C Factor[2]	0.05	N/A
Slope Maximum Gradient[1]	0.5H:1V	0.5H:1V
Permissible Shear Stress[2]	3.0 psf (145 Pa)	10.0 psf (480 Pa)
Permissible Velocity[2]	9.5 fps (2.9 m/s)	15 fps (4.6 m/s)
τ_{veg} / τ_{TRM} (HEC-15)	N/A	0.67
τ_{lower}	τ_{mid}	τ_{upper}
0.038	0.032	0.027

1 Maximum Gradient a recomendation for typical installations.
2 Hydraulic thresholds compliant with ASTM D6459/D6460 but generalized for typical applications.
3 Vegetated values dependent on established stand of vegetation

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Geogrids
- Road Grids
- Wall Grids
- Slope Stabilization

Specialty Fabrics
Composite Geomembranes
- GCLs, PVC, HDPE, LLDPE, EPDM, Granular Bentonite

SEDIMENT CONTROL

Inlet Protection
- Grated Inlet, Curb Inlet, Area Inlet Protection

Ditch Checks
- Triangle Silt Dike
- GeoRidge

Perimeter Protection
- High and Low-Porosity Silt Fence, Straw Wattles, Silt Socks
- Safety Fence

Flocculants & Water Treatment
- Polymer-Based & Natural Flocculants

Sediment Basin Skimmers
Dewatering Bags
Trackout Control
- FODS
- Rumble Grates

Turbidity Curtains

EROSION CONTROL

Basic Hydraulically Applied Mulches
- Wood
- Paper
- Blends
- Straw

High-Performance Hydraulically Applied Products
- BFM
- FGM
- Additives & Tackifiers

Temporary Erosion Control Blankets
- Coir & Jute Mat/Nettings
- Short-Term ECBs
- Extended-Term ECBs

Permanent Erosion Control Blankets
- Turf Reinforcement Mats
- HP-TRMs
- Anchor Reinforced Vegetation System

Structural BMPs
- Transition Mats
- Geoweb Cellular Confinement
- Composite Vegetated Armor System
- Flex MSE Vegetated Wall System
- Articulated Concrete Block
- Gabions
- Grout-Filled Geotextile Mats

Vegetation Establishment
- Native Seed & Turf Seed
- Fertilizers
- Organic Soil Additives
- Stratavault Soil Cells

STORMWATER MANAGEMENT

Water Quality
- Inlet Filter Boxes
- Pre-Treatment Chamber
- Nutrient Separating Baffle Boxes
- High-Flow Biofiltration Media
- Hydrodynamic Separators
- Stratavault

Water Quantity
- Modular Underground Storage Systems
- Chamber Detention Systems

Drainage
- HDPE Swale Liner
- Pipe & Fittings
- Drainage Composites
- Strip Drain

Inlet Structures
- PVC
- Drain Basins, In-Line Drains
- Landscape

Permeable Pavers
- Permeable Articulating Concrete Block
- Grass Pavers
- Gravel Pavers
- Concrete Pavers

SPECIALTY

Natural & Synthetic Coir Fiber Logs
Vegetated Reinforced Soil Slopes
Soil Anchors
Root Barrier System
AquaBlok
Muscle Wall

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GEOSYNTHETICS | EROSION CONTROL | STORMWATER MANAGEMENT
SEDIMENT CONTROL | REVEGETATION & SOIL AMENDMENTS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

BASIN D - CULVERT (Q5)

Invert Elev Dn (ft)	=	7478.77
Pipe Length (ft)	=	40.20
Slope (%)	=	3.05965282022953
Invert Elev Up (ft)	=	7480.00
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

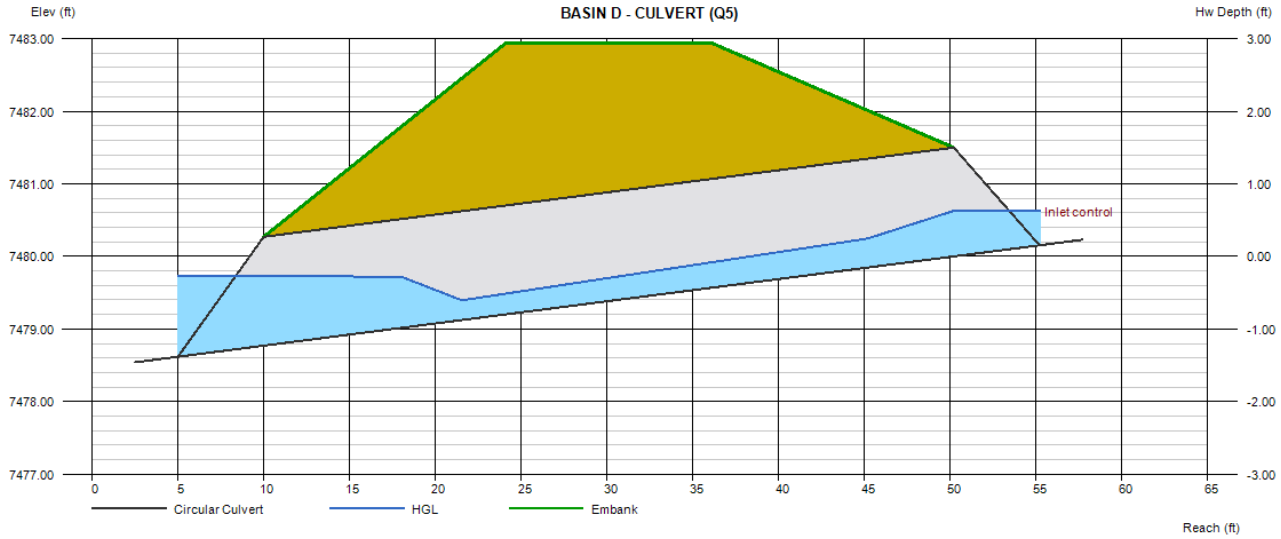
Top Elevation (ft)	=	7482.94
Top Width (ft)	=	12.00
Crest Width (ft)	=	20.00

Calculations

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

Highlighted

Qtotal (cfs)	=	1.30
Qpipe (cfs)	=	1.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.08
Veloc Up (ft/s)	=	3.14
HGL Dn (ft)	=	7479.73
HGL Up (ft)	=	7480.43
Hw Elev (ft)	=	7480.63
Hw/D (ft)	=	0.42
Flow Regime	=	Inlet Control



Culvert Report

BASIN D - CULVERT (Q100)

Invert Elev Dn (ft)	=	7478.77
Pipe Length (ft)	=	40.20
Slope (%)	=	3.05965282022953
Invert Elev Up (ft)	=	7480.00
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

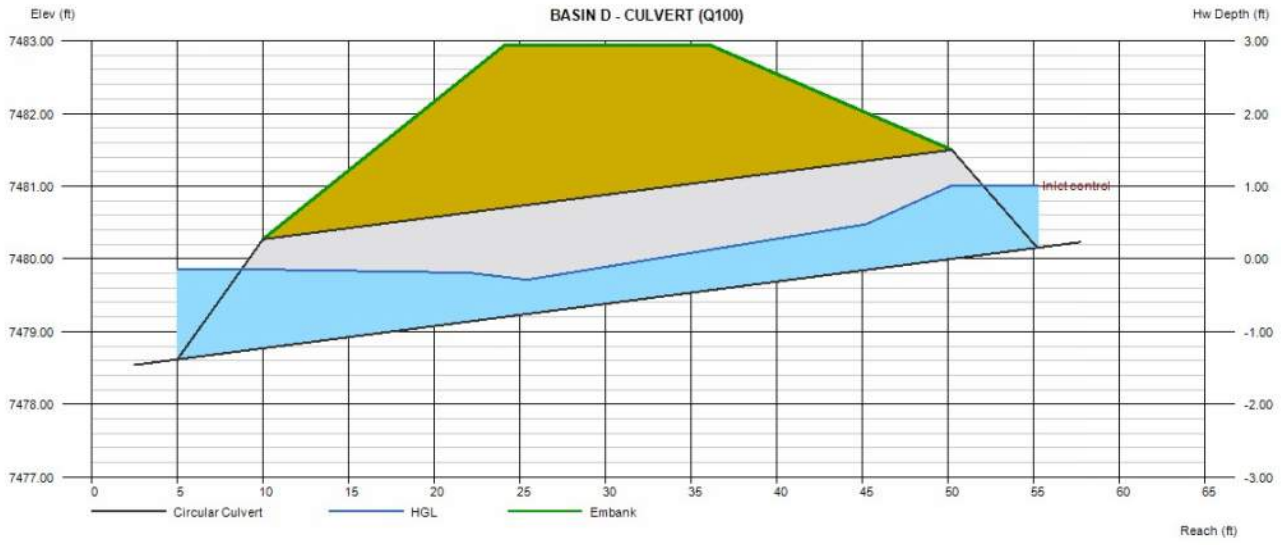
Top Elevation (ft)	=	7482.94
Top Width (ft)	=	12.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	3.10
Qmax (cfs)	=	3.11
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	3.10
Qpipe (cfs)	=	3.10
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.27
Veloc Up (ft/s)	=	4.06
HGL Dn (ft)	=	7479.85
HGL Up (ft)	=	7480.67
Hw Elev (ft)	=	7481.01
Hw/D (ft)	=	0.67
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

BASIN S - CULVERT (Q5)

Invert Elev Dn (ft)	=	7502.55
Pipe Length (ft)	=	31.39
Slope (%)	=	1.97552461177111
Invert Elev Up (ft)	=	7503.17
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

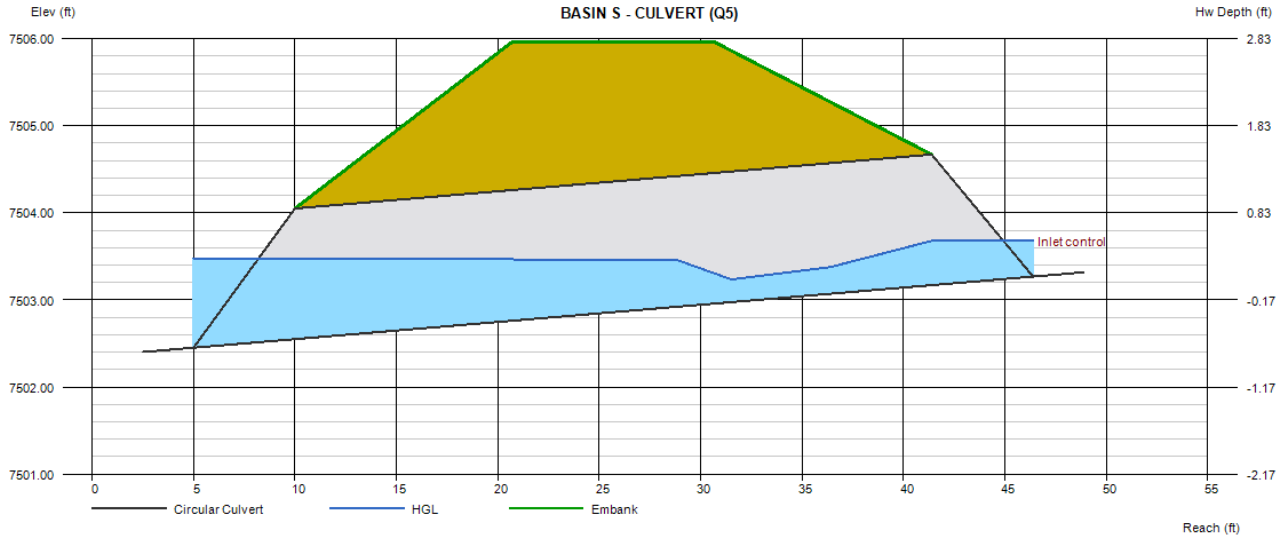
Top Elevation (ft)	=	7505.96
Top Width (ft)	=	10.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	0.90
Qmax (cfs)	=	0.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.90
Qpipe (cfs)	=	0.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.79
Veloc Up (ft/s)	=	2.84
HGL Dn (ft)	=	7503.48
HGL Up (ft)	=	7503.52
Hw Elev (ft)	=	7503.68
Hw/D (ft)	=	0.34
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

BASIN S CULVERT (Q100)

Invert Elev Dn (ft)	=	7502.55
Pipe Length (ft)	=	31.39
Slope (%)	=	1.97552461177111
Invert Elev Up (ft)	=	7503.17
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

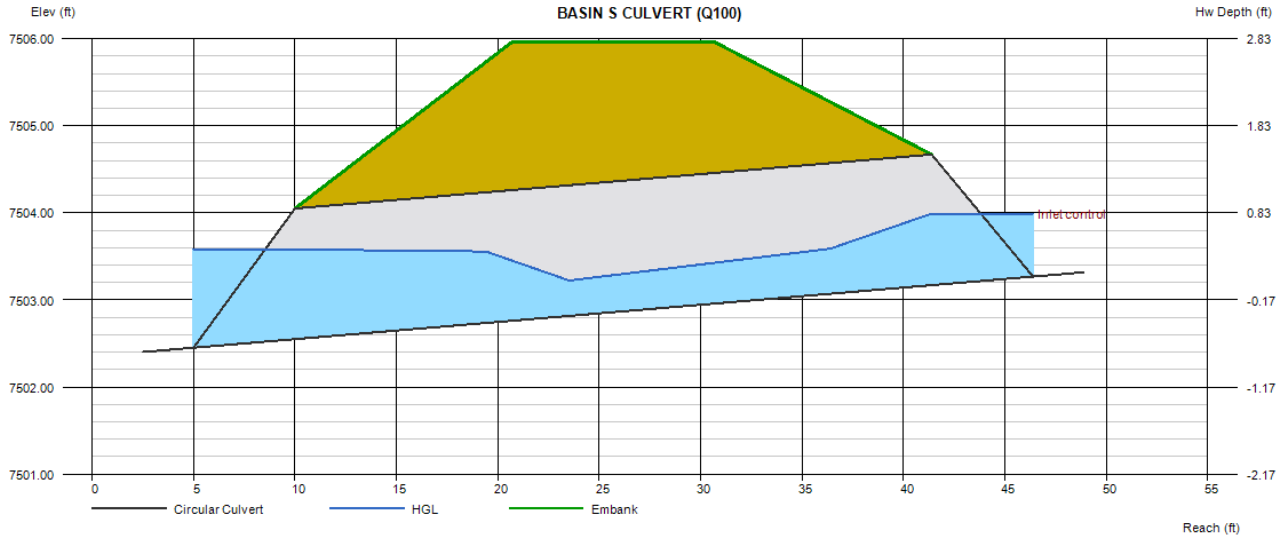
Top Elevation (ft)	=	7505.96
Top Width (ft)	=	10.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	2.20
Qmax (cfs)	=	2.20
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.20
Qpipe (cfs)	=	2.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.70
Veloc Up (ft/s)	=	3.66
HGL Dn (ft)	=	7503.58
HGL Up (ft)	=	7503.73
Hw Elev (ft)	=	7503.99
Hw/D (ft)	=	0.55
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

DP2 - CULVERT (Q5)

Invert Elev Dn (ft)	=	7477.25
Pipe Length (ft)	=	77.76
Slope (%)	=	0.964506156742573
Invert Elev Up (ft)	=	7478.00
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

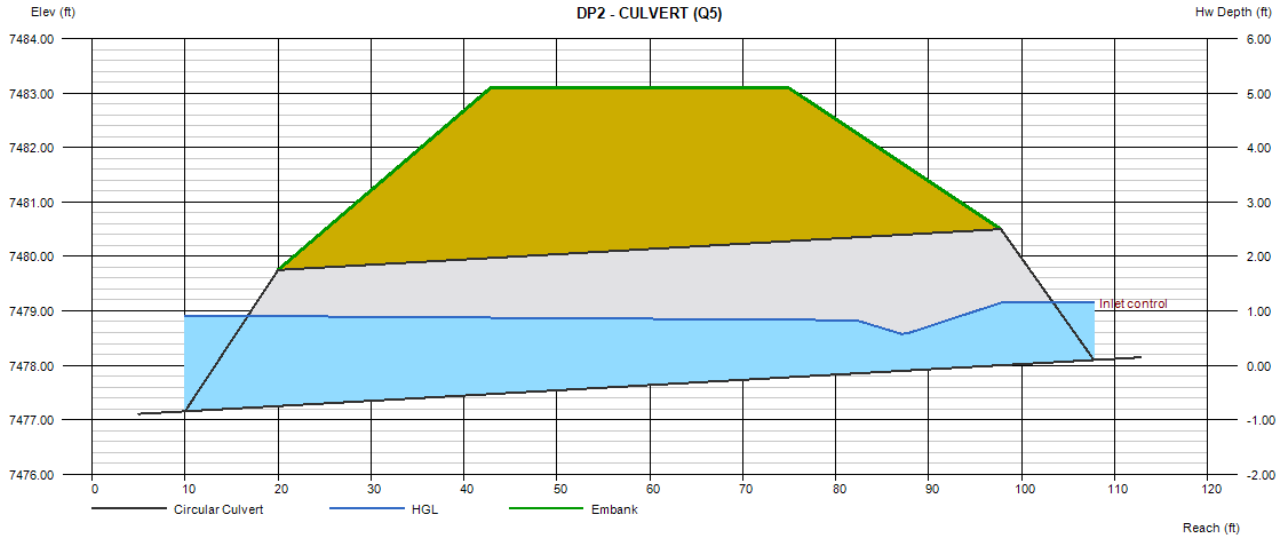
Top Elevation (ft)	=	7483.10
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	5.90
Qmax (cfs)	=	5.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	5.90
Qpipe (cfs)	=	5.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.71
Veloc Up (ft/s)	=	4.34
HGL Dn (ft)	=	7478.90
HGL Up (ft)	=	7478.80
Hw Elev (ft)	=	7479.15
Hw/D (ft)	=	0.46
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

DP2 CULVERT (Q100)

Invert Elev Dn (ft)	=	7477.25
Pipe Length (ft)	=	77.76
Slope (%)	=	0.964506156742573
Invert Elev Up (ft)	=	7478.00
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

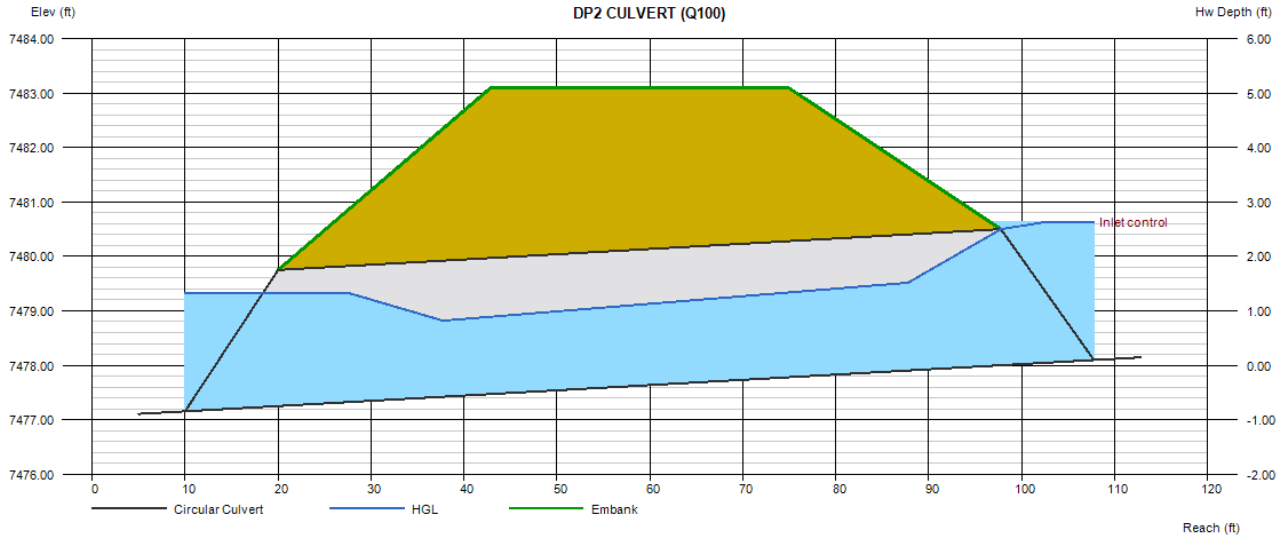
Top Elevation (ft)	=	7483.10
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	23.70
Qmax (cfs)	=	23.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	23.70
Qpipe (cfs)	=	23.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.43
Veloc Up (ft/s)	=	6.87
HGL Dn (ft)	=	7479.33
HGL Up (ft)	=	7479.66
Hw Elev (ft)	=	7480.64
Hw/D (ft)	=	1.06
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

DP9 - CULVERT (Q5)

Invert Elev Dn (ft)	=	7498.50
Pipe Length (ft)	=	41.50
Slope (%)	=	1.20481923222542
Invert Elev Up (ft)	=	7499.00
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
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

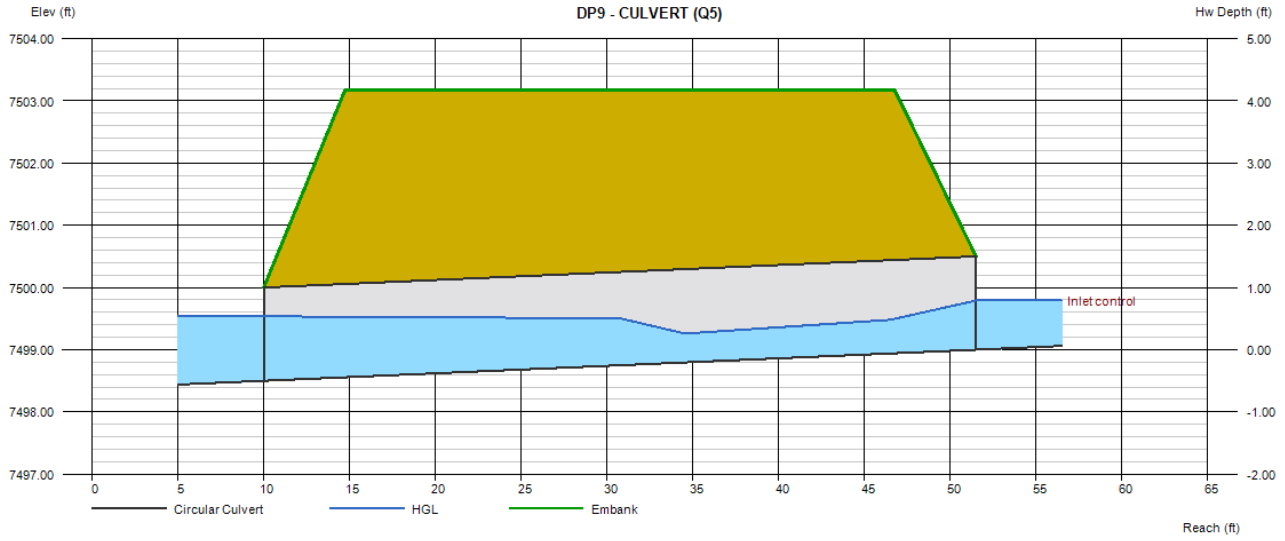
Top Elevation (ft)	=	7503.18
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	2.30
Qmax (cfs)	=	2.30
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.30
Qpipe (cfs)	=	2.30
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.77
Veloc Up (ft/s)	=	3.71
HGL Dn (ft)	=	7499.54
HGL Up (ft)	=	7499.57
Hw Elev (ft)	=	7499.79
Hw/D (ft)	=	0.53
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

DP9 CULVERT (Q100)

Invert Elev Dn (ft)	=	7498.50
Pipe Length (ft)	=	41.50
Slope (%)	=	1.20481923222542
Invert Elev Up (ft)	=	7499.00
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
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

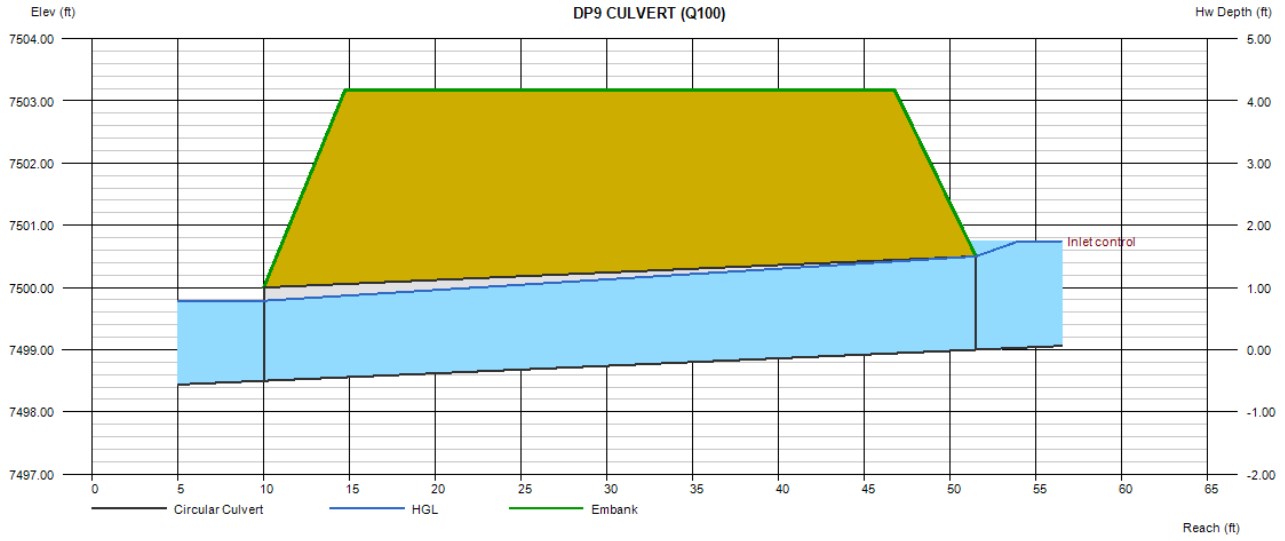
Top Elevation (ft)	=	7503.18
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	7.70
Qmax (cfs)	=	7.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	7.70
Qpipe (cfs)	=	7.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.77
Veloc Up (ft/s)	=	4.36
HGL Dn (ft)	=	7499.79
HGL Up (ft)	=	7500.50
Hw Elev (ft)	=	7500.75
Hw/D (ft)	=	1.16
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

DP12 - CULVERT (Q5)

Invert Elev Dn (ft)	=	7500.32
Pipe Length (ft)	=	68.20
Slope (%)	=	0.997325219213963
Invert Elev Up (ft)	=	7501.00
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

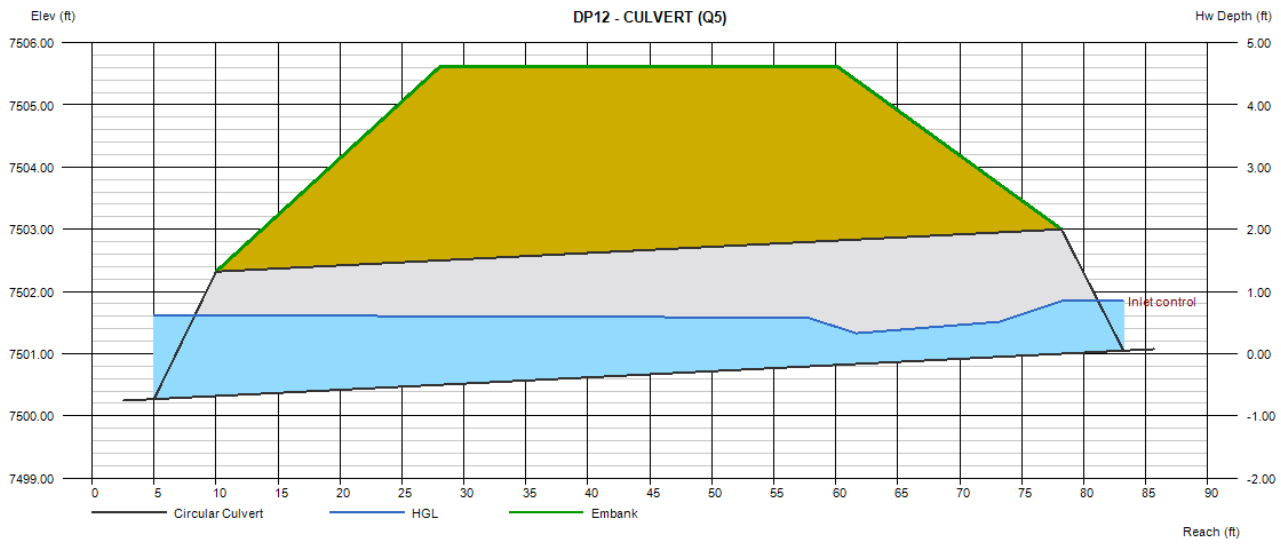
Top Elevation (ft)	=	7505.62
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	2.90
Qmax (cfs)	=	2.90
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.90
Qpipe (cfs)	=	2.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.35
Veloc Up (ft/s)	=	3.72
HGL Dn (ft)	=	7501.62
HGL Up (ft)	=	7501.59
Hw Elev (ft)	=	7501.85
Hw/D (ft)	=	0.42
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

DP12 CULVERT (Q100)

Invert Elev Dn (ft)	=	7500.32
Pipe Length (ft)	=	68.20
Slope (%)	=	0.997325219213963
Invert Elev Up (ft)	=	7501.00
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Mitered to slope (C)
Coeff. K,M,c,Y,k	=	0.021, 1.33, 0.0463, 0.75, 0.7

Embankment

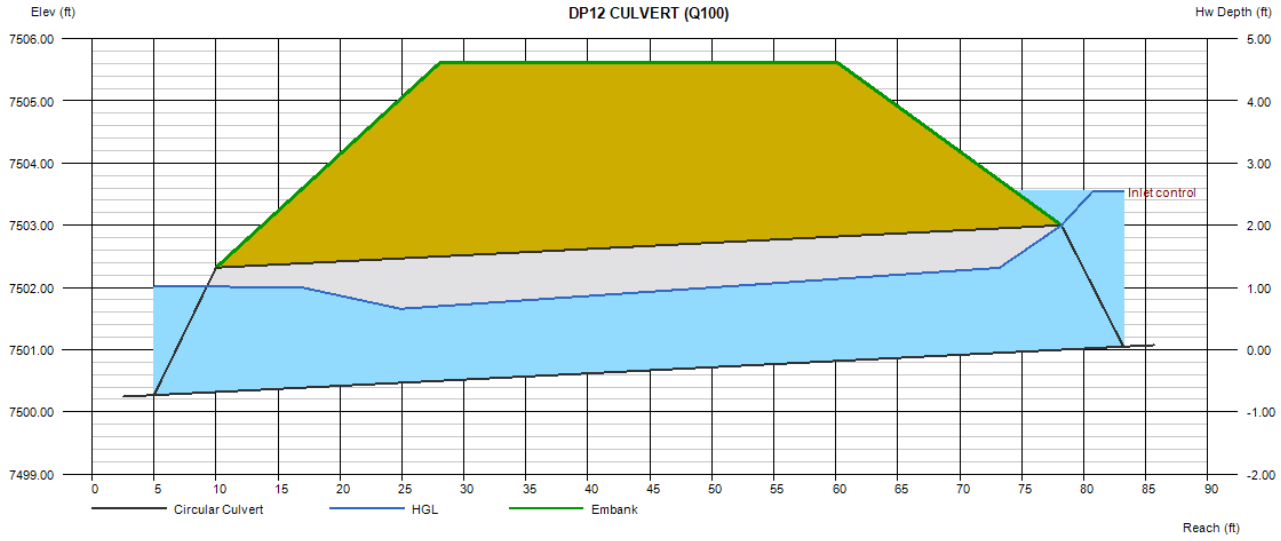
Top Elevation (ft)	=	7505.62
Top Width (ft)	=	32.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	14.80
Qmax (cfs)	=	14.80
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	14.80
Qpipe (cfs)	=	14.80
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.22
Veloc Up (ft/s)	=	6.37
HGL Dn (ft)	=	7502.01
HGL Up (ft)	=	7502.39
Hw Elev (ft)	=	7503.54
Hw/D (ft)	=	1.27
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

EX 72 INCH CMP CULVERT (DP15) WALKER ROAD

Invert Elev Dn (ft)	=	7429.42
Pipe Length (ft)	=	55.38
Slope (%)	=	1.6073253005743
Invert Elev Up (ft)	=	7430.31
Rise (in)	=	72.0
Shape	=	Circular
Span (in)	=	72.0
No. Barrels	=	1
n-Value	=	0.013
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

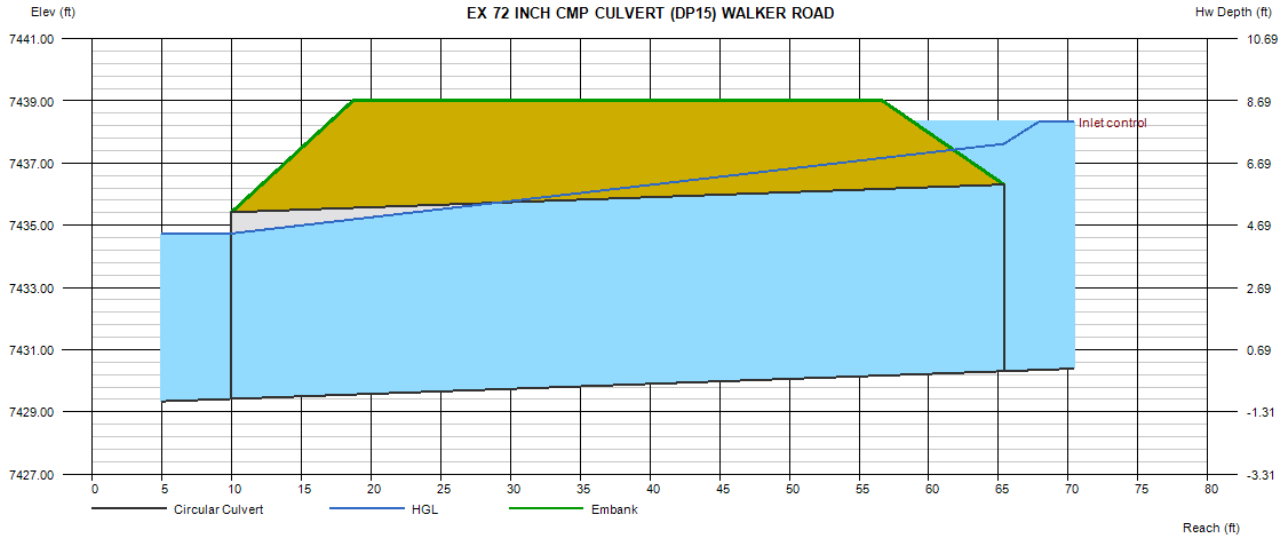
Top Elevation (ft)	=	7439.00
Top Width (ft)	=	38.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	287.70
Qmax (cfs)	=	287.70
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	287.70
Qpipe (cfs)	=	287.70
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	10.86
Veloc Up (ft/s)	=	10.18
HGL Dn (ft)	=	7434.74
HGL Up (ft)	=	7437.62
Hw Elev (ft)	=	7438.33
Hw/D (ft)	=	1.34
Flow Regime	=	Inlet Control



Culvert Report

DRIVEWAY CULVERT SIZING

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 4 2025

ALL LOTS SHALL USE AN 18" CULVERT DRIVEWAY CULVERT EXCEPT FOR LOTS 12 & 13 FILING NO. 2 SHALL USE 24"

18 inch Culvert - Max Flow 11 cfs

Invert Elev Dn (ft)	=	7245.33
Pipe Length (ft)	=	74.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	7246.07
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

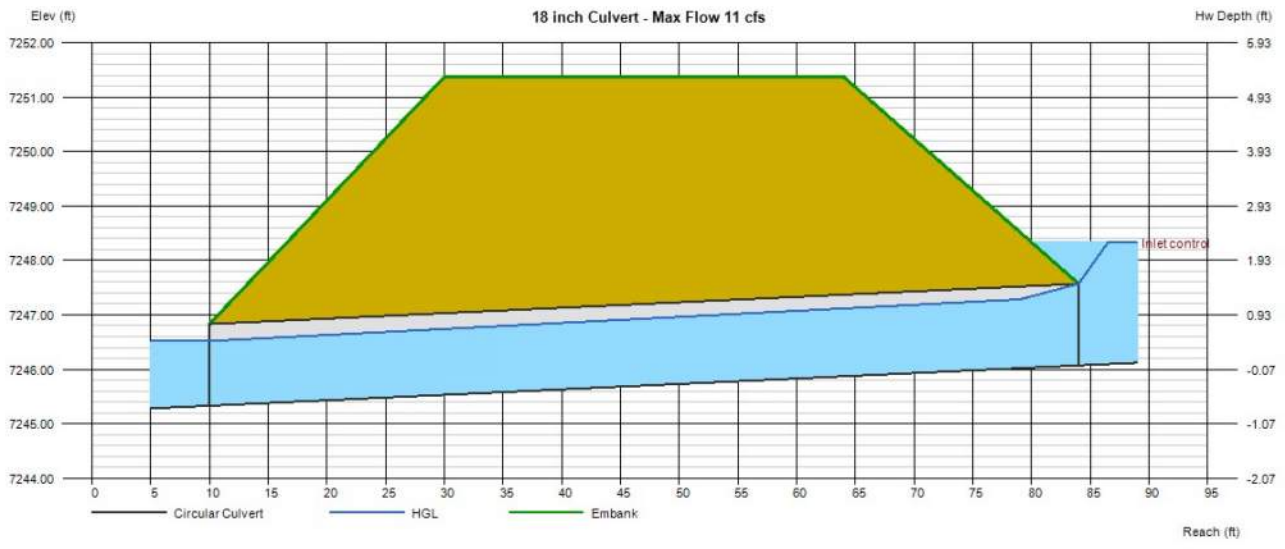
Top Elevation (ft)	=	7251.37
Top Width (ft)	=	34.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	7.00
Qmax (cfs)	=	11.00
Tailwater Elev (ft)	=	Normal

Highlighted

Qtotal (cfs)	=	11.00
Qpipe (cfs)	=	11.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.33
Veloc Up (ft/s)	=	6.90
HGL Dn (ft)	=	7246.52
HGL Up (ft)	=	7247.34
Hw Elev (ft)	=	7248.33
Hw/D (ft)	=	1.50
Flow Regime	=	Inlet Control



Culvert Report

DRIVEWAY CULVERT SIZING

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 4 2025

24 inch Culvert - Max Flow 22 cfs

ALL LOTS SHALL USE AN 18" CULVERT
DRIVEWAY CULVERT EXCEPT FOR LOTS 12 & 13
FILING NO. 2 SHALL USE 24"

Invert Elev Dn (ft)	=	7245.33
Pipe Length (ft)	=	74.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	7246.07
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

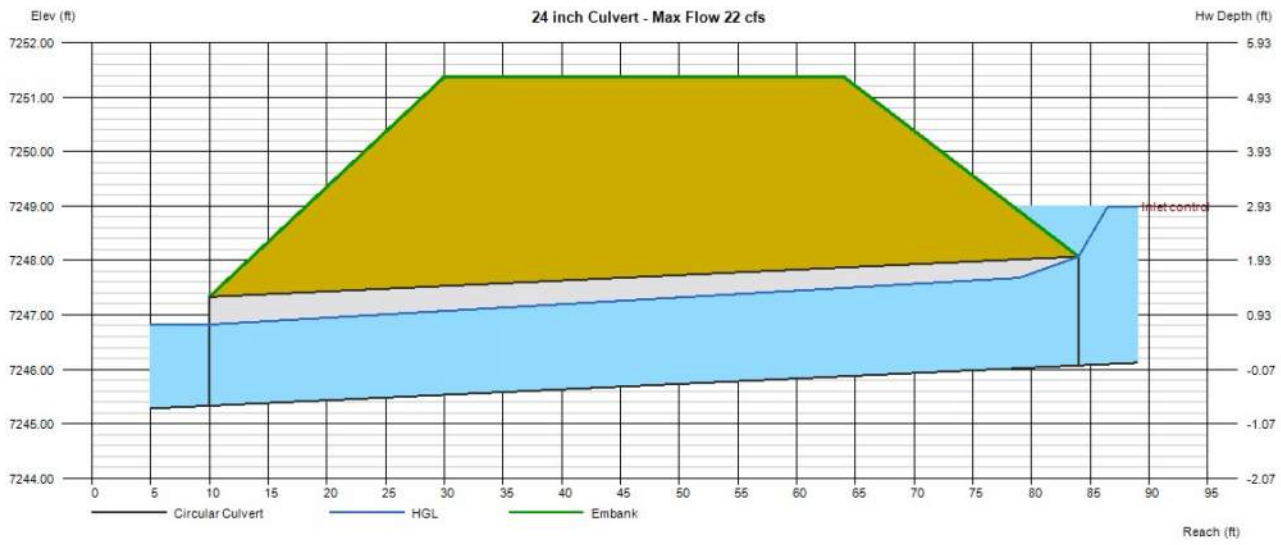
Top Elevation (ft)	=	7251.37
Top Width (ft)	=	34.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	7.00
Qmax (cfs)	=	22.00
Tailwater Elev (ft)	=	Normal

Highlighted

Qtotal (cfs)	=	22.00
Qpipe (cfs)	=	22.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.75
Veloc Up (ft/s)	=	7.84
HGL Dn (ft)	=	7246.82
HGL Up (ft)	=	7247.74
Hw Elev (ft)	=	7248.99
Hw/D (ft)	=	1.46
Flow Regime	=	Inlet Control



PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: REB
Checked By:
Date: 5/15/26

	STORM DRAIN SYSTEM			
	DP2	**Basin D**	**DP4.1**	**Notes**
Q_{100} (cfs):	23.7	3.1	23.9	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	30	18	24	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	1.41	0.60	0.80	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.56	0.40	0.40	***Use Low-tailwater basin for 4.1
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.40	1.12	4.22	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	3.29	1.40	7.00	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	6.60	6.50	3.40	Read from Fig. 9-35 or 9-36
θ:	0.08	0.08	0.15	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	3.39	0.44	3.41	$A_t=Q/V$
Length of Protection, L_p (ft):	-0.7	-5.0	7.7	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	7.5	4.5	6.0	Min L=3D or 3H
Max Length (ft)	25.0	15.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	2.4	0.7	4.3	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**7.5**	**4.5**	**8.0**	
Design Width (ft)	**2.4**	**0.7**	**4.3**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: REB
Checked By:
Date: 9/2/26

	STORM DRAIN SYSTEM			
	DP9	**Basin S**	**DP12**	**Notes**
Q_{100} (cfs):	7.0	2.2	14.8	Flows are the greater of proposed vs. future
Conduit	Pipe	Pipe	Pipe	
D_c, Pipe Diameter (in):	18	18	24	
W, Box Width (ft):	N/A	N/A	N/A	
H, Box Height (ft):	N/A	N/A	N/A	
Y_t, Tailwater Depth (ft):	0.60	0.60	0.87	If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40	0.40	0.44	
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.54	0.80	2.62	
Supercritical?	No	No	No	
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:	N/A	N/A	N/A	$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A	N/A	N/A	
Riprap d_{50} (in) [Subcritical]:	3.16	0.99	3.92	
Required Riprap Size:	**L**	**L**	**L**	**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**	**9**	**9**	
Expansion Factor, $1/(2\tan\theta)$:	5.00	6.60	5.00	Read from Fig. 9-35 or 9-36
θ:	0.10	0.08	0.10	
Erosive Soils?	No	No	No	
Area of Flow, A_t (ft^2):	1.00	0.31	2.11	$A_t=Q/V$
Length of Protection, L_p (ft):	0.8	-6.4	2.2	L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	4.5	4.5	6.0	Min L=3D or 3H
Max Length (ft)	15.0	15.0	20.0	Max L=10D or 10H
Min Bottom Width, T (ft):	1.7	0.5	2.4	$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**4.5**	**4.5**	**6.0**	
Design Width (ft)	**1.7**	**0.5**	**2.4**	
Riprap Depth (in)	**18**	**18**	**18**	Depth=2(d_{50})
Type II Bedding Depth (in)*	6	6	6	*Not used if Soil Riprap
Cutoff Wall	No	No	No	
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

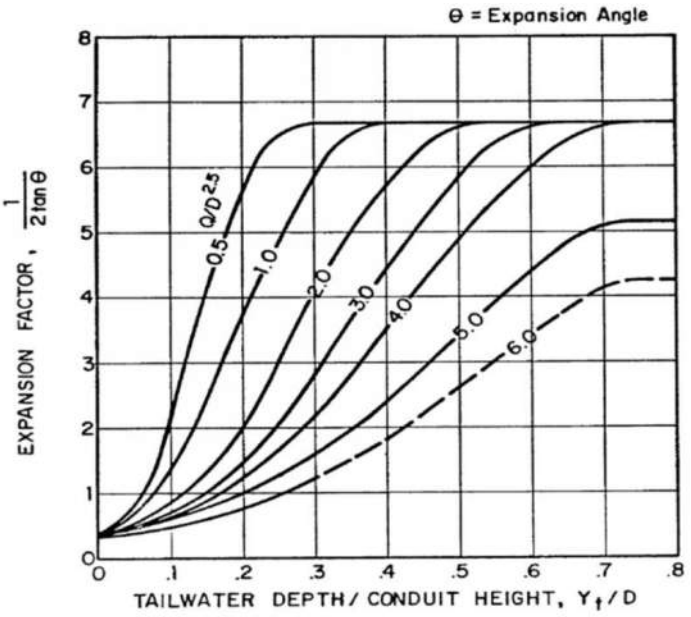


Figure 9-35. Expansion factor for circular conduits

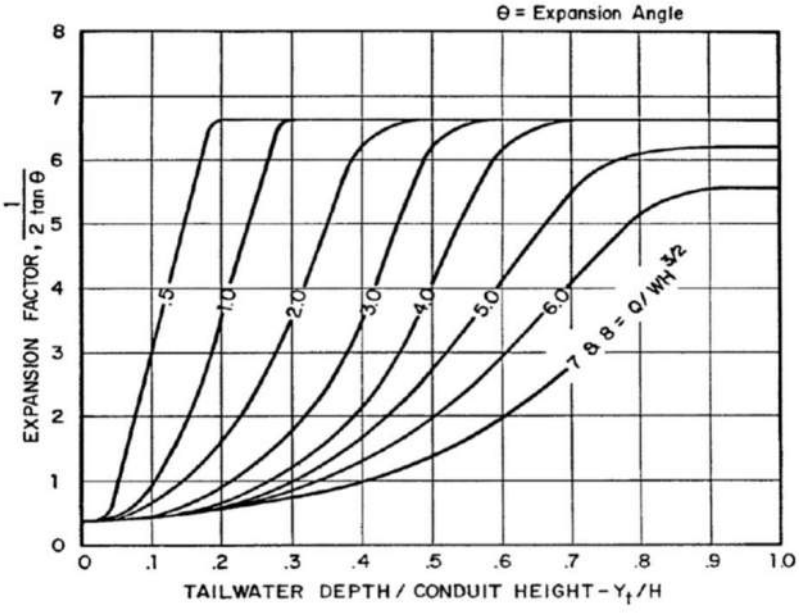


Figure 9-36. Expansion factor for rectangular conduits

PIPE OUTFALL RIPRAP SIZING CALCULATIONS

Subdivision: Iron Ridge Subdivision
Location: El Paso County

Project Name: Iron Ridge Subdivision
Project No.: 25009.00
Calculated By: REB
Checked By:
Date: 9/2/26

	STORM DRAIN SYSTEM			
	DP14.1			**Notes**
Q_{100} (cfs):	14.4			Flows are the greater of proposed vs. future
Conduit	Pipe			
D_c, Pipe Diameter (in):	24			
W, Box Width (ft):	N/A			
H, Box Height (ft):	N/A			
Y_t, Tailwater Depth (ft):	0.80			If unknown, use Y_t/D_c (or H)=0.4
Y_t/Dc or Y_t/H	0.40			*Use Low-tailwater basin for 14.1
$Q/D^{2.5}$ or $Q/(WH^{3/2})$	2.55			
Supercritical?	No			
Y_n, Normal Depth (ft) [Supercritical]:				
D_a, H_a (in) [Supercritical]:	N/A			$D_a=(D_c+Y_n)/2$
Riprap d_{50} (in) [Supercritical]:	N/A			
Riprap d_{50} (in) [Subcritical]:	4.22			
Required Riprap Size:	**L**			**Fig. 9-38 or Fig. 9-36**
d_{50} (in):	**9**			
Expansion Factor, $1/(2\tan\theta)$:	4.90			Read from Fig. 9-35 or 9-36
θ:	0.10			
Erosive Soils?	No			
Area of Flow, A_t (ft^2):	2.06			$A_t=Q/V$
Length of Protection, L_p (ft):	2.8			L=(1/(2 tan θ))(At/Yt - D)
Min Length (ft)	6.0			Min L=3D or 3H
Max Length (ft)	20.0			Max L=10D or 10H
Min Bottom Width, T (ft):	2.6			$T=2*(L_p*\tan\theta)+W$
Design Length (ft)	**6.0**			
Design Width (ft)	**2.6**			
Riprap Depth (in)	**18**			Depth=2(d_{50})
Type II Bedding Depth (in)*	6			*Not used if Soil Riprap
Cutoff Wall	No			
Cutoff Wall Depth (ft)				Depth of Riprap and Base
Cutoff Wall Width (ft)				

Note: No Type II Base to be used if Soil Riprap is specified within the plans

* For use when the flow in the culvert is supercritical (and less than full).

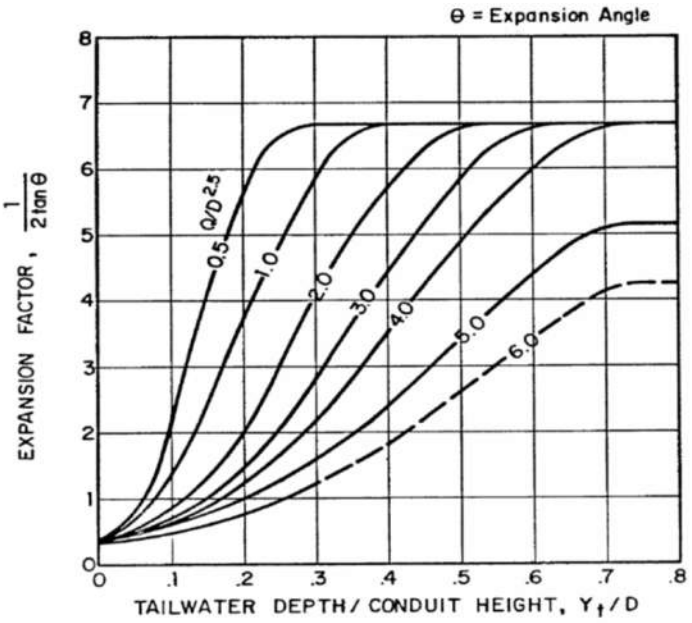


Figure 9-35. Expansion factor for circular conduits

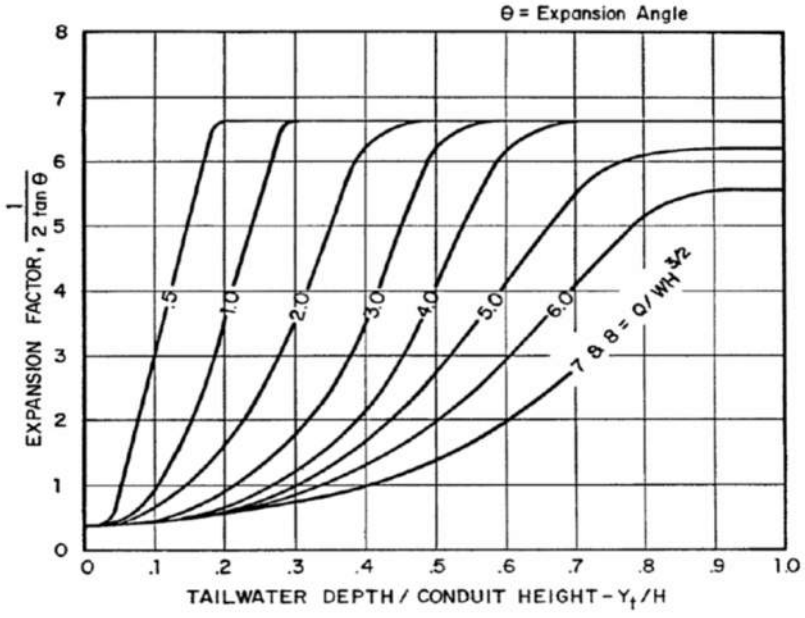


Figure 9-36. Expansion factor for rectangular conduits

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

DP15 - TRIBUTARY 1 Q100

User-defined

Invert Elev (ft)	= 7437.00
Slope (%)	= 1.60
N-Value	= 0.035

Calculations

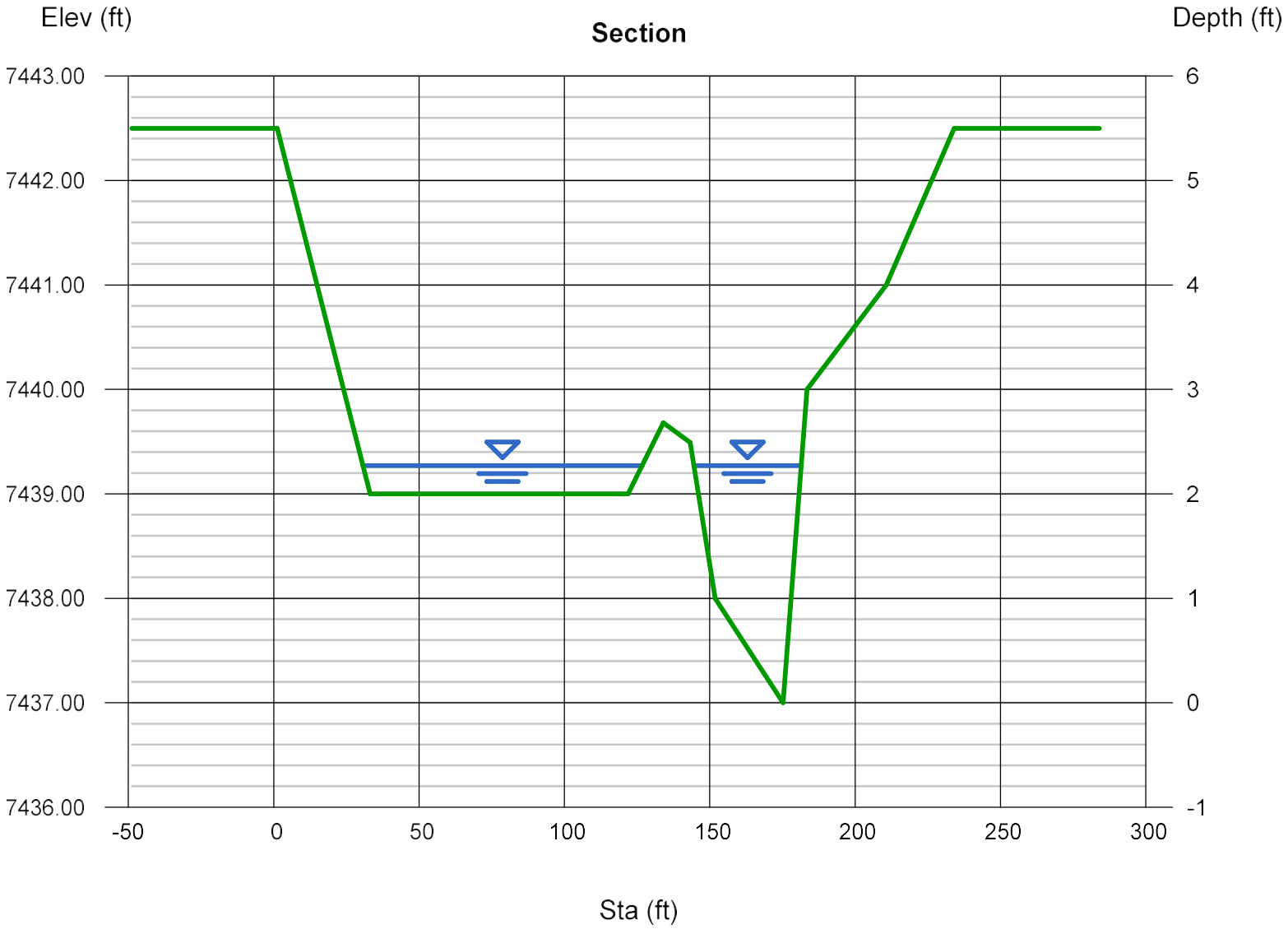
Compute by:	Known Q
Known Q (cfs)	= 287.70

Highlighted

Depth (ft)	= 2.27
Q (cfs)	= 287.70
Area (sqft)	= 77.99
Velocity (ft/s)	= 3.69
Wetted Perim (ft)	= 133.56
Crit Depth, Yc (ft)	= 2.21
Top Width (ft)	= 133.01
EGL (ft)	= 2.48

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

(1.23, 7442.50)-(33.14, 7439.00, 0.035)-(121.92, 7439.00, 0.035)-(134.06, 7439.68, 0.035)-(143.24, 7439.49, 0.035)-(151.90, 7438.00, 0.035)-(175.19, 7437.00, 0.03
-(183.49, 7440.00, 0.035)-(210.68, 7441.00, 0.035)-(234.03, 7442.50, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 1 2026

Ex Swale Tributary 2 @ DP1.1 (total flow) Q100

User-defined

Invert Elev (ft)	= 91.98
Slope (%)	= 3.20
N-Value	= 0.035

Calculations

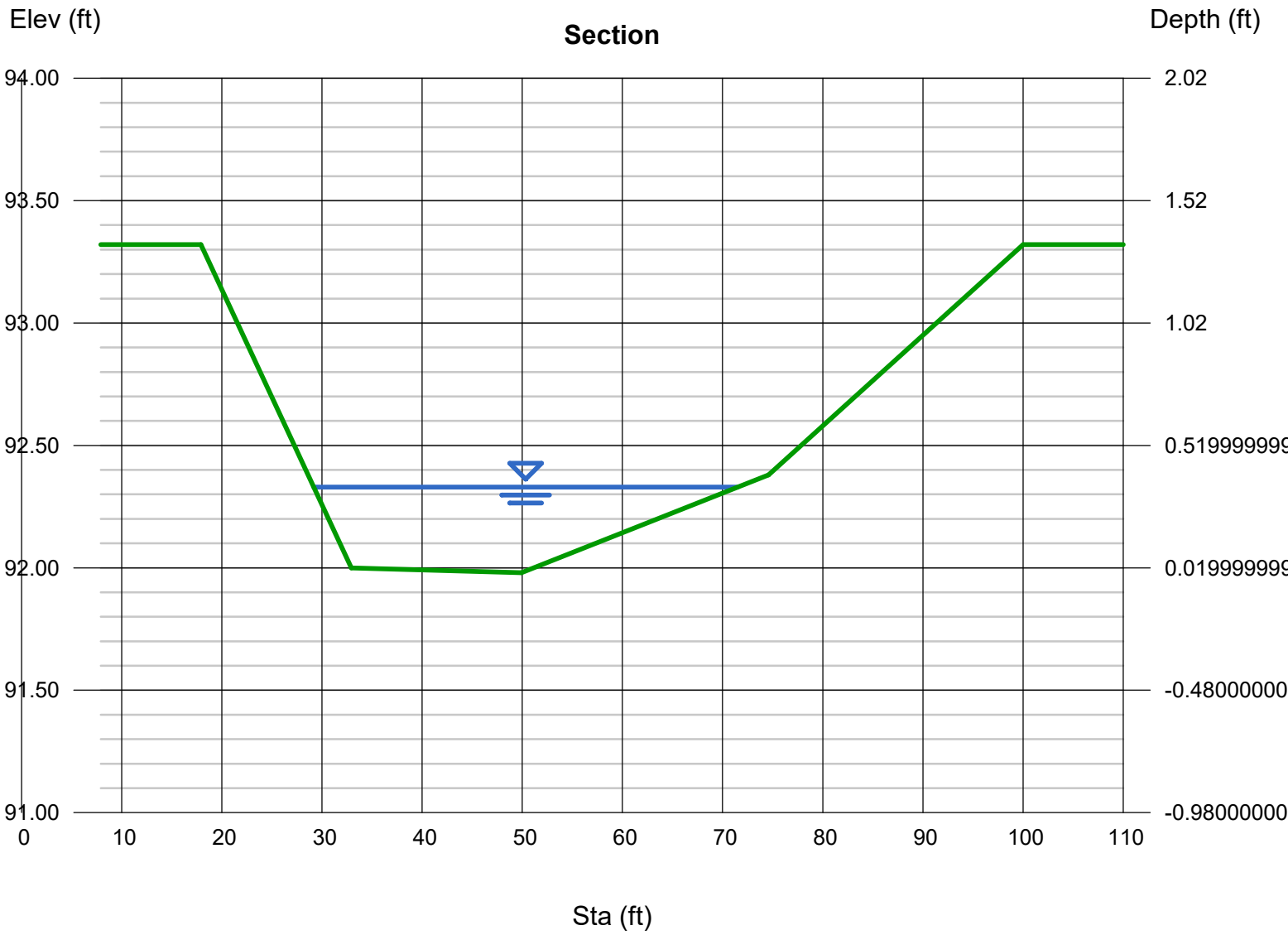
Compute by:	Known Q
Known Q (cfs)	= 29.10

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 29.10
Area (sqft)	= 10.17
Velocity (ft/s)	= 2.86
Wetted Perim (ft)	= 42.32
Crit Depth, Yc (ft)	= 0.36
Top Width (ft)	= 42.31
EGL (ft)	= 0.48

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

(17.92, 93.32)-(32.95, 92.00, 0.035)-(49.92, 91.98, 0.035)-(74.58, 92.38, 0.035)-(100.00, 93.32, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 28 2026

DP11 - TRIBUTARY 3 Q100

User-defined

Invert Elev (ft)	= 7458.80
Slope (%)	= 2.00
N-Value	= 0.035

Calculations

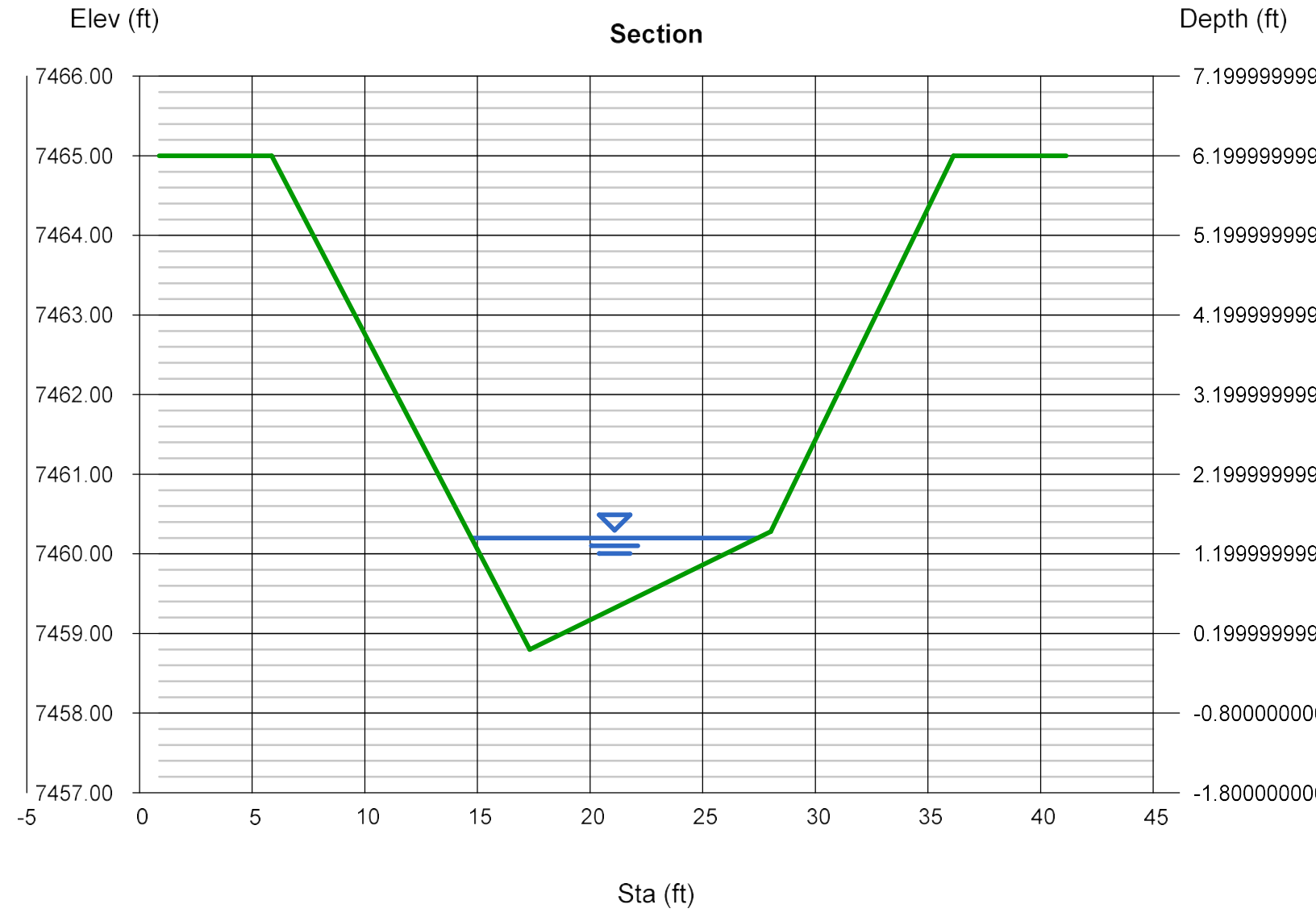
Compute by:	Known Q
Known Q (cfs)	= 40.80

Highlighted

Depth (ft)	= 1.40
Q (cfs)	= 40.80
Area (sqft)	= 8.89
Velocity (ft/s)	= 4.59
Wetted Perim (ft)	= 13.16
Crit Depth, Yc (ft)	= 1.39
Top Width (ft)	= 12.71
EGL (ft)	= 1.73

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

(5.87, 7465.00)-(17.32, 7458.80, 0.035)-(28.02, 7460.28, 0.035)-(36.13, 7465.00, 0.035)



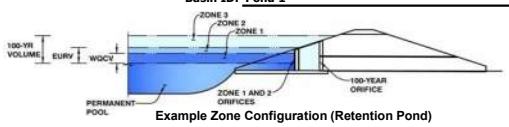
APPENDIX D – WATER QUALITY & DETENTION

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Iron Ridge Subdivision

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	14.99	acres
Watershed Length =	1,200	ft
Watershed Length to Centroid =	415	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	15.70%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.121	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.229	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.123	acre-feet	0.92	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	0.249	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.44 in.) =	0.441	acre-feet	1.44	inches
25-yr Runoff Volume (P1 = 1.82 in.) =	0.975	acre-feet	1.82	inches
50-yr Runoff Volume (P1 = 2.13 in.) =	1.330	acre-feet	2.13	inches
100-yr Runoff Volume (P1 = 2.47 in.) =	1.822	acre-feet	2.47	inches
500-yr Runoff Volume (P1 = 3.36 in.) =	2.918	acre-feet	3.36	inches
Approximate 2-yr Detention Volume =	0.119	acre-feet		
Approximate 5-yr Detention Volume =	0.185	acre-feet		
Approximate 10-yr Detention Volume =	0.333	acre-feet		
Approximate 25-yr Detention Volume =	0.475	acre-feet		
Approximate 50-yr Detention Volume =	0.521	acre-feet		
Approximate 100-yr Detention Volume =	0.677	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.121	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.109	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.448	acre-feet
Total Detention Basin Volume =	0.677	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

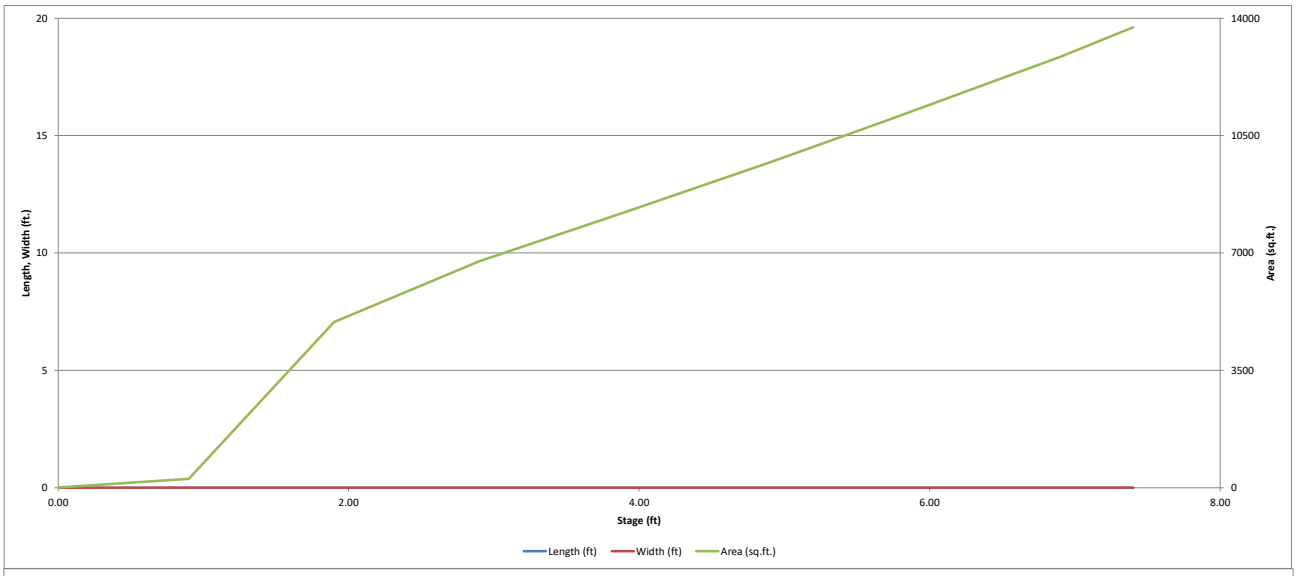
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

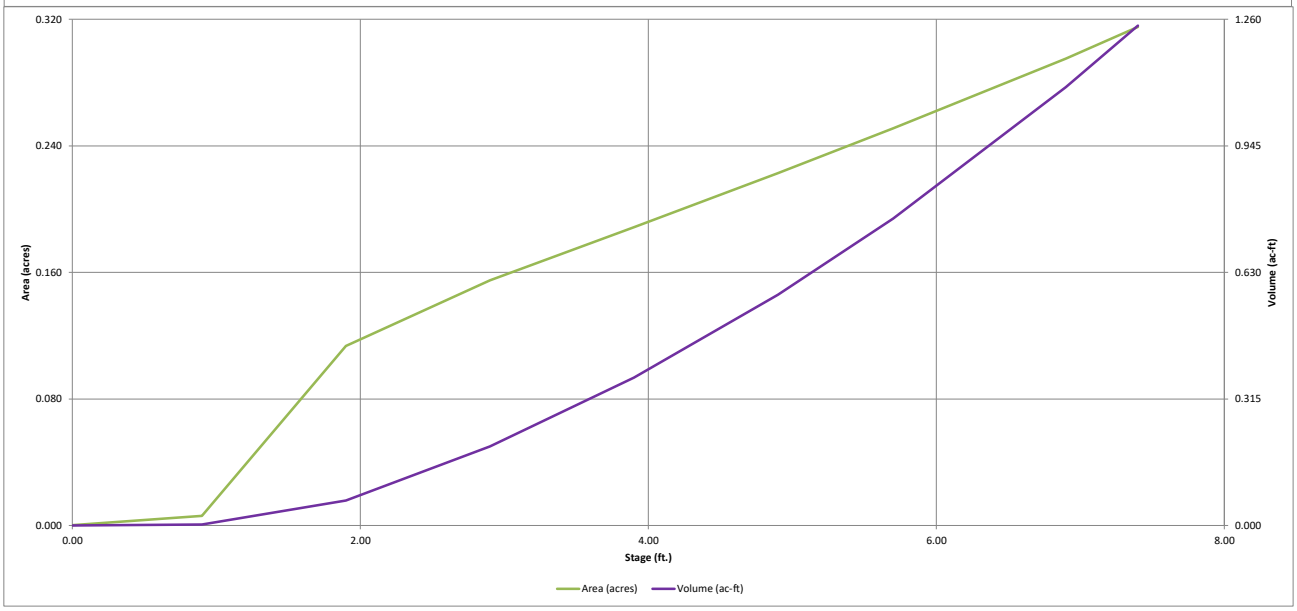
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7457.1 **Top of Micropool**	--	0.00	--	--	--	10	0.000		
7458	--	0.90	--	--	--	265	0.006	124	0.003
7459	--	1.90	--	--	--	4,943	0.113	2,728	0.063
7460	--	2.90	--	--	--	6,758	0.155	8,578	0.197
7461	--	3.90	--	--	--	8,210	0.188	16,062	0.369
7462	--	4.90	--	--	--	9,701	0.223	25,018	0.574
7462.8	--	5.70	--	--	--	10,940	0.251	33,274	0.764
7464	--	6.90	--	--	--	12,858	0.295	47,553	1.092
7464.5	--	7.40	--	--	--	13,728	0.315	54,199	1.244

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



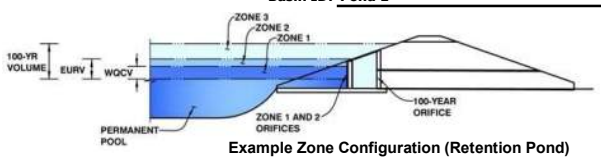


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **Iron Ridge Subdivision**

Basin ID: **Pond 1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.38	0.121	Orifice Plate
Zone 2 (EURV)	3.11	0.109	Orifice Plate
Zone 3 (100-year)	5.35	0.448	Weir&Pipe (Restrict)
Total (all zones)		0.677	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	3.11	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.60	3.00					
Orifice Area (sq. inches)	0.60	0.79	0.38					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.83	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.83	N/A	feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	5.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.81	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	15.82	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	7.91	N/A	ft²
Debris Clogging % =	50%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.03	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.70	N/A	feet
Restrictor Plate Height Above Pipe Invert =	14.75		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.80	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.70	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.63	feet
Spillway Crest Length =	16.00	feet	Stage at Top of Freeboard =	7.33	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.31	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	1.22	acre-ft

Calculated Parameters for Spillway

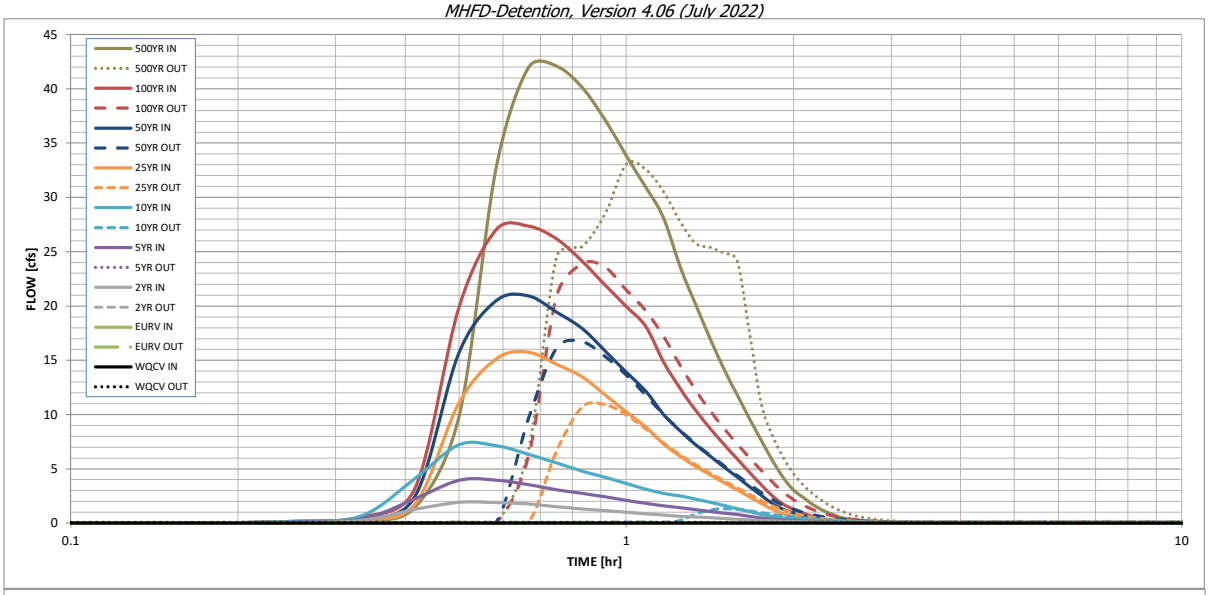
Routed Hydrograph Results

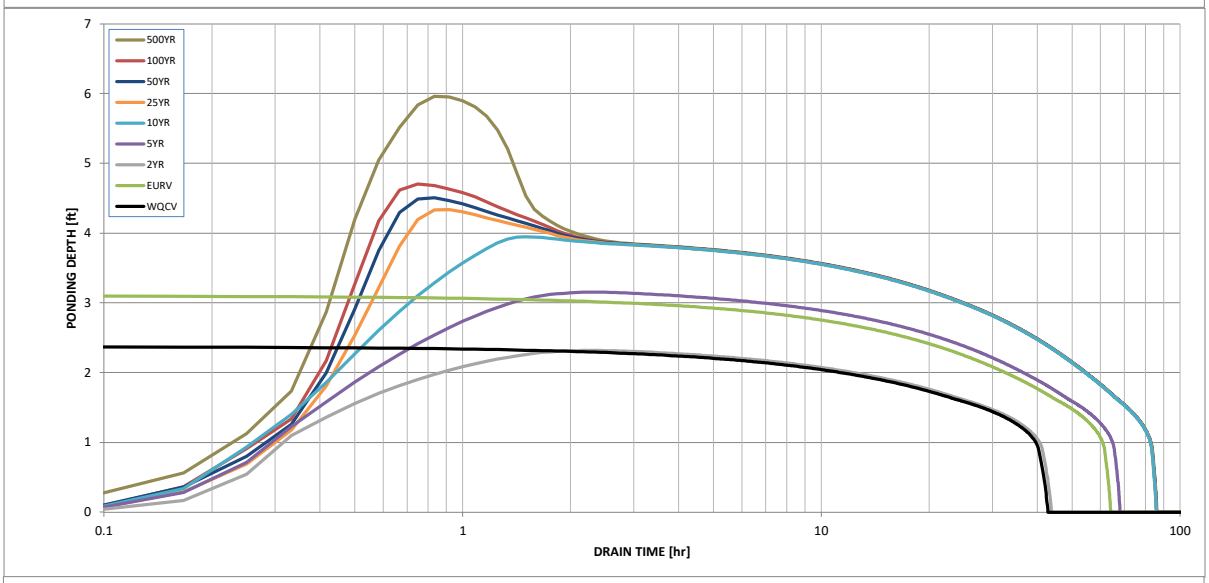
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

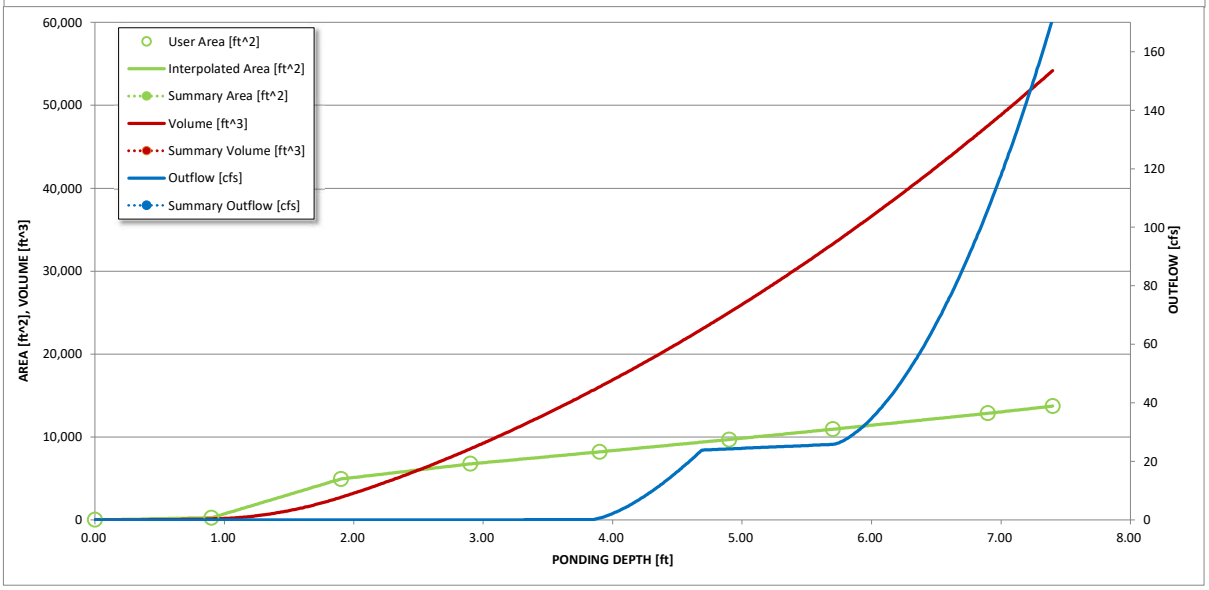
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.92	1.20	1.44	1.82	2.13	2.47	3.36
CUHP Runoff Volume (acre-ft) =	0.121	0.229	0.123	0.249	0.441	0.975	1.330	1.822	2.918
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.123	0.249	0.441	0.975	1.330	1.822	2.918
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	1.7	4.8	13.5	18.6	24.9	39.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.12	0.32	0.90	1.24	1.66	2.63
Peak Inflow Q (cfs) =	N/A	N/A	1.9	4.0	7.2	15.8	20.9	27.3	42.1
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	1.3	10.9	16.7	23.9	33.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.3	0.8	0.9	1.0	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.7	1.1	1.5	1.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	59	41	63	78	70	65	60	51
Time to Drain 99% of Inflow Volume (hours) =	**42**	62	43	66	83	80	78	75	70
Maximum Ponding Depth (ft) =	2.38	3.11	2.32	3.15	3.95	4.34	4.51	4.70	5.96
Area at Maximum Ponding Depth (acres) =	0.13	0.16	0.13	0.16	0.19	0.20	0.21	0.22	0.26
Maximum Volume Stored (acre-ft) =	0.122	0.230	0.113	0.237	0.376	0.453	0.488	0.530	0.830

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	0:15:00	0.00	0.00	0.05	0.10	0.14	0.11	0.16	0.16	0.27
	0:20:00	0.00	0.00	0.25	0.36	0.66	0.31	0.39	0.57	1.46
	0:25:00	0.00	0.00	1.27	2.23	4.10	1.74	2.45	3.18	9.81
	0:30:00	0.00	0.00	1.92	3.95	7.22	11.08	15.71	19.90	32.75
	0:35:00	0.00	0.00	1.90	3.97	7.13	15.14	20.48	27.02	41.97
	0:40:00	0.00	0.00	1.76	3.53	6.35	15.75	20.93	27.34	42.09
	0:45:00	0.00	0.00	1.51	3.09	5.54	14.61	19.43	26.16	40.11
	0:50:00	0.00	0.00	1.31	2.74	4.80	13.49	17.92	24.11	37.10
	0:55:00	0.00	0.00	1.15	2.42	4.21	11.79	15.83	21.90	33.86
	1:00:00	0.00	0.00	1.00	2.11	3.66	10.25	13.92	19.97	30.95
	1:05:00	0.00	0.00	0.87	1.82	3.13	8.89	12.19	18.13	28.17
	1:10:00	0.00	0.00	0.73	1.60	2.74	7.31	10.03	14.88	23.62
	1:15:00	0.00	0.00	0.64	1.42	2.50	6.16	8.50	12.40	20.16
	1:20:00	0.00	0.00	0.56	1.24	2.23	5.23	7.22	10.40	16.95
	1:25:00	0.00	0.00	0.50	1.08	1.91	4.46	6.15	8.70	14.18
	1:30:00	0.00	0.00	0.43	0.93	1.61	3.72	5.15	7.25	11.81
	1:35:00	0.00	0.00	0.37	0.79	1.33	3.06	4.24	5.93	9.65
	1:40:00	0.00	0.00	0.31	0.63	1.07	2.43	3.38	4.69	7.64
	1:45:00	0.00	0.00	0.25	0.48	0.82	1.83	2.56	3.53	5.78
	1:50:00	0.00	0.00	0.20	0.36	0.62	1.27	1.81	2.50	4.18
	1:55:00	0.00	0.00	0.17	0.29	0.48	0.85	1.26	1.74	3.05
	2:00:00	0.00	0.00	0.14	0.25	0.41	0.61	0.96	1.28	2.35
	2:05:00	0.00	0.00	0.11	0.20	0.32	0.43	0.69	0.91	1.71
	2:10:00	0.00	0.00	0.09	0.15	0.26	0.31	0.50	0.63	1.22
	2:15:00	0.00	0.00	0.07	0.12	0.20	0.22	0.36	0.43	0.86
	2:20:00	0.00	0.00	0.06	0.09	0.15	0.16	0.26	0.28	0.58
	2:25:00	0.00	0.00	0.04	0.07	0.12	0.11	0.19	0.18	0.39
	2:30:00	0.00	0.00	0.03	0.05	0.09	0.08	0.14	0.12	0.27
	2:35:00	0.00	0.00	0.03	0.04	0.06	0.06	0.10	0.09	0.20
	2:40:00	0.00	0.00	0.02	0.03	0.05	0.04	0.08	0.07	0.15
	2:45:00	0.00	0.00	0.02	0.02	0.03	0.03	0.06	0.06	0.12
	2:50:00	0.00	0.00	0.01	0.02	0.03	0.02	0.04	0.04	0.09
	2:55:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.06
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.04
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.03
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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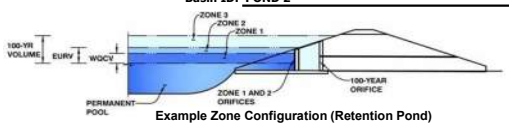
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: IRON RIDGE SUBDIVISION

Basin ID: POND 2



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	9.57	acres
Watershed Length =	1,093	ft
Watershed Length to Centroid =	250	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	17.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.082	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.160	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.92 in.) =	0.086	acre-feet	0.92	inches
5-yr Runoff Volume (P1 = 1.2 in.) =	0.169	acre-feet	1.20	inches
10-yr Runoff Volume (P1 = 1.44 in.) =	0.293	acre-feet	1.44	inches
25-yr Runoff Volume (P1 = 1.82 in.) =	0.632	acre-feet	1.82	inches
50-yr Runoff Volume (P1 = 2.13 in.) =	0.858	acre-feet	2.13	inches
100-yr Runoff Volume (P1 = 2.47 in.) =	1.170	acre-feet	2.47	inches
500-yr Runoff Volume (P1 = 3.36 in.) =	1.867	acre-feet	3.36	inches
Approximate 2-yr Detention Volume =	0.083	acre-feet		
Approximate 5-yr Detention Volume =	0.129	acre-feet		
Approximate 10-yr Detention Volume =	0.226	acre-feet		
Approximate 25-yr Detention Volume =	0.318	acre-feet		
Approximate 50-yr Detention Volume =	0.349	acre-feet		
Approximate 100-yr Detention Volume =	0.451	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.082	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.078	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.291	acre-feet
Total Detention Basin Volume =	0.451	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

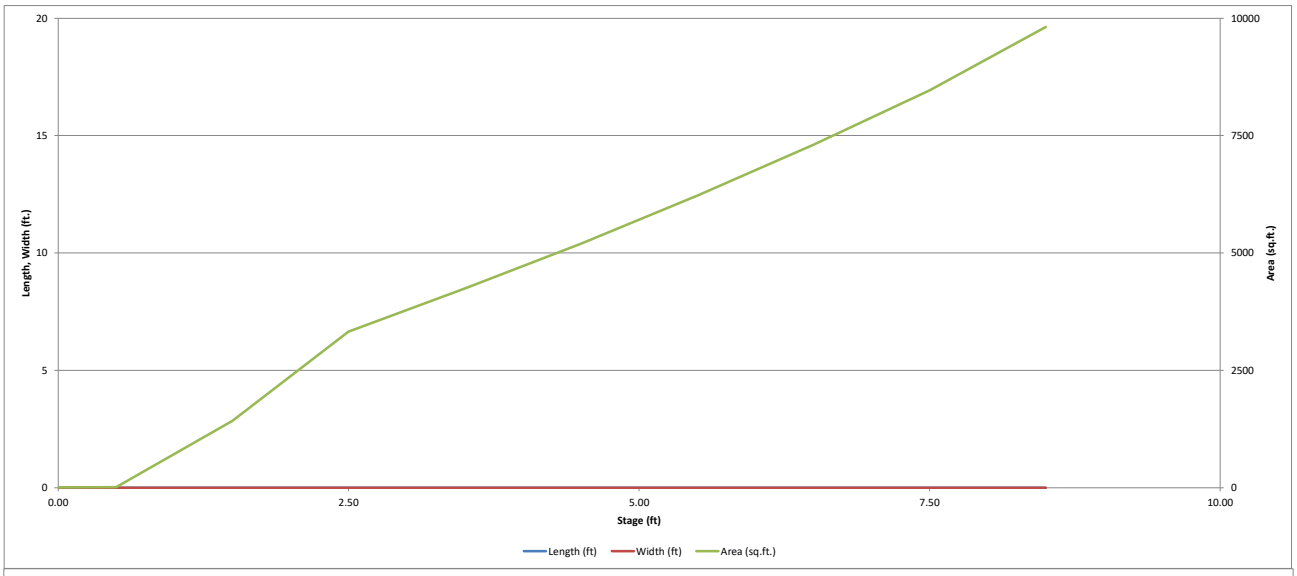
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

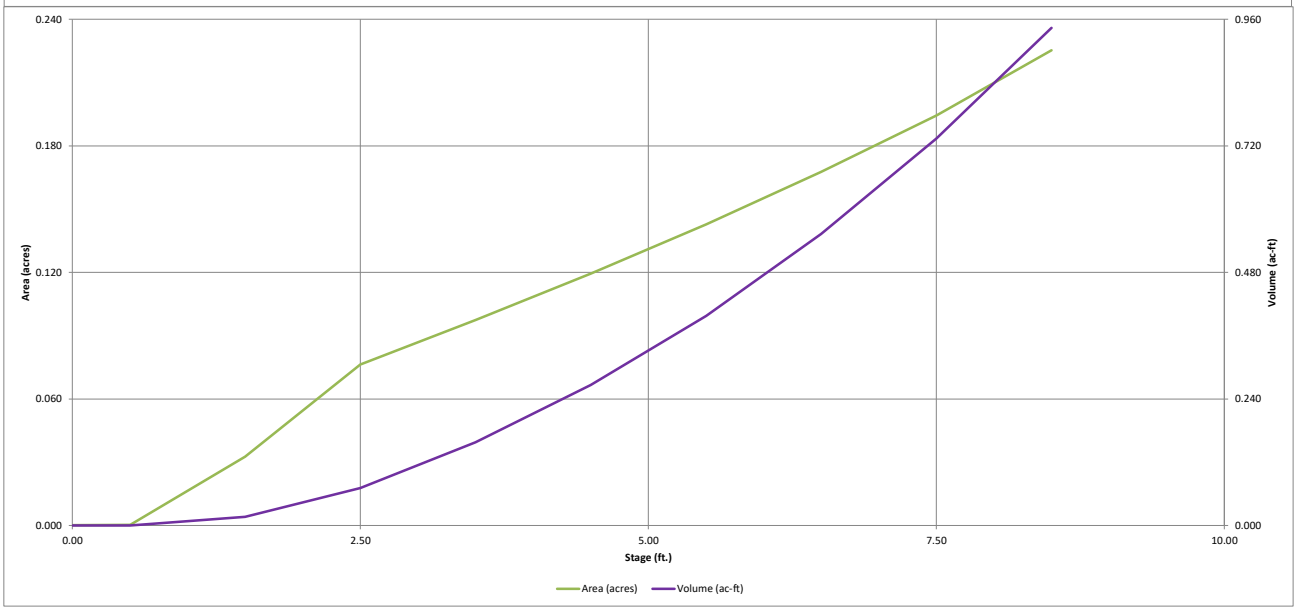
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
7485.5									
Top of Micropool	--	0.00	--	--	--	10	0.000		
7486	--	0.50	--	--	--	15	0.000	6	0.000
7487	--	1.50	--	--	--	1,422	0.033	725	0.017
7488	--	2.50	--	--	--	3,325	0.076	3,098	0.071
7489	--	3.50	--	--	--	4,245	0.097	6,883	0.158
7490	--	4.50	--	--	--	5,202	0.119	11,607	0.266
7491	--	5.50	--	--	--	6,219	0.143	17,317	0.398
7492	--	6.50	--	--	--	7,304	0.168	24,079	0.553
7493	--	7.50	--	--	--	8,469	0.194	31,965	0.734
7494	--	8.50	--	--	--	9,814	0.225	41,107	0.944

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



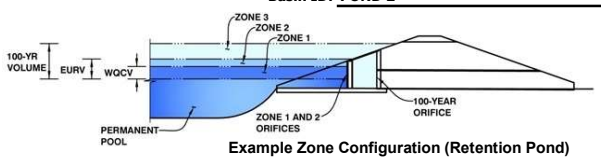


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **IRON RIDGE SUBDIVISION**

Basin ID: **POND 2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.64	0.082	Orifice Plate
Zone 2 (EURV)	3.52	0.078	Circular Orifice
Zone 3 (100-year)	5.86	0.291	Weir&Pipe (Restrict)
Total (all zones)		0.451	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.65	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.75						
Orifice Area (sq. inches)	0.44	0.44						

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.64	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.00	N/A	ft²
Depth at top of Zone using Vertical Orifice =	3.54	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.02	N/A	feet
Vertical Orifice Diameter =	0.38	N/A	inches				

Calculated Parameters for Vertical Orifice

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.75	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.75	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	5.78	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	7.12	N/A	ft²
Overflow Grate Type =	Close Mesh Grate	N/A		Overflow Grate Open Area w/ Debris =	3.49	N/A	ft²
Debris Clogging % =	51%	N/A	%				

Calculated Parameters for Overflow Weir

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.50	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.23	N/A	ft²
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.48	N/A	feet
Restrictor Plate Height Above Pipe Invert =	9.95		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.40	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.62	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	8.37	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.22	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.91	acre-ft

Calculated Parameters for Spillway

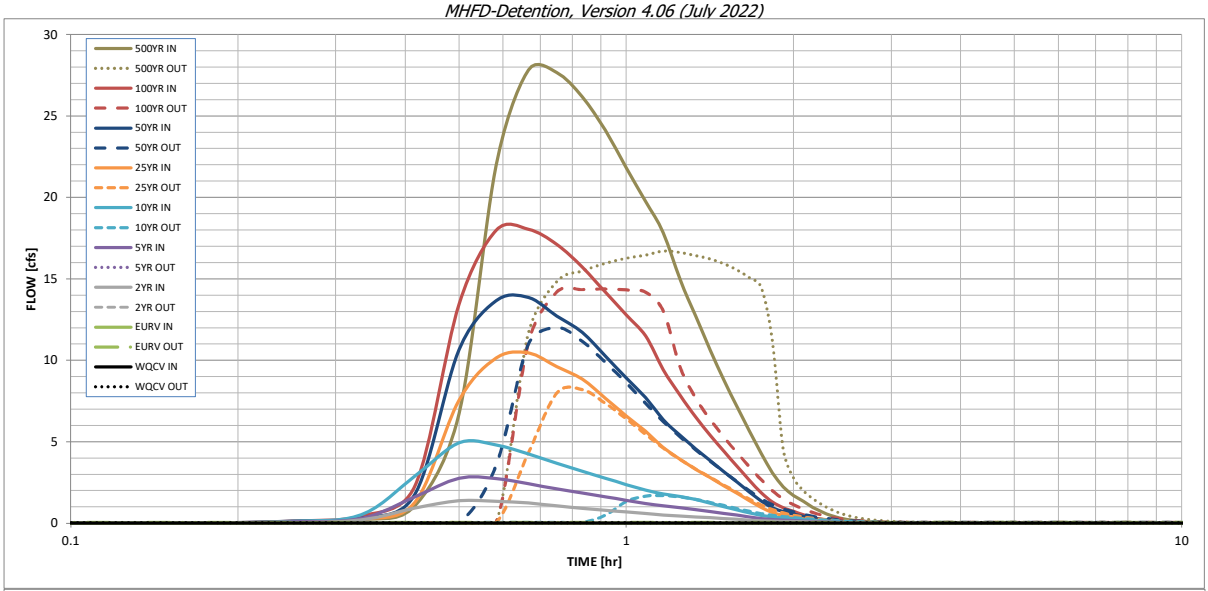
Routed Hydrograph Results

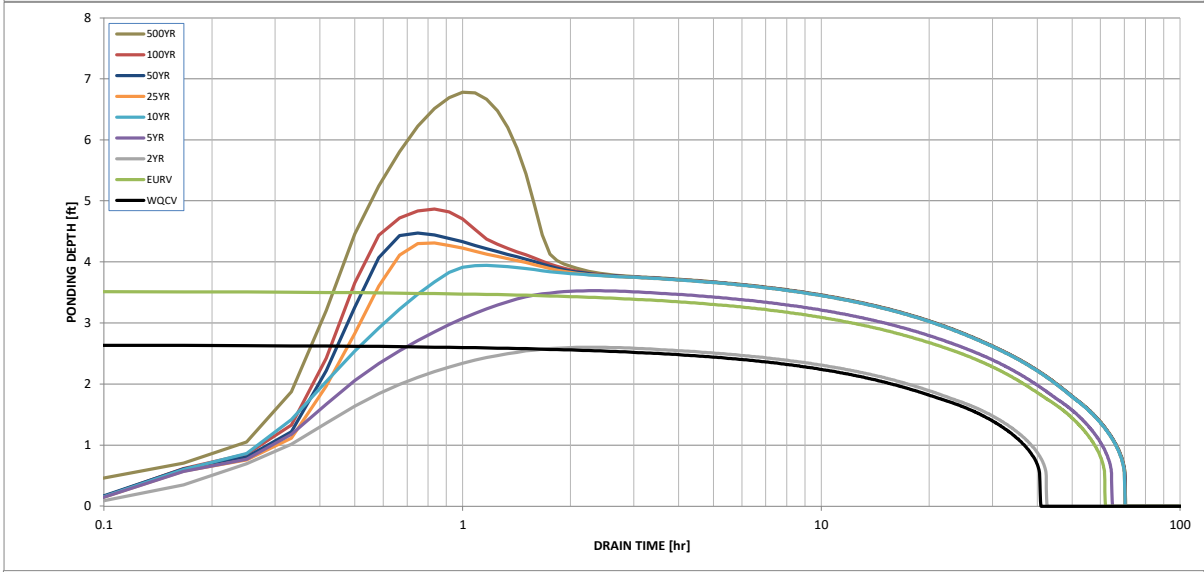
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

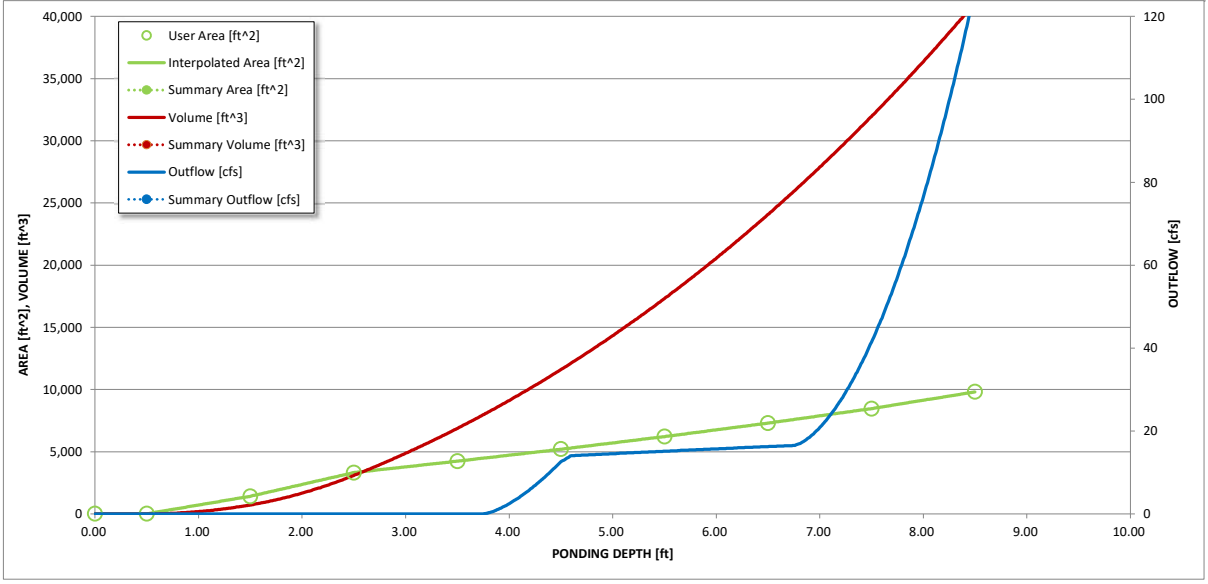
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.92	1.20	1.44	1.82	2.13	2.47	3.36
CUHP Runoff Volume (acre-ft) =	0.082	0.160	0.086	0.169	0.293	0.632	0.858	1.170	1.867
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.086	0.169	0.293	0.632	0.858	1.170	1.867
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	1.1	3.2	8.7	12.0	16.1	25.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.12	0.33	0.91	1.26	1.69	2.67
Peak Inflow Q (cfs) =	N/A	N/A	1.4	2.8	4.9	10.5	13.8	18.0	27.8
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	1.7	8.2	12.0	14.4	16.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.5	0.9	1.0	0.9	0.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Plate	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	1.2	1.7	2.0	2.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	58	40	60	63	56	52	47	39
Time to Drain 99% of Inflow Volume (hours) =	**40**	60	42	63	67	65	63	61	56
Maximum Ponding Depth (ft) =	2.64	3.53	2.60	3.53	3.94	4.31	4.47	4.87	6.78
Area at Maximum Ponding Depth (acres) =	0.08	0.10	0.08	0.10	0.11	0.12	0.12	0.13	0.17
Maximum Volume Stored (acre-ft) =	0.082	0.161	0.079	0.161	0.203	0.243	0.263	0.311	0.599

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	0:15:00	0.00	0.00	0.04	0.08	0.11	0.09	0.12	0.13	0.21
	0:20:00	0.00	0.00	0.20	0.28	0.51	0.24	0.30	0.44	1.08
	0:25:00	0.00	0.00	0.93	1.62	2.89	1.28	1.78	2.28	6.72
	0:30:00	0.00	0.00	1.38	2.76	4.93	7.55	10.66	13.45	21.99
	0:35:00	0.00	0.00	1.34	2.74	4.80	10.14	13.66	17.99	27.83
	0:40:00	0.00	0.00	1.24	2.42	4.24	10.46	13.85	18.05	27.67
	0:45:00	0.00	0.00	1.06	2.11	3.69	9.61	12.72	17.11	26.17
	0:50:00	0.00	0.00	0.92	1.86	3.18	8.85	11.72	15.73	24.12
	0:55:00	0.00	0.00	0.80	1.63	2.77	7.67	10.26	14.18	21.84
	1:00:00	0.00	0.00	0.69	1.41	2.37	6.60	8.92	12.80	19.75
	1:05:00	0.00	0.00	0.59	1.21	2.03	5.64	7.70	11.49	17.83
	1:10:00	0.00	0.00	0.51	1.07	1.80	4.64	6.35	9.42	14.95
	1:15:00	0.00	0.00	0.44	0.96	1.65	3.93	5.40	7.85	12.75
	1:20:00	0.00	0.00	0.39	0.83	1.46	3.32	4.56	6.53	10.61
	1:25:00	0.00	0.00	0.34	0.71	1.23	2.80	3.84	5.40	8.76
	1:30:00	0.00	0.00	0.29	0.61	1.02	2.29	3.15	4.41	7.15
	1:35:00	0.00	0.00	0.24	0.50	0.82	1.83	2.52	3.49	5.66
	1:40:00	0.00	0.00	0.19	0.39	0.63	1.39	1.92	2.64	4.29
	1:45:00	0.00	0.00	0.16	0.29	0.47	0.98	1.37	1.87	3.09
	1:50:00	0.00	0.00	0.14	0.23	0.38	0.66	0.95	1.30	2.23
	1:55:00	0.00	0.00	0.12	0.20	0.33	0.47	0.71	0.95	1.70
	2:00:00	0.00	0.00	0.10	0.17	0.28	0.36	0.57	0.73	1.35
	2:05:00	0.00	0.00	0.08	0.14	0.22	0.26	0.42	0.51	0.98
	2:10:00	0.00	0.00	0.06	0.10	0.17	0.19	0.30	0.35	0.69
	2:15:00	0.00	0.00	0.05	0.08	0.13	0.14	0.22	0.24	0.48
	2:20:00	0.00	0.00	0.04	0.06	0.10	0.10	0.16	0.15	0.32
	2:25:00	0.00	0.00	0.03	0.05	0.07	0.07	0.12	0.11	0.22
	2:30:00	0.00	0.00	0.02	0.03	0.05	0.05	0.09	0.08	0.16
	2:35:00	0.00	0.00	0.02	0.03	0.04	0.04	0.06	0.06	0.12
	2:40:00	0.00	0.00	0.01	0.02	0.03	0.03	0.05	0.05	0.09
	2:45:00	0.00	0.00	0.01	0.01	0.02	0.02	0.04	0.04	0.07
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.05
	2:55:00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.04
	3:00:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

POND 1 - FOREBAY SIZING

$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$ **Equation 4-1**

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	WATERSHED IMPERVIOUS AREA (IA)				
	IA UP TO 2 ACRES	IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume [1]		1% of WQCV			
Forebay Depth [1]		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

[1] Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 15.8% * 14.89 acres = 2.35 IA's
Design Depth = 15"

Minimum Volume = 1% of WQCV = 1% *
0.121 ac-ft * 43,560 = 52.7 CF

Provided Volume ~ 125 CF

A_{fb} = 214 sf
t = 300 s
h_{max} = 1.25
w = 9.23 * (214/300)*(1/sqrt(1.25)) =
5.89" FOR A 5 MINUTE DRAIN TIME,
USE 6"

Afb = 214 sf
t = 240 s
hmax = 1.25
w = 9.23 * (214/240)*(1/sqrt(1.25)) =
7.36" FOR A 4 MINUTE DRAIN TIME
USE 6"

POND 2 - FOREBAY SIZING

$w = 9.23\ (A_{FB} / t)\ (1 / \sqrt{h_{max}})$ **Equation 4-1**

Where:

w = width of the rectangular vertical notch (inches)

A_{FB} = surface area of the forebay (square feet)

t = emptying time of the brim-full forebay (seconds)

h_{max} = maximum depth of the forebay (feet)

TABLE 4-12. FOREBAY SIZING CRITERIA

FOREBAY SIZING CRITERIA	WATERSHED IMPERVIOUS AREA (IA)				
	IA UP TO 2 ACRES	IA 2 UP TO 5 ACRES	IA 5 UP TO 10 ACRES	IA 10 UP TO 20 ACRES	IA GREATER THAN 20 ACRES
Forebay Release Rate and Configuration	Concrete sediment pad with dense grasses surrounding, concrete pad with slotted metal edge, or similar design	Size to drain in 4 to 5 minutes using Equation 4-1			
Minimum Forebay Volume [1]		1% of WQCV			
Forebay Depth [1]		12 to 15 inches	15 to 18 inches	18 to 24 inches	24 to 30 inches

[1] Appropriate volume and depth should consider maintenance and access needs. The values provided are approximate and provide a starting point for design.

IA = 17.3% * 9.48 acres = 1.64 IA's
Design Depth = 12"

Minimum Volume = 1% of WQCV = 1% *
0.082 ac-ft * 43,560 = 52.7 CF

Provided Volume ~ 60 CF

A_{fb} = 101 sf
t = 300 s
h_{max} = 1.0
w = 9.23 * (101/300)*(1/sqrt(1.0)) = 3.1"
FOR A 5 MINUTE DRAIN TIME, USE
3.5"

Afb = 101 sf
t = 240 s
hmax = 1.0
w = 9.23 * (101/240)*(1/sqrt(1.0)) = 3.9"
FOR A 4 MINUTE DRAIN TIME USE
3.5"

Weir Report

POND 1 - FOREBAY NOTCH MAX FLOW

Rectangular Weir

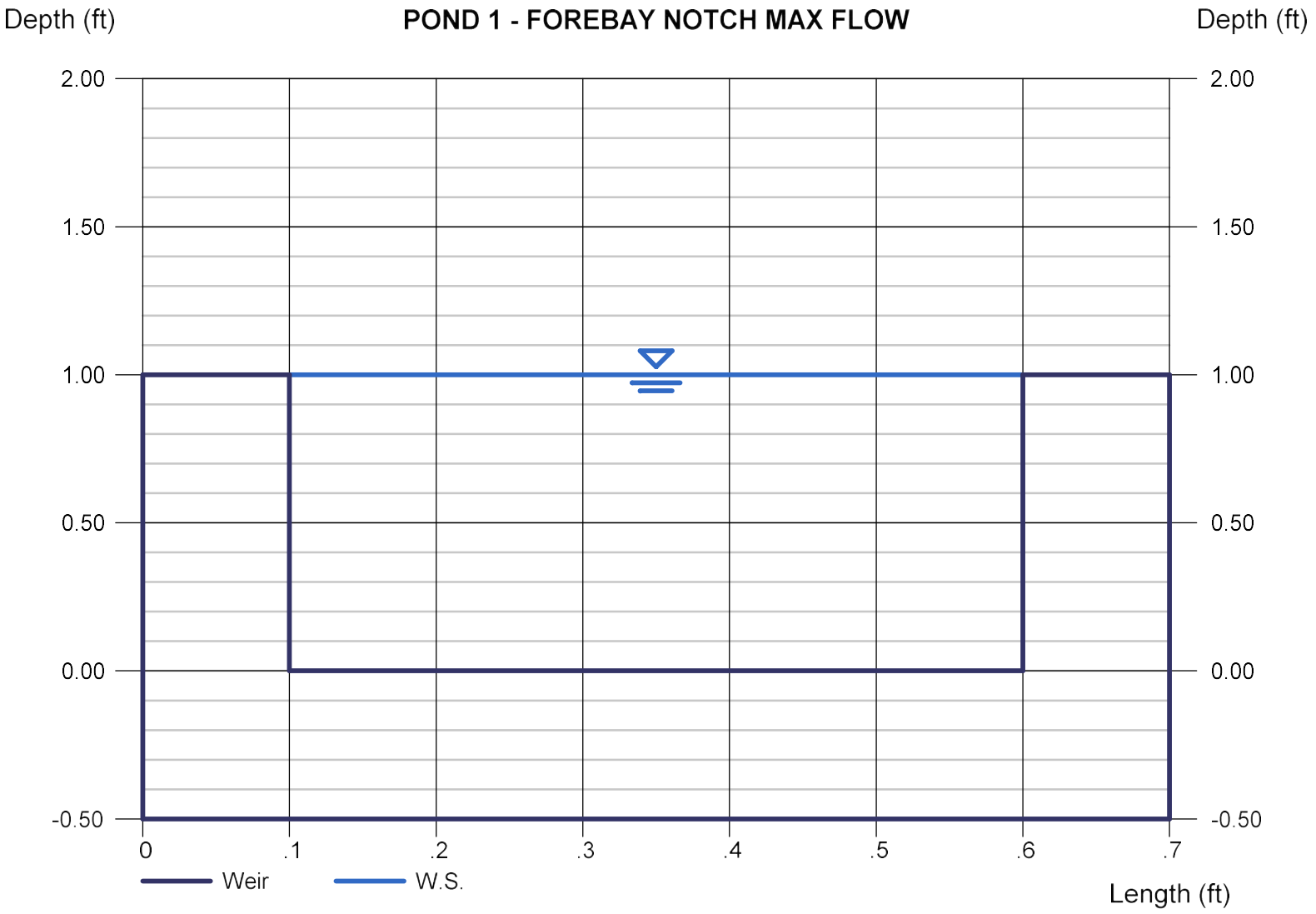
Crest	= Sharp
Bottom Length (ft)	= 0.50
Total Depth (ft)	= 1.00

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 1.665
Area (sqft)	= 0.50
Velocity (ft/s)	= 3.33
Top Width (ft)	= 0.50



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

POND 1 TRICKLE CHANNEL

Rectangular

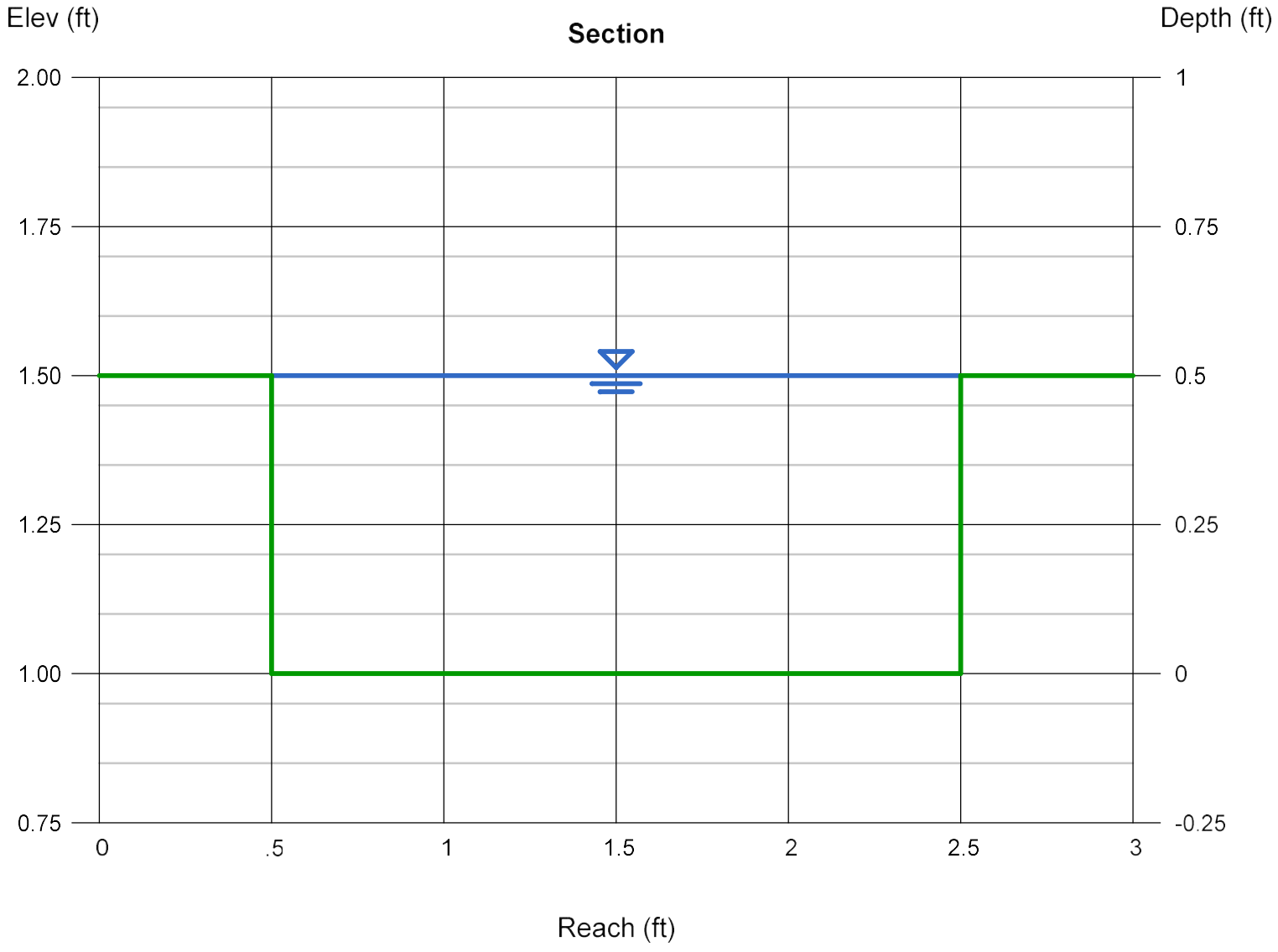
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Q vs Depth
No. Increments	= 4

Highlighted

Depth (ft)	= 0.50
Q (cfs)	= 4.208
Area (sqft)	= 1.00
Velocity (ft/s)	= 4.21
Wetted Perim (ft)	= 3.00
Crit Depth, Yc (ft)	= 0.50
Top Width (ft)	= 2.00
EGL (ft)	= 0.78



Weir Report

POND 2 - FOREBAY NOTCH MAX FLOW

Rectangular Weir

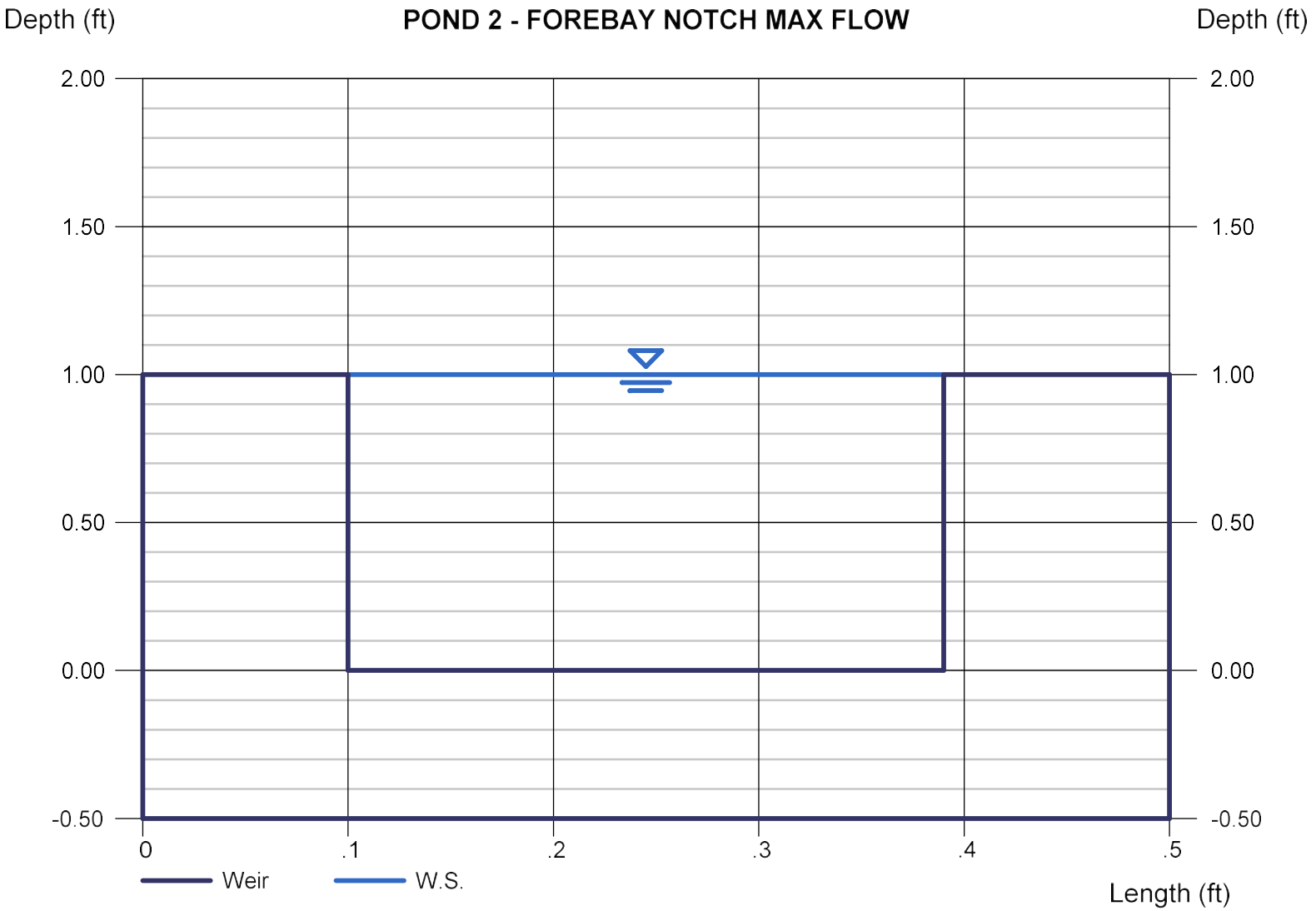
Crest	= Sharp
Bottom Length (ft)	= 0.29
Total Depth (ft)	= 1.00

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 0.966
Area (sqft)	= 0.29
Velocity (ft/s)	= 3.33
Top Width (ft)	= 0.29



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 3 2026

POND 2 TRICKLE CHANNEL

Rectangular

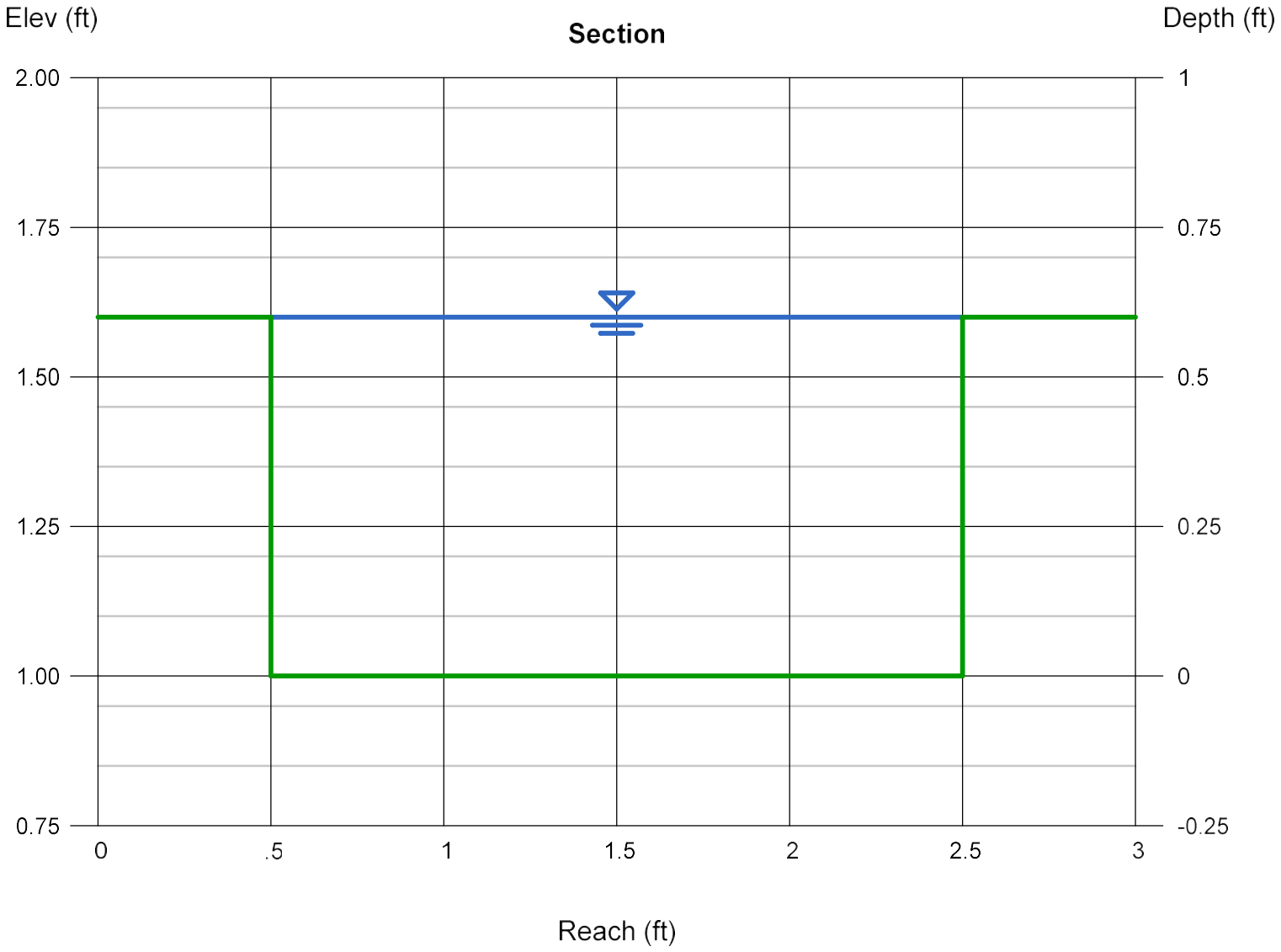
Bottom Width (ft)	= 2.00
Total Depth (ft)	= 0.60
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Q vs Depth
No. Increments	= 4

Highlighted

Depth (ft)	= 0.60
Q (cfs)	= 5.462
Area (sqft)	= 1.20
Velocity (ft/s)	= 4.55
Wetted Perim (ft)	= 3.20
Crit Depth, Yc (ft)	= 0.60
Top Width (ft)	= 2.00
EGL (ft)	= 0.92



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

DP4.1 - POND 1 OUTLET (Q5)

Circular

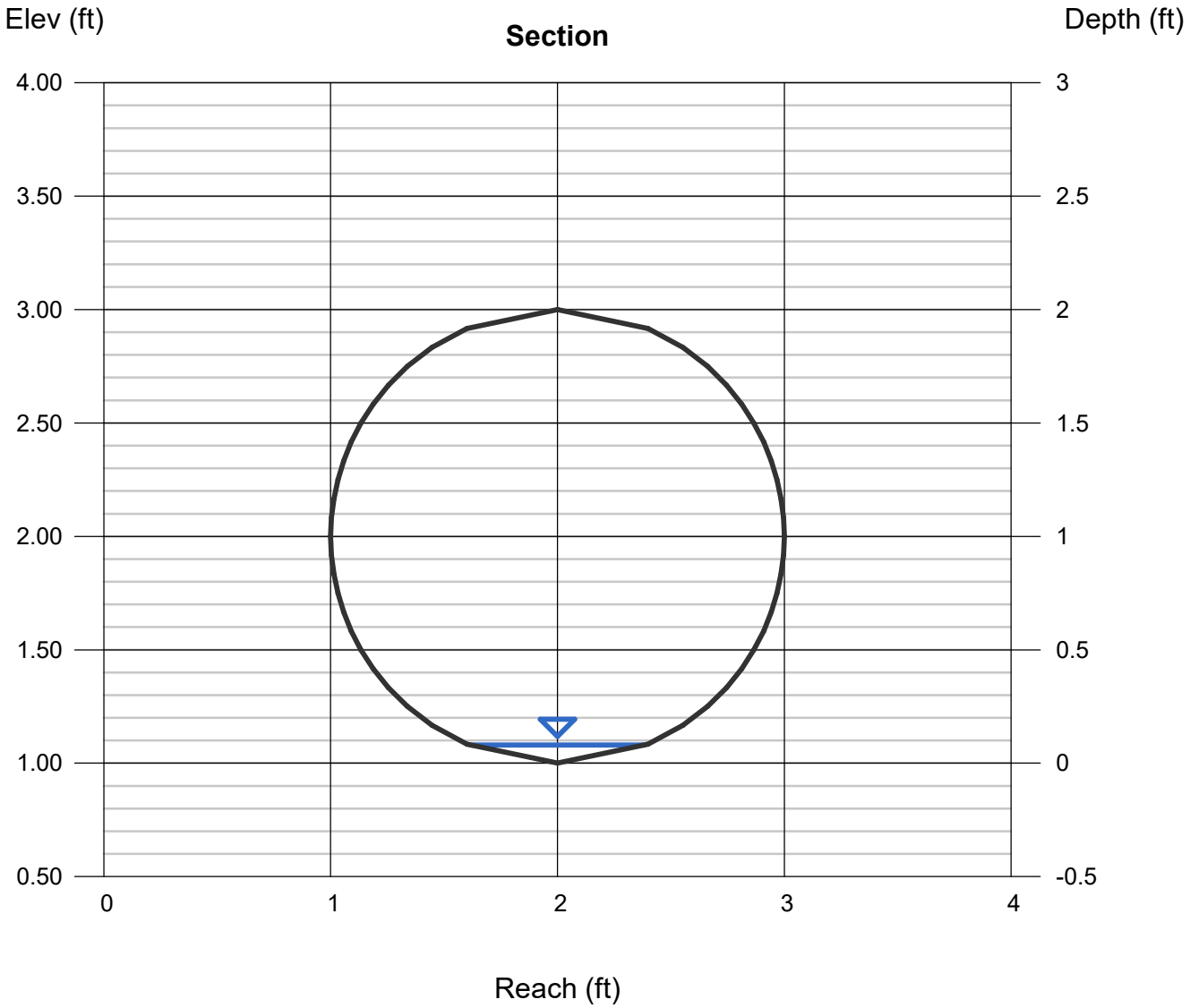
Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.69
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.08
Q (cfs)	= 0.100
Area (sqft)	= 0.04
Velocity (ft/s)	= 2.33
Wetted Perim (ft)	= 0.81
Crit Depth, Yc (ft)	= 0.11
Top Width (ft)	= 0.79
EGL (ft)	= 0.16



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, 00 28 2026

DP4.1 - POND 1 OUTLET (Q100)

Circular

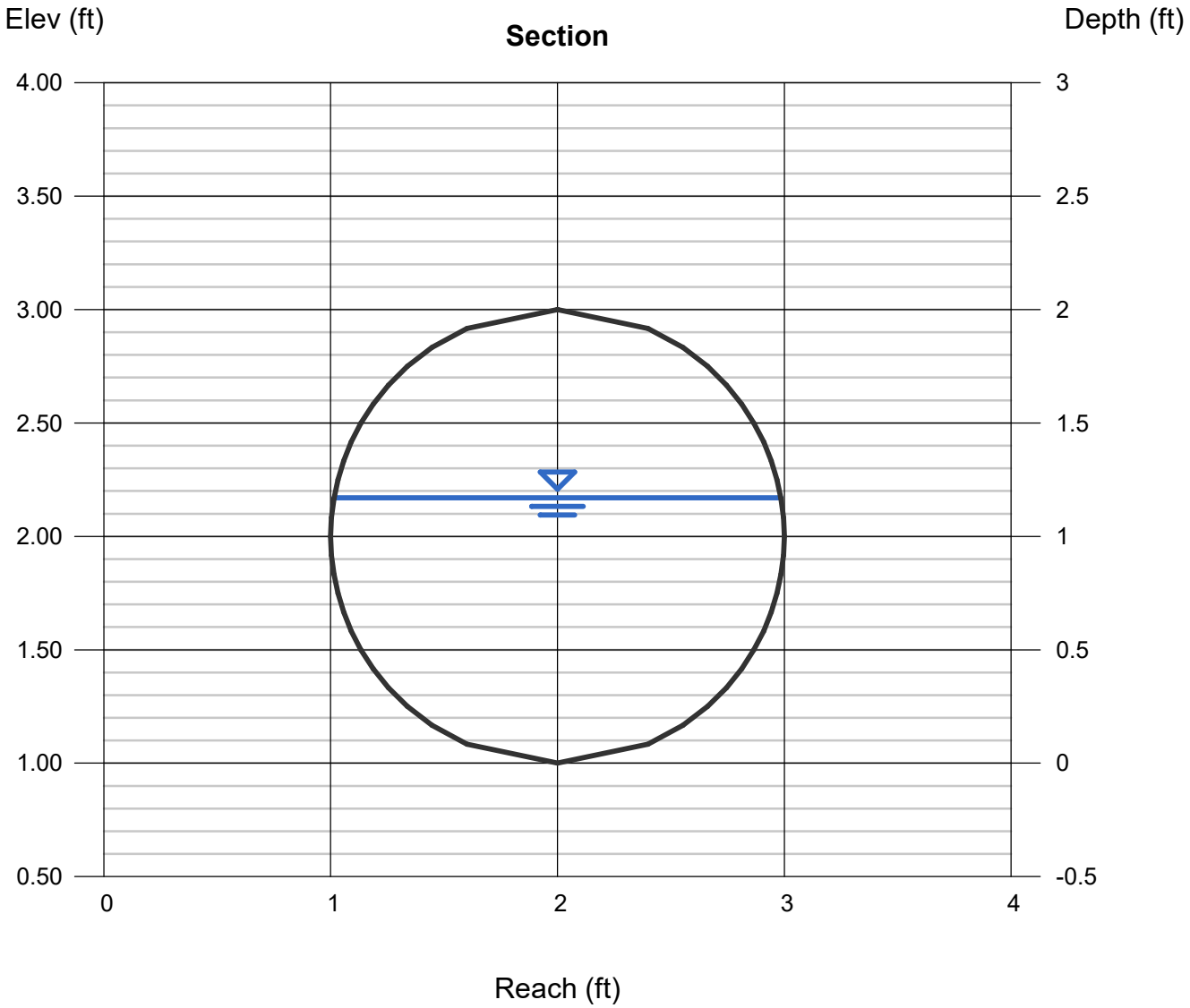
Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.69
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.90

Highlighted

Depth (ft)	= 1.17
Q (cfs)	= 23.90
Area (sqft)	= 1.92
Velocity (ft/s)	= 12.48
Wetted Perim (ft)	= 3.49
Crit Depth, Yc (ft)	= 1.74
Top Width (ft)	= 1.97
EGL (ft)	= 3.59



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, 00 9 2026

DP14.1 - POND 2 OUTLET (Q5)

Circular

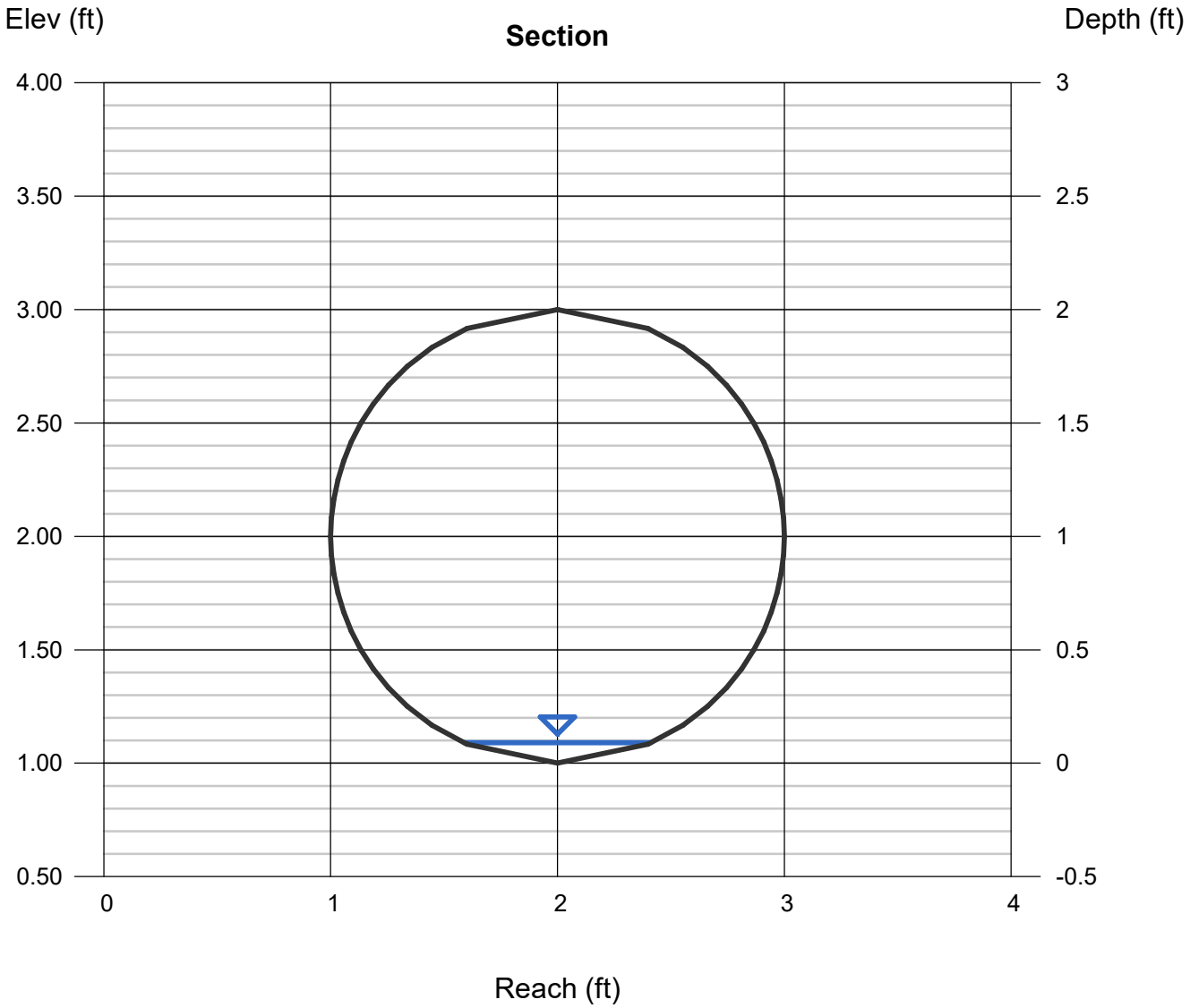
Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.10

Highlighted

Depth (ft)	= 0.09
Q (cfs)	= 0.100
Area (sqft)	= 0.05
Velocity (ft/s)	= 1.96
Wetted Perim (ft)	= 0.86
Crit Depth, Yc (ft)	= 0.11
Top Width (ft)	= 0.83
EGL (ft)	= 0.15



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, 00 19 2026

DP14.1 - POND 2 OUTFALL PIPE (Q100)

Circular

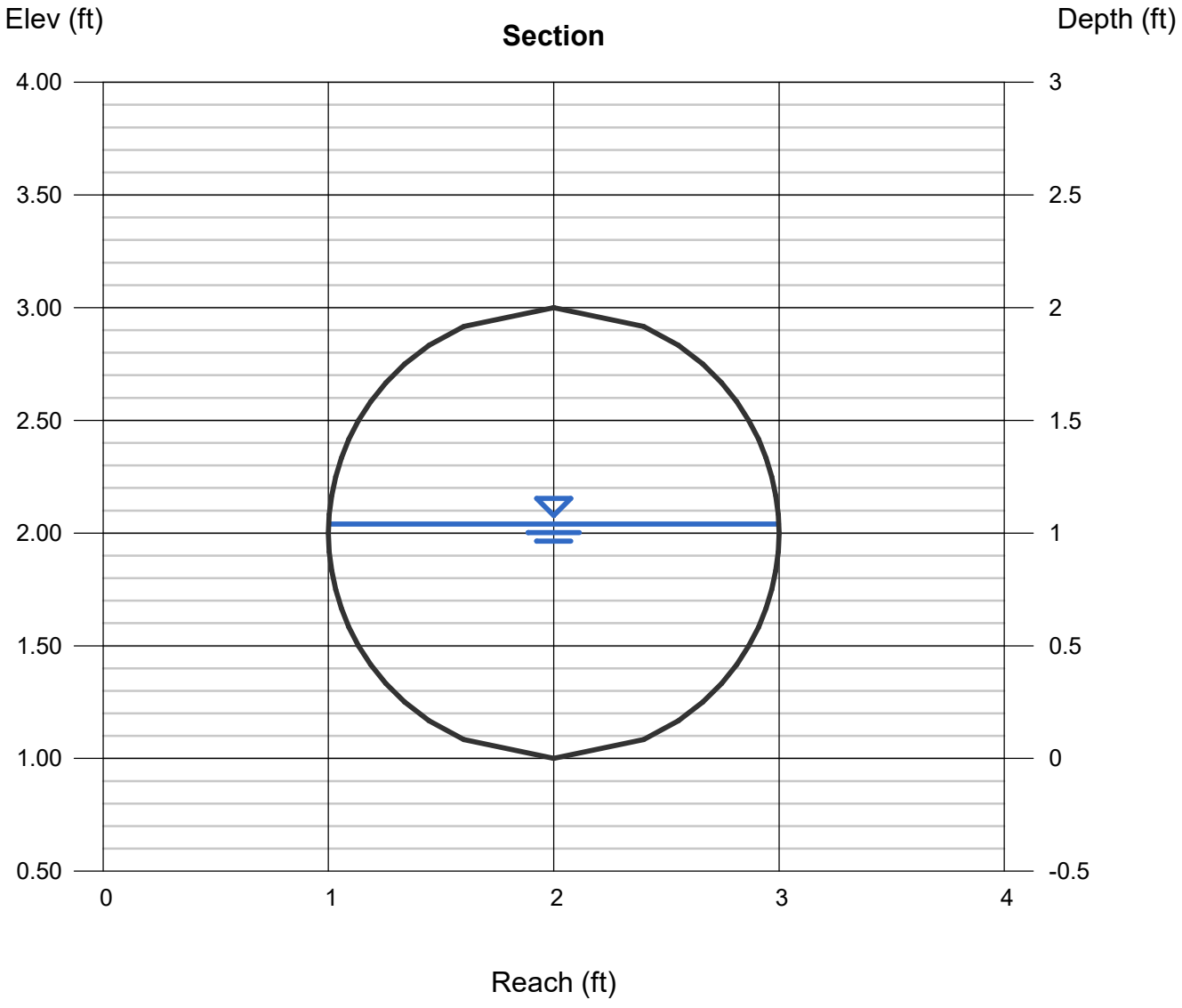
Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.40
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.30

Highlighted

Depth (ft)	= 1.04
Q (cfs)	= 14.30
Area (sqft)	= 1.66
Velocity (ft/s)	= 8.62
Wetted Perim (ft)	= 3.23
Crit Depth, Yc (ft)	= 1.37
Top Width (ft)	= 2.00
EGL (ft)	= 2.19



POND 2

Figure 13-12c. Emergency Spillway Protection

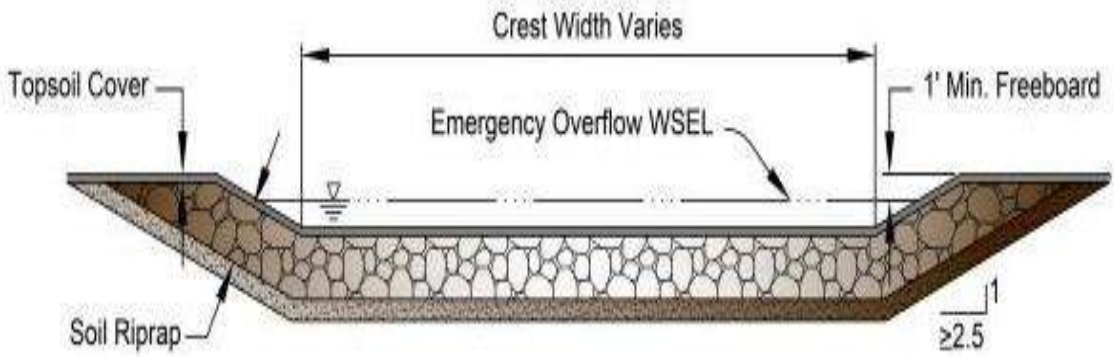
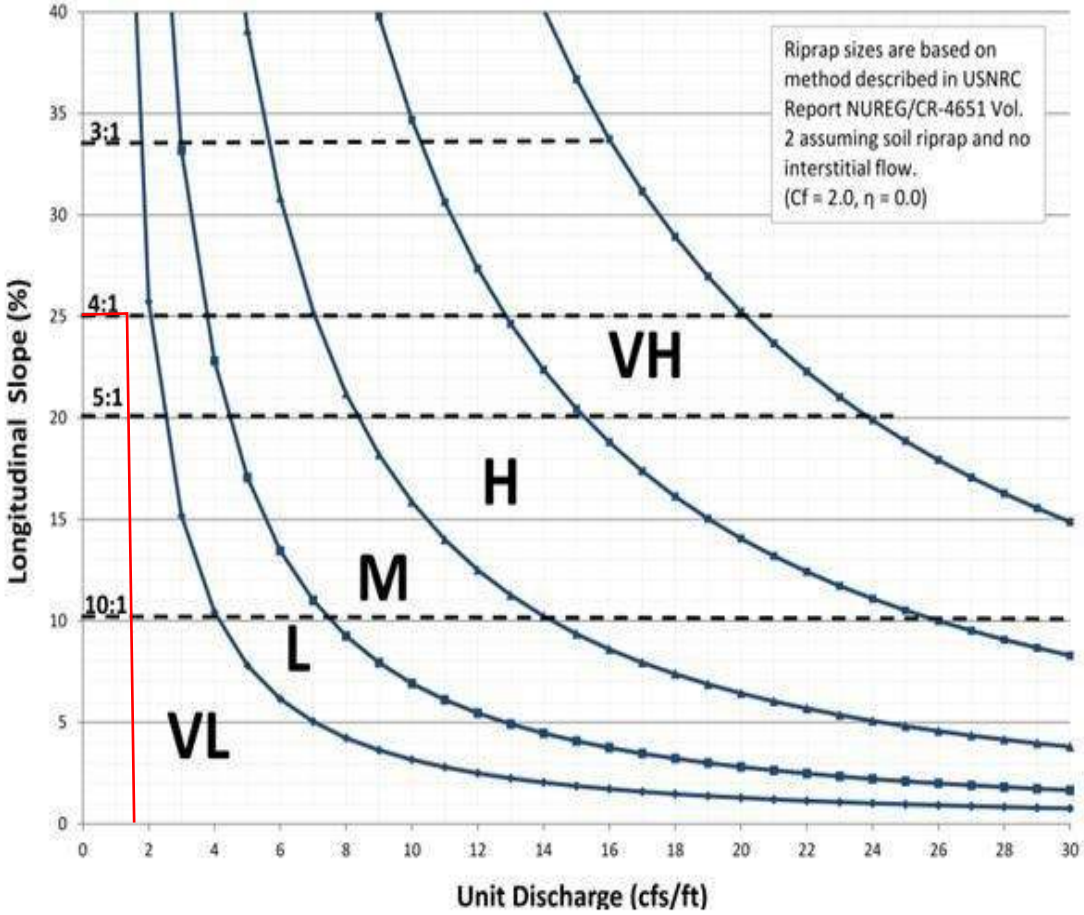


Figure 13-12d. Riprap Types for Emergency Spillway Protection



POND 1

Figure 13-12c. Emergency Spillway Protection

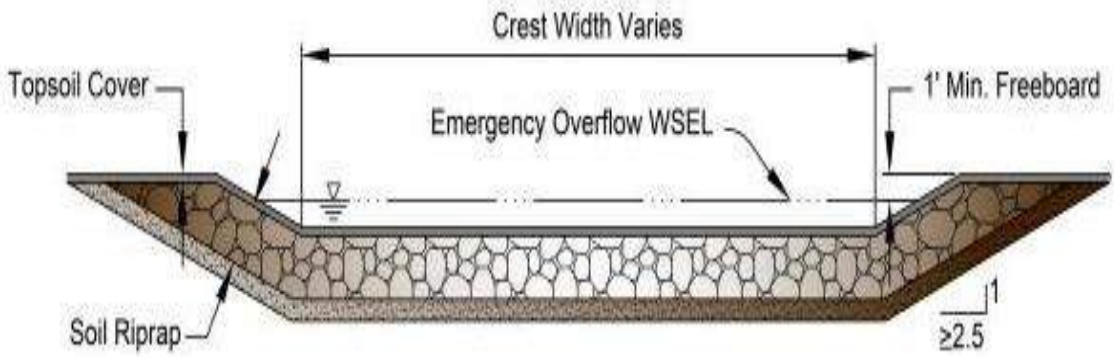
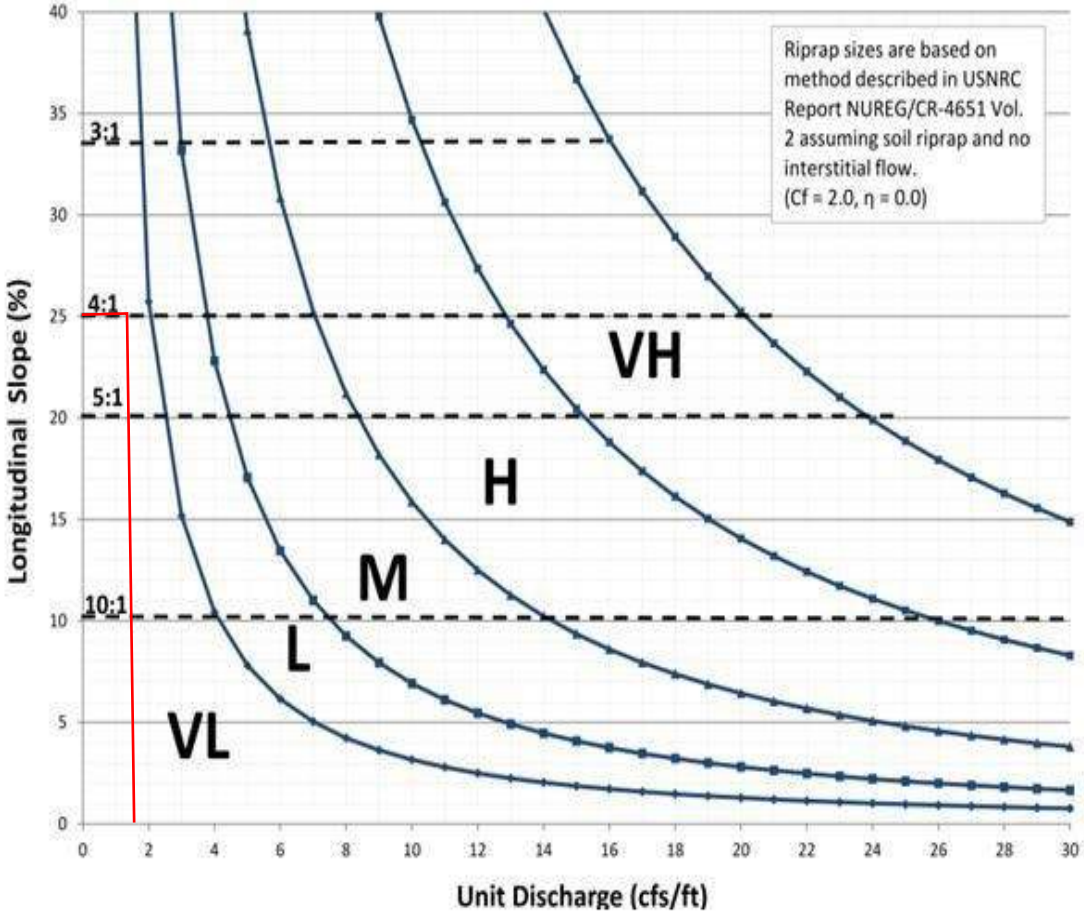


Figure 13-12d. Riprap Types for Emergency Spillway Protection



APPENDIX E – REFERENCE MATERIAL

POND COST ESTIMATES

IRON RIDGE FILING NO. 1				
POND 1 - ENGINEER'S OPINION OF PROBABLE COSTS				
Item*	**Quantity**	**Units**	**Unit Cost**	**Total**
Earthwork	2500.00	CY	$ 6.50	$16,250.00
Rip Rap, d50 size from 6" to 24" (Forebay, Spillway, Inlet/Outlet Protection)	152.00	TONS	$ 102.00	$15,504.00
Aggregate Base Course (135 lbs/cf) - Maint. Road	87.00	CY	$ 81.00	$ 7,047.00
Turf Reinforcement Mat	71	SY	$ 2.00	$ 142.00
Concrete Paving (4" thick w/ Fibermesh) - Forebay	6.00	SY	$ 69.00	$ 414.00
Concrete Weir Wall Forebay	1	EA	$ 1,750.00	$ 1,750.00
Coincrete Trickle Channel (3' wide, 6" deep)	141	LF	$ 50.00	$ 7,050.00
Outlet Structure & Appurtenances	1	EA	$12,500.00	$12,500.00
24" RCP (OR CMP)	64	LF	$ 161.00	$10,304.00
24" RCP FES (OR CMP)	1	EA	$ 600.00	$ 600.00
			TOTAL	$71,561.00
*All items include labor costs				

IRON RIDGE FILING NO. 1				
POND 2 - ENGINEER'S OPINION OF PROBABLE COSTS				
Item*	**Quantity**	**Units**	**Unit Cost**	**Total**
Earthwork	1800.00	CY	$ 6.50	$11,700.00
Rip Rap, d50 size from 6" to 24" (Forebay, Spillway, Inlet/Outlet Protection)	176.00	TONS	$ 102.00	$17,952.00
Aggregate Base Course (135 lbs/cf) - Maint. Road	57.00	CY	$ 81.00	$ 4,617.00
Turf Reinforcement Mat	51	SY	$ 2.00	$ 102.00
Concrete Paving (4" thick w/ Fibermesh) - Forebay	3.00	SY	$ 69.00	$ 207.00
Concrete Weir Wall Forebay	1	EA	$ 1,750.00	$ 1,750.00
Coincrete Trickle Channel (3' wide, 6" deep)	88	LF	$ 50.00	$ 4,400.00
Outlet Structure & Appurtenances	1	EA	$12,500.00	$12,500.00
24" RCP (OR CMP)	81	LF	$ 161.00	$13,041.00
24" RCP FES (OR CMP)	1	EA	$ 600.00	$ 600.00
			TOTAL	$66,869.00
*All items include labor costs				

10853

EQUINE MEADOWS

IN A PORTION OF THE W 1/2 OF THE SW 1/4 OF SECTION 18, T 11 S, R 65 W OF THE 6th P.M., COUNTY OF EL PASO, STATE OF COLORADO

COUNTY GOVERNMENT NOTES

ALL FOUNDATIONS AND SEPTIC SYSTEMS SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF COLORADO.

THE FOLLOWING REPORTS HAVE BEEN SUBMITTED AND ARE ON FILE WITH THE COUNTY LAND USE DEPARTMENT: WATER RESOURCES, SEWERAGE, SOILS & GEOLOGICAL, NATURAL FEATURES REPORT, AND DRAINAGE REPORT AS THEY PERTAIN TO EQUINE MEADOWS.

FUTURE DEVELOPMENT OF EQUINE MEADOWS WILL COMPLY WITH THE EQUINE MEADOWS PROPERTY OWNERS' ASSOCIATION (POA) AGREEMENT AS RECORDED UNDER RECEPTION NO. [illegible] OF THE RECORDS OF THE EL PASO COUNTY CLERK AND RECORDER.

DEVELOPER, HARLEY G. JERGENSEN., HAS CREATED RESTRICTIVE COVENANTS AS SET FORTH IN THE DECLARATION OF PROTECTIVE COVENANTS FOR EQUINE MEADOWS AS RECORDED AT RECEPTION NO. 079165712 IN THE RECORDS OF THE CLERK AND RECORDER OF EL PASO COUNTY, COLORADO WHICH COVENANTS RUN WITH THE LAND.

LOT OWNERS WILL ACCEPT ADJACENT PROPERTY, LOT, AND/OR ROAD STORMWATER RUNOFF AND WILL MAINTAIN THEIR LOTS TO ACCEPT SAID STORMWATER.

- THE EQUINE MEADOWS PROPERTY OWNERS' ASSOCIATION, INC. WILL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL DETENTION PONDS WITHIN EQUINE MEADOWS.

NO STRUCTURES, SEPTIC SYSTEMS OR GRADING OF ANY KIND ARE ALLOWED IN THE FLOOD PLAIN OR PRESERVATION EASEMENT AREAS. THIS INCLUDES, BUT IS NOT LIMITED TO, FENCES AND LANDSCAPING. DRAINAGE IMPROVEMENTS WILL BE ALLOWED AS REQUIRED.

THE DEPARTMENT OF TRANSPORTATION MUST BE CONTACTED PRIOR TO THE ESTABLISHMENT OF ANY DRIVEWAY.

THERE SHALL BE NO DIRECT LOT ACCESS TO WALKER ROAD. ONLY LOTS 9 & 10 WILL BE ALLOWED DIRECT LOT ACCESS TO THOMPSON ROAD ALONG WITH ACCESS FOR POND MAINTAINENCE.

ALL MAIL BOXES WILL BE A MINIMUM OF 12 FEET FROM THE EDGE OF ASPHALT AND CLUSTERED PURSUANT TO U.S. POSTMASTER.

ALL STREET SIGNS SHALL BE IN COMPLIANCE WITH EL PASO COUNTY STANDARDS.

NO LIGHTING IN PUBLIC RIGHT-OF-WAYS.

THE ADDRESSES EXHIBITED ON THIS PLAT ARE FOR INFORMATIONAL PURPOSES ONLY. THEY ARE NOT THE LEGAL DESCRIPTION AND ARE SUBJECT TO CHANGE.

A TEMPORARY TURN AROUND WILL BE LOCATED IN THE AREA OF THE COMMON FRONT LOT CORNER OF LOTS 13&14 AS SHOWN ON APPROVED CONSTRUCTION PLANS. TEMPORARY TURN AROUND WILL BE CONSTRUCTED IN COUNTY ROAD RIGHT-OF-WAY AND ADJACENT TURN AROUND EASEMENTS.

TEMPORARY TURNAROUND EASEMENT RECORDED IN RECEPTION NUMBER 201036659 OF THE RECORDS OF EL PASO COUNTY AS SHOWN ON THIS PLAT SHALL BE VACATED AT SUCH TIME THAT COLT COURT IS COMPLETED THROUGH EQUINE MEADOWS AND INTO NEIGHBORING PROPERTY.

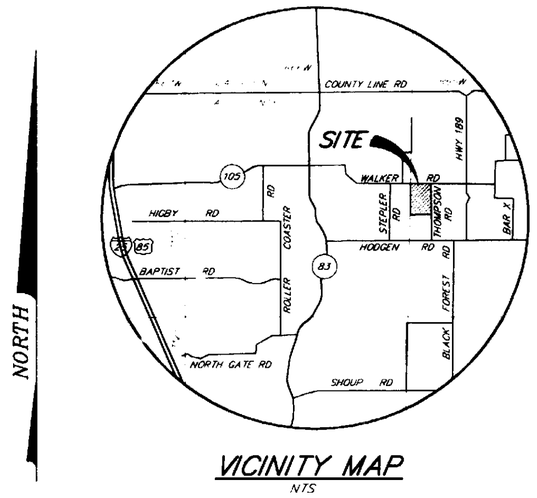
WATER IN THE DENVER BASIN AQUIFERS IS ALLOCATED BASED ON A 100 YEAR AQUIFER LIFE, HOWEVER, FOR EL PASO COUNTY PLANNING PURPOSES, WATER IN THE DENVER BASIN AQUIFERS IS EVALUATED BASED ON A 300 YEAR AQUIFER LIFE. APPLICANTS, THE HOME OWNERS ASSOCIATION, AND ALL FUTURE OWNERS IN THE SUBDIVISION SHOULD BE AWARE THAT THE ECONOMIC LIFE OF A WATER SUPPLY BASED ON WELLS IN A GIVEN DENVER BASIN AQUIFER MAY BE LESS THAN EITHER THE 100 YEARS OR 300 YEARS INDICATED DUE TO ANTICIPATED WATER LEVEL DECLINES. FURTHERMORE, THE WATER SUPPLY PLAN SHOULD NOT RELY SOLELY UPON NONRENEWABLE AQUIFERS, ALTERNATIVE RENEWABLE WATER RESOURCES SHOULD BE ACQUIRED AND INCORPORATED IN A PERMANENT WATER SUPPLY PLAN THAT PROVIDES FUTURE GENERATIONS WITH A WATER SUPPLY.

APPLICANTS, THEIR SUCCESSORS AND ASSIGNS, SHALL ADVISE THE POA AND ALL FUTURE OWNERS OF THESE LOTS OF ALL APPLICABLE REQUIREMENTS OF THE DECREES ENTERED IN CONSOLIDATED CASE NOS. 98 CW 250 (DIVISION 1) AND 98 CW 69 (DIVISION 2), AND THE NORTHGATE CONTRACT, AS WELL AS THEIR OBLIGATIONS TO COMPLY WITH THE DECREE AND CONTRACT, INCLUDING, BUT NOT LIMITED TO, COSTS OF OPERATING THE PLAN FOR AUGMENTATION WHICH MAY INCLUDE CONSTRUCTION AND PUMPING OF A LARAMIE-FOX HILLS AQUIFER WELL TO REPLACE POST-PUMPING DEPLETION'S, AND RESPONSIBILITY FOR METERING AND COLLECTING DATA REGARDING WATER WITHDRAWALS FROM WELLS, THERE SHALL BE A PLAT NOTE ADDED TO THIS EFFECT.

APPLICANT SHALL ASSIGN TO THE POA APPLICANTS INTERESTS, RIGHTS, AND OBLIGATIONS IN THE PLAN FOR AUGMENTATION AND THE NORTHGATE CONTRACT, AND CREATE RESTRICTIVE COVENANTS UPON AND RUNNING WITH THE PROPERTY WHICH SHALL OBLIGATE INDIVIDUAL LOT OWNERS AND THE POA TO CARRY OUT THE REQUIREMENTS OF THE NORTHGATE CONTRACT AND THE PLAN FOR AUGMENTATION. THIS ASSIGNMENT REQUIREMENT SHALL BE NOTED ON THE PLAT. SUCH ASSIGNMENT SHALL BE ACCOMPLISHED BY AN APPROPRIATE AGREEMENT AND ASSIGNMENT INSTRUMENT THAT SHALL BE REVIEWED AND APPROVED BY BOTH THE PLANNING DEPARTMENT AND THE COUNTY ATTORNEY'S OFFICE PRIOR TO RECORDING THE FINAL PLAT.

APPLICANT SHALL RESERVE IN ANY DEEDS OF THE PROPERTY 2,550 ACRE-FEET TOTAL OF ITS NON TRIBUTARY LARAMIE-FOX HILLS AQUIFER WATER AS DECREED IN CASE NOS. 98 CW 250 (DIVISION 1) AND 978 CW 69 (DIVISION 2), FOR USE IN THIS AUGMENTATION PLAN, AND APPLICANT SHALL CONVEY BY RECORDED DEED THESE RESERVED NON TRIBUTARY LARAMIE-FOX HILLS AQUIFER WATER RIGHTS TO THE POA FOR USE IN THE AUGMENTATION PLAN. A PLAT NOTE SHALL BE ADDED TO THIS EFFECT. APPLICANT SHALL PROVIDE COPIES OF SUCH RESERVATION AND CONVEYANCE INSTRUMENTS THAT SHALL BE REVIEWED AND APPROVED BY BOTH THE PLANNING DEPARTMENT AND THE COUNTY ATTORNEY'S OFFICE PRIOR TO RECORDING THE FINAL PLAT.

APPLICANT, ITS SUCCESSORS AND ASSIGNS, AT THE TIME OF LOT SALES, SHALL CONVEY TO INDIVIDUAL LOT OWNERS SUFFICIENT WATER RIGHTS IN THE DAWSON AQUIFER UNDERLYING EACH LOT TO SATISFY EL PASO COUNTY'S 300 YEAR WATER SUPPLY REQUIREMENT. THESE CONVEYANCE REQUIREMENTS SHALL BE ADDED AS A PLAT NOTE. IT IS ANTICIPATED THAT THESE CONVEYANCES WILL SATISFY THE STATE ENGINEER'S EVIDENTIARY REQUIREMENT THAT AN APPLICANT FOR AN INDIVIDUAL ON-LOT WELL HAS ACQUIRED THE RIGHT TO THE PORTION OF WATER BEING REQUESTED ON THE APPLICATION.



VICINITY MAP
NTS

EASEMENTS

THE FOLLOWING EASEMENTS SHALL APPLY TO THE EQUINE MEADOWS SUBDIVISION UNLESS OTHERWISE SHOWN ON THE PLAT DRAWINGS. ALL SIDE LOT LINES ARE HEREBY PLATTED WITH A 10 FOOT EASEMENT FOR UTILITY AND DRAINAGE PURPOSES. ALL FRONT AND REAR LOT LINES ARE HEREBY PLATTED WITH A 20 FOOT WIDE EASEMENT FOR DRAINAGE AND UTILITY PURPOSES. ALL UTILITY GUY WIRES THAT MAY EXTEND BEYOND THE ABOVE DESCRIBED EASEMENTS SHALL HAVE A 10 FOOT EASEMENT ON ALL SIDES OF THE GUY WIRE. ALL PRESERVATION EASEMENTS ARE ALSO DESIGNATED AS DRAINAGE EASEMENTS.

SURVEY NOTES

BEARINGS AS REFERRED TO HEREIN ARE RELATIVE TO THE WEST LINE OF THE W 1/2 OF THE SW 1/4 OF SECTION 18, TOWNSHIP 11 SOUTH, RANGE 66 WEST OF THE 6TH P.M., AS MONUMENTED AND SHOWN HEREON, BEARING OF N00°23'05"W.

ALL CORNERS SET WITH 1/2" REBAR AND SURVEYOR CAP MARKED L.S. NO. 17665 UNLESS OTHERWISE SHOWN.

THIS SURVEY DOES NOT CONSTITUTE A TITLE SEARCH BY M.V.E., INC. TO DETERMINE OWNERSHIP OF EASEMENTS OR RECORD. FOR ALL INFORMATION REGARDING EASEMENTS, RIGHT-OF-WAYS AND TITLE OF RECORD, M.V.E., INC. RELIED UPON TITLE INSURANCE POLICY NO. 117795 AS PREPARED BY, NORTH AMERICAN TITLE INSURANCE COMPANY AND DATED OCTOBER 8, 1997.

"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 CERTIFICATIONS SHOWN HEREON." (SECTION 13-80-105 C.R.S.)

SURVEYOR'S STATEMENT:

THE UNDERSIGNED REGISTERED LAND SURVEYOR IN THE STATE OF COLORADO HEREBY STATES THAT THE ACCOMPANYING PLAT WAS SURVEYED AND DRAWN UNDER HIS SUPERVISION AND ACCURATELY SHOWS THE DESCRIBED TRACT OF LAND AND SUBDIVISION THEREOF AND DECLARES THAT, IN HIS PROFESSIONAL OPINION THE REQUIREMENTS OF TITLE 38 OF THE COLORADO REVISED STATUTES 1973, AS AMENDED HAVE BEEN MET TO THE BEST OF HIS KNOWLEDGE AND BELIEF.

THIS 16th DAY OF FEBRUARY, 2001.

JOHN L. SWAYNE, P.L.S. 17665

COLORADO REGISTERED JOHN LORENZ SWAYNE 17665 L.S.

KNOW ALL MEN BY THESE PRESENTS:

THAT HARLEY G. JERGENSEN IS THE OWNER OF THE FOLLOWING DESCRIBED TRACT OF LAND, TO WIT:

THE WEST 1/2 OF THE SOUTHWEST 1/4 OF SECTION 18, TOWNSHIP 11 SOUTH, RANGE 65 WEST OF THE 6TH P.M., EXCEPT THE EASTERLY 60 FEET THEREOF CONVEYED TO EL PASO COUNTY BY DEED RECORDED APRIL 13, 1966 IN BOOK 2127 AT PAGE. 69, COUNTY OF EL PASO, STATE OF COLORADO, AND CONTAINING 93.6 ACRES MORE OR LESS.

DEDICATION:

THE ABOVE OWNER HAS CAUSED SAID TRACT OF LAND TO BE SURVEYED, AND PLATTED INTO STREETS LOTS, AND EASEMENTS, AS SHOWN ON THE ACCOMPANYING PLAT, WHICH PLAT IS DRAWN TO A FIXED SCALE AS INDICATED AND ACCURATELY SETS FORTH THE BOUNDARIES AND DIMENSIONS OF SAID TRACT AND THE LOCATION OF SAID EASEMENTS. ALL STREETS AS PLATTED ARE HEREBY DEDICATED TO PUBLIC USE AND SAID OWNER DOES HEREBY COVENANT AND AGREE THAT ALL PLATTED STREETS WILL BE CONSTRUCTED AND THAT PROPER DRAINAGE FOR THE SAME WILL BE PROVIDED AT THE OWNERS EXPENSE, ALL TO THE SATISFACTION OF THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO, AND UPON ACCEPTANCE BY RESOLUTION, ALL STREETS SO DEDICATED WILL BECOME MATTERS OF MAINTENANCE BY EL PASO COUNTY, COLORADO. THIS TRACT SO PLATTED SHALL BE KNOWN AS "EQUINE MEADOWS", EL PASO COUNTY, COLORADO.

IN WITNESS WHEREOF:

HARLEY G. JERGENSEN HAS EXECUTED HIS PRESENTS THIS 16th DAY OF February, 2001.

Harley G. Jergensen
HARLEY G. JERGENSEN

STATE OF COLORADO }
EL PASO COUNTY } SS

THE ABOVE AND FOREGOING STATEMENT WAS ACKNOWLEDGED BEFORE ME THIS 16th DAY OF February, 2001. BY HARLEY G. JERGENSEN.

WITNESS MY HAND AND OFFICIAL SEAL: Lynda Adams
NOTARY PUBLIC

MY COMMISSION EXPIRES: 05-05-02
DATE

LYNDA ADAMS NOTARY PUBLIC STATE OF COLORADO

APPROVALS:

APPROVED BY THE EL PASO COUNTY PLANNING DEPARTMENT THIS 23rd DAY OF March, 2001.

PLANNING DIRECTOR

APPROVED BY THE EL PASO COUNTY CHAIRMAN OF THE BOARD OF COUNTY COMMISSIONERS THIS 21ST DAY OF DECEMBER, 2000

CHAIRMAN OF BOARD

RECORDATION:

STATE OF COLORADO }
EL PASO COUNTY } SS

I HEREBY CERTIFY THAT THIS INSTRUMENT WAS FILED FOR RECORD IN MY OFFICE AT 3:29 O'CLOCK P.M. THIS 27th DAY OF MARCH, 2001, A.D. AND IS DULY RECORDED UNDER RECEPTION NO. 201036660 OF THE RECORDS OF EL PASO COUNTY, COLORADO.

J. PATRICK KELLY, RECORDER

FEE: 25.-

BY: [illegible]
DEPUTY

PARK FEE: $3,570.00
Regional / Urban

SCHOOL FEE: $5,236.00
DIST. 38

SHEET 1 OF 2 DISK NO. 1834

MVE (719) 635-5736

MONUMENT VALLEY ENGINEERS INC.
*** ENGINEERS *** SURVEYORS ***
1911 LELARAY ST., COLORADO SPRINGS, COLORADO 80909

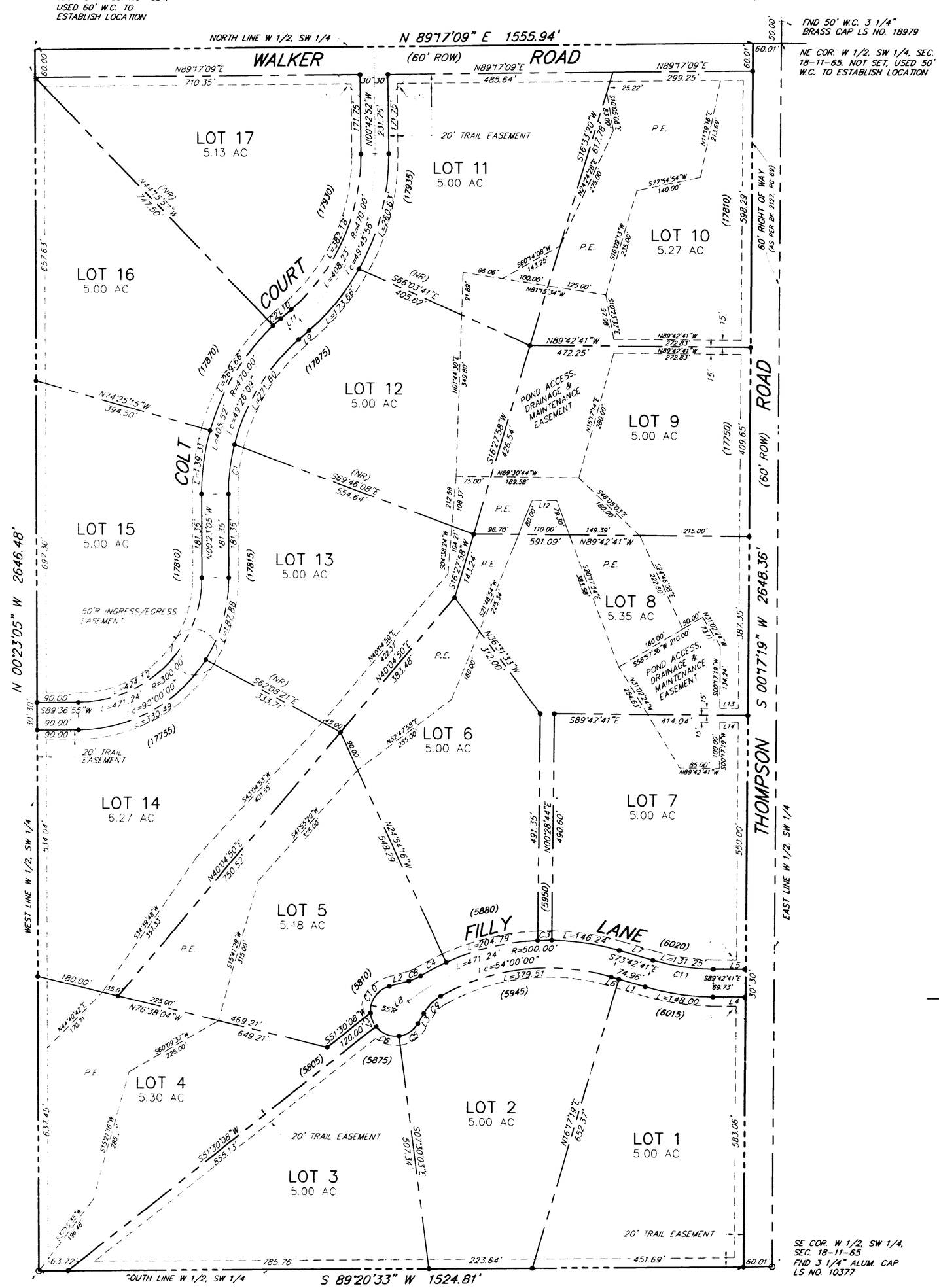
EQUINE MEADOWS

SCALE 1" = 100' DRAWN BY HAA DWG NO. 60635006
DATE 02-16-2001 CHECKED BY [illegible] JOB NO. 606.35

EQUINE MEADOWS

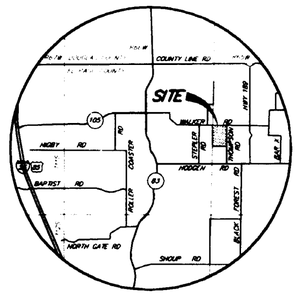
IN A PORTION OF THE W 1/2 OF THE SW 1/4 OF SECTION 18, T 11 S, R 65 W OF THE 6TH P.M., COUNTY OF EL PASO, STATE OF COLORADO

10853



LINE TABLE		
LINE	LENGTH	BEARING
L1	58.25	S73°42'41"E
L2	43.60	S74°48'07"W
L3	25.65	S29°46'31"W
L4	69.73	S89°42'41"E
L5	69.73	S89°42'41"E
L6	16.71	S73°42'41"E
L7	74.97	S73°42'41"E
L8	33.24	N52°17'19"E
L9	29.76	N49°03'04"E
L10	29.76	N49°03'04"E
L11	29.76	N49°03'04"E
L12	52.76	N89°30'44"W
L13	40.00	S89°42'41"E
L14	40.00	S89°42'41"E

CURVE TABLE			
CURVE	LENGTH	RADIUS	DELTA
C1	108.04	440.00	14°04'06"
C2	22.44	500.00	02°34'17"
C3	30.02	530.00	03°14'42"
C4	62.51	530.00	06°45'28"
C5	50.61	55.00	52°43'29"
C6	56.64	55.00	59°00'11"
C7	31.73	55.00	33°03'21"
C8	28.74	100.00	16°27'50"
C9	52.79	100.00	30°14'57"
C10	77.03	55.00	80°14'41"
C11	139.63	500.00	16°00'00"



VICINITY MAP
NTS

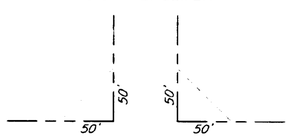
NORTH

SCALE

150' 100' 50' 0 75' 150' 300'

1" = 150' 1:1800

SIGHT EASEMENT



DISTANCES ARE ALONG LOT LINES (CURVED OR TANGENT) NO OBSTRUCTION GREATER THAN 18" IN HEIGHT

TYPE · EASEMENT

SHEET 2 OF 2 DISK NO. 2001

MONUMENT VALLEY ENGINEERS INC.
*** ENGINEERS *** SURVEYORS ***
(719) 635-5736
1911 LE..ARAY ST., COLORADO SPRINGS, COLORADO 80909

EQUINE MEADOWS

SCALE 1" = 150' DRAWN BY BDK DWG. NO. 60635007

DATE 02-16-2001 CHECKED BY CCR JOB NO. 60635

EQUINE MEADOWS
FINAL DRAINAGE &
EROSION CONTROL REPORT

November 16, 2000
Project No. 60635

PREPARED FOR:

Harley G. Jergensen
%
Land Resources Associates
9736 Mountain Road
Chipita Park, CO 80809
(719) 684-2298

PREPARED BY:

M.V.E., Inc.
1903 Lelaray Street, Suite 200
Colorado Springs, CO 80909
(719) 635-5736

60635pdr.wpd-d94

STATEMENTS AND ACKNOWLEDGMENTS

ENGINEER STATEMENT:

This Final Drainage Report for the Equine Meadows was prepared:

1.) under my direction and supervision,

2.) in accordance with the criteria as established by El Paso County for drainage studies and reports,

3.) is correct to the best of my knowledge and belief,

4.) and I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Charles C. Crum, P.E. 11-16-00

Charles C. Crum, P.E. Colorado No. 13348 Date

APPROVAL:

The owner, Harley G. Jergensen, has read and will comply with all the requirements specified in this final drainage report and plan.

By: Harley G Jergensen 11-28-00

Harley G. Jergensen, Owner Date

ACKNOWLEDGMENT:

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

John A. McCarty 12-6-00

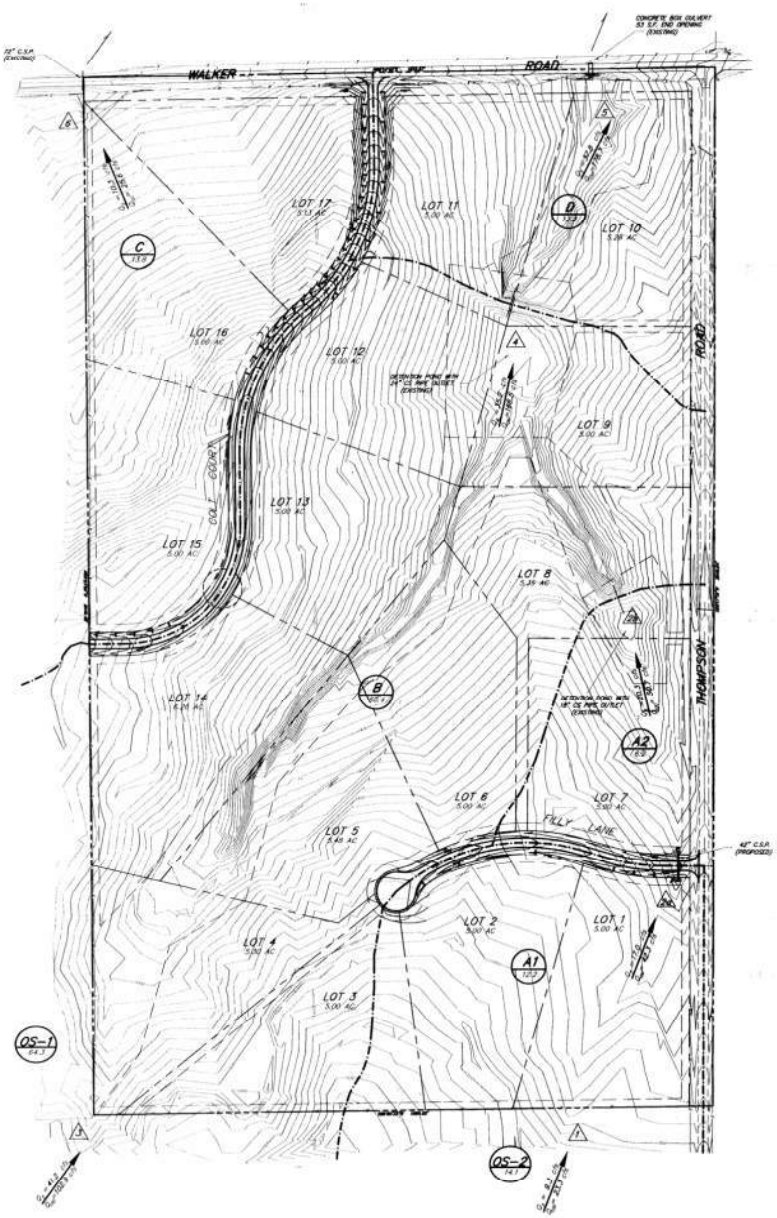
John A. McCarty, P.E. Date
Director / County Engineer

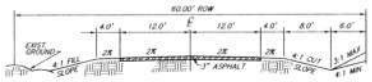
same as Historic except Basin A. Design points have also been numbered on the plan for ease of reference. The basin sizes and estimated peak water runoff flows from the developed basins are also shown within this report. The proposed culvert has been located and sized. Culverts are shown on the Drainage Map. The existing detention ponds, which tend to not retain runoff for extended periods of time will remain. These detention ponds have been ignored in the calculation of storm runoff from the site. The ponds will remain part of the development. No improvements will be provided for these ponds. The Property Owners Association (POA) will provide upkeep and maintenance for these existing ponds. Easement storm runoff flows as calculated are more conservative as provided in this report by ignoring the detention ponds.

Proposed roads will be constructed with ditches 2.0 feet in depth. The ditch side slope adjacent to the road will be 4:1, while the other side slope will vary with a maximum of 3:1 in most locations. Concrete ditch checks are required to be placed to prevent erosion of proposed ditches. Road grades of final design allow different amounts of flow in the proposed ditches. Calculations for ditch checks are included for your pursual.

The roads and lots have been configured to create as little disruption to the natural drainage patterns as possible. Therefore, the basic drainage patterns will remain the same as the existing. Natural drainage ways will be utilized as much as possible and preservation/drainage easements have been shown on the final plat to preserve said natural drainage ways. Drainage pond maintenance, and access easements have also been shown on the final plat. The northern cul-de-sac runs along an existing ridge line and will allow final road design to utilize a no road ditch scenario.

The culvert to be placed beneath the proposed road will have flared end sections on both ends or acceptable substitutes per the construction plans. Culvert size is designed to meet County criteria for both 5-year and 100-year discharges. The stream and ditch bottom adjacent to the culvert exit will be lined with a short rip-rap apron. The road embankment around the culvert inlet will also have rip-rap protection. Driveway culverts are to be placed by the individual lot owners and be minimum 18" in diameter. The County Standard roadside ditches accommodate such culverts. The southern cul-de-sac will only have a ditch on the south side to direct a small portion of the 100-year 42.3 cubic feet per second (cfs) to the proposed 42" CSP at Design Point (D.P.) 2a. (D.P.) 2a accepts





TYPICAL ROAD SECTION



VICINITY MAP

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- DRAINAGE BASIN BOUNDARY LINE
- E — 0.40 — DRAINAGE BASIN DESIGNATION / DRAINAGE BASIN AREA
- 18" CSP — PROPOSED CULVERT PIPE
- 1 — DESIGN POINT DESIGNATION
- FLOW DIRECTION ARROW
- $Q_5 = 10.8$ cfs, $Q_{100} = 21.9$ cfs — FLOW DIRECTION AND QUANTITIES

NORTH

NOTES

1. INDIVIDUAL LOT OWNERS WILL BE RESPONSIBLE FOR CONSTRUCTING POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES.
2. INDIVIDUAL LOT OWNERS WILL BE RESPONSIBLE FOR PLACING DRIVEWAY CULVERTS. EL PASO COUNTY D.O.T. SHOULD BE CONTACTED FOR CULVERT SIZING AND LOCATION. MINIMUM DRIVEWAY CULVERTS SIZE SHALL BE 18" DIAMETER.
3. PUBLIC UTILITY AND DRAINAGE EASEMENTS AS SHOWN ON THE SUBDIVISION PLAT FOR EQUINE MEADOWS ARE 20' WIDE ON ALL FRONT AND REAR LOT LINES, 10' WIDE ON ALL SIDE LOT LINES UNLESS OTHERWISE SHOWN.
4. SEE OFFSITE DRAINAGE BASIN MAP FOR OFFSITE BASINS (OS___).

SCALE

1" = 150' 1:1800

DEVELOPED HYDROLOGIC DATA TABLE

DESIGN POINT	INCL. BASINS	AREA (ac)	Q_5 (cfs)	Q_{100} (cfs)	STRUCTURE TYPE AND SIZE
1	OS-2	14.1	9.3	23.3	----
2	OS-2, A1	26.3	17.0	42.3	42"
2A	OS-2, A1, A2	32.7	20.3	50.7	----
3	OS-1	64.3	41.2	102.9	----
4	OS-1 & 2, A1 & 2, B	114.7	35.2	166.5	----
5	OS-1 & 2, A1 & 2, B, D	160.7	57.8	178.7	CBC 539' EXIST
6	C	15.8	10.3	25.8	72" --EXIST

PROJECT: EQUINE MEADOWS

TITLE: DEVELOPED DRAINAGE MAP

MONUMENT VALLEY ENGINEERS INC.
ENGINEERS • SURVEYORS
1911 ELARA STREET
COLORADO SPRINGS, COLO. 80909
PHONE (719) 635-5736

PROJ. NO. 60635
DRAWN: BDK
ENGINEER: DDC
CHECKED: DDC
SCALE: 1" = 150'
DATE: 11-11-00
REVISIONS:

NO.	DATE:	ITEM

SHEET 1 OF 1

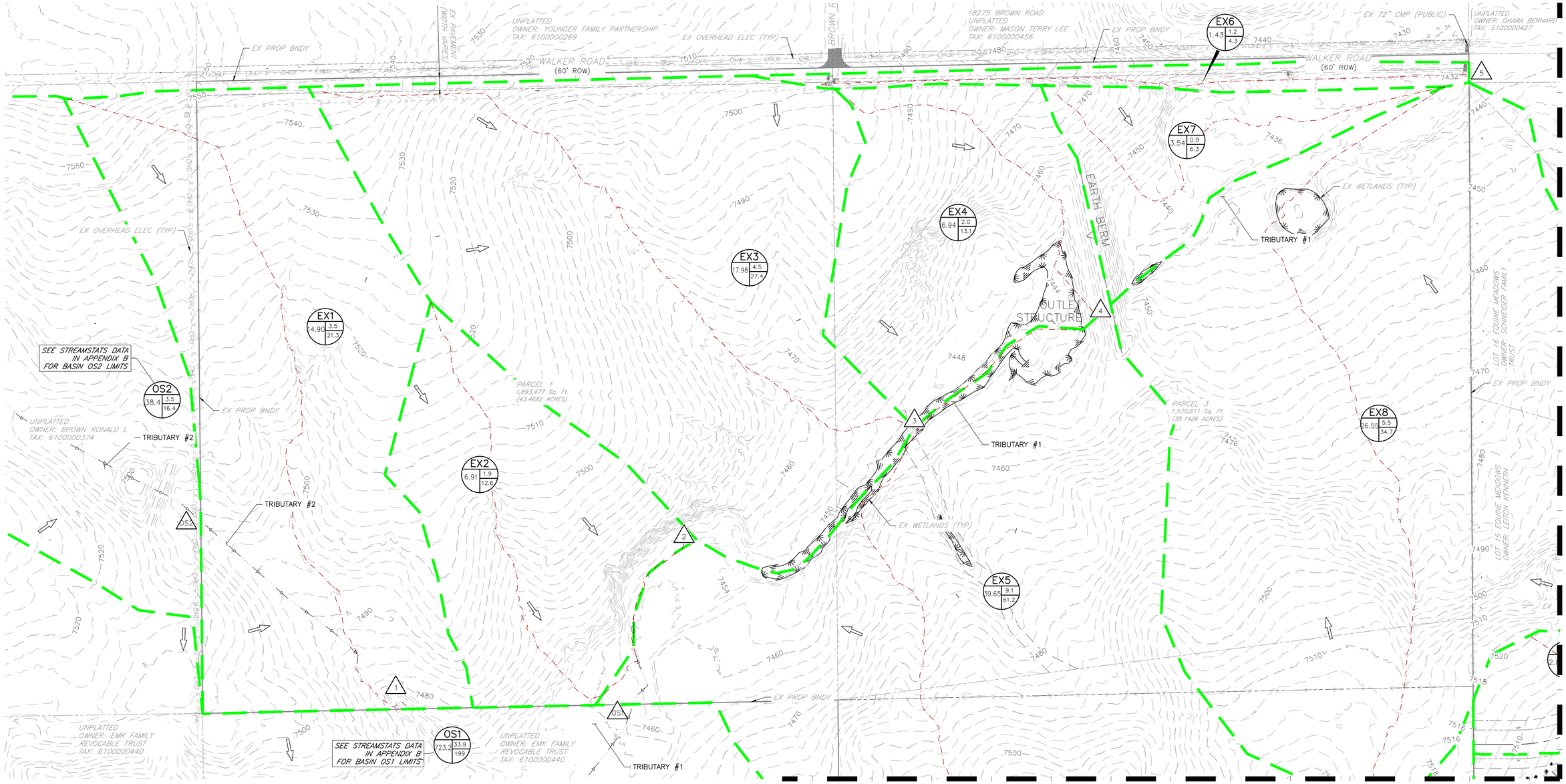
DRAWING NO. 60635002

DESK NO. 1836

APPENDIX F – DRAINAGE MAPS

IRON RIDGE SUBDIVISION

EXISTING DRAINAGE MAP



EXISTING CONDITIONS - BASIN SUMMARY TABLE

Sub-basin	Area (ac)	Impervious	C_5	C_{100}	t_c (min)	$Q_{5\text{-YR}}$ (cfs)	$Q_{100\text{-YR}}$ (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	14.6%	0.18	0.43	12.2	1.9	7.9
EX12	0.89	16.7%	0.20	0.44	11.0	0.7	2.6

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	3.5	21.3
2	3.9	24.4
3	11.6	74.4
4	12.5	80.8
5 (ONSITE)	14.0	89.0
5 (TOTAL)	48.7	291.5
6	2.7	18.4
7 (ONSITE)	3.6	20.5
7 (TOTAL)	7.9	40.9

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

TC PATH

N

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

EXISTING DRAINAGE MAP

IRON RIDGE SUBDIVISION

JOB NO. 25009 | SHEET 1

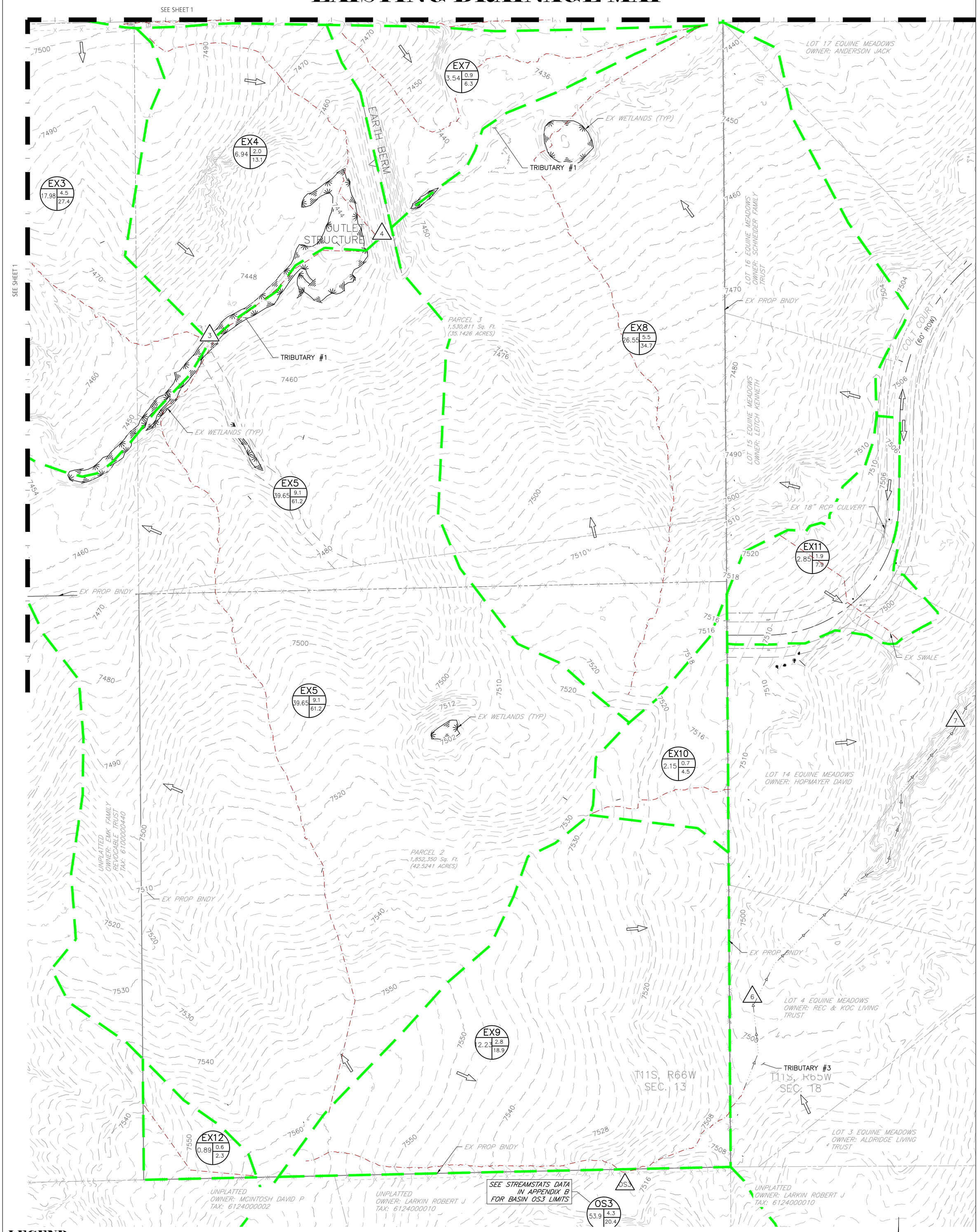
LOCATION: EPC

10/26/2026

ALL TERRAIN ENGINEERING

IRON RIDGE SUBDIVISION

EXISTING 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		
TC PATH		

EXISTING CONDITIONS - BASIN SUMMARY TABLE

Sub-basin	Area (ac)	Impervious	C_5	C_{100}	t_c (min)	$Q_{5\text{-YR}}$ (cfs)	$Q_{100\text{-YR}}$ (cfs)
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4
EX1	14.90	3.4%	0.10	0.37	33.7	3.5	21.3
EX2	6.91	2.0%	0.09	0.36	21.1	1.9	12.6
EX3	17.98	3.4%	0.10	0.37	30.3	4.5	27.4
EX4	6.94	2.0%	0.09	0.36	19.5	2.0	13.1
EX5	39.65	2.0%	0.09	0.36	28.5	9.1	61.2
EX6	1.43	22.2%	0.22	0.45	11.1	1.2	4.3
EX7	3.54	2.0%	0.09	0.36	21.7	0.9	6.3
EX8	26.55	3.4%	0.10	0.37	38.3	5.5	34.7
EX9	12.23	2.0%	0.09	0.36	30.0	2.7	18.4
EX10	2.15	2.0%	0.09	0.36	15.9	0.7	4.5
EX11	2.85	14.6%	0.18	0.43	12.2	1.9	7.9
EX12	0.89	16.7%	0.20	0.44	11.0	0.7	2.6

EXISTING CONDITIONS - DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	3.5	21.3
2	3.9	24.4
3	11.6	74.4
4	12.5	80.8
5 (ONSITE)	14.0	89.0
5 (TOTAL)	48.7	291.5
6	2.7	18.4
7 (ONSITE)	3.6	20.5
7 (TOTAL)	7.9	40.9

N

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

EXISTING DRAINAGE MAP

IRON RIDGE SUBDIVISION

JOB NO. 25009 | SHEET 2

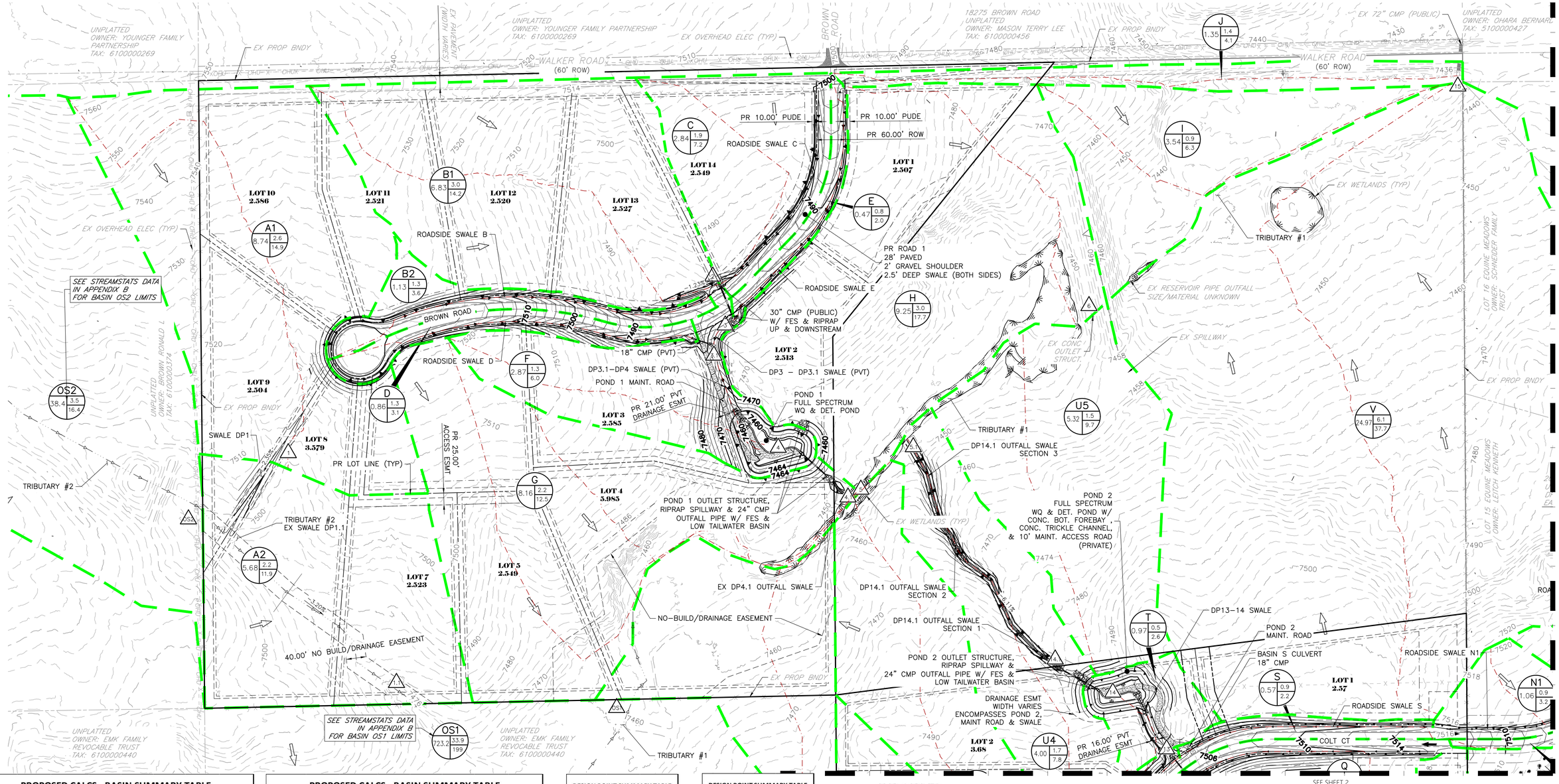
LOCATION: EPC

10/26/2026

ALL TERRAIN ENGINEERING

IRON RIDGE SUBDIVISION

PROPOSED DRAINAGE MAP



PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.06	18.6%	0.22	0.46	11.4	0.9	3.2
N2	1.25	18.1%	0.21	0.46	10.7	1.1	3.8

PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
O1	0.56	25.1%	0.26	0.49	13.8	0.5	1.7
O2	0.15	68.1%	0.62	0.75	5.0	0.5	1.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	2.6	14.9
1.1	5.8	29.1
2	5.9	23.7
3	6.4	25.1
3.1	7.4	27.2
4	8.4	32.2
4.1	0.1	23.9
5	8.4	64.5
5.1	8.5	0.0
6	9.5	76.3
7	5.4	26.6
7.1	2.2	12.6

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
8	0.9	5.0
9	1.9	7.0
10	2.3	8.1
11 (ONSITE)	4.1	20.4
11 (TOTAL)	8.4	40.8
12	2.9	14.8
13	4.7	21.5
14	4.8	22.7
14.1	0.1	14.4
15 (ONSITE)	11.6	85.3
15 (TOTAL)	46.3	287.7

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		
TC PATH		

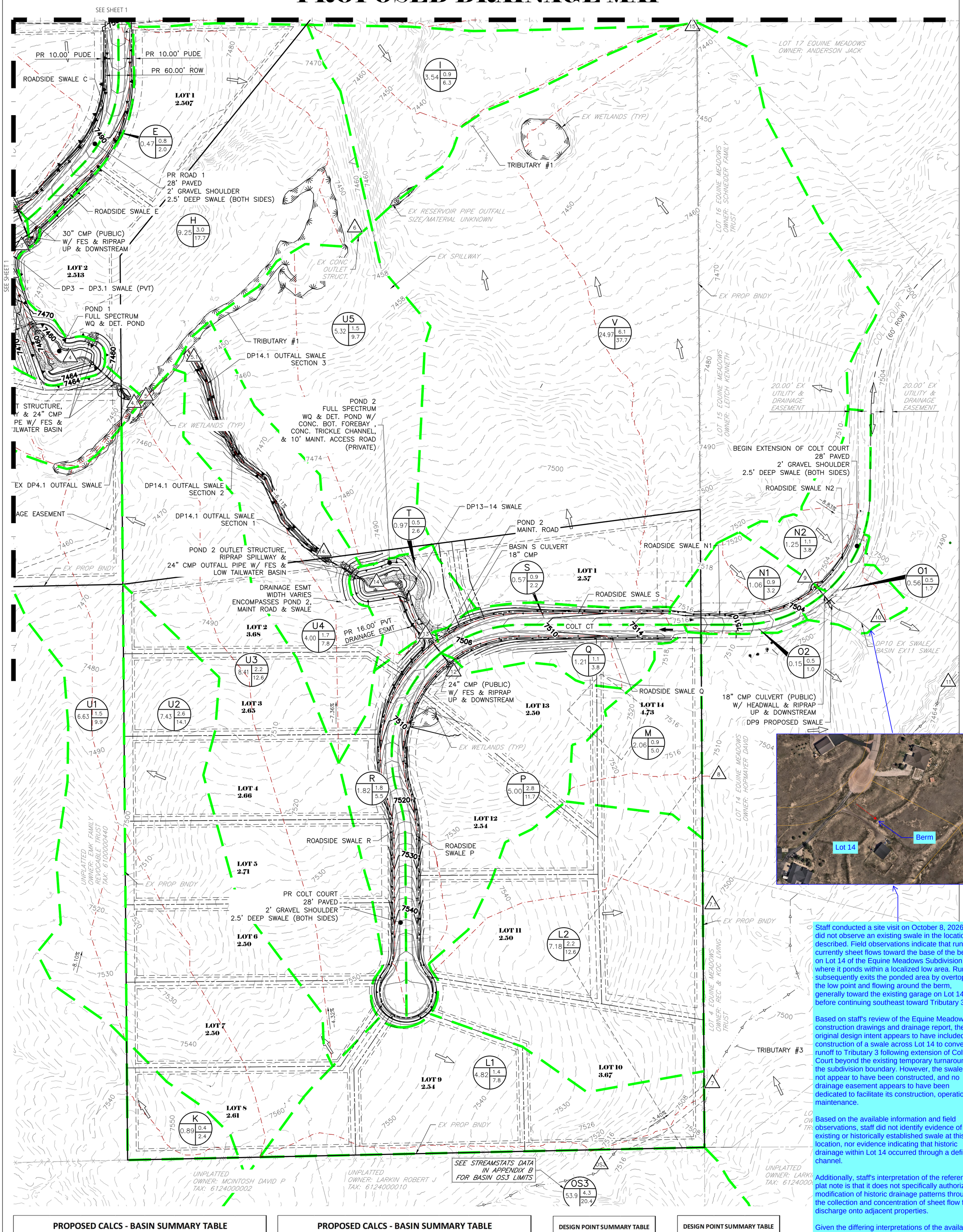
ORIGINAL SCALE: 1" = 100'

PROPOSED DRAINAGE MAP	
IRON RIDGE SUBDIVISION	
JOB NO. 25009	SHEET 1
LOCATION: EPC	
10/26/2026	

ALL TERRAIN ENGINEERING

IRON RIDGE SUBDIVISION

PROPOSED DRAINAGE MAP



Staff conducted a site visit on October 8, 2026, and did not observe an existing swale in the location described. Field observations indicate that runoff currently sheet flows toward the base of the berm on Lot 14 of the Equine Meadows Subdivision, where it ponds within a localized low area. Runoff subsequently exits the ponded area by overtopping the low point and flowing around the berm, generally toward the existing garage on Lot 14, before continuing southeast toward Tributary 3.

Based on staff's review of the Equine Meadows construction drawings and drainage report, the original design intent appears to have included construction of a swale across Lot 14 to convey runoff to Tributary 3 following extension of Colt Court beyond the existing temporary turnaround to the subdivision boundary. However, the swale does not appear to have been constructed, and no drainage easement appears to have been dedicated to facilitate its construction, operation, or maintenance.

Based on the available information and field observations, staff did not identify evidence of an existing or historically established swale at this location, nor evidence indicating that historic drainage within Lot 14 occurred through a defined channel.

Additionally, staff's interpretation of the referenced plat note is that it does not specifically authorize modification of historic drainage patterns through the collection and concentration of sheet flow for discharge onto adjacent properties.

Given the differing interpretations of the available information, staff recommends a meeting to discuss site conditions and identify a path forward.

PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	8.74	3.8%	0.11	0.37	25.4	2.6	14.9
A2	5.68	7.0%	0.12	0.39	18.5	2.2	11.9
B1	6.83	9.9%	0.14	0.41	20.7	3.0	14.2
B2	1.13	32.3%	0.34	0.55	15.9	1.3	3.6
C	2.84	16.2%	0.20	0.45	16.4	1.9	7.2
D	0.86	41.9%	0.42	0.60	14.6	1.3	3.1
E	0.47	42.7%	0.43	0.60	9.5	0.8	2.0
F	2.87	4.3%	0.14	0.41	20.4	1.3	6.0
G	8.15	5.5%	0.11	0.38	31.7	2.2	12.5
H	9.25	3.1%	0.10	0.37	19.9	3.0	17.7
I	3.54	2.0%	0.09	0.36	21.8	0.9	6.3
J	1.35	27.1%	0.30	0.51	14.9	1.4	4.1
K	0.89	7.0%	0.12	0.39	9.6	0.4	2.4
L1	4.82	6.4%	0.12	0.39	29.5	1.4	7.8
L2	7.18	4.1%	0.11	0.37	24.3	2.2	12.6
M	2.06	6.9%	0.12	0.39	13.3	0.9	5.0
N1	1.06	18.6%	0.22	0.46	11.4	0.9	3.2
N2	1.25	18.1%	0.21	0.46	10.7	1.1	3.8

PROPOSED CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
O1	0.56	25.1%	0.26	0.49	13.8	0.5	1.7
O2	0.15	68.1%	0.62	0.75	5.0	0.5	1.0
P	5.00	13.2%	0.17	0.43	17.8	2.8	11.7
Q	1.21	21.1%	0.24	0.47	11.7	1.1	3.8
R	1.82	24.8%	0.27	0.50	14.3	1.8	5.5
S	0.57	36.8%	0.37	0.57	9.8	0.9	2.2
T	0.97	5.2%	0.12	0.37	9.5	0.5	2.6
U1	6.63	0.0%	0.09	0.35	28.7	1.5	9.9
U2	7.43	7.0%	0.12	0.39	22.7	2.6	14.1
U3	8.41	5.2%	0.11	0.38	32.7	2.2	12.6
U4	4.00	0.8%	0.09	0.35	17.7	1.2	7.8
U5	5.31	0.0%	0.09	0.35	19.8	1.5	9.7
V	24.97	3.9%	0.10	0.37	31.2	6.1	37.7
OS1	723.20	-	-	-	129.0	33.9	199.0
OS2	38.40	-	-	-	62.4	3.5	16.4
OS3	53.90	-	-	-	41.4	4.3	20.4

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
OS1	34.6	202.5
OS2	3.5	16.4
OS3	4.3	20.4
1	2.6	14.9
1.1	5.8	29.1
2	5.9	23.7
3	6.4	25.1
3.1	7.4	27.2
4	8.4	32.2
4.1	0.1	23.9
5	8.4	64.5
5.1	8.5	0.0
6	9.5	76.3
7	5.4	26.6
7.1	2.2	12.6

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
8	0.9	5.0
9	1.9	7.0
10	2.3	8.1
11 (ONSITE)	4.1	20.4
11 (TOTAL)	8.4	40.8
12	2.9	14.8
13	4.7	21.5
14	4.8	22.7
14.1	0.1	14.4
15 (ONSITE)	11.6	85.3
15 (TOTAL)	46.3	287.7

100 50 0 100 200

ORIGINAL SCALE: 1" = 100'

PROPOSED DRAINAGE MAP

IRON RIDGE SUBDIVISION

JOB NO. 25009 | SHEET 2

LOCATION: EPC

10/26/2026

ALL TERRAIN ENGINEERING

V3_Drainage Report - Final.pdf Markup Summary

Laura Besler (24)



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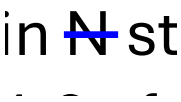
Please refer to comment provided on Proposed Drainage Map for Filing 2 at the end of this report.



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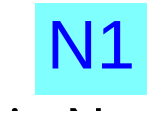

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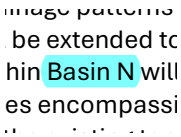

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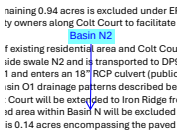
Basin N



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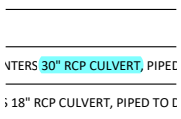
Basin N2



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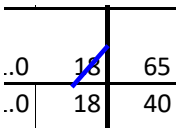
30" RCP CULVERT



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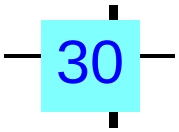

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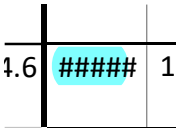

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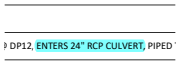

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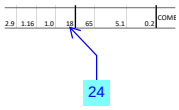
ENTERS 24" RCP CULVERT



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Page Label: 40
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Date: 11/13/2026 4:11:27 PM
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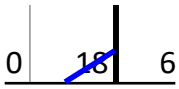
24



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Date: 11/13/2026 4:11:31 PM
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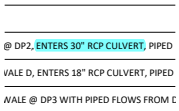

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Page Label: 42
Author: Laura Besler
Date: 11/13/2026 3:01:15 PM
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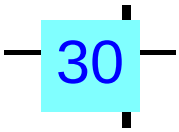
ENTERS 30" RCP CULVERT



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Page Label: 42
Author: Laura Besler
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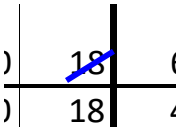

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Date: 11/13/2026 3:02:30 PM
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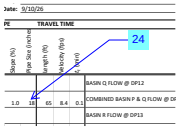

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Author: Laura Besler
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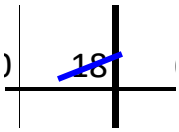
24



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Page Label: 45
Author: Laura Besler
Date: 11/13/2026 4:12:45 PM
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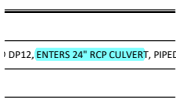

Subject: Highlight
Page Label: 45
Author: Laura Besler
Date: 11/13/2026 4:12:52 PM
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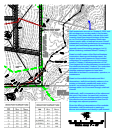
ENTERS 24" RCP CULVER



Subject: Callout
Page Label: [1] Pr Drainage Map (2)
Author: Laura Besler
Date: 11/16/2026 10:14:15 AM
Status:
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Staff conducted a site visit on October 8, 2026, and did not observe an existing swale in the location described. Field observations indicate that runoff currently sheet flows toward the base of the berm on Lot 14 of the Equine Meadows Subdivision, where it ponds within a localized low area. Runoff subsequently exits the ponded area by overtopping the low point and flowing around the berm, generally toward the existing garage on Lot 14, before continuing southeast toward Tributary 3.

Based on staff's review of the Equine Meadows construction drawings and drainage report, the original design intent appears to have included construction of a swale across Lot 14 to convey runoff to Tributary 3 following extension of Colt Court beyond the existing temporary turnaround to the subdivision boundary. However, the swale does not appear to have been constructed, and no drainage easement appears to have been dedicated to facilitate its construction, operation, or maintenance.

Based on the available information and field observations, staff did not identify evidence of an existing or historically established swale at this location, nor evidence indicating that historic drainage within Lot 14 occurred through a defined channel.

Additionally, staff's interpretation of the referenced plat note is that it does not specifically authorize modification of historic drainage patterns through the collection and concentration of sheet flow for discharge onto adjacent properties.

Given the differing interpretations of the available information, staff recommends a meeting to discuss site conditions and identify a path forward.



Subject: Image
Page Label: [1] Pr Drainage Map (2)
Author: Laura Besler
Date: 11/13/2026 10:55:14 AM
Status:
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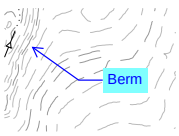
Space:



Subject: Callout
Page Label: [1] Pr Drainage Map (2)
Author: Laura Besler
Date: 11/13/2026 10:55:00 AM
Status:
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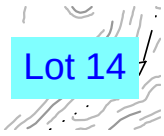
Berm



Subject: Callout
Page Label: [1] Pr Drainage Map (2)
Author: Laura Besler
Date: 11/13/2026 10:54:46 AM
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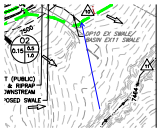
Lot 14



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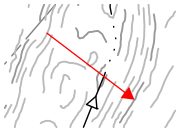

Subject: Arrow
Page Label: [1] Pr Drainage Map (2)
Author: Laura Besler
Date: 11/13/2026 10:54:52 AM
Status:
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